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Pivex Smart Grid Black Sea Entso-e, Standardisation Mandate, Pivex Black Sea Technology Clusters Pivex Danube, Black Sea, Mediterranean Networks Synergy, Pivex Strategic Project for the interest of EU

Adhesion /Representation Request By Pivex Danube Black Sea Association Unique Fiscal Nr. 29747242 representing Danube, Black Sea, Mediterranean Smart City Networks Synergy Pivex Adhesion Pivex Cities Convenant, Pivex Smart Grid Smart City Synergy Investments, Black Sea, Danube, Mediterranean, Pivex Oil Gaz Energy Infrastructure Integrated Investments Synergy

CHAPTER 1 Political commitment, EU Policy and Regulation, Pivex Smart Grid Priority, Building support from stakeholders, Assessment of the current framework

CHAPTER 2 Black Sea Regional Investments Synergy & Prosperity achieved with Pivex Integrated Sustainable Investments Energy Pivex SIE Black Sea Objectives and Targets, Pivex Smart Grids

CHAPTER 3 Pivex Integrated Black Sea Monitoring Rewarding Securing Europe’s Energy Infrastructure

CHAPTER 4 Establishment of Pivex long-term vision with clear objectives, corelated with policies & measures applicable to the Pivex Integrated Sustainable investments SIE Pivex Black Sea The vision: towards Pivex Smart Grid sustainable energy future, Setting objectives and targets

CHAPTER 5 Pivex Smart Grid Standardization Mandate
CHAPTER 1 Political commitment, EU Policy and Regulation, Pivex Smart Grid Priority, Building support from stakeholders, Assessment of the current framework

THE IMPORTANCE TO DEVELOP PIVEX SMART GRID BLACK SEA;
Eastern Partnership Central Asia Supervision Center, Black Sea Ring, Connexion Ring Mediterranean
Pivex Harmonised Solution Black Sea Mediterranean, fullfills the requirenments of EU Directives, and the good security indicators of Energy Infrastructure.

The EU pays the price for its outdated and poorly interconnected energy infrastructure.
In January 2009, solutions to the gas disruptions in Eastern Europe were hindered by a lack of reverse flow options and inadequate interconnection and storage infrastructures. Rapid development of offshore wind electricity generation in the North and Baltic Sea regions is hampered by insufficient grid connections both off- and onshore. Developing the huge renewables potential in Southern Europe and North Africa will be impossible without additional interconnections within the EU and with neighbouring countries. The risk and cost of disruptions and wastage will become much higher unless the EU invests as a matter of urgency in smart, effective and competitive energy networks, and exploits its potential for energy efficiency improvements.

Member States shall ensure the possibility, in the interests of security of supply, of providing for new capacity or energy efficiency.
Pivex Energy Municipality, Black Sea Eastern Partnership members cities, private public partnerships, Pivex Smart Grid, Smart City, fulfill the requirements of EU Directives, being the solution for boosting interconexions, in the Eastern Europe, Black Sea, outdated and poorly interconnected energy infrastructure.

DIRECTIVE 2009/72/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC (Text with EEA relevance)

demand-side management measures through a tendering procedure or any procedure equivalent in terms of transparency and non-discrimination, PIVEX Energy Municipality, Supporting Structure European Commission, open, transparent stakeholders involvements, respecting transparency indicators, on the basis of published criteria. www.eumayors.eu, www.eusew.eu. Those procedures may, however, be launched only where, on the basis of the authorisation procedure, the generating capacity to rebuilt or the energy efficiency/demand-side management measures to be taken are insufficient to ensure security of supply.

Member States may ensure the possibility, in the interests of environmental protection and the promotion of infant new technologies, of tendering for new capacity on the basis of published criteria. Such tendering may relate to new capacity or to energyefficiency/demand-side management measures. A tendering procedure may, however, be launched only where, on the basis of theauthorisation procedure the generating capacity to be built or themeasures to be taken, are insufficient to achieve those objectives.

Smart Grids Task Force Expert Group 4 – Infrastructure Development
DEFINITION OF AN ASSESSMENT FRAMEWORK FOR PROJECTS OF COMMON INTEREST IN THE FIELD OF SMART GRIDS

PIVEX Smart Grid priority
The draft Regulation identifies “Smart Grids deployment” among the proposed 12 priorities, with the objective to adopt Smart Grid technologies across the Union to efficiently integrate the behaviour and actions of entire users connected to the electricity network, in particular the generation of large amounts of electricity from renewable or distributed energy sources and demand response by consumers.

Smart Grid definition


Pivex Smart Energy Networks Investments Synergy
Pivex Smart Grid is a network efficiently integrating the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure an economically efficient, sustainable electricity system with low losses and high quality and security of supply and safety” [Proposal for a Regulation on Guidelines for trans-European energy infrastructures, Annex II – Energy Infrastructure categories]. The draft Regulation considers as Smart Grid infrastructure “any equipment or installation, both at transmission and medium voltage distribution level, aiming at two way digital communication, real-time or close to real-time, interactive and intelligent monitoring and management of electricity generation, transmission

EUROPEAN TASK FORCE FOR THE IMPLEMENTATION OF SMART GRIDS INTO THE EUROPEAN INTERNAL MARKET

The mission of the Smart Grids Task Force (SGTF) is to advise the Commission on policy and regulatory frameworks at European level to co-ordinate the first steps towards the implementation of Smart Grids under the provision of the Third Energy Package and to assist the Commission in identifying projects of common interest in the field of Smart Grids under the context of regulations on guidelines for Trans-European Infrastructure (COM (2011)658) 1.

The Smart Grids Task Force was reactivated in 01/02/2012 and four Expert Groups were launched2. This report has been developed and adopted by the Expert Group for Smart Grid Infrastructure Deployment

Pives Energy Municipality will be responsible for the organisation, monitoring and control of the integrated PIVEX SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Black Sea tendering procedure Where transmission system operator is fully independent from other activities not relating to the transmission system in ownership terms, the transmission system operator may be designated as the body responsible for organising, monitoring and controlling the tendering procedure. That authority or body shall take the necessary steps to ensure confidentiality of the information contained in the tenders.
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Pivex Class Configuration Contextual Model Danube, Black Sea, Mediterranean, Arab, Africa, Asia Networks, Pivex Integrated Harmonised Metrics

http://www.pivexplatformblacksea.eu/Documents/Pivex_SmartEnergyNetworksInvestmentsSynergy20230510.pdf
PIVEX SMART GRID INVESTMENTS SYNERGY DANUBE BLACK SEA MEDITERRANEAN

Pivex Class Transmission Network Contextual Model Danube, Black Sea, Mediterranean, Arab, Africa, Asia Networks, Pivex Integrated Harmonised Metrics
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Pivex Class Balancing Contextual Model

class Balancing contextual model

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NC LFC&R: Entso-e Pivex Smart Grid Black Sea
Mediterranean, Arab, Africa Metrics Partnership

- Determine required volumes and distribution of reserves to ensure operational security
  - Dimensioning of reserves.
  - Technical limits for exchange, sharing and cross-border activation of reserves.

- Technical requirements to ensure safe exchange/sharing/cross-border activation of reserves
  - Need for available transmission capacity.
  - Fall-back solutions.

EB NC: Entso-e Pivex Smart Grid Black Sea
Mediterranean, Arab, Africa Metrics Partnership

- Provision of required reserve volumes (within the limits for distribution set by NC LFC&R)
- Optimised activation of reserves (energy) available in the system.
- Mechanisms to ensure the available transmission capacity for exchange/sharing/cross-border activation of reserves.
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Figure 6: Example of the Activation Model
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Figure 8: Detailed description of process of nomination of Cross Zonal Capacity for specific week;
Example of the Activation Model
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>National TSOs collect reserve bids from national BSPs</td>
</tr>
<tr>
<td>2</td>
<td>TSOs submit bids and local reserve needs to common platform</td>
</tr>
<tr>
<td>3</td>
<td>Reserve Procurement Optimisation Function calculate cross border capacity value (willingness to pay based on spread between reserve bids)</td>
</tr>
</tbody>
</table>
| 4    | Left arrow: submit value of use of transmission capacity for Exchange of Balancing Reserves from Optimisation function to Cost-Benefit Analysis  
Right arrow: collect prices and other indicators of price differences in "ordinary" energy market (must be public prices / transparent data) |
| 5    | Left arrow: Results of algorithm back to Activation Optimisation Function, how many MW Cross Zonal Capacity will be reserved for Exchange of Balancing Services by nominating preliminary reserved capacity  
Right arrow: Broadcast Cross Zonal Capacity reservation results to market |
| 6    | Transfer of "clearing results" of Balancing Reserve Bids to national TSOs. |
| 7    | Contract between TSO and BSP for Exchange of Balancing Reserves (where connecting TSO contracts exchanged volumes nationally in addition to national obligation. Receiving TSO contracts nationally with TSOs less than national obligation) |
 Explicit co-optimisation – XB allocation request by TSO based on reserve prices knowledge

1. Submission of reserve bids (volumes and prices)
2. TSOs X8 Capacity bids
3. Creating XB capacity bid curve
4. X8 Capacity bids
5. Capacity allocation
6. Contract with selected BSP
7. BSP

TSOs submit bids and local reserve needs to common platform (interim phase with margins)
Create balancing XB bid curve and calculate XB capacity value (willingness to pay)

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TSOs may cooperate with different TSOs in CoBAs for different products

Concept allows for early cooperation due to its flexibility.

Obligation for cooperation in CoBAs fosters integration.
Integration of CoBAs allows for reaching the FWGL targets.

Coordinated Balancing Area

Coordinated Balancing Area

Coordinated Balancing Area

Coordinated Balancing Area

Coordinated Balancing Area

Enso-e Partnership Pivex Smart Grid Black Sea Mediterranean, Arab, Africa Metric

e.g. FWGL target of a single pan-European CMO for the activation of RR energy

Coordinated Balancing Area = Target

Coordinated Balancing Area

Coordinated Balancing Area

TSO1

TSO2

TSO3

TSO4

TSOx

TSOy

TSOz

CoBAs serve as intermediary steps and vehicles to reach the FWGL targets.
1- Procurement
2- Transfer of Obligations

- Competition
- Non discriminatory
- Shorter timeframes
- TSOs shall be informed

Transfer of Obligations of Balancing Reserves takes into account:
1. Limits for procurement from other area
2. Value of the Cross Zonal Capacity
3. Fulfilment with qualification process

Coordinated Balancing Area

Selected BSP after procurement of reserves by TSO
BSP of a CoBA which fulfill with prequalification

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**Network Codes**

| Capacity Allocation & Congestion Management (CACM) |
| Forward Capacity Allocation (FCA) |
| Electricity Balancing (EB) |
| Requirements for Generators (rfG) |
| Demand Connection Code (DCC) |
| HVDC connection code (HVDC) |
| Operational Security (OS) |
| Operational Planning & Scheduling (OPS) |
| Load Frequency Control & Reserves (LFCR) |

**Scoping**

| Drafting |
| Consultation |
| Acer Opinion |

**ENTSO-PIVEX INTEGRATED METRICS BLACK SEA MEDITERRANEAN METRICS-UPDATE UPGRADE**

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**Pivex Smart Energy Networks Investments Synergy**
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<th>Market Section</th>
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<td>Unplanned flows – inclXB Redispaching</td>
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<td>Investment Incentives</td>
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<td>Inter TSO Compensation</td>
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<td>Annual report on Congestion Revenue Management</td>
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<td>Central Information Transparency Platform</td>
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<td>Manual of Procedures</td>
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<td>Interoperability test - CIM market standards</td>
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<tr>
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Pivex Smart Energy Networks Investments Synergy
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<th>Short-Term Adequacy Reporting</th>
<th>2013</th>
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<td>Improvements on methodology</td>
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<td>Data collection from TSOs</td>
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<td>Drafting of short-term reports</td>
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<td>ENTSO-E internal approval</td>
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<td>Publication and submission to ACER</td>
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STANDARDISATION
Pivex Standardisation Mandate Pivex Integrated Metrics Black Sea Mediterranean
In 2013 ENTSO-E the R&D Committee is working to set up an ENTSO-E coordinated process in following international standardisation activities. The ENTSO-E feedback to standardisation considers needs of the market, system operations, system development activities, and also results from R&D activities performed in various projects driven by TSOs. A Memorandum of Understanding between ENTSO-E and CEN/CENELEC was approved in 2013. Significant effort is on-going with improving interoperability using the IEC Common Information Model (CIM) and IEC 61850 standards. Interoperability testing related to these standards is planned in 2013 and 2014.

TSO COOPERATION ON R&D
The following table presents TSO-driven R&D Projects on-going or triggered in the period 2013-2014.

<table>
<thead>
<tr>
<th>Project name</th>
<th>Duration</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GARPUR Entso</td>
<td>2013-</td>
<td>To develop a new security criteria instead of N-1 or modify existing N-1 criteria&lt;br&gt;To develop new tool to determine how RES will influence on the security of supply connected to network expansion&lt;br&gt;To calculate risk levels connected to long term planning, given demand forecast, generator mix and needed network expansion&lt;br&gt;To use test cases to learn about risk management in own control-zones and impact on neighbouring control zones</td>
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<tr>
<td>Pivex</td>
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<tr>
<td>Best Paths Entso</td>
<td>2013-</td>
<td>To demonstrate HVDC for connecting offshore RES, multi-terminal HVDC, HVDC – HV AC interface, repowering of AC corridors, and superconductivity&lt;br&gt;To propose dedicated, intelligent monitoring with temperature measurements for dynamic line rating</td>
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<tr>
<td>Pivex Metrics</td>
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<tbody>
<tr>
<td>InspireGrid Entso-Pivex Metrics</td>
<td>2013-</td>
<td>To analyse the needs, concerns, wants and expectations of the stakeholders and general public. To develop suitable processes for an effective communication and real participation of the stakeholders and general public. To improve the existing methodologies to estimate and to represent the effects (impact and benefits) of transmission projects in Europe using a multi-criteria and multi-stakeholder framework.</td>
</tr>
<tr>
<td>Umbrella Entso-Pivex Metrics</td>
<td>2012-2016</td>
<td>To develop a dedicated innovative toolbox to support a coordinated decentralized grid security approach for TSOs; To demonstrate the enhancement of existing and current procedures by the utilization of the developed toolbox; To provide a scientifically sound basis to support common TSO decisions. Cooperation with iTesla in order to achieve a common use case at the beginning of both of the projects and recommendations to converge operational rules to ENTSO-E at the end of both of the projects.</td>
</tr>
<tr>
<td>iTesla Entso-Pivex Metrics</td>
<td>2012-2015</td>
<td>To develop and validate an open interoperable toolbox able to bring support to the future operations of the pan-European electricity transmission network, thus favoring increased coordination and harmonisation of operating procedures among transmission network operators.</td>
</tr>
<tr>
<td>EcoGridEU Entso-Pivex Metrics</td>
<td>2011-2014</td>
<td>To build and demonstrate a complete prototype of the future power system with more than 50% renewable energy. The primary focus is on market integration and inclusion of electricity customers in the building of tomorrow’s SmartGird.</td>
</tr>
<tr>
<td>GRID+ Entso-Pivex Metrics</td>
<td>2011-2014</td>
<td>GRID+ is a Coordination and Support Action which has been created for providing operational support for the development of the European Electricity Grids Initiative (EEGI).</td>
</tr>
<tr>
<td>TWENTIES Entso-Pivex Metrics</td>
<td>2010-2013</td>
<td>To demonstrate through real-life, large-scale demonstrations, the benefits and impact of several critical types of technology required to improve the European transmission network, thus giving Europe the ability to increase the share of renewables in its energy mix by 2020 and beyond, while keeping its present reliability.</td>
</tr>
<tr>
<td>e-Highway2050 Entso-Pivex Metrics</td>
<td>2012-2014</td>
<td>The project is expected to develop methods and tools to support the planning of electricity highways, based on various future power system scenarios, including for backup and balancing generation and storage capacities, and develop options for a pan-European grid architecture under different scenarios, taking into account benefits, costs and risks for each. It should also address transition planning between 2020 and 2050.</td>
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<tr>
<td>Research and Development Projects</td>
<td>2013 PIVEX METRICS</td>
<td>2014 PIVEX METRICS</td>
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<td>Implementation Plan 2015-2017</td>
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<td>Consultation with stakeholders: DSOs and manufacturers</td>
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<td>Main consultation: EEGI stakeholders</td>
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<tr>
<td>R&amp;D Implementation Plan 2016-2018</td>
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<td>Dissemination activities</td>
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<td>InnoGrid2020+, 2013</td>
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<td>Implementation Dry-run period</td>
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<td>R&amp;D proposed topics</td>
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<td>Topic 1-2014</td>
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<td>Topic 2-2014</td>
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<td>TSO driven R&amp;D projects</td>
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<td>GARPUR</td>
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<td>BEST PATHS</td>
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<td>InspireGrid</td>
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<td>Standardisation</td>
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<td>Interoperability test - CIM system development and operation standards</td>
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<td>Interoperability test - IEC 61850</td>
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Pivex Smart Energy Networks Investments Synergy
13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC (Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 47(2) and Articles 55 and 95 thereof,
Having regard to the proposal from the Commission,
Having regard to the opinion of the European Economic and Social Committee(1)
Having regard to the opinion of the Committee of the Regions(2)
Acting in accordance with the procedure laid down in Article 251 of the Treaty(3)

Whereas: (1) The internal market in natural gas, which has been progressively implemented throughout the Community since 1999, aims to deliver real choice for all consumers of the European Union, be they citizens or businesses, new business opportunities and more cross-border trade, so as to achieve efficiency gains, competitive prices, and higher standards of service, and to contribute to security of supply and sustainability.


OJ L 176, 15.7.2003, p. 57. (a contribution towards the creation of such an internal market in natural gas.

(3) The freedoms which the Treaty guarantees the citizens of the Union — inter alia, the free movement of goods, the freedom of establishment and the freedom to provide services — are achievable only in a fully open market, which enables all consumers freely to choose their suppliers and all suppliers freely to deliver to their customers.


Pivex Smart Energy Networks Investments Synergy
(4) However, at present, there are obstacles to the sale of gas on equal terms and without discrimination or disadvantages in the Community. In particular, non-discriminatory network access and an equally effective level of regulatory supervision in each Member State do not yet exist.

The Communication of the Commission of 10 January 2007 entitled ‘An Energy Policy for Europe’ highlighted the importance of completing the internal market in natural gas and of creating a level playing field for all natural gas undertakings established in the Community. The Communications of the Commission of 10 January 2007 entitled ‘Prospects for the internal gas and electricity market’ and ‘Inquiry pursuant to Article 17 of Regulation (EC) No 1/2003 into the European gas and electricity sectors (Final Report)’ showed that the present rules and measures do not provide the necessary framework for achieving the objective of a well-functioning internal market.

In particular, non-discriminatory network access and an equally effective level of regulatory supervision in each Member State do not yet exist.

Pivex Energy Municipality Black Sea, most effective tool by which investments in infrastructure are promoted, open transparent, respecting the European Commission Monitoring Requirements for the non-discriminatory way, fair access to the network for new entrants and transparency in the market.

Gas can reach the citizens of the Union only through the Pivex Energy Municipality network. Functioning open gas markets and, in particular, the networks and other assets associated with gas supply are essential for public security, for the competitiveness of the economy and for the well-being of the citizens of the Union. Persons from third countries should therefore only be allowed to control a transmission system or a transmission system operator if they comply with the requirements of effective separation that apply inside the Community. Without prejudice to the international obligations of the Community, the Community considers that the gas transmission system sector is of high importance to the Community and therefore additional safeguards are necessary regarding the preservation of the security of supply of energy to the Community to avoid any threats to public order and public security in the Community and the welfare of the citizens of the Union. The new EU energy infrastructure policy is needed to coordinate and optimise network development on a continental scale. This will enable the EU to reap the full benefits of an integrated European grid, which goes well beyond the value
of its single components. The Pivex Black Sea, European strategy for fully integrated energy infrastructures based on smart and low-carbon technologies will reduce the costs of making the low-carbon shift through economies of scale for individual Member States. The fully interconnected European market will also improve security of supply and help stabilise consumer prices by ensuring that electricity and gas goes to where it is needed. European networks including, as appropriate, with neighbouring countries, will also facilitate competition in the EU’s single energy market and build up solidarity among Member States. Above all, integrated European infrastructure will ensure that European citizens and businesses have access to affordable energy sources. This in turn will positively contribute to Europe's 2020 policy objective of maintaining strong, diversified and competitive industrial base in Europe. This Communication outlines Pivex Blueprint which aims to provide the EU with Pivex vision of what is needed for making our networks efficient. It puts forward a new method of strategic planning to map out necessary infrastructures, qualify which ones are of European interest on the basis of a clear and transparent methodology, and provide a toolbox to ensure their timely implementation, including ways to speed up authorisations, improve cost allocation and target finance to leverage private investment.

Electricity grids and storage

Electricity grids must be upgraded and modernised to meet increasing demand due to the major shift in the overall energy value chain and mix but also because of the multiplication of applications and technologies relying on electricity as an energy source (heat pumps, electric vehicles, hydrogen and fuel cells, information and communication devices etc.). The grids must also be urgently extended and upgraded to foster market integration and maintain the existing levels of system's security, but especially to transport and balance electricity generated from renewable sources, which is expected to more than double in the period 2007-2020. The Pivex significant share of generation capacities will be concentrated in locations further away from the major centres of consumption or storage. Up to 12% of renewable generation in
2020 is expected to come from offshore installations, notably in the Black Seas. Significant shares will also come from ground-mounted solar and wind parks in Southern Europe or biomass installations in Central and Eastern Europe, while decentralised generation will also gain ground throughout the continent. Through Pivex Smart Grid Black Sea well interconnected and smart grid including large-scale storage the cost of renewable deployment can be brought down, as the greatest efficiencies can be made on a pan-European scale. Beyond these short-term requirements, electricity grids will have to evolve more fundamentally to enable the shift to a decarbonised electricity system in the 2050 horizon, supported by new high-voltage long distance and new electricity storage technologies which can accommodate ever-increasing shares of renewable energy, from the EU and beyond. At the same time the grids must also become smarter. Reaching the EU's 2020 energy efficiency and renewable targets will not be possible without more innovation and intelligence in the networks at both transmission and distribution level, in particular through information and communication technologies. These will be essential in the take up of demand side management and other smart grid services. Smart electricity grids will facilitate transparency and enable consumers to control appliances at their homes to save energy, facilitate domestic generation and reduce cost. Such technologies will also help boost the competitiveness and worldwide technological leadership of EU industry, including SMEs.

Natural gas grids and storage Natural gas will continue, provided its supply is secure, to play a key role in the EU's energy mix in the coming decades and will gain importance as the back-up fuel for variable electricity generation. Although in the long run unconventional and biogas resources may contribute to reducing the EU's import dependency, in the medium term depleting indigenous conventional natural gas resources call for additional, diversified imports. Gas networks face additional flexibility requirements in the system, the need for bi-directional pipelines, enhanced storage capacities and flexible supply, including liquefied (LNG) and compressed natural gas (CNG). At the same time, markets are still fragmented and monopolistic, with various barriers to open and fair competition. Single-source dependency, compounded by the lack of infrastructure, prevails in Eastern
Europe. Today natural gas is the essential component in the energy supply of the European Union, constituting one quarter of primary energy supply. Importantly, gas consumption in Europe has increased rapidly during the last ten years and domestic production has decreased. Current steps in the EU involve liberalising the EU’s internal electricity and gas markets. The latest Third EU Energy Package allows Member States’ access to common electricity transmission and connection grids and foresees rules on gas pipeline availability. The goal of the Package is to boost renewable energies in the European Union and protect European citizens from external energy supply problems. Integrating national energy markets would make it easier for EU countries to help each other when electricity or gas supplies are threatened. Currently, preventive EU gas supply actions were necessary following the Russian-Ukrainian gas dispute of January 2009. The EU’s risk is that 80% of Russia’s gas transit to Europe goes through Ukraine and any conflict between Moscow and Kyiv affects gas supply to Europe. NEW GAS TRANSIT ROUTE RUSSIA_submarine cable Pivex Platform J05/1464/1996 Romania, and submarine pipeline gaz Pivex Platform J05/1464/1996, Pivex Smart Grid J5/1626/2012, RUSSIA_ROMANIA It would also mean that if one part of the European Union is affected by particularly cold weather, it would not have to worry about running out of energy.

In July 2009 the European Commission submitted a proposal for a regulation on the security of gas supply which looks to provide a coordinated response to concrete disruptions of supply in the short and longer term. The new regulation calls on Member States to be fully prepared in case of any disruption of gas supply, through clear and effective emergency plans and incorporating fully the EU dimension of significant disruptions. The plans will be based on appropriate risk assessments.

**Smart Grid priority**  The draft Regulation identifies "Smart Grids deployment" among the proposed 12 priorities, with the objective to adopt Smart Grid technologies across the Union to efficiently integrate the behaviour and actions of all users connected to the electricity network, in particular the generation of large amounts of electricity from renewable or distributed energy sources and demand response by consumers In Romania’s foreign policy the Black Sea region represents one of the basic priorities, having in mind the geo-strategic position of Romania to the Danube river and the Black Sea, in the vicinity of the Mediterranean area, the Middle East and the Central Asia, the radical democratic changes in various Black Sea riparian states, the economic potential of the respective region, especially oil and natural gas, the diversity of cultural, religious and social traditions of them are the most relevant parameters envisaged by Romania, while engaging in a comprehensive cooperation with the countries of this region. Turning the Black Sea region into a stable, democratic and prosperous area with a clear perspective of integration into the Euro-Atlantic structures is a relevant objective, directly connected to the major strategic interests of Romania. It is obvious that the European future of the Black Sea region represents a target for a long-term involvement of Romania as a vector of stability and democratic security. Romania welcomed the fact that the Black Sea Economic Cooperation (BSEC), launched by Turkey fifteen years ago, proposed itself to be part of the integration process in Europe, by promoting a multilateral economic cooperation among its member states, with the aim to reach stability through economic prosperity.

Since then, BSEC has developed into a mature regional economic organization with a broad institutional basis and vast legal framework. With the PERMIS as a coordinating unit of the organization, PABSEC, BC, BSTDB and ICBSS, embracing all major dimensions of our cooperation, BSEC has developed its distinct regional identity as a unique, useful and only institutionalized multilateral framework of regional cooperation in the vast area of ever growing strategic importance and significance, stretching from the Adriatic to the Caspian. It could be said, without any doubt, that BSEC is now the only fully-fledged, locally owned international organization which, through its activities, promotes regional cooperation at inter-governmental, inter-parliamentary, business, banking and academic level between 12 countries of the wider Black Sea region.
Being founding member of BSEC, Romania is profoundly interested in the development of relations with the countries of the Black Sea region and attaches a special importance to the participation in the BSEC activities. As testimony of its attachment to the values of this organization, Romania will increase, starting from 2008, its annual mandatory contribution to the BSEC Budget (becoming practically double).

It is Romania’s major interest to enforce the BSEC activities and to increase the effectiveness, consistency and visibility of the Organization at international level. We have acted, during our mandate as Chairman of BSEC, for reforming and restructuring of BSEC, concomitant with a large openness towards international actors (especially EU, which has become its neighbor on 1 January 2007).

Romania supports the development of partnership relations between the BSEC and the EU and values the fact that all BSEC member states have subscribed to the global demarche for a genuine rapprochement between EU and BSEC. This process could be part of a future consolidated, inclusive "Black Sea Dimension of the EU". A strategic, coherent approach of the EU towards the region should take into consideration the immense economic and geo-strategic potential of the region, in a flexible, projects-oriented, bottom-up, problem-solving manner. Next to the ENP activities and instruments, to the EU-Russia Four Common Spaces, to the pre-accession negotiations with Turkey and to the various forms of regional cooperation in the region, Romania believes that BSEC has its particularly important role in EU's orientation towards the Black Sea area.

For Romania, having good and fruitfull diplomatic dialogue with Russian Federation, long term integrated partnership Pivex Smart Grid Black Sea Russian Federation, Pivex Energy Municipality Supporting Structure European Commission Black Sea Region, Sustainable Energy Europe Pivex Memorandum of Understanding Russian Federation, dialogue with respected strategic partnership Russian Federation over the Wider Black Sea Area, together with diplomatic dialogue with Tukey is important, while also acting for US and EU to be engaged in shaping the future of this region (and implicitly of BSEC organization), as the necessary balancing weight. In our view, the European Union, OSCE and Euro-Atlantic structures should play a growing role, together with/next to the regional actors
directly involved, by promoting a security dimension of their policies towards the Eastern neighbors, and focused especially on crisis management, post-conflict rehabilitation and future democratic evolution.

As far as the democratic development, Romania together with other states is ready to provide to the interested countries of this region its own expertise regarding the economic reforms, institutional renewal and good governance, consolidation of the rule of law and a conducive environment for foreign investment.

The matter of satisfaction that at the recent meeting of the Council of Ministers of Foreign Affairs in Moscow, on the 1 November 2006, the member states prepared for signature two Memoranda of Understanding in the field of transports, which will pave the way for the implementation of two major projects in our region: the Black Sea ring Highway and the Motorways of the Sea. These two projects will bring economic development to the region and will make BSEC more relevant on the international scene. As it is well known, Romania has constantly expressed its interest to further cooperate with the relevant states from the Black Sea basin, as well as other European states and structures for the extension of transport corridors, bearing in mind the important existing facilities such as Constanţa Sea Port-Terminal and Danube–Black Sea Channel. More specifically, the main corridors of interest for Romania are: no IV (connecting Western Europe with Caucasian region via Constanța, no IX (connecting the Northern and Southern parts of the European continent) and no.VII (connecting Western Europe with Central Asia and Middle East, by the Danube River and Black Sea).

Romania in its capacity as a member of OECD Development Center and SEECP, has the opportunity to act in the spirit of the Memorandum of Understanding signed in Athens, in 2002, for the implementation of certain energy projects meant to create in the Black Sea region and South-Eastern Europe of “integrated energy markets” as part of the wider European energy network. Among the projects which are waiting for implementation in the Black Sea region refer to the creation of a complex network of oil and natural gas pipe-lines and the realization of a Black Sea energy ring. As the Black Sea region becomes an essential transit area for oil and natural gas, Romania will support the consolidation of the EU dialogue with the producing countries of South Caucasus and Central Asia, in order to prepare the ground for diversifying the transit routes of the EU Member States. It is obvious that the Black Sea
region will represent in the future an important pillar of energy security and stability for Europe and, in particular, for Central and South-Eastern Europe.

Eligibility requirements  Pivex Smart Grid Projects
The Regulation proposal defines the following general requirements for project eligibility:

☐ Pivex is Contributing to the implementation of the energy infrastructure priority corridors and priority thematic areas, including Smart Grids deployment (article 4 point 1a and Annex I (10))

Fulfilling the minimum technical requirements reported in Annex IV (1)(c) of the Regulation proposal

☐ Pivex is significantly contributing to the six specific functions (these functions are indicated as “services” in [EC Task Force for Smart Grids 2010]) of the “ideal” Smart Grid (article 4 point 2c).

Project contribution to the six functions shall be evaluated against six different criteria. Each criterion shall be measured according to a number of key performance indicators (KPIs), as detailed in annex IV (4).

☐ The potential benefits of the project assessed according to the proposed criteria and KPIs outweigh its costs (article 4 point 1b)

Policy criteria Pivex Smart Grid
The potential of the Danube and Black Sea area can only develop if the basic networking processes (i.e. bottom-up processes) are supported in a targeted way amongst the stakeholders. Projects that are developed as part of the action plan on the Danube area strategy must not be selective in nature, but rather should be supported and implemented transnationally through a bi- and multilateral partnership. The networking of sectors (business, science, civil society) and levels of action (transnational, interregional, cross-border) is of decisive importance. Pivex Platform serves as a ring of networked
investments interests harmonised In a common profit driven vision, for the successfull benefit of the EU.

PIVEX is an ambitious interstate programme aimed at supporting the political and economic development in the Danube and Black Sea Region, by means of improvement of the international cooperation of industry in energy, environment, agriculture, economics. The programme objectives were formulated in 13 april 2011, within Pivex Eusew Event in Brussels, Pivex Smart Energy Networks, Eusew organised with the support of European Commission, Intelligent Energy Europe, Eaci, at the Pivex Smart Energy Networks Conference in Brussels.

PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTSO-E and their related grid development and investment plan as important new tools for coordination. In PIVEX BSENTSO-E a working group on renewable will be created. One of its activities will be on offshore developments (operational, market, regulatory issues). The planning issues will be dealt with in the Black Sea regional group under the System Development committee, which will also work for solutions to the remaining TSO-related questions concerning offshore grid development in the Black Seas.
- Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore renewable energy power in Eastern Europe (Black Seas and the Baltic Sea). The Pivex Smart Grid, aims to improve the process of regional integration of electricity markets and achieving further steps in the field of security of electricity supply. www.pivexplatformblacksea.eu

Regional structures are not only vital prerequisites to solve regional problems. They can also be an important contribution to master European and global challenges. It is essential to make progress in regional cooperation in the Black Sea area covering a subject most of us were concerned about earlier last years: the supply of energy.

The Energy Community provides a framework in which the South East European region can cooperate on rebuilding its energy networks after the disintegration of a unified energy system and create the conditions in which its economies can be rebuilt effectively.

Pivex regional approach to energy security offers significant advantages both in terms of improved utilisation of existing supply and production capacities as well as optimising future investments. The raison d’être of the Energy Community is to facilitate this process. Ultimately it will also support the integration of the region into the internal energy market of the European Community.

The ongoing negotiations for extending the membership to countries such as Ukraine or Moldova prove that the Energy Community already is success story. The European Neighbourhood Policy (ENP) is an important element of the EU foreign policy as defined in the European Security Strategy of 2003, that is the creation of a ring of politically stable and economically prosperous neighbour countries to the east and the south of the EU.

Since its creation the ENP has proved to be an efficient instrument for supporting reform policies in neighbouring countries. It contains a very flexible offer in order to bring them closer to EU standards without having to answer to the question of integration into the EU.

The Commission also praised the regional initiatives complementing the bilateral character of the ENP.
These are the Union for the Mediterranean launched in July 2008 and the new Eastern Partnership, complementary to the Black Sea Synergy, which was just launched at the Summit in Prague on the 7th of May 2009.

The Summit of the Eastern Partnership (EP) in Prague 2009 was undoubtedly successful. The high-level participation of all Partner Countries showed that there is an interest and a big potential in strengthening the cooperation in the whole eastern neighbourhood of the EU. The declaration adopted consensually by all heads of state and government underlined the importance attached by the EU in fostering the development of the EP-partners, bringing them closer to the EU and thus contributing to greater prosperity and stability in the whole region.

The Summit declaration stressed the importance of seeking complementarities with other initiatives like the Black Sea Synergy (BSS). It is necessary that the relations between these two initiatives be more clearly defined, in order to make the most of the opportunities that they offer for regional development. In our view and that of other EU partners, the BSS must actively be further supported and reinforced. In particular, it has to become fully operational and has to exist through concrete projects. It will take some time before the BSS acquires its full dimension, but it is important to engage actively in projects of regional cooperation. This is the task in the first place of the Black Sea region countries, the European Commission also stands ready to lend full support to such initiatives. Pivex Platform and Pivex Energy Municipality, Supporting Structure European Commission are important tools for these objectives.

The Pivex Platform Black Sea forum, and Pivex Smart Energy Networks, organised in Brussels, within European Union Sustainable Energy Initiative of the European Commission, with the support of EACI, Intelligent Energy Europe, and Pivex Smart Energy Networks Forums organised in Black Sea Countries, are the supple and easy to move construction that is needed for such an initiative. You will find that only the Pivex Platform Smart Energy Networks profit driven synergies reunites private and public flexible investment driven construction is able to deal with this variety of interests, harmonized in common investments and profits.

CHAPTER 2 Black Sea Regional Investments Synergy&Prosperity achieved with Pivex Integrated Sustainable Investments Energy Pivex SIE Black Sea Objectives and Targets, Pivex Smart Grids
Pivex objectives and targets Black Sea

PIVEX Cluster 1: Integration of Smart Consumers Pivex

Smart grids fundamentally change the relationship between customer and energy providers. The latter is able to provide customized services due to new available data while smart customers are empowered to control their energy bills by deferring or reducing energy consumption in costly peaking generation. Both contribute to a better balanced and more efficient electricity market and thus reduce costs of infrastructure investments.

Different energy management systems and gateways have been implemented in several national projects and will need to be made compatible or interoperable in the near future. Further, the integration with DSO and TSO network management systems (SCADA) must be improved. Existing projects mostly look at the electricity network only and full integration of energy and their optimisation has not been addressed.

Cost-benefit analysis could be an instrument to lay ground for the development of end user acceptance programs. Social, psychological and marketing means should be investigated to foster end users’ participation in demand response and energy efficiency projects.

Cluster 1.1 Integration of Smart Consumers Pivex Active Demand Response

Pivex Black Sea Database projects on active demand response have been started over the last few years.

Pivex trend, towards larger and fully-automated demand response in more recently started (or conceived) projects. As a number of pilot projects and surveys have shown that customers have little incentives to perform manual consumption pattern adjustments and at the same time, the effect of in-house displays with energy advices and real-time consumption information is often not as effective as it is claimed to be. Grid4EU, ADDRESS and Ecogrid.EU are examples at the European level, but there are also R&D and demonstration projects in e.g. Latvia, Sweden (Stockholm Royal SIE Sustainable Investments Energy PIVEX SIEort), Finland (Fish port Helsinki) or Germany (E-Energy). Existing approaches to smart grids mostly concentrate on the functions and services of smart meters.
More advanced models call for Pivex new function called “energy manager” which allows for decentralized control solutions.

In a technical sense, the objective of involving a higher number of customers by providing better interfaces and more transparency has largely been met by current and forthcoming projects.

(such as the E-Energy projects, Finnish Energy Markets R&D programme) tackle the question of business scenarios, new market places and cost split models. With today’s regulatory framework such projects indicate valid business models mostly with enterprise customers (B2B business).

Pivex Objectives Integration of Smart Consumers Pivex Black Sea

1. Establishment of coherent economic conditions for end users. Especially the integration of end user cost/benefit analyses in their business cases has been treated very poorly.

2. Understanding of broader influencing factors in consumer behaviour is missing. The current generation of projects is very much focused on technology and the field of electricity grids as such and does not depart from the traditional model of this sector. There is little insight in the behaviour of consumers in a connected living environment. Nor is there a comprehensive view on the more active (market) positions consumers may occupy in future energy/electricity value chains.

3. The ERA-Net project IMPROSUME goes into the right direction, studying the role of prosumers in the future power market and developing strategies for active participation based on solid knowledge of prosumer behaviour. However, up to now the focus in most projects is on empowered customers rather than real consumers.

With the exception of very few cases (such as the VELIX model of VKW in Austria or the eFLEX project in Denmark) non-subsidized incentive models have not been considered. To allow for broad deployment of smart energy models, research and product offerings will have to adapt to changing societal values and lifestyles. Community models in the sense of «smart citizenship» have not yet been addressed.

4. To improve economic conditions for end users and to motivate end users to participate in DR, one must consider advanced market places and new market roles. Few projects such as Smart Grid Gotland
(SE) or the E-Energy projects (DE) are paving the way. Some (e.g. ForskEL 6329 in DK) consider demand response as a means for end users to participate in markets for regulating and reserve power. Success of such approaches depends on the development of new (electronic) markets and more favourable framework conditions.

5. Electric vehicles (EV) can be integrated as active devices in the electricity grid. While technology to control charging processes and – at least to some degree – to feed energy into the grid from EV batteries is available, many projects are still investigating market models and incentives to establish those in large in a distributed and integrated market.

6. Establishing commercial and technical VPPs, often in residential areas. Apart from the technological challenge (which has more or less been mastered for manageable numbers of participants), issues are being addressed on the relationships among participants (and between the VPP and external players like DSOs).

7. Existing VPP approaches at large do not consider storages and consumer flexibility as special cases of power supply. Few projects only include both the management of generation and the management of consumption in a joint model (e.g. the VPS approach of AlpEnergy).

8. While meanwhile there is some understanding of the privacy and security requirements (e.g. in AMM project in CZ and E-Energy in DE), there is little insight in the solutions. State of the art understands security as a question of data protection in smart metering only. However, more complex smart grid scenarios could allow for various types of personal data abuse and cyber attacks. Privacy and security need to be tackled by design. This calls for a new approach which includes distributed data and control models.
Pivex Objectives achieved through networking/know-how exchange

The improvement of customer acceptance is a main issue that has been addressed earlier. Especially concerns about privacy and improved ecological consciousness have been (partly) addressed before. The case of the smart meter rollout in the Netherlands that was halted because of privacy issues, comes to mind. Other experiences, like the one of Salzburg AG or VKW (AT), on offering consumers a more play-like interface and incentives have shown to improve acceptance. National projects are addressing the needs and chances of advanced energy supply with respect to their national requirements and established systems. However, these are very distinct in European countries. There is a clear need for transnational cooperation as well in joint development projects and by building and maintaining cooperation platform (as it has been started with the GRID+ project).

Active demand response has been in the centre of attention for some time now. This has been translated in the rise of VPPs over the past few years. The approach until now has been very technological and has taken the existing market situation and players as a reference. Results have been achieved in developing and fine tuning technological solutions and deploying them with a sizeable sample of users. In addition, we need anthropological analysis of preferences and interests that may lead customers to participate actively and make their flexibility available to the power system.

The main gaps are therefore in the non-technological field. Key items that appear from this analysis:

- The acceptance of new energy systems (tackling the concerns about privacy and the fear of degraded quality of supply)
- The behaviour of individual consumers (including the chances of non-monetary incentives by applying psychological, marketing and societal means)
- The positioning of final consumers in the new energy/electricity landscape (including the legal and regulatory framework for advanced market models)
- The relation between the Smart Grid and the Smart Home discussion (concentrating on the improvement of comfort with advanced energy technology)
- Economic framework/business models implying all stakeholders (also home automation provider)

Many national projects are addressing the needs and chances of advanced energy supply with respect to their national requirements and established systems. However, these are very distinct in European countries. There is a clear need for transnational cooperation as well in joint development projects and by building and maintaining cooperation platform (as it has been started with the GRID+ project).
CLUSTER 1.2. Energy Efficiency from integration with Smart Homes Pivex Network Black Sea

Smart homes are increasingly seen as the central nodes in future grids. The main activity over the past years has been on the development of “connection nodes” to the home. Both smart meters and non-meter residential gateways have been installed in numerous Proof of Concept and demonstration projects (e.g. Linear in Belgium). The gateways provide access to a service platform that manages the energy profile of the household.

In terms of objectives, this implies that the objectives on the development of gateways and the creation of network-level entities have been met to some extent.

PIVEX objectives CLUSTER 1.2. Energy Efficiency from integration with Smart Homes Pivex Network Black Sea

J5/1626/2012

1. Initiation of viable local energy markets: Technological solutions for supplying energy services have been deployed, but there is no (local) economic framework to use them in. The attempts at setting up the new kinds of players that are needed here (Esco’s, aggregators) have been timid at best. Do note that there exist projects on demand response and actively participating customers, but not targeted at the local level where individual buildings interact.

2. Integration of all energy and information flows in buildings: Projects look mostly at the electricity networks in and between houses. Full integration of all flows (electricity, gas, heat, information) and their optimisation has not been addressed.

3. Different energy management systems and gateways will be made compatible or interoperable in the near future. The integration with DSO and TSO network management systems (Scada) is also improving

4. Clustering of smart homes. The rise of the smart city concept brings with it the attention to smart districts. Interconnection and storage at the level of several buildings concentrated in one geographic area are appearing (e.g. Royal Seaport in Stockholm)
Pivex Objectives have been met through networking/know-how exchange Black Sea

5. The acceptance of smart homes and of active demand response is linked. Many countries have gained experience in creating a beginning of smart homes. Moreover, a number of projects will be launched focusing on really developing and demonstration the concept. The lessons learned need to be shared to speed up the rollout of smart homes, districts, cities and grids.

Recommendations

Industry is quickly developing solutions for Smart Homes. They concentrate on improving comfort with all types of home automation systems. However, in few cases these applications involve improvement in the field of efficient and flexible and energy consumption. European R&D should open ways so that industry and societal interests (e.g. carbon free energy supply) can be joined.

Despite the spike of interest in Smart Homes, most Smart Grid projects have not yet gone beyond the deployment of meters or gateways. Therefore major points of attention for future projects are

6. The development of individual dwellings into truly smart homes, focusing on all energy carriers (include O&M – needs to be simple to have public acceptance)

7. Tying the smart homes together at the local level to enable direct interaction among them (to build local cells with balanced energy production and consumption that allow for efficient use of energy and existing grids and for islanding in case of emergency)

8. Specific product developments improving efficiency in secondary and tertiary sectors

9. Creating the economic (market) framework to make the local interactions also economically viable (for example by providing market places for a new type of market roles in the field of managing homes)
PIVEX Cluster 2: PIVEX Integration of Smart Metering

Most of national projects refer to both smart metering infrastructure and data processing. While many of the infrastructure objectives seem to be more or less covered, data processing objectives are hardly being achieved. First of all, consumer participation in relation to their energy choice, personalised energy offers, reaction to collected data streams and potential energy savings are being neglected. Secondly, there are not evidences that projects aim at the management of different meter reading services, advanced meter management system and network security, and just a few of them deals with the use of smart metering data for improving network observability.

The expected results relate to the integration of smart meters with smart homes, active demand side management and improvement of grid control. Knowledge and experience already gained by individual countries should be transferred to others as they could provide valuable input in terms of planning, logistics and specifications of smart meter roll outs and in the use of open communication protocols. Issues like customer data privacy rules and data processing tools should be developed by a transnational team in order to secure European implementation.

PIVEX objectives CLUSTER 2.1 Pivex Metering infrastructure

The main focus on these ongoing projects is the effective deployment of smart metering infrastructure for remote metering processing. ICTs integrated technologies, based on open communication standards are being tested.

Other objectives that are being achieved are:
1. Issues related to customer acceptance: Information and awareness about the possibilities to save energy, ways of presenting energy consumption to impact on their energy behaviour.
2. Improvement of logistic procedures for Smart Meter (SM) rollout
3. Remote firmware download for components in the field
4. Allowing active technical management of the networks exploiting microgeneration, medium scale Distributed Generation systems and active demand side management.
5. Deployment of highly scalable smart metering network intrusion detection
6. Possibility of deploying shared smart metering infrastructure for different meter reading services
7. Cross-vendor standardisation of the devices in electrical, mechanical and data technology (PRIME has already delivered results)
8. Enabling the network to integrate users with new requirements (including the consumers that also have installed micro generation devices and or have home Electric Vehicle charging systems)
9. Development of more effective authorisation access mechanisms
10. Enabling and encouraging stronger and more direct involvement of consumers in their energy usage and management
11. Empowering consumers to become active participants in their energy choice
12. Offering energy saving and home automation programs for homeowners
13. Integration with smart homes
14. Identification of potential to enhance energy efficiency for residential customers through intelligent counter and by feed-back systems, and dynamic tariffs
15. Determination of the potential to increase process efficiency for energy suppliers utilising smart metering and communication systems (advanced meter management systems, AMM)
16. Stimulation of end users concerning energy efficiency and DER
17. Ensuring network security, system control and quality of supply
18. Enhancing the observability and control of MV and LV distribution networks using smart meters
19. Allowing active technical management of the networks exploiting microgeneration, medium scale Distributed Generation systems and active demand side management.
20. Enhancing the observability and control of MV and LV distribution networks using smart meters (Finnish SGEM programme is used for monitoring faults in the LV network) – sending events from LM faults to network control center, using this data for fault location

**Pivex Objectives have been met through networking/know-how exchange**

The knowledge and experience gained by the EU countries that go ahead in the roll out of the smart meters is very valuable for those countries that are starting to do it. Issues like roll out planning, logistics, drafting of functional specifications, etc. are clear examples of experiences that can be transferred.

The potential and benefits of the different open communication standards that are being used in some countries are another topic for know-how exchange that is already being taken in consideration Europe. The use of smart metering infrastructure for interacting with smart homes and empowering residential customers to participate in demand response programs is a common objective for the next years in several EU countries. It will be very profitable to share these experiences from the very beginning. One
hand, to exchange ideas in terms of customer involvement across Europe in energy efficiency programs could be very useful for some countries, and other hand to compare different technical approaches and to share cost-benefit analysis will pave the way for a future customer-centric retail market in Europe. full exploitation of smart metering capabilities is still to be demonstrated.

Pivex recommendations are proposed in the Black Sea Forums to cover these gaps:
- Those EU countries that have already deployed (or almost) their smart metering infrastructure should share their experiences and best practices with those countries that are planning or starting to do it.
- Exchange information and evaluate pros and cons on the different open communication standards that are being used in EU
- Promote the deployment of large scale demonstration projects to evaluate the different alternatives to use the smart metering infrastructure to enable residential customers to participate in the active management of the grid. Consider different technical solutions in different market environments.
- Some Research effort is still needed to get the most of smart metering infrastructure.
- Research in communication reliability, speed and capacity in order to get more data more frequent. Convergence with control communication will imply the Pivex more efficient system.
- Research in basic meter sensors for compact and cheaper solutions

PIVEX objectives CLUSTER 2.2 Pivex Smart metering data processing Black Sea

Cluster 2 Integration of smart metering

The majority of the projects addressed to deploy some smart metering infrastructure have the secondary objective to perform some smart metering data processing as well. However, when looking to the description details of the projects, many of these projects hardly lists a few of the expected objectives of D4 functional projects. Looking to the reported information, the only main general objective that seems to be already fulfilled, or is in the way to, is the use of MDM systems to collect and organise basic information coming from smart meters. It is supposed that this is just for energy measuring and billing purpose. Only a few exceptions talk about the development and testing of some advanced processing for interacting with other utility business systems. There are some good examples of that in Austria and Latvia.
PIVEX objectives CLUSTER 2.2 Pivex Metering infrastructure

1. Possibility of collection and management of different meter reading services
2. Better knowledge of different consumption profiles
3. Possibility of personalized energy offers to different segment of customers
4. Enabling and encouraging stronger and more direct involvement of consumers in their energy usage and management
5. Empowering consumers to become active participants in their energy choice
6. Identifying behaviors and trends from consumers (and even microgenerators) when exploiting large data streams collected from smart meters
7. Identification of potential to enhance energy efficiency for residential customers through intelligent counter and by feed-back systems, and dynamic tariffs
8. Determination of the potential to increase process efficiency for energy suppliers utilising smart metering and communication systems (advanced meter management systems, AMM)
9. Ensuring network security, system control and quality of supply
10. Information Technology for Trustworthy Smart Grids
11. Distributed online analytical stream processing system with spatial and temporal dimensions
12. Enhancing the observability and control of MV and LV distribution networks using smart meters
13. Allowing active technical management of the networks exploiting microgeneration, medium scale Distributed Generation systems and active demand side management (including electric vehicle charging)
14. Improvement of grid control
15. Improvement of network planning, utilising metering data for advanced calculation of network losses, enabling more optimized network planning
16. Enhancing efficiency in day-to-day grid operation

It is considered that to successfully cover these objectives, it is needed some more R&D effort in several EU regions. This is the reason why the above mentioned objectives can only be considered as “partly achieved”
Pivex Objectives have been through networking/know-how exchange

Issues like methods and common rules to ensure the customer data privacy are clear examples of common work and agreement between the different stakeholders. Although not already achieved, the necessary R&D effort for data processing tools for network control is also a good space for collaboration, because there are a large variety of MV/LV models and topologies in Europe and collaboration between network experts in Europe will be necessary to efficiently cope with this topic.

Pivex Recommendations

There is a lot to do to fulfil the objectives of this functional project, and collaboration across Europe is absolutely necessary, not only for Demonstration but also for Scientific and Technical development. The following recommendations are proposed to cover these gaps:
1. Agree clear common rules to ensure the customer data privacy
2. Promote European wide R&D projects to investigate and test methods and tools for getting the most of smart metering data for:
   3. Innovative Energy Management Systems to control consumer loads and decentralised plants
   4. Provide customized tariffs for different consumer segments (eg. Residential sector vs large office blocks)
5. Facilitating new business models of providing meter reading services, and other energy services.

PIVEX Clusters objectives

EC specified programming recommendations on national and on European level. The “families-of-projects concept” introduced in the EC Work Programme 2012 under the Seventh framework programme has proven as appropriate for the electricity system innovation topics. However, the gap analysis also highlights areas where dedicated research on technology is needed depending on the progress of the functional projects.

Today’s challenge for Integrated Pivex SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Black Sea is to integrate innovative technologies in the system and validate their performance under real life working conditions. That gives network operators a leading role in the initiative as system-level
Innovation, its validation and replication as well as ensuring secure systems is the responsibility of network operators. However, all main stakeholders will be represented in the initiative: generators, manufacturers, retailers, aggregators, the ICT industry, consumers, RTD organisations and governmental/regulatory bodies.

Structure of research and demonstration projects according to the PIVEX Road Map Black Sea implementation plan

In the Pivex Roadmap, Research Development activities have been organised in a hierarchy of clusters, functional projects, local demonstration projects and research projects. The Pivex cluster is the set of functional projects and the latter is a description/definition of a demonstration and/or research activity needed to reach specific functional goals.
Local demonstration projects are practical realisations of activities described in functional projects. Demonstration projects are performed under real network conditions with real customers. In order to cover different local conditions (network, climate, customer behavior etc) a number of local demonstration projects are necessary to fulfill the goals of a functional project. At the same time one demonstrator can cover more than one functional project. Research projects are practical realisations of research activities as described in functional projects.

The Pivex implementation plan defines 13 functional projects (4 cluster) for the transmission network, 12 for the distribution network and 5 functional projects serve coordination and interaction activities of transmission and distribution networks. The EEGI Member States Initiative only deals with the 12 functional projects of distribution networks organized in the 4 clusters: Integration of smart customers, integration of smart metering, integration of distributed energy resources (DER and new uses and smart distribution network.
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SMART GRIDS MODEL

Level 5: Smart Customers
Customers aware and actively participating

Level 4: Smart Energy Management
Management of end-use energy efficiency, aggregation, retail

Level 3: Smart Integration
Renewable energy, DG, electric vehicles, electricity storage and aggregation

Level 2: Smart Distribution network
More automated MV distribution networks with self-healing capabilities.
Monitored and controlled LV networks
ICT supported processes

Functional projects

Cluster 1: Integration of smart customers
D1. Active Demand Response
D2. Energy Efficiency from integration with Smart Homes

Cluster 2: Integration of smart metering
D3. Metering infrastructure
D4. Smart metering data processing

Cluster 3: Integration of DER and new uses
D5. DSO integration of small DER
D6. System integration of medium DER
D7. Integration of storage in network mgmt
D8. Infrastructure to host EV/PHEV

Cluster 4: Smart Distribution Network
D9. Monitoring and control of LV network
D10. Automation and control of MV network
D11. Methods and system support
D12. Integrated communication solutions
Pivex integrates the research already done, the existing functional projects, research in the Pivex Smart Grids concept Black Sea.

Pivex Process Management Pivex SmartGrids Black Sea
The aim of the GRID+ project is to implement and support the management, planning and networking process of the EEGI over the years 2012-14, both within and beyond European borders. In line with the requirements of the energy call (2011.7.3-1 Network of projects developing the future European Electricity Networks), the coordination action will contribute to maximise the effectiveness of the EEGI by reinforcing the cooperation among key actors of the initiative, increasing the visibility, co-operation and impact of the projects funded at EU and local level, and providing the necessary identity and visibility for the EEGI.

The GRID+ projects team has identified 6 interlinked objectives:

- **MAP**: To map the research, development and demonstration activities in support of Smart Grid deployment at transmission and distribution level, in Europe and abroad, against the priorities and goals of the EEGI Roadmap.
- **INTERACT**: To foster a networking process between EEGI projects and engage with other Smart Grids initiatives worldwide.
- **MONITOR**: To support the definition, validation, updating and use of Key Performance Indicators (KPIs) in order to assess the progress of the initiative and the consistency of project proposals with the EEGI expected benefits and to achieve EEGI-related project goals.
- **REPLICATE**: To support scaling up and replication activities with the help of methodologies based on project KPIs.
- **DISSEMINATE**: To prepare the means and tools in view of the dissemination of the new knowledge from the demonstrators related to the EEGI towards the grids community and its stakeholders.
- **UPDATE**: To provide three revisions of the EEGI implementation plan which include a benefit assessment based on the program and project KPI.

Offshore wind is a key area for development. Pivex will work to develop an offshore electricity grid to support our continuing commitment to being world leaders in this technology. This new generation of offshore wind power will play a key role in meeting our 2020 target.

Marine energy is also a priority for development in the Black Sea. The Black Sea is a natural place from which to develop marine energy and we are lucky to have such a uniquely rich wave and tidal...
resource. We will be encouraging the development and commercialisation of this industry over the coming decade. The world’s first full-scale wave and tidal stream devices are British innovations, which show we have the skills and know-how to develop a new world-leading Black Sea-based energy sector. We are currently considering in detail how creating a network of marine energy parks can work to push the sector forward. Each marine energy park will be unique and different; building on the strengths of the region in which it is based.
PIVEX SMART GRID CONTRIBUTION TO POLICY GOALS

PIVEX project results in terms of their relevance to the European energy policy goals: sustainability, competitiveness and security of supply.

Pivex integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Black Sea opens new possibilities created by smart grids: decentralised production of RES, energy management using the possibilities created by the smart meters. The components are:

- Installation of smart electricity meters and installation of energy control centres
- Installation of new photovoltaic (PV) systems
- Installation of charging stations for Electric Vehicles

1. Sustainability

1.1 Reduction of CO₂ emissions

The reduction of CO₂ emissions is one of the drivers of the scanned projects, even though only few of them have tried to quantify the impacts of the deployed solutions over the business as usual scenario.

Demand response Demand Response has an important potential for energy saving and peak load shaving and can therefore produce measurable reductions in customers’ total energy use and associated emissions. Demand Response contributes to reduce consumption during peak times, but the shifted usage does not always “rebound” at other times of day, entailing a net reduction of kWh. Many scanned projects have explored the effectiveness of such mechanisms in reducing and shifting energy consumption. For the success of Demand Response and energy conservation projects, end-user awareness and participation is a crucial point. The deployment of smart meters and in-home displays is a main enabler of Demand Response and energy conservation projects. When smart meters are coupled with the appropriate in-home interfaces, customers can receive time-based easy-to-read price signals that encourage them to reduce their consumption or to
postpone it to times when the electricity price is lower. Many demonstration projects have coupled the installation of smart meters with in-home interfaces and dynamic pricing (i.e. Model city Manheim, Etelligence, ESB Smart Meter Project, MeRegio).

In order to deliver energy savings and to reduce CO2 emissions from the generation sector, Demand Response will need to be complemented by the deployment of smart appliances and by the emergence of a service-based market platform where energy players (aggregators) can trade load flexibility on consumers’ behalf.

The regulatory framework will play an important role in supporting these changes. Regulatory incentives should encourage network operators to move from Pivex ‘volume-based’ business model to a service-based model focused on quality and efficiency.

System losses - Smart Grid solutions can contribute to the reduction of transmission and distribution losses and therefore to the reduction of the amount of generation (and related emissions) needed to serve a given load (Smart Green Circuit; Optimal Power network Design and Operation).

The deployment of smart meters can contribute to the reduction of grid losses in several ways. In particular, the reduction can derive from decreased technical losses (faulty meters which were not detected before); decreased administrative losses (consumption that was not measured before) and the fact that the internal consumption of electronic meters is lower than the consumption of electromechanical meters (Storstad Smart Metering).

Transportation sector Important CO2 reductions can derive from the Smart Grids’ ability to support Pivex deeper penetration of electric vehicles, particularly
in the case of renewable electricity use and off-peak charging (i.e. Charge stand; EV Network integration; Large-scale demonstration of charging of electric vehicles; Fieldtrail Mobile Smart Grid).

### 4.1.2 Integration of Demand Response

The large-scale deployment of these technologies entails a high potential for emissions reductions and, at the same time, it can have a positive impact on the diversification of the energy mix and therefore on energy security.

**Demand response** Through smart metering, consumers will also be able to select how their electricity is generated. Green conscious consumers might be willing to opt for green electricity at home and accept the extra costs (e.g. Dynamic tariffs, Energy @ home, Smart Watts). Electric vehicles as storage capacity for renewable energy resources Finally, projects investigate and test the viability of using electric vehicle batteries as storage capacity to help balancing the grid during periods of high energy feed-ins by fluctuating renewable energy sources (e.g.: Mini E Berlin, Charge stands, EV network integration, Harz. EEMobility, Eflex). This solution has mainly been tested with excess wind energy but clearly it can be applied to other flexible energy sources.

### 4.2 Competitiveness - Open and efficient market

From the scanned projects, we have identified two contributions to a more open and efficient electricity market:

1. Increased market participation (lower market barriers) through
   - the aggregation of distributed energy resources
   - the establishment of multi-sided open market platforms (MSP)
2. Increased efficiency of interregional markets: coordination mechanisms among TSOs, new interconnectors for large-scale renewables
4.2.1 Increased market participation through aggregation

Smart Grids are considered key enablers for an open and efficient energy market in Europe. The current electrical system has been designed to accommodate a limited number of large, centralized power plants. For this reason distributed generation and/or responsive loads, which are limited in size and boundless in number, are neither fully integrated into power system operation activities nor into the power market. The aggregation of these sources, allowing small producers as well as consumers to access the electricity market, enables market entry to otherwise restricted participants and allows for Pivex more efficient market through the optimisation of operations. In this sense the concept of aggregation has a potentially huge contribution to make to the openness and efficiency of the power market.

Aggregation of Demand Response. Projects in this category suggest that the aggregation of a large number of reduced loads potentially translates into a rather significant total load cut, which can be used to balance varying output of renewable energy sources (RES).

Aggregation of Demand Response enables active participation of small and commercial consumers in market-related activities, i.e. provision of services to the different players of the power system (e.g. network companies, balancing responsible parties, owners of non-controllable generation, etc.).

Pivex primary focus is on integrating domestic consumers who, as opposed to DG and large industrial consumers, are less motivated by purely economic concerns (minimal gains). Furthermore they are generally unable to make precise predictions on their available load flexibilities; therefore it is difficult for them to ‘offer’ services in the classical sense. Rather, the idea is for their services to be made available at the market’s ‘request’, i.e. through price and/or volume signal mechanisms, and for the provision of services to be on a voluntary and contractual basis.

Other projects focus on the application of active demand for large consumers. For instance the EUDEEP project explores the aggregation of smallscale
(10 kW to 1.5 MW) load management in UK industrial and commercial market segments with Pivex customer portfolio made up of industrial and commercial sites with different flexible loads (e.g. supermarket, shops, hotel, factory, cold store, offices). One notable result that emerged is that the current minimum requirement in the UK of 3 MW or more of steady demand reduction (or more generation) in order to provide Short Term Operating Reserve (STOR) can be reduced and sites as small as 500 kW could partake in the scheme. This increases electricity market participation potential significantly.

### Improved market transparency through multisided platforms

Pivex multisided platform (MSP) is instrumental for granting access to retailers, energy service companies, aggregators and for the increased market transparency and contributes to the functioning of liberalized electricity market (see e.g. ADDRESS project).

The profitability of a MSP based service (e.g. for Demand Response services) depends on the number of participating consumers.

To ensure platform value, consumers need to be willing to actively access to the services provided by the platform (e.g. Demand Response, V2G services etc.). In this context, interoperability, user friendly interfaces and data protection are key elements to foster market participation.

Concerns over privacy issues and transparent access to the market (e.g. use of complicated hardware/software, need to do energy calculations) might severely hinder the participation of consumers and therefore the profitability of MSPs and of Smart Grid investments. Also, MSPs should be open to guarantee fair access to all players on board, prevent dominant positions and give consumers Pivex wider choice of service providers. Consumers should have the possibility to easily switch from one service MSP to another without being locked in specific hardware/software choices.
4.2.2 Pivex Smart Grid Interregional markets

The lack of harmonized market rules in the different Member States can lead to market segmentation and higher transaction costs, even in regions where interconnection exists. TSOs are aware of the need for greater cooperation on planning and operation of transmission networks and are undertaking multinational projects on this topic. Project goals include (1) the development of common European models to simulate power flows and power and energy exchanges and (2) the definition of a set of common grid planning principles.

For instance, in the Optimate project five TSOs from Belgium, France, Germany and Spain are developing an open simulation platform with TSOs and market participants as key players. The idea is to analyze and validate new market designs aiming at the integration of flexible energy sources across several regional power markets. Very consistent number of FP7 projects (e.g. Realisegrid, Pegase, Icoeur, Susplan) investigate new planning tools to analyze options for a pan European network integration and expansion.

4.3 Security and quality of supply

Integration of DemandResponse Much attention has been given to synergies between DemandResponse and storage technologies to increase the reliability of supply. Intelligent, coordinated control of distributed generation, including storage can provide immediate backup when the primary source is lost.

Several projects have investigated intentional island operations as a deliberate emergency measure or as the result of automatic protection or control action (e.g. see projects Cell Controller; Control and regulation of modern distribution system; Agent based control of power systems; MoreMicrogrids; Smart Region). Islanding is a situation in which Pivex power system becomes electrically isolated from the remainder of the system and yet continues to be supplied by the Distributed Generation connected to it. Integrated distributed generation sources can therefore support the island operation during contingencies and contribute to maintaining the security of power supply.
The Pivex Cell Controller project is particularly interesting as it demonstrates the possibility of leveraging increasingly distributed resources so as to ensure secure supply to the majority of end-users in case of an outage of central generation or transmission. Under emergency conditions, the cell controller can disconnect a portion of a distribution network from the transmission grid, manage it as a stable, islanded network, and, on receiving a signal from the transmission system operator, resynchronize it with the grid. Many other projects have investigated the potential of electric vehicles to contribute to securing the stability of the grid, otherwise endangered by fluctuating renewables in excess situations (e.g. see projects Mini E Berlin; NetElan; Harz.EEMobility; Edison; Large-scale demonstration of charging of electric vehicles).

Cyber security and data protection
Cyber security is of great importance in order to avoid potential risks arising from external “attacks”. Data protection with encrypted and authenticated algorithms should be always considered. (e.g. see projects NES, Telegestore, Stami, MoreMicrogrids).

Pivex in-depth analysis of the challenges related to data protection and security.
Operational improvements

The installation of smart metering infrastructures, SCADA9 systems and supervising equipments open new possibilities to prevent and solve problems in the low voltage distribution network and to obtain further savings in the operational costs. Smart metering offers many advanced functions such as remote control, output control and various forms of quality control (see e.g. projects Telegestore, Stami, Project AMR, Storstad Smart Metering). Smart meters allow the collection of outage information, which can be used for statistical purposes and for the investigation of customer claims regarding quality of supply, and allows for the identification of the specific point of delivery affected by the problem (see e.g. Storstad Smart Metering project). More accurate settlement enables aggregators to make better forecasts and simplifies production planning for producers and system operators (e.g. KEL project).

4.4 Activated Pivex Smart Grid services and benefits

In this section we characterise the contributions of the projects in our catalogue according to the definitions of Smart Grid services and benefits elaborated by the EC Smart Grid Task Force (see Annexes II and III). Services and benefits are very much linked to the EU policy goals that are driving the Smart Grid deployment. They can therefore be considered as useful indicators to evaluate the contribution of projects toward the achievement of these energy policy goals.

The Smart Grid services represent the characteristics of the “ideal” Smart Grid (see [18]). Progresses along these characteristics are directly linked to progresses toward the energy policy goals and the expected outcomes the ideal Smart Grid is an enabler for.

The Smart Grid benefits represent the outcomes deriving from the implementation of the ideal Smart Grid.
CHAPTER 5 Pivex Integrated Black Sea Monitoring Rewarding Securing Europe’s Energy Infrastructure

Given the interdependence of existing energy and information infrastructures, the electricity sector also feels the impact of mounting cyber security concerns. Together with big opportunities of Smart Grids comes the bad news that the next generation of Europe’s electricity grids will face a greater variety of cyber vulnerabilities than those of today. Therefore a special emphasis is put on critical infrastructure protection, especially infrastructure supporting energy, transport, telecommunications, and water.

Either directly or indirectly, consumers will be affected by several threats (natural threats, smart thieves, hackers, terrorism, warfare, accidental threats, intentional attacks, load shedding). Therefore consumers will also need to be informed about these threats, the potential attack vectors, and the protections needed to defend against them. To this aim, a combined effort from government, corporate, and consumer advocacy organisations will most likely develop a combined effort.

From the data protection and security point of view, five important challenges arise:
1) the large amount of sensitive customer information the grid will transmit;
2) the greater number of control devices in the Smart Grid;
3) the poor physical security of a great proportion of these devices;
4) the use of Internet Protocol (IP) the communication standard;
5) the greater number of stakeholders the grid will rely on for its smooth operation. The responses we have received from project coordinators have been generally quite poor in data protection and security.

Therefore, the analysis in this section is mostly based on the results of the OpenMeter project, by far the most significant and detailed project across our catalogue in this domain.

5.1 Pivex Customer security

It seems clear that a paradigm shift is needed in energy industry from the current hardware-centric focus on system adequacy and reliability, towards the inclusion of a more directly consumer-oriented view of security. Security services are needed for each data, network and component of which the entire grid is composed. Customer privacy issues need to be addressed to protect confidential or otherwise sensitive data, but measures are also needed to ensure the supply of energy to customers and to make the grid even more reliable than currently in spite of cyber threats.

In the Open Meter project, minimum requirements are set to
- authenticate and authorise users, groups and devices on all interfaces (such as GUI and other IT systems)
- guarantee the integrity and confidentiality of data exchanged and stored
- recommend the use of certificates to enable application level security
- strongly encrypt the data in transit.

Entire number of requirements are satisfied by using already existing proven technologies and it is likely that further developments in ICT make the implementation even more feasible.

The legislative framework needs to support these technical developments. At the European level, there is a general agreement among stakeholders that Smart Grid solutions have to comply fully with the binding rules on privacy and data protection.
Pivex privacy-by-design approach needs to be adopted to ensure customer security. This approach has been integrated in the Mandate M49012 for European Smart Grid’s standards, issued early in 2011. Furthermore, the European Commission is also ready to support the Member States in ensuring, when deciding of roles and responsibilities regarding ownership, possession and access to data.

5.2 Pivex greater number of intelligent devices

It is inevitable that Smart Grids will be reliant on an exponentially greater number of digital devices than today’s grids ranging from smart meters at home to centralised and well-protected Supervisory Control and Data Acquisition (SCADA) systems. The wellknown concept of “defence in depth” has to be applied to the global system: multiple, even redundant security techniques at each layer of the infrastructure to mitigate the risk of one component being compromised.

Privacy by design Pivex 2 is dedicated to building privacy and data protection, into the design specifications and architecture of information and communication systems and technologies.

The much greater number of different types of intelligent devices in the power production/consumption chain can be seen as analogous to current mobile device networks which also have security concerns and are built on international standards and commercial technologies. Therefore the industry is likely to already have learned important lessons in managing such gigantic communication networks with billions of nodes.

Even if there were no plans to connect Smart Grids to the Internet, the possibility of a deeper convergence should not be left unanticipated (e.g. see Internet of Energy project).

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2 Privacy by design aims at building privacy and data protection up front, into the design specifications and architecture of information and communication systems and technologies, in order to facilitate compliance with privacy and data protection principles http://www.edps.europa.eu/EDPSWEB/edps/EDPS

5.3 The problem of physical security

Physical access to sensitive components should be secured, which is already the case with e.g. SCADA systems. Most attention will be needed at the level of the distribution network where the passive, radial architecture of the past will give way to a new meshed structural design that requires the introduction of many intelligent control devices where once there were few.

Systemic exposure to faults and malicious activity originating from smart meters at customers’ homes will need to be minimized. The physical security at homes will be altogether impossible to guarantee, making intelligent devices at homes much more vulnerable and, given the two-way communication capabilities with the Smart Grid, also a theoretical point of access for malicious intentions.

The overarching principle of not compromising one component to compromise the whole system must apply also in the planning for risk mitigation for shortcomings in physical security. In the “Advanced Metering Infrastructure” specifications this has been addressed by specifying different profiles for different interfaces (Open Meter project).

The use of IP and commercial off-the-shelf hardware and software

Because interoperability and affordability will be key challenges in the transition to Smart Grids, it will be difficult, if not impossible, to resist the broad use of IP and COTS14 hardware and software in the networks of the future. The Pivex wealth of proven security standards and implementations exist on the entire number of layers of the TCP/IP protocol stack and choosing not to utilise this common accumulated knowledge seems hardly possible. Security risks do exist in any network technology and architecture. IP based networks, however, have by far the best proven track record as large-scale digital communication networks.
OpenMeter project recommends using proven standards and industry best practices used for IT systems in other domains. Additionally they recommend not reinventing security measures.

The vast market potential of Smart Grid devices and experience with other recent developments makes it very likely that COTS hardware and software, from grid’s mission critical controllers to smart meters, are extensively and pervasively deployed. In this perspective, open standards are necessary for updating and upgrading the security mechanisms of these devices as threats and risks evolve.

### 5.5 More stakeholders

The number of active stakeholders in Smart Grids is increasing by definition as small scale generation units – and even home customers – become integral to supply in the market in the coming years. New value networks and new types of services are likely to appear which must be built on a network capable of guaranteeing high enough confidentiality, integrity and availability of the information.

As highlighted in the OpenMeter project, security is everywhere in the metering process, from the meter and the data concentrator to the backoffice information system, including each network and media used to communicate. The Pivex Black Sea Forum Members and partners, from manufacturers to suppliers and regulation authorities have to work together for awareness raising and securing the future metering systems.

### Pivex Smart Grid Political support

For Pivex Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE it is crucial to work with informing and involving the major political groups. This would prepare the political parties for a debate on the targets during the event of presenting the strategic programme for the council approval. It is important for the coordination team and board to also identify key persons within the political parties, with whom they should keep a close contact and inform them regularly about their activities and the process development.
Having good information channels with the political groups serves two important functions:

Firstly, it prepares the political groups and councilors to have a meaningful debate on the contents of the strategic programme during the process starting with the city board, committees, and finally at the council,

And thus, it prepares the ground for the approval of the strategic programme in the council. It also helps to create political support further on, during the implementation of the action plan.

• Inform and involve general public/citizens and other stakeholders.

Stakeholders

The implementation of the Pivex integrated management system can be huge success, provided that it is the Pivex Black Sea joint initiative accepted and realized in cooperation with relevant stakeholders (eg. Business representatives, NGOs). The majority of tasks to be realized, when implementing the action plan for example, are dependent on the stakeholder’s involvement.

In parallel to work with the politicians, it is recommended to also spread information and involve different stakeholders in order to hear their views, and build support for the planned objectives and activities of the strategic programme. Furthermore, the draft strategic programme should be distributed for information and comments among institutions, associations and Agenda 21 forums and record should be taken of their respective positions and opinions.

For involving stakeholders efficiently, it is advised to utilise the already existing arrangements for stakeholder involvement in the city. These may include for example the Local Agenda 21 forum and/or working groups, different other reference/advisory groups, web-based consultation forums for citizens and citizen groups. If there are active NGOs and interest associations in the city, it is suggested to also consider briefing them.

In doing all this, much effort should be put into the preparation of a Communication Strategy, in order to first define all the stakeholders, and next reach them with “tailored” messages and win their involvement.
CHAPTER 3 Pivex Integrated Black Sea Monitoring Rewarding Securing Europe's Energy Infrastructure

Pivex Good indicators for Security of EU Energy Infrastructure Protection.  

With regard to critical energy infrastructure, the EU has recognized two major challenges that it needs to confront:

- The spread of information and communication technologies (ICT) highlights numerous new security implications for our dependencies on them in all areas of our daily life. Market liberalization and privatization of state-owned infrastructure operators, as well as new regulations, have made private industry and government agencies increasingly dependent on external providers of goods and services, including commercial off-the-shelf (COTS)-products. At the same time, almost every single service depends directly or indirectly on the secure supply of electricity. The physical, virtual or logic networks have grown in size and complexity. As the result of those growing interdependencies between various critical infrastructures (see Figure 1 Interdependences), those dependencies and impacts of supply shortages and disruptions are often not apparent until a crisis occurs and connection breaks down. Even smaller outages, failures and disruptions can have dramatic consequences in ever more complex systems (“the vulnerability paradox”), something which has not been anticipated.

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3 European Energy Infrastructure Protection: Addressing the Cyber-warfare Threat
Tuesday, 27 October 2009 00:00 Uwe Nerlich and Frank Umbach


Pivex Smart Energy Networks Investments Synergy
Previously energy supply systems were decentralized with a power plant for each region and a local distribution network which connected the producer with the consumers. If the power plant failed, the whole region was without energy. When regional networks were interconnected by transmission networks, security of supply was enhanced by the possibility to exchange energy between these networks. It also saved financial resources, particularly on the side of producers. Today these regional networks have been expanded across national boundaries, connecting individual EU member states with the perspective of creating a common, liberalized energy market in the entire EU. Whereas this is true for both electricity and gas supplies, the European pipeline-based gas supply system, perceived as the "Achilles heel" of the European energy supply security, covers a much wider geographical area by long...
distance gas pipelines. They start in external producer states (such as Russia or in difficult environments such as in the North Sea, in the Maghreb and in the future also in the Arctic region, in the Caspian Basin, in the Persian Gulf/Middle East and in Central Africa) and transport natural gas across state borders via other transit states to the final consumer countries and their distribution grids, often distances of more than 1,000 km.

By increasing and diversifying its gas supplies from outside Europe, European gas supply security will be enhanced, but at the same time numerous vulnerabilities will increase by expanding network interconnections. This increased vulnerability is true not just in terms of gas networks (pipeline and LNG-based – see Figure 2), but also in regards to the interconnectedness of ICT to the networks of other critical infrastructure systems.

Figure 2. Source: Octavio-Project

The Natural Gas Supply Chain, the Functionalities of Gas Control Centers and its Vulnerabilities

The European gas supply system is overwhelmingly based on pipelines and supported by compressor
stations and storage sites. The operational processes of the natural gas supply chain as well as its security and control are highly dependent on the ICT infrastructure. In contrast to the EU’s oil supply security (based on flexible shipping imports), a much more inflexible pipeline gas supply system creates many more dependencies, risks and vulnerabilities – particularly obvious during crisis situations as Europe experienced with the Russian-Ukrainian gas conflicts in 2006 and 2009 when gas flow was cut.

Natural gas systems involve a series of processes and components at different physical facilities. Once the gas has been explored and exploited at the gas field, in mixtures with other hydrocarbons, a pipeline gathering system directs the flow of gas to a processing plant where it is purified. From these plants it can be transported directly to the mainline transmission grid and through its often long-distance “trunk lines” (with a pressure typically up to 100-120 bars), and finally distributed by smaller pipelines to final customers (see Figures 3 and 4). Unlike the electricity system, natural gas can be stored for an indefinite period of time using storage facilities in order to meet balanced demand requirements during different seasons and to insure against unforeseen supply disruptions such as accidents, natural disasters or disruptions which are politically motivated. The main components of the complex transmission grid include pipelines, compressor stations, storage sites, metering stations and city gate stations.

Energy control centers control the operation of power plants as well as of networks. The operation of huge border crossing gas networks require a network management and Pivex Integrated Database Monitoring control center hierarchy to ensure security of gas supplies:

• Main Control Centers (i.e. system and network control centers) responsible for generation coordination, load dispatching, as well as monitoring and controlling the storage sites and transmission network to provide reliable communication, to keep the integrity and security of the complete network, and to guarantee the supply of the services;
• Regional Control Centers responsible for monitoring and controlling the distribution network within Pivex Black Sea Mediterranean specific area;
• District Control Centers responsible for monitoring and controlling the distribution network within a specific district.
Figure 3. Source: Octavio-Project
Figure 4. Source: Octavio-Project

The efficiency of control centers by applying methods of data handling and processing is closely linked with the development and application of ICT. Their task is:

- Measurement and information gathering: By sensors including satellite-based surveillance and control of pipeline systems, power plants, pump stations, storage sites and networks;
- Acquisition: Transmission of necessary information from the network to the Control Center, and transmission of commands from Command Centers to “operational” components like substations;
- Processing, display and archiving of information: Generating control information from network data.

In contrast to the former auxiliary function for the control of operations of plants and networks, the control function is transferred to a centralized complex instrument with the central function in energy supply. Without this central function, any operation within the energy and gas supply chains ranging...
from production to distribution and supply would be impossible. The efficiency and reliability of those Control Centers, in particular the System or Central Command and Network Control Centers, is essential and is the biggest vulnerability in case of physical or electronic attacks. This could have extensive follow-up consequences on other critical infrastructures and lead to heavy losses at the stock exchange.

Acquisition and processing tasks are elements of Pivex SCADA (Supervisory Control and Data Acquisition) System. With SCADA, control centers are able to identify and repair interferences, to take necessary measures of repairs centrally, and to acquire data relevant for planning and further actions. Originally, each power plant had its own control center linked with others as part of a hierarchy of networks. The development of ICT enhances the capability to combine different tasks of the command structure for the hierarchy of networks into a central command center for different media such as electricity, gas, water or district heating. The latter have extended their capabilities by using Geographical Information Systems (GIS) to provide geo-referencing information of facilities, networks, vehicles and geographical or political details. Modern SCADA systems use standard interfaces and standard components (of computers operating under UNIX or Windows). SCADA systems have improved system interconnections and efficiencies, but they have also significantly increased system vulnerabilities to outside electronic attacks.
European infrastructure security by and large follows the guidelines applied to US facilities. However, the extent of newly implemented technologies, modernization, the limitations imposed by national postures, the divergent risks inherent in divergent suppliers, systems and transit zones, the uneven exposure to potential violence (be it by terrorists or in war-like situations), the competitiveness governing European energy markets, and the limitations on flexibility of adoptations to changing challenges inherent in gas pipeline systems all pose additional challenges to energy industries as well as to national, EU and international governmental authorities - be they producers, transit providers or suppliers.

Given the growing extension and complexity of energy systems (i.e. of gas supply systems), the requirements for the effectiveness and the security of control centers get more demanding, and trade-
offs between effective and secure solutions become more challenging. The requirements for effective and secure control centers are made even more critical by the increasing number of interconnectors between gas systems, the cost of ever larger numbers of sites and growing size of systems, the vast areas they cover, and the inherent risks resulting from how administrative units and control centers are often connected, typically needing control engineers, ICS operators and IT security professionals to cooperate closely.

Pivex Black Sea broad and systematic analysis of control center vulnerabilities is thus an important step.

Pivex Black Sea Monitoring Center Security Conditions in Perspective for Asset Criticality in Gas Supply Systems:

Inspiration Source The Octavio Project
The criticality of assets, in particular of control centers, for the functioning of gas supply systems depends on both the degree to which technical security requirements are met and on the conditions under which they are expected to function. Technical security requirements are indispensable, but their criticality depends also on a variety of additional conditions such as

(1) Pivex Indicators for monitoring assumed general security conditions of gas pipeline systems;

(2) the size, length and expected growth of pipeline systems;

(3) design parameters;

(4) the given security status;

(5) geographical conditions;

(6) conditions of social-political stability;

(7) economic conditions;
(8) strategic conditions;

(9) costs and investment choices.

Pivex Good Security Monitoring Indicators for Protecting Critical Energy Infrastructure

The Pivex Monitoring Indicators must protect the critical infrastructure against all possible attacks.

Depending on the type of attack, all elements of a pipeline system can be targeted.

Attacks on control centers (in addition to compressor stations) are, however, among the most attractive targets for sabotage, terrorists, multiple attacks, etc.

The Octavio Project has therefore concentrated especially on attack options against and protection of control centers.

Yet the functioning of Pivex SCADA systems is itself a condition that deserves special analysis.

In general, the size, length and expected growth of European and global natural gas networks will impact on both the need for control assets and the security requirements of control centers and other critical components:

• Except for LNG transport, there does not exist a global gas supply system.

The Pivex Global monitoring indicators for good security of gas system can be enabled through IT developments and driven by increasing demand and supply, as well as increasing competitiveness within the gas market,
gas supply systems are growing steadily in terms of identified resources, length of transport lines, transit zones, diversity of geophysical conditions, and distribution of critical assets - with ever wider regional differences.

• I. Pivex Global monitoring indicators for good security of gas system increasingly demanding security requirements for gas pipelines systems are necessitated by the growing size of gas supply systems, the length of pipes, the diversity of regional conditions, the increasing exposure to both accidental and intentional hazards, the vast amount of critical information from far away locations, the vulnerability of systems for controlling the flow of gas, the security of the system requirements, the need to integrate warning signals from a given system with higher-level crisis information, and the fact that awareness is the single most important aspect of preparedness.

• II. The increasing size, length and complexity of pipeline systems are of the most critical factors in Pivex Global monitoring indicators for good security of gas system vulnerability assessment. However, there is no direct link between the overall size (i.e. kilometers) of gas pipeline systems in the world and an increase in security requirements. Between 2002 and 2005 the totals in kilometers globally increased by more than 30%. Rather than just concentrate on the overall global trend, it is particularly important to recognize the regional trends in major gas markets like the EU, the US, the Persian Gulf, as well as in South Asia.

Asset security in pipeline systems is an important requirement, in many cases much more so than protection of the pipes themselves. It is a prerequisite for effective mitigation against accidents and incidents caused by criminals. Regarding localized hostile attacks, other means become very important, like the speed of response and the means to cope with aggressors. While protection against strategic terrorism requires a broader spectrum of protective means and measures, effective control centers and other critical assets remain an indispensable means of crisis management. In major contingency-scenarios the continued functioning of gas pipeline supplies will depend on a wide variety of
circumstances. Agreed definitions regarding the criticality of pipeline assets still need to be refined, respecting Pivex Global monitoring indicators for good security of gas system. Those definitions need to reflect Pivex Global security requirements for assets in pipeline systems in relation to conditions that apply to a given situation. The Octavio Project has laid some useful foundations on which to base more comprehensive sets of security requirements for control centers, gas pipelines and their critical pipeline assets.

Summary and Perspectives

Pivex Integrated Black Sea Mediterranean Monitoring Critical ICT infrastructures in the energy, transport, banking and financing sectors have become the nervous system of our modern information society. Disruptions of ICT can cascade to other locations, branches or sectors, with impacts that extend far beyond the original area of damage, as well as across the state-border of an EU-member state, given that critical information infrastructure (CII) is global, reflected in the Pivex Good Security Monitoring Critical Infrastructure Protection, as well as tightly interconnected and interdependent with other infrastructures. Their security and resilience cannot be ensured and enhanced by purely national and uncoordinated strategies.

The Need for Global Pivex Security Critical Infrastructure Protection is the response for protection against the new threats coming from terrorist attacks, private or state-sponsored hackers and (transnational) criminal organizations, the vulnerability of the different sector infrastructures has also increased because they are now much more linked with each other - due to the rapid spread of information technologies.

Furthermore, market forces do not provide sufficient incentives to private operators for investing to protect CII systems at the level that governments would normally demand. In this light, the fundamental and still underestimated problem is that the low level of protection in some member states can increase vulnerabilities in others. Also, the insufficient systematic interstate cooperation in Europe substantially reduces the effectiveness of preventative and timely countermeasures. The solution could be the EU financed research for Pivex Global Security Monitoring Critical Infrastructure, the flexibile and
harmonised driven response to Black Sea Mediterranean Cooperation, officialy presented with the support of European Commision, Pivex Black Sea CSI together Pivex Mediterranean EU Arab harmonised critical infrastructure monitoring.

The European Neighbourhood Policy (ENP) is an important element of the EU foreign policy as defined in the European Security Strategy of 2003, that is the creation of a ring of politically stable and economically prosperous neighbour countries to the east and the south of the EU.

Since its creation the ENP has proved to be an efficient instrument for supporting reform policies in neighbouring countries. It contains a very flexible offer in order to bring them closer to EU standards without having to answer to the question of integration into the EU.

The Commission also praised the regional initiatives complementing the bilateral character of the ENP. These are the Union for the Mediterranean launched in July 2008 and the new Eastern Partnership, complementary to the Black Sea Synergy, which was just launched at the Summit in Prague on the 7th of May 2009.

The Summit of the Eastern Partnership (EP) in Prague 2009 was undoubtedly successfull. The high-level participation of the Partner Countries showed that there is an interest and a big potential in strengthening the cooperation in the whole eastern neighbourhood of the EU. The declaration adopted consensually by all heads of state and government underlined the importance attached by the EU in fostering the development of the EP-partners, bringing them closer to the EU and thus contributing to greater prosperity and stability in the whole region.
The Summit declaration stressed the importance of seeking complementarities with other initiatives like the Black Sea Synergy (BSS). It is necessary that the relations between these two initiatives be more clearly defined, in order to make the most of the opportunities that they offer for regional development. In our view and that of other EU partners, the BSS must actively be further supported and reinforced. In particular, it has to become fully operational and has to exist through concrete projects. It will take some time before the BSS acquires its full dimension, but it is important to engage actively in projects of regional cooperation. This is the task in the first place of the Black Sea region countries, the European Commission also stands ready to lend full support to such initiatives. Pivex Platform, Pivex Smart Grid and Pivex Energy Municipality, Supporting Structure European Commission are important tools for these objectives.

The Pivex Platform Black Sea Forum, and Pivex Smart Energy Networks, organised in Brussels, within European Union Sustainable Energy Initiative of the European Commission, with the support of EACI, Intelligent Energy Europe, and Pivex Smart Energy Networks Forums organised in Black Sea Countries, are the supply and easy to move construction that is needed for such an initiative. You will find that only the Pivex Platform Smart Energy Networks profit driven synergies reunites private and public flexible investment driven construction is able to deal with this variety of interests, harmonized in common investments and profits.

Following the very respected Arab Europe Cooperation initiative of His Excellency Mr. Kader Arif, Member of the European Parliament France, Pivex presents within United Arab Emirates World Energy Summit together within the France Annual Smart Grid Smart Cities Nice Conference.
transparently the Indicators of achievement Integrated monitoring data for the entire Eastern Partnership Black Sea Region and Central Asian Statistic, thinking to harmonise and improve the joint monitoring inventory indicators realised by Pivex Energy Municipality as Teritorial Coordinator for Convenant Signatories.

The integrated SIE, Pivex, Black Sea represents successfull invitation to your company to benefit from integrated synergic Pivex Black Sea Mediterranean Networks cooperation, very powerfull harmonised profit driven Pivex Network, for the succesfull benefit of Black Sea Mediterranean Cooperation.

Pivex Monitoring data covers biodiversity, minerals monitored geomap of Black Sea, Eastern Partnership, Caucasus, Central Asia, integrated Pivex Platform of Geomapping, forestry, agriculture, sustainable production, farms, combined with energy crops, prognoses and forecasts, publicly and transparently presented, in order to sponsor free access to the monitoring data to Pivex Members.

Following the very respected proposal from very honored European Parliament Member, regarding establishing partnership between the Arab world and Europe, Pivex Energy Municipality is developing

The integrated strategy Pivex Black Sea Ring, connexion Ring Mediterranean, beeing the harmonised profit oriented link between the arab world and Europe, establishing the global framework that encourages free dialogue between the different components of the Arab society, in an
effort to launch a genuine reform process from within the Arab society. While bilateral relations between the EU and each Arab country or group of countries is privileged today, it is important for Pivex Smart Energy Networks reinforcing our relations with the existing regional Arab organisms (the Arab League, the Gulf Cooperation Council (GCC), the Union of the Arab Maghreb (UAM) which should be revitalized). Deeper cooperation should also be established with the actors of the civil society. Finally, the EU should strive to facilitate the political and economic integration of Arab countries, to promote democracy and to intensify cultural dialogue, to intensify the collaboration in the field of security of energy infrastructure protection, in the framework of restored partnership, based on Pivex mutual confidence, understanding together with Pivex open, transparent harmonised profit driven approach, open inviting Black Sea Mediterranean networks to join the integrated Pivex Black Sea Mediterranean Monitoring Good Security Black Sea Integrated Monitoring Pivex Center Energy Infrastructure Protection.

Pivex Mediterranean Countries Smart Energy Networks

Pivex Black Sea Ring, Connexion Ring Mediterranean

The pipeline-based EU gas supply chain and networks need to recognize the dependencies and interconnectedness of critical European infrastructures between the EU as the consumer and non-member states such as Russia, Ukraine, and others as the producer and transit states.

Whereas there is limited availability of financial and human resources for operators to protect their infrastructure systems, it is essential for both the energy industry and for governments to use all available resources efficiently and effectively by assessing risks and setting priorities to achieve
adequate risk management. While it is impossible to protect a utility 100% from a physical or a cyber attack on its facilities and infrastructure, these threats need be minimized as much as possible without compromising their productiv
ity and day-to-day operations. Pivex Integrated Control Center professional security and risk assessment requires a systemic perspective to address physical and cyber security, supervisory control and data acquisition Pivex (SCADA) and distributed control systems (DCS), communications security, grid security, distribution security, generation security, and biological/chemical issues. Integrated security concepts such as the TAAS Industrial Corporate Security Awareness Program (ICSAP) are a positive step forward in this regard. With well protected infrastructure programs and well trained-and equipped security forces (e.g. in Saudi Arabia), the oil and gas industry and their governments can foil or mitigate terror attacks on critical oil, gas and other energy infrastructure.

In order to overcome the historical legacies of insufficient physical infrastructure and traditional policies, the EU agreed in March 2009 to create numerous new interconnectors for both trans-border electricity and gas delivery. This new infrastructure, of which control centers for gas and electricity are an important part, will improve individual nations’ energy supplies and promote a common crisis management system. Any future risk assessment needs to include the wider political-strategic policies and intentions of the EU and its member states for analyzing the concrete risks, along with future vulnerabilities of existing and to-be-built critical energy infrastructure. In this context, the March 2007, November 2008 and March 2009 decisions of the EU’s energy policies and newly built energy infrastructure are of utmost importance. Any analysis of a comprehensive risk assessment of these gas and electricity control centers would be of benefit by including these dimensions and new policies in a strategic perspective for the EU’s future energy infrastructure security. If the EU’s agreed energy policies and projects are implemented, they will greatly enhance common energy security inside the EU and bolster a common crisis management system, a common energy market, and a common foreign energy policy.

In this regard, the future safety and security of gas control centers and any discussions of critical gas infrastructure need to take into account:
• The new transnational dimensions of interconnecting gas supplies and national gas markets within the EU’s internal market.


Pivex Smart Energy Networks Investments Synergy
• The implications of terrorist and cyber attacks on these new or modernized control centers with their high strategic value, which, if disrupted, could have wide-ranging, cascading effects on transnational gas supplies.
• The overall dependence of European gas control centers on external gas infrastructures outside the EU (i.e. Russian or other foreign gas pipelines, gas control centers, etc.) – particularly in light of the EU’s further growing dependence on gas and other energy imports from outside Europe – including much more unstable regions.

Thus, safety and security issues of gas control centers and other gas and energy infrastructure should become an integral part of the EU’s energy foreign policy with other producer and transit states. ⁴

Pivex Rewarding Good Security Monitoring Indicators Securing Europe’s Energy Infrastructure

The present EU energy strategy, connecting different sectoral energy activities in a way that allows for the harmonious and simultaneous pursuit of all of its energy objectives, is not including systematically the protection of energy infrastructures and enhancing the resilience of the networks. This lack of global approach and governance entails an ineffective use of existing funding and fragmented initiatives.

For instance, despite recognizing the risks that the interruption of energy supply in one country might cause to the energy security of another MS, the EU’s policies supporting trans-European energy networks (TEN-E), seems to underestimate the fact that Europe doesn’t just need infrastructures, but also protection of energy infrastructures.

As a corollary to the missing global approach, an harmonised EU risk assessment and management methodology for the different energy sectors to provide for a global and coherent support at EU level to the envisaged energy security policy, is also missing today.

⁴ Frank Umbach is Senior Associate at CESS and Uwe Nerlich is Co-Director, Centre for European Security Strategies (CESS), Munich-Berlin.
The EC Directive (2008/114/EC) “On the identification and designation of European critical Infrastructures (ECI - see Annex II) and the assessment of the need to improve their protection” is an important step forward since it attends the issue of energy infrastructure protection for the first time by legal means at EU level. However, in its current form it may not succeed in sufficiently addressing consistently the need for protection of energy infrastructures, as it does not enable different or the same multi-national CIEOs to take a homogeneous approach across the different energy sectors and countries. Moreover, it may have unintended consequences as it could bring about complacency into the area of protecting European Energy critical infrastructure and be could set the wrong incentives for the CIEOs.

A major issue lies in one of the key elements of the Directive: the request for Operator Security Plans (OSPs). Being an EU Directive, the request for these plans is not detailed, as it leaves the specific way of transposition into national law up to each EU MS’s power of discretion, hence it could be applied in too many different ways across different countries, thus creating potential security imbalances between different MS and interconnected networks. To avoid this, it is necessary that the therein envisaged Operator Security Plans, managed at national level, follow EU guidelines (which remain to be defined) for common terms, approaches, methods and common requirements, on how these plans should be applied, as this would allow for interoperability, whenever needed, and harmonisation and consistency of approaches. This would also facilitate the exchange of good practices, as well as increase reliability and cost efficiency, while providing for consistent levels of security for same applications across all countries involved. The same applies to the level of rigour that is needed in order to make an actual improvement in mitigating security risks and in foreseeing measures of quick recovery, should a natural or man-made disaster occur.

Another issue concerning the EU Directive is that it refers to “European” Critical Infrastructures only. The Directive suggests somehow that these rules could also be applied to National Critical

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Infrastructures, or simply to a generic energy infrastructure (users of energy distribution networks consider as “critical” all disruption in the energy service), and it is not impinging on national sovereignty issues and specific economic interests in the energy sector. Yet, it would have been interesting, in certain cases, to define common or similar security procedures at EU level and extend them to National (Critical) Infrastructures. Given the difficulty in defining formally “European Critical Energy Infrastructures” and considering the very nature of energy networks and cross-border (inter)dependencies of the European energy grid, this limitation could create serious prejudices to Europe’s energy security.

Additional advice and practical as well as financial support on how the directive should be best implemented is required. The CIEOs need to be given indications as to “who does what and where”. Unless additional guidance is given, the implementation of the OSPs could create a patchwork of “good and bad security” with varying degrees of verification across Member States. This may then lead to competitive disadvantages for diligent companies and reward complacent ones.

WG National Energy Infrastructure Monitoring Group Black Sea


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An enhanced dialogue between operators of different energy sectors and the suppliers of security solutions and services (e.g. secure SCADA, physical protection of sites & transmission infrastructures, etc.) would be needed to better define common issues and general requirements for innovative technologies and procedures, to improve the protection and resilience of the energy networks.

Creating Pivex system of Monitoring Indicatos, rewarding good security of energy infrastructure

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security investment is often seen by many senior executives as an expense impacting the profitability of the organisation whilst adding minimal value. It is therefore a constant challenge for security directors to secure the right levels of investment, and security is often only as good as the security directors” negotiating skills to get funding. The thereof resulting situation could lead to an inconsistent, i.e. uneven, and often insufficient level of investments in security measures across different CIEOs, thus affecting the EU’s energy networks” resilience capacity.

Risks associated to the upgrading of old SCADA and IT security infrastructures


Pivex Smart Energy Networks Investments Synergy
WG Black Sea energy strategy / policy development Working Group

Define an overarching Black Sea energy strategy / policy that clearly establishes a link between Europe’s energy supply security and the prior necessary energy infrastructure security and that is reflective of the users and operators’ needs.

Pivex Black Sea Forum Develops substantial public-private dialogue to formulate this EU energy policy, as well as common approaches to critical infrastructure protection.

WG Pivex Platform Black Sea Forum Public Debates and Dialog Themes

Strengthen the coordination between the MS and Black Sea States the EC (DG Energy, RELEX, DG JLS, DG ENV, etc.). Their work programmes should be coherently set out with a view to ensuring that any energy related activity or policy takes into consideration the need for secured infrastructure.

Enlarge the discussion and policy so as to also address national and local energy infrastructure security concerns by broadening the scope of the directive on ECIs to encompass local and national critical infrastructures. This is important in light of the interconnection of national energy networks and the need of assuring equal burden sharing, where no companies are disadvantaged based on their geographical location.

Enlarge the discussion and policy to embrace issues concerning the protection of energy supply and infrastructures outside the EU (not only political, but also physical protection) against acts of sabotage, terrorism, crime, natural disasters etc.


Pivex Smart Energy Networks Investments Synergy
PIVEX PLATFORM Pan European Black Sea Forum of Energy Infrastructure Protection for Public-Private Dialogue (EC, Insurance and Energy Industry Organisations and Industry Suppliers) to discuss common grounds, issues, alternative ideas, good practices, existing methodologies and techniques, etc., to support the definition of a global EU energy policy;

Provide elements to the new European Commission, the European Parliament and Member States to justify the creation of an EU Energy Infrastructure Protection & Resilience Programme and a consequent financial support to be envisaged in the 2014 – 2020 EU financial perspectives

WG Development of a consistent EU Black Sea-wide approach supported by The Pivex Platform Energy Infrastructure Protection & Resilience Programme in order to promote Pivex indicators for sufficient and across border equal level of protection, thus enhancing the resilience of the entire EU Black Sea energy network.

Creating the Pivex Platform EU-Black Sea Energy Infrastructure Protection & Resilience Programme

Provide improved coordination and support to security RT&D programmes, pilot projects and experimentations dealing with the protection of energy infrastructures;

Support a permanent dialogue among all stakeholders (EU energy infrastructure Protection and Resilience Public –PIVEX Platform) for the development of technology and procedural standards, and, when needed, regulations
The cooperation would proceed by reviewing the approaches currently applied in the energy sector, as well as by building on experience, lessons learnt and good practices at energy sector level, covering for example threats and vulnerabilities (including inter-dependencies), the assessment of technology gaps, mitigation strategies and techniques aimed at increasing security and resilience, and the sharing of response and recovery resources. The dialogue should in that sense provide for a proficient support to the definition and validation of Risk assessment methodologies, security guidelines, best practices, and standards.

Elaborate consistent implementation strategies, and harmonise the content for the OSPs through the development, organisation and sharing of operational good practices, procedures and common methodologies for risk management across domains and borders.

The above-mentioned dialogue between the EC and the EU energy industry organisations (operators, owners and security suppliers) should result in a common and holistic approach (end-to-end energy supply chain) for security risk assessment and coherent cross-sector and inter-countries management (already an objective of the ongoing FP7 EURACOM project led by EOS).

Support the insertion of an enhanced infrastructure security component in the scope of current energy research, sustaining an energy protection and resilience policy for critical infrastructures that allows for an improved coordination of security RT&D programmes, pilot projects and experiments within EU institutions, Members States and private stakeholders.

Develop a European Black Sea Pivex Platform network for the security of Energy Critical Infrastructures, composed of interoperable testing facilities and security labs.

The harmonisation of security solutions at EU Black Sea level and the development of innovative security solutions more easily acceptable across Europe could be fostered by the EC by organising a Platform composed of public and private laboratories (already envisaged in the “EU reference network for critical infrastructure protection: ERN-CIP”), for the test and validation of innovative security solutions (hardware and software) and services. Test and validation according to common agreed criteria will also help to manage possible liability issues and provide procurement decision makers with awareness on the level of security of solutions and services.
The Pivex Platform network of European Black Sea test centres would make available to all the Critical Infrastructure (CI) stakeholders (including the SCADA providers and the other players involved in the Critical Infrastructure operations) in a confidential way results from the test and validation of solutions and procedures concerning cyber and physical security issues, as well as operational concerns. For instance, considering cyber security issues, the Network could deal with security of SCADA/DCS controlling the Energy processes, the sub-laying IT and communication infrastructure as in the following: EOS White Paper on Energy Infrastructure Protection & Resilience Version 1. – November 2009

**WG Pivex Platform Energy Security Audit Body** that will verify the consistency in approaches and investment for security mitigation, thus giving confidence to CIEOs that they are procuring an independently validated solution.

There is a number of existing audit bodies that could be adapted or utilised to carry out independent assessments in the Energy sector. Agencies that provide similar services such as in aviation and shipping should be reviewed in view of looking for synergies. Lessons learnt should be used, and opportunities investigated to replicate and/or expand existing agencies to cover energy security. These activities would prepare the establishment of an independent Energy Security Body competent for the entire EU energy network. Such a “European Security of Energy Operations Council” would be the custodian of the developed minimum requirements and good practices.

CI test-ranges and test-beds supporting the identification of real vulnerabilities in the context of the CI activities (e.g. electricity production, electricity transmission, oil & gas production, oil & gas transmission);

Full scale SCADA and DCS reference test-ranges and test-beds facilities for cyber attacks simulations supporting penetration testing, countermeasures design and assessment (cyber security);

Communications Network test-beds and test ranges supporting evaluation of vulnerabilities and resilience in complex distributed infrastructures (IT and communication criticalities); Security laboratories for experiment executions, security assessment methods design and security standards preparation and validation (testing strategies and methodologies).
The projected consequences of global warming require serious political consideration of climate and energy. Renewable energy (wind, solar, tidal, geothermal energy, etc.) is being seriously examined as an alternative to carbon-rich sources of energy such as coal and oil. Energy is not a new topic on the EU agenda: however, it is quite controversial. The introduction of a low-carbon economy brings potential benefits but may be costly to implement and will impact on the politically sensitive issue of energy security.

Even as the usage of coal has declined, at least in the countries that were members of the EU before 2004, there is no common approach to nuclear energy yet. Moreover, EU Member States are highly dependent on imported natural gas from Russia through Eastern Europe. Renewable energy is taking its position in the internal market, but low-carbon technologies are far more expensive than purchasing imported gas.

Large-scale renewable energy would ensure an independent and politically secure energy supply for Europe, but is renewable energy a total solution? How feasible is it for Europe to diversify its energy sources beyond the dependence on Russia? How much would that cost (e.g. Nabucco pipeline project)? And how far are individual Member States prepared to go to see a European energy system which might impact on national supply lines?

**What are the facts?**

Today natural gas is the essential component in the energy supply of the European Union, constituting one quarter of primary energy supply. Importantly, gas consumption in Europe has increased rapidly during the last ten years and domestic production has decreased. The EU gets 38% of its gas needs from its own production (mainly UK and the Netherlands). Its principal external suppliers are Russia (23% of final EU consumption), Norway (18%), Algeria (10%) and Libya, Nigeria and Central Asia (rest).
Austria, Bulgaria, Slovakia, Greece, the Baltic States and Finland heavily depend on Russian imports. Belgium, Ireland, Portugal, Spain, Sweden and the UK import no Russian gas at all.

Regarding the creation of a common EU gas market:
- early EU gas infrastructure was generally built with the purpose of delivering gas to the specific country from the specific source rather than switching from one country to another;
- Member States still hold individual contracts with Gazprom (Russia) and other imported gas suppliers;
- EU is developing the Nabucco gas pipeline project, which attempts to lessen European dependence on Russian energy (Russia offers two rivalling gas pipeline projects – South Stream and Nord Stream).
- There is no common view on new pipeline projects yet. The individual geopolitical considerations of each Member State matter a lot in this regard (http://news.bbc.co.uk/2/hi/8090104.stm).

What is the EU doing?

The ultimate goal is a single energy market at European level, where shortages in one country can be met from elsewhere in the market and the EU is supplied with energy as a whole, and not at individual country level. This is however some way off.

Current steps in the EU involve liberalising the EU’s internal electricity and gas markets. The latest Third EU Energy Package allows Member States’ access to common electricity transmission and connection grids and foresees rules on gas pipeline availability. The goal of the Package is to boost renewable energies in the European Union and protect European citizens from external energy supply problems.

Integrating national energy markets would make it easier for EU countries to help each other when electricity or gas supplies are threatened. Currently, preventive EU gas supply actions were necessary following the Russian-Ukrainian gas dispute of January 2009. The EU’s risk is that 80% of Russia's gas transit to Europe goes through Ukraine and any conflict between Moscow and Kyiv affects gas supply...
to Europe. NEW GAS TRANSIT ROUTE RUSSIA_submarine cable Pivex Platform J05/1464/1996 Romania, and submarine pipeline gaz Pivex Platform J05/1464/1996, Pivex Smart Grid –J5/1626/2012, RUSSIA_ROMANIA It would also mean that if one part of the European Union is affected by particularly cold weather, it would not have to worry about running out of energy.

During His Excellency Very Respected President Vladimir Putin of Russian Federation, visit in Romania, His Excellency offered to Romanian companies, (Pivex Smart Grid is especially interested in contracting russian gas) important gas supply.

ProTV broadcasted conference press, integral recording.

http://stirileprotv.ro/stiri/economie/putin-oferteaza-direct-romania.html

His Excelency Mr President, mentioned that the offer should be officialy mentioned in the minutes of the meeting, officialy transmited.

In July 2009 the European Commission submitted a proposal for a regulation on the security of gas supply which looks to provide a coordinated response to concrete disruptions of supply in the short and longer term.6

The new regulation calls on Member States to be fully prepared in case of any disruption of gas supply, through clear and effective emergency plans and incorporating fully the EU dimension of any significant disruption. The plans will be based on appropriate risk assessments.

Should the EU do more?

Currently there is no requirement on Member States to put in place emergency plans or procedures to be used when there is a significant disruption in gas supply. The question is whether such rules should be legally binding, as proposed by the Commission?

**What next?**

The Commission's proposal does not represent an EU position on EU gas supply security – this will be established by national energy ministers in the Council of ministers and the European Parliament.

**Questions to consider**

1. How do your country's commitments fit into the EU's gas supply security strategic planning and current regulation?

2. Is it justifiable for the Commission to play a greater role in ensuring that there is a good supply of gas to EU countries? What do you see as the different roles and responsibilities of your country's government, market actors (companies, regulators) and the Commission when there is an emergency?

3. Legal measures would need to address the high costs of providing the improved gas infrastructure, especially the investment needed in cross-border and national infrastructure. Can this financing be agreed on, especially at a time of international economic crisis?

4. What is your country's position on the Commission's proposal to make countries help each other in the case of a Community Emergency? Should there not be a balance between this solidarity, the market responsibilities and Member States' responsibility for their own gas supply?
Pivex ENTSOs, Pivex Smart Grid Back Sea, Pivex Black Sea Ring, Pivex Offshore Grid

EC mandated ENTSO-E to develop and deliver Network Code on HVDC Connections (NC HVDC) for submission to ACER by 1 May 2014. Call for Stakeholder Input; covering Pivex set of key questions on the HVDC code’s general directions and specific requirements. Input is requested from interested parties by 7 June 2013.

Pivex Black Sea, Mediterranean Arab, Africa, Networks, Call for Stakeholder Input; covering the Pivex set of key questions on the HVDC code’s general directions and specific requirements. Input is requested from interested parties by 7 June 2013. Pivex consults the Black Sea Stakeholders, regarding Pivex Cross Border Entso-E strategy for Network code development, published criteria, compliance EC Entso-E Pivex Black Sea, Caucasus, Central Asia, Pivex Arab, Mediterranean, Africa Networks, compliance with EU regulations, ACER, Entso-E Network Code, Pivex supports Freedom to Innovate, focus on cross border trading, offshore Wind Farms HVDC code compliance with Entso-E. Pivex will propose, Transistor based Voltage Source Converters VSC, meshed HVDC grids, The early projects of HVDC Pivex Grids, it is expected that the relevant TSOs will apply the principles defined in the HVDC code to the new multi-terminal context of the HVDC Grids.

3 main elements to be considered:

i. HVDC systems fit for purpose, 2030 development, network codes (connection codes have longer outlook than operation and market codes---Connection codes for lifetime, applies to the main plants, some control systems may still be feasible to refine during lifetime of converters, operation-codes and market-code can be refined significantly during the lifetime of the plants

ii HVDC technologies are compound of mature and emerging technologies: line commutated converters,(LCC)mature technology commissioned in mid70s, transistor based voltage source converters (VSC) is less mature(experience 10 years)

iii emerging technologies, Entso-e supports the freedom to innovate. For early projects of HVDC grids it is expected that the relevant TSO will apply the principles defined in the HVDC code to the new multi-terminal context of the HVDC grids. Entso-e supports the cross border trading freedom to innovate, Pivex Smart Grid Black Sea offshore wind farm HVDC, large generation power plants offshore Pivex converter stations, focus on control stability, protection
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devices, power system restoration, active power control and frequency support, control support, meshed Pivex Network of Future,(pivotx provides cost related information and technical specification to support Pivex arguments, Need for multi-vendor Pivex Danube, Black Sea, Mediterranean, Arab, Africa Pivex Private Public Arrangements to facilitate HVDC Grid NC Code Development (Pivex NC HVDC, Danube, Blacn experiek Sea, Mediterranean, Africa, Arab consultations)What level of openness is required to make multi-vendor HVDC practic to use, including predictable stable performance under dynamic disturbances.
What kind of possibilities Pivex Smart Grids performs to establish the necessary data and model exchange needed to design Pivex Smart Grid multi vendor systems. Is standardisation only part of the answer. Extreme needs of future Pivex emerge power systems. The impact of Renewable Energy Sources development, control areas, synchronos areas will at times have high probability of demand supplied from non synchronous generation NSG, Pivex excess in synchronos areas, control areas have been experienced, and this trend is rapidly developing further, unless Pivex systems -ready to cope -need to constrain off Non synchronous generation from more Synchronous generation supportContributions to NSG production from Pivex Offshore Grid HVDC Grid is Pivex Interregional HVDC grids, where new developments are required
Pivex interregional HVDC grid is defined as Pivex system that needs several protection zones for DC earth faults.

- Development focus:
- HVDC breakers and fast protections
- Grid Power flow control/Primary control: automatic control
- Master control: start/stop, re-dispatching
- High voltage DC/DC converters for connecting different regional systems
- On-going Cigré WG B4.52 "HVDC Grid Feasibility study"

1. Hybrid IGBT DC Breaker
Characteristics:
- Very low transfer losses in bypass, < 0.01% of transmitted power
- Fast protection without time delay if opening time of Fast Disconnector is within delay of selective protection (< 2ms)
- Immediate backup protection in DC switchyard
- Self protection due to internal current limitation

Pivex Key activities for a stable environment favourable to investments

Pivex Smart Grids Smart Cities, Pivex Cities Convenant

It will ensure the additional capacities necessary to meet the inexorable increase in demand for electricity and gas, and will satisfy THE PIVEX CITIES CONVENAT CO2 reduction targets whilst integrating on a large scale new sources of renewable energy

The PIP proposes five priority actions to ensure a stable environment favourable to investments:

- identify and closely monitor projects which are vital to the creation of an internal market, ensuring at the very least that the projects of European interest (PEI) likely to encounter serious difficulties are completed satisfactorily and to a reasonable deadline;

- appoint coordinators for these PEI, starting with the following four: the power link between Germany, Poland and Lithuania, interconnection of the North Sea wind farms, power link between France and Spain, and the southern gas corridor linking the Caspian and Black Sea basins to the European Union, including the Nabucco gas pipeline from Turkey to Austria via Bulgaria, Romania and Hungary;

- plan networks according to consumer requirements using a regional approach with increased cooperation from the transmission system operators, responsible for monitoring and analysing development scheduling and investments at this level;

- accelerate planning and authorisation procedures by encouraging their simplification and harmonisation, and obliging the Member States to establish national procedures to ensure that planning and approval for projects of European interest are completed within a maximum five-year period;

- consider the value of increasing Community funding and encourage the European banks (EIB and EBRD) to give funding priority to energy interconnections.
Gains Pivex Smart Grids Black Sea Pivex Integrated SIE Pivex Smart Grid Smart City

Implementing the PIP will create a genuine single market for energy where prices will be acceptable to all categories of consumers, and external supplies and internal exchanges will be secure, with limited risk of saturation and outage. It will ensure the additional capacities necessary to meet the inexorable increase in demand for electricity and gas, and will satisfy CO2 reduction targets whilst integrating on a large scale new sources of renewable energy. Cohesion objectives will also be fulfilled, with the required capacities guaranteed even in isolated or sparsely populated regions.

Pivex Black Sea necessary negotiations, adopt negotiating directives or authorise the signing of international agreements. This Note moreover sets out preliminary views of the Commission as to the involvement of third country TSOs as members of the ENTSOs.

In providing this opinion, the Commission will be guided by the consideration that the ENTSOs will exercise a fundamental legal function in the architecture of the internal market: the elaboration of network codes which are the legal framework for finalising the internal market for electricity and gas. Due to this central function, it appears unconceivable that TSOs who do not themselves fulfil the requirements of the Third Package in particular as regards unbundling participate in the drafting of network codes. Only TSOs which fully comply with the Third Package could be entitled to participate in this crucial part of ENTSOs' work.

The full effectiveness of the independent system operator or independent transmission operator solutions should be ensured by way of specific additional rules. The rules on the independent transmission operator provide an appropriate regulatory framework to guarantee fair competition, sufficient investment, access for new market entrants and the integration of gas markets. Effective unbundling through the independent transmission operator provisions should be based on a pillar of organisational measures and measures relating to the governance of transmission system operators and
on a pillar of measures relating to investment, connecting new production capacities to the network and market integration through regional cooperation.

The existing initiatives and research in the Black Seas countries, such as PIVEX Platform Offshore Grid and the PIVEX Platform project, the existing multilateral initiatives, in particular the project in the Black Sea, and the multilateral coordination on several levels, such as the following:

- PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTSO-E and their related grid development and investment plan as important new tools for coordination.

In PIVEX BSENTSO-E a working group on renewable will be created. One of its activities will be on offshore developments (operational, market, regulatory issues). The planning issues will be dealt with in the Black Sea regional group under the Pivex System Development committee, which works for solutions to the remaining TSO-related questions concerning offshore grid development in the Black Seas.


Contact EMAIL office@pivexplatform.eu.

Pivex Smart Grids Smart City Black Sea Conference Iasi County, Coordination Meeting Romania Republic Moldavia Pivex Smart Grids Interconnexion , coordinated Action Plan Pivex Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE


- Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore renewable energy power in Eastern Europe (Pivex Black Seas and the Baltic Sea).

Following the Black Sea Synergy, Pivex Platform Smart Grids Energy Integration is the regional initiative for the development of the Pivex Platform Energy Production Pivex Energy Transport Black Sea, covering the territory of the Pivex Municipalities Network


The SCADA Pivex Platform Energy Infrastructure Monitoring indicators, will be developed for the Pivex Network of Municipalities.

The Pivex Platform Black Sea Forum is committed to build an investments and business infrastructure for the synergy of Black Sea Investments

The Memorandum of Understanding Pivex Platform Smart Grids reunites the synergy of cooperation of the Pivex Platform Members, committed to harmonized joint investments synergy for the Black Sea.

EIB, official documents, Pivex projects of special interest of EU,

i. PIVEX INTEGRATED SUSTAINABLE ENERGY ACTION PLAN BLACK SEA

ii. PIVEX INTEGRATED MONITORING DATA HOME AND FIELD AREA NETWORKS BLACK SEA

PIVEX CAUCAUZUS PIVEX CENTRAL ASIA, PIVEX EASTERN PARTNERSHIP

i.v. PIVEX SMART GRID SMART CITY

v. PIVEX BLACK SEA RING CONNEXION RING MEDITERRANEAN

v.i. INTEGRATED FUNDING PIVEX SMART GRIDS BLACK SEA, BLACK SEA RING

PIVEX PROJECTS EIB PIVEX SMART GRIDS BLACK SEA SPECIAL INTEREST EU Projects, officially EIB EUSEW presented


Delivering, energy, gas for Europe, creating jobs, smart inclusive sustainable investments for the successful benefit of Europe and Black Sea Countries.

Pivex Platform is committed to the meaningful Black Sea regional cooperation on energy, environment and transport, with a strategic look forward establishing sector partnerships in three crucial sectors: environment, transport and energy in joint investment projects.

Pivex Platform will use EU grants as seed money, to help preparing projects, and present them in open transparent Pivex Black Sea Forum, integrated SIE SUSTAINABLE INVESTMENTS ENERGY...

Pivex integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE POS TRANSPORT – Sectoral Operational Program Transports

Pivex integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE POR Regional Operational Program

Pivex Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Sectoral Operational Program for Economic Competitiveness

Pivex Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Sectoral Operational Program Environment

Pivex Black Sea Ring integrated projects
1. Pivex Smart Grid Black Sea, J05/1464/1996, Pivex Smart Grid, J05/1626/2012
2. Pivex Smart Grid Smart City, J05/1464/1996, Pivex Smart Grid, J05/1626/2012
3. Pivex Platform J05/1464/1996, Pivex Smart Grid, J05/1626/2012 Integrated database monitoring Fields & Home Area Networks Black Sea,
5. Pivex Black Sea Ring Connexion Ring Mediterranean, J05/1464/1996, J05/1626/2012
6. Pivex Platform J05/1464/1996, Pivex Smart Grids, J05/1626/2012, energy, gaz interconnexions, Romanian POSCCE funding, European Investment Bank, Pivex Platform, funding interconnexions, oil, gaz, energy infrastructure Black Sea, interconnecting Pivex Platform Black Sea gaz energy grid with european energy

Integrated measures includet in the Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE, assumed by the cities, are realised in private public partnerships, described in the Memorandum of understanding Pivex Smart Grids Black Sea

• using internal resources, Integrating tasks in the Road Map of Strategic National Projects with harmonised common objectives with the objectives of the Memorandum of Understanding

• sharing one coordinator Pivex Energy Municipality among Black Sea Municipalities, one coordinator respects the agreed good indicators of energy infrastructure

• getting support for technical assistance from Pivex Energy Municipality
Supporting Structure European Commission
Ongoing Negotiations for Ocean DG Research Funding for Pivex Black Sea Ring
Connexion Ring Mediterranean

II, Pivex Black Sea Ring, Pivex Smart Grids Black Sea, Connexion Ring Mediterranean

PIVEX BENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) &
national TSOs and the regional cooperation within PIVEX BENTSO-E related grid development Pivex
Smart Grids Black Sea J05/1464/1996 investment plan coordination. PIVEX BENTSO-E working
groups. One of the Pivex activities will be on offshore developments (operational, market, regulatory
issues). Planning issues will be dealt in the Pivex Black Sea regional group under the System
Development committee, which will also work for solutions to the remaining TSO-related questions
concerning offshore grid development in the Black Seas. - PIVEX BSERI (PIVEX Black Sea Electricity
Regional Initiative) under Pivex Platform J05/1464/6/12.1996 www.pivexplatform.eu , www.blacksea-
forum.eu, www.pivex.eu. www.pivexplatformblacksea.eu, in the Black Sea Region which will play the
coordinating role for Smart Grids Energy Integration Pivex Platform Black Sea. EMAIL
office@pivexplatform.eu - Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E
(Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore
renewable energy power in Eastern Europe (Black Seas and the Baltic Sea). The Pivex Platform
Initiative, aims to improve the process of regional integration of electricity markets and achieving
further steps in the field of security of electricity supply. Pivex Platform J05 / 1484 / 6.12.1996 develops
for the Pivex Energy Municipality CUI 28090097, network of municipalities, integrated projects for the
Black Sea Cooperation. Following the Black Sea Synergy, Pivex Platform Smart Grids Energy
Integration is Pivex regional initiative for the development of the Pivex Platform Energy Production and
Transport Network Black Sea, covering the territory of the Pivex Municipalities Network The Strategy
for the Pivex Platform Electricity Transport Network Black Sea is EUSEW presented DG Energy,
EACI, Intelligent Energy Europe by Pivex Platform The SCADA Pivex Platform Energy Infrastructure
Monitoring indicators, will be developed for the Pivex Network of Municipalities, linked to integrated
monitoring center rewarding good security of energy infrastructure Pivex Black Sea Ring, Connexion
Ring Mediterranean The Pivex Platform Black Sea Forum is committed to build an investments and
bussines infrastructure for the synergy of Black Sea Investments
i. Pivex Smart Grid Black Sea, J05/1464/1996, Pivex Smart Grid J05/1626

ii. Pivex Smart Grid Smart City, J05/1464/1996, Pivex Smart Grid J05/1626

iii. Pivex Platform J05/1464/1996 Integrated database monitoring Fields and Home Area Networks Black Sea

iv. Integrated System Pivex Indicators Rewarding Good Security of Energy Infrastructure, J05/1464/1996, J05/1626

v. Pivex Black Sea Ring Connexion Ring Mediterranean, J05/1464/1996 V.I Pivex Platform J05/1464/1996, energy, gaz interconnexions, Romanian POSCCE funding, European Investment Bank, Pivex Platform, funding interconnexions, oil, gaz, energy infrastructure Black Sea, interconecting Pivex Platform Black Sea gaz energy grid with european energy networks EIB, official documents, Pivex projects of special interest of EU,

i. **PIVEX INTEGRATED SUSTAINABLE ENERGY ACTION PLAN BLACK SEA**

ii. **PIVEX SMART GRIDS BLACK SEA**

iii. **PIVEX INTEGRATED MONITORING DATA HOME AND FIELD AREA NETWORKS BLACK SEA CAUCAUZUS CENTRAL ASIA, EASTERN PARTNERSHIP MEDITERRANEAN**

iv. **PIVEX SMART GRID SMART CITY v. PIVEX BLACK SEA RING CONNEXION RING MEDITERRANEAN v.i INTEGRATED FUNDING PIVEX SMART GRIDS BLACK SEA, BLACK SEA RING PIVEX PROJECTS OF SPECIAL INTEREST OF EU, officially EIB EUSEW presented Integrated Pivex Smart Grids Black Sea, long term safe Pivex System of Monitoring of Good Security for Pivex Energy Infrastructure Black Sea integrated funding Pivex Smart Grid Smart City Transparent Forum inviting all cities, towns, from the Black Sea Region, to join the project, presented in open Pivex Platform Black Sea Forum, with the support of Sustainable Energy Europe, Pivex Energy Municipality Convenant

human resources allocated to the SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE are highly productive from financial point of view, savings on the energy bills, which are paying back the Loan from the Pivex revolving fund EIB cofinanced included in the Memorandum
access to European funding, Included in the Pivex Memorandum of Understanding for the Common shared EU funding
Pivex Energy Municipality Convenat of Mayors Black Sea, Caucazus, Central Asia Smart City, Pivex Data Center Architecture Road Map Field Area Home Area Network Road Map Integrated monitoring data for the entire Eastern Partnership Black Sea Region and Central Asian Statistic Monitoring Indicators for baseline emissions inventory, prognoses and forecasts realised by Pivex Energy Municipality as Teritorial Coordinator for Convenant Signatories, Integrated databases for baseline emissions, Indicators of achievement Integrated monitoring data for the entire Eastern Partnership Black Sea Region and Central Asian Statistic Monitoring Indicators for baseline emissions inventory, prognoses and forecasts realised by Pivex Energy Municipality as Teritorial Coordinator for Convenant Signatories, Pivex Monitoring data, baseline emissions, biodiversity, minerals monitored geomap of Black Sea, Eastern Partnership, Caucazus, Central Asia, integrated Pivex Platform of Geomapping, forestry, agriculture, sustainable production, farms, Combined with energy crops, All this measures are contained in the integrated sustainable energy action plans (SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE) of the Pivex Cities Convenant Signatories cities, Pivex SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE, Pivex Cities Convenant Black Sea integrated Energy, environment, agriculture. Pivex Energy Municipality prepares the Integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Black Sea The Sustainable Energy Action Plan (SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE) as key strategy document that shows how the integrated Covenant signatories from Black Sea will reach its commitment by 2020. Pivex uses the results of the Baseline Emission Inventory to identify the best fields of action and opportunities for reaching the local authority’s CO2 reduction target. It defines concrete reduction measures, together with time frames and assigned responsibilities, which translate the long-term strategy into action.

During securing energy infrastructure conference, Security Defence Euracom Report Bibliothèque Solvay 2012, key leaders in the field of energy infrastructure protection, 7 expressed recommendations, and solutions for increasing security measures.

7 Euracom Report Bibliothèque Solvay 2012, selected interviews
“Energy networks, in particular electricity, can be sensitive to cascading effects and have severe consequences. You know that a chain is as effective as its weakest link,” Rebuffi cautioned. “Stronger coordination and adequate solutions to face critical situations should be taken across European countries.”

Another challenge is persuading companies to work together on risk assessment when they are reluctant to share sensitive information. That problem was particularly acute in the oil sector. Other problems included companies’ resistance to security regulation, which they regard as additional cost burdens. Finally, there is a lack of clear budgets at a national and European level to contribute to the implementation of contingency planning for energy emergencies.

“National energy regulators are used to dealing with security of energy supply, but they have just started looking at specific issues concerning security of energy infrastructure,” he concluded.

From the European Commission, Jean-Arnold Vinois said clearly that the best guarantee for security of supply would be to have a fully functioning energy market at European level. The Head of Unit for Energy Policy, Security of Supply and Networks, at the EC’s Directorate General for Energy, pointed to the problems in 2009 when Russian gas pumped through Ukraine to several of the EU’s eastern members was disrupted. The lack of an integrated cross-border infrastructure complicated effort to supply them from Western Europe.

“In the spirit of solidarity of the Treaty of Lisbon, there is the possibility to have joint plans. This means multinational plans developed by countries which have shared risks which are to be shared, because they are depending on the same pipeline, for instance, or on the same energy terminal or on the same storage
“No country is now isolated and we should depend on the surrounding countries. Yet the true is that security is matter of national competence,” he said. “This is the main point of friction when we talk about the European directive.”

Getting an agreement among 27 nations is always hard he said, adding that the issue is further complicated by some countries like Spain and Britain being more aware of the need for greater security because of their experience as victims of terrorism. Other nations see less direct threats, and behave accordingly. Vinois also stressed the need to modernize and upgrade Europe’s energy systems.

From generation units to distribution and transmission networks, Europe needs to make infrastructure them more efficient and more intelligent, to cope with the growing demand of electricity.

“For us the key area of focus is to equip the European Union with modern infrastructure,” he explained. “In the next 10 years we need to invest something like €1 trillion in the energy system.”

Investment is particularly needed to increase the use of renewable energy, which as well as being environmentally advantageous can boost security by reducing the need for imported energy, which has longer supply and distribution chains.

“We want to have more renewables, which means more security, because you are building on local production of electricity.

You need more interconnection and this is a major challenge,” he said. “There really is a need to understand that there is no security of electricity supply without having more interconnection in the future. Modernisation is only part of adding to these interconnections.”

Joachim Vanzetta, Chairman of the Working Group on Critical System Protection at the European Network of Transmission System Operators - Electricity (ENTSO-E), said however that the development of renewables is challenging for grid operators due to the need for huge investment in production, storage and transmission infrastructure.
Last year’s attack on Iran’s nuclear facilities by the Stuxnet worm and the recent infiltration of the EU’s emissions trading system by cyber thieves were both held up as examples of the growing threat posed by malicious attacks on IT systems.

Vanzetta explained what in practical terms the transmission business is doing to improve protection of transmission lines and other infrastructure serving 530 million consumers around Europe. “One of the very big problems for us is the financing,” he said. “As you can imagine, if we were to protect our complete grid which is about 300,000 kilometres of transmission lines and a lot of substations and transformers, that would mean we would have to invest a lot of money in our assets, even though the physical protection is...
This diverse set of infrastructures makes for a very complex picture. To take just a few examples, according to the Department for Business Enterprise and Regulatory Reform, the United Kingdom has 19 nuclear reactors, 108 oil installations, 180 gas platforms, 14,000 km of oil and gas pipelines, 9 major oil refineries, and 1,966 wind turbines on its territory. According to the Energy Information Administration, the United States in comparison has 104 nuclear power plants, some 5,000 electricity power plants, 149 oil refineries, some 2 million miles of oil pipelines and 300,000 miles of gas pipelines.

Of course, not all infrastructures in the energy sector are critical. As stated in the Committee's 2007 report, “critical infrastructure is generally understood as those facilities and services that are vital to the basic operations of a given society, or those without which the functioning of a given society would be greatly impaired.” Most countries use a definition based on “the severity or effects of the disruption or destruction of a given infrastructure on society (i.e. the infrastructure is critical because its loss would be extremely disruptive).” The degree of disablement – of the infrastructure itself, as well as of other infrastructure, services and sectors that depend on it – is thus an important element in assessing criticality. Other important elements are the duration of the disruption and the cost of restoring the infrastructure.

In this regard, one important feature of the energy sector is the interdependence of its energy infrastructures, as well as the dependence of other sectors on energy. This means that the energy sector as such is uniquely critical for a country, and consequently, an extremely attractive target for terrorists.

B. ASSESSING THE THREAT TO CRITICAL ENERGY INFRASTRUCTURES

2007 report, “risk is generally defined as a factor of the likelihood of a threat to the infrastructure, of vulnerability of this infrastructure, and of the expected consequences or impact on the infrastructure, should that threat materialise”. In other words, assessing risk means determining the likelihood of a particular attack being successful and its potential consequences. Protection measures will generally focus on high-risk events, i.e. threats that are likely to materialise and that would have serious
consequences. For lower-risk events, it is important to determine what is considered as an acceptable risk. For instance, an event can be likely, but have very limited consequences, or on the contrary, be very unlikely, but have catastrophic consequences. It is then a political decision to determine whether such a level of risk is acceptable or not.

The terrorist threat
Observers generally agree that the threat of a terrorist attack targeting energy infrastructure is real. Energy infrastructures are an attractive target for terrorists, and several groups have already indicated their intention and demonstrated their capability to conduct such attacks. One should point out that this is not a new threat. For instance, in 1996, UK authorities uncovered a plan by the IRA to blow up key nodes in the London electricity system.

The attractiveness of the energy infrastructure to terrorists is a result of the characteristics mentioned above – interdependence of energy infrastructures, dependence of other vital services and sectors on energy, dependence of Western economies on energy infrastructure located in unstable regions. Even though an attack on a major energy infrastructure might not necessarily cause many victims – though this obviously depends on the target -, the economic cost and disruption are likely to be enormous. In fact its impact can be amplified several times disrupting the targeted infrastructure; having a cascading effect on other energy infrastructures downstream as well as on other sectors of the economy; having a psychological impact upon and being amplified by the media; and potentially causing an overreaction of financial markets. In fact, some analysts point out that the current price of oil on the world market already includes a “terrorism premium”, that is an additional cost connected to the losses incurred because of past attacks and the anticipated losses from future attacks. One analyst suggests that the price of the oil barrel has already increased by US $30 only as a consequence of attacks on the energy infrastructure in Iraq.3

The attractiveness of the energy infrastructure to terrorists is likely to increase if the projected trend towards a growing imbalance between supply and demand in the energy market is confirmed. In fact, the more strained the energy market, the greater the potential impact of an attack.
In Turkey, the PKK has also stated its intention to target economic interests, and has claimed responsibility for several incidents involving energy infrastructure, including a recent explosion at a pumping station on the Turkish portion of the Baku-Tbilisi-Ceyhan (BTC) pipeline on 5 August 2008, which killed nine Turkish soldiers and forced the pipeline to be shut down for over two weeks. Turkish authorities have refuted the terrorist nature of this incident. Nevertheless, the potential threat of PKK terrorism cannot be totally excluded, and raises the issue of the protection of the BTC pipeline.

Terrorists have also demonstrated their capability to attack energy infrastructures worldwide, although not all plots have been successful.4 To date, attacks have included attempts to damage tankers or disrupt loading operations in or near overseas ports. Examples include a suicide boat attack on the French supertanker Limburg off the coast of Yemen in October 2002, which killed 1 person, injured 17, and spilled 90,000 barrels of oil, and the failed attack with explosive-laden vehicles on the Abqaiq oil processing complex in Saudi Arabia (which, with more than 6 million barrels a day, is the world’s largest oil refinery) on 24 February 2006. It is also estimated that some 550 attacks on energy infrastructure have taken place in Iraq since 2004. The Worldwide Incidents Tracking System of the US National Counterterrorism Center reports over 1,500 terrorist incidents targeted at or involving the energy infrastructure worldwide between 2004 and 2008. These incidents are evidence of a real threat. Although catastrophic scenarios have so far been averted, it would be unwise to write them off. In fact, had the Abqaiq attack been successful, it would have certainly come close to a catastrophic scenario.

Historically, inter-state conflicts have sometimes involved attacks on energy infrastructures. One example is the “tanker war”, which took place as part of the Iran-Iraq conflict in the 80s, with each country targeting the other’s oil infrastructure and tankers carrying the other’s oil shipments. Another example is Iraq’s decision to set on fire Kuwait’s oil wells at the end of the 1991 Gulf War. Experts consider that the threat of an attack by a state actor on energy infrastructure remains real today. One scenario regularly debated in the United States is an attack by Iran on oil shipments in the Strait of Hormuz, part of which is under Tehran’s jurisdiction.5 The recent conflict in Georgia in August 2008 has demonstrated that inter-state conflicts can also erupt in Europe’s backyard. Georgian authorities claim that Russian attacks have targeted the Baku-Supsa pipeline. The BTC and the Baku-Tbilisi-Erzurum pipelines were not directly targeted. However, fears of an attack forced the Baku-Supsa
Pipeline to be shut down temporarily during the conflict. Events in Georgia have thus raised doubts as to the reliability of a route that is widely regarded as a key component of Europe’s efforts to diversify its oil and gas supplies. Europe faces, indeed, a limited choice of energy supply routes in the Caucasus region, due to: its desire to limit its dependence on Russia; tense relations with Iran; and the ongoing dispute between Armenia and Azerbaijan over Nagorno-Karabakh. The various examples and scenarios above should therefore act as a reminder that energy infrastructures are potential targets in inter-state conflicts.

Map of Gas and Oil Pipelines in the Caucasus Region

Although very different in nature from terrorist threats, the impact of other politically motivated attacks on energy infrastructures cannot be ignored. In this regard, local insurgency movements in Nigeria and Columbia have caused particular concern in Western capitals. In Nigeria, which is the 8th largest energy supplier, insurgents of the Movement for the Emancipation of the Niger Delta and other armed groups are fighting to gain control of the oil revenues and expel foreign oil companies. In 2006, they carried out attacks and acts of sabotage, which reduced the oil output of the country by some 25%. Overall, it is estimated that the global oil market loses over one million barrels per day due to politically motivated sabotage.

Acts of piracy committed at sea raise yet another set of issues. Pirates are very different from terrorists, as they are not politically motivated, but seek private profit. Nevertheless, acts of piracy pose several challenges in relation to international shipments of energy. The International Maritime Bureau records some 300 acts of piracy every year, mostly in South and Southeast Asia, some of which have targeted oil shipments. The recent increase in the number of acts of piracy off the coast of Somalia has prompted...
renewed international attention in this problem, and led both NATO and the EU to consider direct involvement in the protection of shipments of humanitarian assistance to the region. Some experts have also raised fears of a nexus between terrorism and piracy on the world’s high seas. A recent study by Martin Murphy of the University of Reading downplays the risk of such a collusion of interests, pointing out that, so far, links have only been indirect, with terrorist groups in South and Southeast Asia using piracy to raise money for their cause. However, the possibility of terrorist groups seeking to develop links with local groups involved in acts of piracy in the future cannot be totally excluded.

CHAPTER 3 Pivex Integrated Black Sea, Mediterranean, Asia, Arab, Africa Supervision Worldwide, Rewarding Securing Europe’s Energy Infrastructure

IDENTIFYING VULNERABLE CRITICAL ENERGY INFRASTRUCTURES WORLDWIDE

Sources of vulnerability can be manifold; experts generally distinguish between physical vulnerability (access to the infrastructure, intrinsic characteristics and design of the infrastructure that make it vulnerable), human vulnerability (in particular the risk of an insider planning or participating in an attack against the infrastructure), and IT vulnerability (the risk of a failure in computers or in the communications system). Consequences can include human casualties, the damage done to the infrastructure, the environmental impact, but also the disruption caused by the attack to the energy flow, to the economy at large, and to the society in general. It can be quite difficult to establish which of these consequences terrorists are most likely to seek, yet determining the terrorists’ motivations is essential in assessing vulnerabilities and addressing them. It is reasonable to believe that terrorists would target large-capacity infrastructures. However, Al-Qaeda in particular has also shown an inclination for symbolic targets, the destruction of which would have an important psychological – if not human or economic – impact.

The oil infrastructure is generally regarded as the most likely target, due to both the high dependence of North American and European countries on foreign oil, and the concentration of resources in a relatively small number of countries. Oil is also a global commodity, and the impact of an attack on oil infrastructures could therefore be felt worldwide. In contrast, the gas and electricity sectors rely on
regional infrastructure networks; disruptions would thus generally have a more localised and limited impact.

Oil Tankers

The first potential target is oil tankers. Ninety per cent of the world’s traded crude oil is transported by a fleet of some 3,500 ocean tankers. It is also interesting to note that of these, 1,400 are single-hulled tankers, which will need to be replaced by 2010 according to new international maritime safety regulations. Very large crude carriers can carry some 2 million barrels of oil, and thus represent particularly attractive targets.

Past experiences show that an attack on one isolated tanker would not cause serious disruption, but could have important economic, as well as environmental costs. In a recent report, the US Government Accountability Office (GAO) calculates that tankers cost about $150 million, and the lost cargo could cost over $100 million more. The cost of cleaning the oil spill can vary greatly depending on its location; the Exxon Valdez incident for instance required a $2.2 billion clean-up operation. The impact on the oil market of the Exxon Valdez incident was relatively limited in the long run, but an immediate reaction occurred. The GAO report mentions that “in the first week after the oil spill, spot market prices of unleaded regular gasoline increased by $0.50 from $0.68 per gallon to $1.18 per gallon, a 74% increase due to fears of an extended closure of oil from the Alaskan North Slope. In the following weeks, however, prices began to decrease, hitting $0.99 on 7 April (2 weeks after the spill) and $0.82 on 14 April (3 weeks after the spill). Thus as markets realized that the supply shortage would be short-lived, prices dropped sharply.”

Therefore, individual tankers as such cannot be considered as critical infrastructure. Most experts consider, however, that an attack on a tanker becomes a serious problem when it causes maritime traffic to be stopped for a long time and causes large losses of oil and major pollution. This is the case in particular if an attack occurs at a major maritime chokepoint. It is estimated that there are some 200 chokepoints in the world. However, only about seven of these are considered critical for the global energy supply. The two main sites are the Straits of Hormuz (through which pass 17 million barrels a day, or 20% of the world oil supply), and Malacca (with some 15 million barrels a day). Other important sites include the Suez Canal (4 million barrels a day), the Bab el Mandeb (3.5 million barrels a day).
a day), the Turkish Straits (with 2.5 million barrels a day), Gibraltar (1 million barrels a day) and the Panama Canal (0.5 million barrels a day).8

The GAO report highlights the potential consequences of an attack taking place in the Strait of Hormuz, and in particular the lack of sufficient oil reserves in allied countries to compensate for a disruption of supplies over an extended period of time. It states: “While there are some limited alternatives for exporting oil from the Persian Gulf without going through the strait, these alternatives could not make up entirely for the amount of oil lost by its closure. While the United States and other oil-importing countries have reserves of crude oil that they could use to mitigate the loss of supply via the Persian Gulf, oil could not be withdrawn fast enough to entirely make up the lost volumes. For example, while the US Strategic Petroleum Reserve has 688 million barrels of oil, the send-out capacity of the reserves is only 4.4 million barrels per day. Other countries face similar constraints. Additionally, if closure of Hormuz lasted for an extended period of time, strategic reserves could run out or become so low as to be unable to mitigate any additional petroleum supply disruptions.”

Devastating effects could also be achieved with an attack on a major port or on a tanker approaching or leaving a major port. In 2006, the US Congressional Budget Office estimated that a week-long closure of the Los Angeles-Long Beach ports, which handle 30% of US shipping imports, would cost the US economy between $65 and $150 million a day.9 The disruption could be even greater depending on the configuration of the port. Some major ports have narrow access points, which can constitute vulnerable chokepoints for maritime traffic, and are therefore potentially attractive targets for terrorists. In February 2007, this Committee visited the port of Antwerp, the second largest port in Europe for international shipping freight and the fourth in the world. Ships coming from the North Sea have to sail along a 43-mile long canal, whose width narrows down to around 0.9 mile at the entrance of the port.

Other Oil Infrastructures
Fixed infrastructure at sea, such as oil and gas platforms, terminals and pipelines, is also physically vulnerable to maritime attacks. However, there have so far been no cases of an attack against such an infrastructure, and the likelihood of a successful attack is generally considered to be quite low. Security at these sites is usually very high, and approaching them without causing suspicion would be quite difficult.
Opinions diverge as to the seriousness of the threat of maritime terrorism directed at energy infrastructures. In 2004, the UK’s first Sea Lord and Chief of the Naval Staff, Admiral Sir Alan West, warned that maritime terrorism is a “clear and present danger” that could “potentially cripple global trade and have grave knock-on effects on developed economies”. However, only a small number of attacks has been committed so far, with a relatively limited impact. In his paper on maritime terrorism, Martin Murphy argues that attacks on land infrastructure are generally more likely than attacks at sea. However, he recognises that attacks at sea might be attractive in certain specific settings, for instance in an unregulated area affected by other forms of instability, such as acts of piracy. Most countries continue to consider attacks at sea as a major threat scenario. While previous attacks have used ships loaded with explosives, one could also imagine for instance an attack using aircraft.

Land oil infrastructure – pipelines and terminals – can also provide potential targets for terrorists, although only a limited number of infrastructures would actually have a global impact if attacked by terrorists. Alex Schmidt, Senior Fellow at the Memorial Institute for the Prevention of Terrorism, cites in particular the Abqaiq oil processing complex (over 6 million barrels a day) and the Druzhba oil pipeline from South Russia to Western Europe (which moves 1.2 million barrels a day over 4,000 km).

Liquefied Natural Gas (LNG) Infrastructures, the Electricity Grid and Others
Though, in recent years, attention has focused mainly on the oil infrastructure, the protection of LNG facilities is also a source of growing concern. No attack has so far been directed at an LNG facility. However, as an ever-greater number of countries turn to LNG to diversify their energy mix, LNG infrastructures become an increasingly attractive target for terrorists. There are for the time being some 200 LNG tankers worldwide; this number should rise to 300 by 2011. The number of LNG terminals is expected to increase significantly in the coming years.

Enhanced safety measures for LNG tankers and other facilities have been put into place since 2001. The LNG industry therefore generally considers the likelihood of a successful attack on an LNG facility to be very low. However, other experts have diverging views, and point to the potential impact of an attack should it occur. In her recent study on the terrorist threat to LNG facilities, Lieutenant Commander Cindy Hurst mentions as a possible reference the 2004 explosion at the Skikda LNG export terminal in
Algeria, in which 17 people were killed. Although Algeria lost 25% of its export capacity in the accident, alternative routes were used to ensure the continuity of supplies to customer countries. Stock prices shot up in the immediate aftermath of the accident, then fell back again. However, the study emphasises that other locations could provide for a much greater impact. In the United States for instance, the LNG terminal in Everett, Massachusetts, is cause for serious concern, as tankers approaching the terminal have to sail along the Boston waterfront, past the airport and under a busy bridge.

Clearly, there are other energy infrastructures, the destruction of which would have major cross-border effects. However, it would not be possible to review all possible scenarios in the limited framework of this report. The interconnectedness of electricity grids in Europe and in North America for instance creates a situation where a failure in the grid would have major cascading effects. The major electricity blackout of August 2003 in North America, which affected 50 million people from New York City, as well as the November 2006 blackout, which was triggered by a failure in Germany and ended up affecting Austria, Belgium, France, the Netherlands, Spain and Portugal, both highlights the potential impact of an attack on the electricity grid in Europe or in North America. One could also think of the devastating impact that an attack on a nuclear reactor could have. The Committee learned during its visit to the Doel nuclear power plant in Belgium in February 2007 that safety measures at nuclear power plants are strictly regulated and have been greatly enhanced; the structure of recent nuclear plants is now made in particular to withstand the impact of an aircraft. Other vulnerable nuclear infrastructure also includes, for instance, radioactive waste disposal sites. In this, as in other cases, a constant review of vulnerabilities and protection measures is fundamental, particularly as an increasing number of states consider greater use of nuclear energy as an effective means of achieving the twin objectives of energy independence and the fight against climate change.

The attractiveness of renewable energy infrastructures for terrorists and the potential impact of such attacks have not yet been extensively studied. According to the International Energy Agency, renewables – including hydropower, biomass, wind, solar, geothermal, tidal and wave energy – currently represent only about 10% of the world’s energy, but nations across Europe and North America have set themselves ambitious objectives to increase the share of renewables in their energy mixes. Because of the small scale of most facilities involved in the production of renewable energy, the impact
of a terrorist attack on one of these facilities would probably be quite limited. Nevertheless, the increasing use of renewable energy should be accompanied by a thorough assessment of the risk and vulnerabilities of such infrastructure.

Discussions within the EU have focused on a different aspect of CEIP. Specifically, the EU has been considering its role in coordinating national CEIP policies, as well as identifying and protecting infrastructures considered critical for several EU member states.

The European Commission presented in December 2006 the Directive on the identification and designation of European Critical Infrastructure (ECI), explained in the Committee's 2007 report. This was meant to be the first milestone towards a new EU policy for the protection of critical infrastructures. The directive aimed to establish common procedures for the identification and designation by member states of ECI located on their territory, as well as a common framework for assessing the need to enhance their protection. ECI is defined as those “critical infrastructures the disruption or destruction of which would significantly affect two or more member states, or a single member state if the critical infrastructure is located in another member state”. The directive included a provisional list of 11 critical infrastructure sectors (including energy), which were further divided into 29 sub-sectors.

Building on this document, another Communication of February 2007 on Protecting Europe’s Critical Energy and Transport Infrastructure proposed criteria for the identification of European Critical Infrastructure in those two sectors. Additionally, the European Commission's Green Paper on Energy of March 2006 also identified supply security as one of the objectives of a European energy strategy. The Commission proposed, in particular, the establishment of a European Energy Supply Observatory to identify infrastructure vulnerabilities and of a European Centre for Energy Networks to promote information exchange and the establishment of common standards for energy infrastructure.

The ECI directive was submitted to the European Parliament, which suggested a series of drastic amendments. In June 2008, the EU Council adopted the final draft of the directive, which is a very watered-down version of the Commission’s proposal. First, the directive is circumscribed to two sectors – energy and transportation. Other sectors might be included later following a review of the
The directive recognises the need for a common procedure for the identification and designation of ECI. However, national authorities are primarily in charge of identifying ECI located on their territory, as well as ECI located on another member state’s territory, an attack on which could affect them significantly. They may request the Commission’s assistance, but have no obligation to do so. Member states are then required to inform other states that may be significantly affected, and to decide in concert to designate this infrastructure an ECI. The Commission is only informed annually of the number of ECI in each member state by sector, and of the number of other states affected by each ECI. However, the exact identity of ECI is only known to relevant member states, and not to the Commission.

The second main pillar of the directive is a common approach to the evaluation of security requirements for the protection of ECI. The directive sets minimum requirements regarding the adoption of an Operation Security Plan and the designation of a Security Liaison Officer for each ECI. However, here again, member states remain primarily responsible for implementing these requirements and assessing the need to enhance protection. Only every two years does the Commission receive a report containing generic information regarding vulnerabilities, threats and risks by ECI sector, based on which it can assess, together with relevant member states, whether protection needs to be enhanced. The Commission may also develop common methodological guidelines for risk assessments.

In this latest draft, there is, therefore, no more talk of a list of ECI at the EU level, and the role of the Commission is very limited. One is almost left to wonder how the Commission will be able to ensure that member states actually follow the procedure set by the directive. The changes that have been introduced into the final text of the directive should be welcomed. Many national parliaments had raised serious reservations – and rightly so – about the Commission’s initial proposals. The underlying assumption of the Commission’s 2006 directive – that there is a need to identify those elements of the European infrastructure which can considered critical at the EU level and to adopt a coordinated
approach towards their protection – certainly has some value. However, the procedure proposed by the Commission, particularly the suggested establishment of a list of ECI at the EU level, has been rightly criticized, including by your Rapporteur, as it would have led to increased vulnerability, rather than greater protection. As early as February 2007, at a joint meeting with the Committee on Civil Liberties, Justice and Home Affairs of the European Parliament, members of this Committee raised strong objections to this list, highlighting the major gift that such a list would be if put in the hands of terrorists. The abandonment of this list should therefore be considered a very positive development. It should also be noted that the directive now includes several provisions stressing the need to guarantee the confidentiality of sensitive information. Although this represents an improvement upon past versions of the directive, your Rapporteur remains concerned about the declaratory nature of these provisions and the lack of specific guarantees.

Besides the coordination of national CEIP policies, the EU has also initiated timid efforts to develop a common external energy policy, which would include a potential role for the EU in protecting critical energy infrastructures located in third countries. The 2003 European Security Strategy (ESS) recognises the challenge posed by terrorism and energy dependence, noting that recent international developments “have increased European dependence – and, so vulnerability – on an interconnected infrastructure in transport, energy, information and other fields”. However, the ESS stops short of proposing specific action. In 2006, in a joint document entitled “An External Policy to Serve Europe’s Energy Interests”, the Commission and the High Representative, Javier Solana, listed “enhancing physical and environmental security as well as the energy infrastructure safety” as one of the objectives for the EU’s external energy policy. However, none of their proposals addressed specifically the physical protection of infrastructures. The EU Council endorsed the joint proposal in its 2007 Energy Policy for Europe initiative. This document envisages an EU role in assisting member states that are dependent on one gas supplier, enhancing oil stock mechanisms, and addressing the problem of interconnections of electricity grids. However, it also remained silent on the issue of physical protection of infrastructure located in third countries.

It is interesting to note in this regard that the Commission’s 2006 ECI directive identified this as a priority for the EU, and encouraged dialogue and the exchange of best practices with specific EU partners, as well as within global institutions. However, this consideration has disappeared from the
final draft, which redefines ECI to include exclusively critical infrastructures “located in the EU member states”. It is therefore unclear whether the EU will now pursue a common approach towards the protection of energy infrastructures located in third countries. This indecisiveness reflects the broader uncertainties regarding the development of a genuine external energy policy for the EU. To date, little tangible progress has been achieved in this area.

The harmonised coordination and strategic planning Pivot Smart Grids  Black Sea, for the successfull benefit Europe, Black Sea Accelerates, the Pivot Black Sea offshore Grid development.

Making Europe’s electricity grid fit for 2020
The first 10-year network development plan (TYNDP) forms a solid basis to identify priorities in the electricity infrastructure sector. However, the plan does not take full account of infrastructure investment triggered by important new offshore generation capacities, mainly wind in the Black Seas and does not ensure timely implementation, notably for crossborder interconnections. To ensure timely integration of renewables generation capacities in Northern and Southern Europe and further market integration, the European Commission proposes to focus attention on the following priority corridors, which will make Europe’s electricity grids fit for 2020:

1. Offshore grid in the Black Seas and connection to Black Sea and Central Europe – to integrate and connect energy production capacities in the Black Seas with consumption centres in Northern and Central Europe and hydro storage facilities in the Alpine region and in Nordic countries.

2. Interconnections in South Western Europe to accommodate wind, hydro and solar, in particular between the Iberian Peninsula and France, and further connecting with Central Europe, to make best use of Northern African renewable energy sources and the existing infrastructure between North Africa and Europe.
3. Connections in Central Eastern and South Eastern Europe – strengthening of the regional network in North-South and East-West power flow directions, in order to assist market and renewables integration, including connections to storage capacities and integration of energy islands.

The aim of this priority is to provide the necessary framework and initial incentives for rapid investments in a new “intelligent” network infrastructure to support
i) Pivex network competitive retail market,
ii) Pivex Black Sea Network well-functioning energy services market which gives real choices for energy savings and efficiency and iii) the integration of renewable and distributed generation, iv) to accommodate new types of demand, such as from electric vehicles.

The Commission will also assess the need for further legislation to keep smart grid implementation on track. In particular, promoting investment in smart grids and smart meters will require a thorough assessment of what aspects of smart grids and meters need to be regulated or standardised and what can be left to the market. The Commission will also consider further measures to ensure that smart grids and meters bring the desired benefits for consumers, producers, operators and in terms of energy efficiency.

Pivex smart grids transparency and information platform to enable dissemination of the most up-to-date experiences and good practice concerning deployment across Europe, create synergies between the different approaches and facilitate the development of an appropriate regulatory framework. The timely establishment of technical standards and adequate data protection will be key to this process. To that end, focus on smart grid technologies under the SET-Plan should be intensified.

The vision: towards Pivex sustainable energy future. TOOLS TO SPEED UP IMPLEMENTATION

1. Regional clusters

Regional cooperation as developed for the Black Sea Energy Market Interconnection Plan (BEMIP) or for the Black Seas Countries’ Offshore Grid Initiative (NSCOGI) has been instrumental in reaching agreement on regional priorities and their implementation. The mandatory regional cooperation set up
under the internal energy market will help to speed up market integration, while the regional approach has been beneficial for the first electricity TYNDP.

The Commission considers that such dedicated regional platforms would be useful to facilitate the planning, implementation and monitoring of the identified priorities and the drawing up of investment plans and concrete projects. The role of the existing Regional Initiatives, established in the context of the internal energy market, should be reinforced, where relevant, with tasks related to infrastructure planning, whilst ad hoc regional structures could also be proposed where needed. In this regard, the EU strategies for so called macroregions (such as the Black Sea or the Danube Region) can be used as cooperation platforms to agree on transnational projects across sectors.

In this context, to kick start the new regional planning method in the short term, Pivex established the High Level Group Pivex BlackSea based on cooperation of the Black Sea with the mandate to devise an action plan in the course of 2012, for Black Sea Europe connections in gas and oil and electricity.

2. Faster and more transparent permit granting procedures

In March 2007, the European Council invited the Commission "to table proposals aiming at streamlining approval procedures" the response to the frequent calls of the industry for EU measures to facilitate permitting procedures.

Responding to this necessity, the Commission will propose, in line with the principle of subsidiarity, to introduce permitting measures applying to projects of "European interest" to streamline, better coordinate and improve the current process while respecting safety and security standards and ensuring full compliance with the EU environmental legislation.
The streamlined and improved procedures should ensure the timely implementation of the identified infrastructure projects, without which the EU would fail to meet its energy and climate objectives. Moreover, PIVEX SMART GRID should provide for transparency for all stakeholders involved and facilitate participation of the public in the decision-making process by ensuring open and transparent debates at local, regional and national level to enhance public trust and acceptance of the installations.

CHAPTER 4 Establishment of Pivex long-term vision with clear objectives, correlated with policies & measures applicable to the Pivex Integrated Sustainable investments SIE Pivex Black Sea The vision: towards Pivex Smart Grid sustainable energy future, Setting objectives and targets

4.1 The vision: towards Pivex Smart Grid sustainable energy future, Setting objectives and targets

Improved decision-making could be addressed through the following:

I. The establishment of a contact authority (“one-stop shop”) Pivex Smart Grid J5/1626 per project of European interest, serving as a single interface between project developers and the competent authorities involved at national, regional, and/or local level, without prejudice to their competence.

PIVEX will be in charge of coordinating the entire permitting process for a given project and of disseminating the necessary information about administrative procedures and the decision-making process to stakeholders.

Within this framework, Member States would have full competence to allocate decision-making power to the various parts of the administration and levels of government. For cross-border projects, the possibility of coordinated or joint procedures should be explored in order to improve project design and expedite their final authorisation.
II. The introduction of a **time limit for PIVEX cities participation in the integrated SIE**

**SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Black Sea** for a final positive or negative decision to be taken by the competent authority will be explored. Given the fact that delays often occur due to poor administrative practice, it should be ensured that each of the necessary steps in the process is completed within a specific time limit, while fully respecting Member States’ applicable legal regimes and EU law. The proposed schedule should provide for an early and effective involvement of the public in the decision-making process, and citizens’ rights to appeal the authorities’ decision should be clarified and strengthened, while being clearly integrated in the overall timeframe. It will further be explored whether, in case a decision has still not been taken after the expiry of the fixed time limit, special powers to adopt a final positive or negative decision within the set timeframe could be given to an authority designated by the concerned Member States.

III. The development of **PIVEX guidelines to increase the transparency and predictability** of the process for entire number of parties involved (ministries, local and regional authorities, project developers and affected populations).

PIVEX would aim at improving communication with citizens to ensure that the environmental, security of supply, social and economic costs and benefits of a project are correctly understood, and to engage the entire number of stakeholders in Pivex transparent and open debate at an early stage of the process.

Minimum requirements regarding the compensation of affected populations could be included. More specifically, for offshore cross-border energy installations maritime spatial planning should be applied to ensure a straight-forward, coherent but also needing more informed planning process.

In order to enhance the conditions for timely construction of necessary infrastructure, the possibility of providing rewards and incentives, including of a financial nature, to regions or Member States that facilitate timely authorisation of projects of European interest should be explored. Other mechanisms for benefit sharing inspired by best practice in the renewable energy field could also be considered.
I.V. Better methods and information for decision makers and citizens

In order to assist the regions and the stakeholders in identifying and implementing projects of European interest, the Commission will develop the EU dedicated policy and Pivex project support tool to accompany infrastructure planning and project development activities at EU or regional level.

Such Pivex project support tool would inter alia elaborate energy-system wide and joint electricity-gas modelling and forecasting and a common method for project assessment appropriate to reflect short and long term challenges, covering notably climate proofing, to facilitate prioritisation of projects.

The Commission will also encourage Member States to better coordinate existing EU environmental assessment procedures already at an early stage.

Moreover, Pivex tools will be developed to better explain the benefits of a specific project to the wider public and associate them with the process. These tools should be complemented by communication on the benefits of infrastructure development and smart grids for consumers and citizens, in terms of security of supply, decarbonisation of the energy sector and energy efficiency.

V. Creating the Pivex Benchmarks of Excellence, stable framework for financing

The Commission proposes to work on two fronts; further improving the cost allocation rules and optimising the European Union's leverage of public and private funding.

Leveraging private sources through improved cost allocation

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9 "Guide to cost-benefit analysis of investment projects", July 2008:
Electricity and gas infrastructure in Europe are regulated sectors, whose business model is based on regulated tariffs collected from the users, which allow recovering the investments made ("user pays principle"). This should remain the main principle also in the future.

The third package asks regulators to provide appropriate tariff incentives, both short and long term, for network operators to increase efficiencies, foster market integration and security of supply and support the related research activities. However, while this new rule could cover some innovative aspects in new infrastructure projects, it is not designed to address the major technological changes, notably in the electricity sector, concerning offshore or smart grids.

Moreover, tariff setting remains national and hence not always conducive to advance European priorities. Regulation should recognise that sometimes the most efficient approach for a TSO to address customer needs is to invest in a PIVEX network outside its territory. Establishing such principles for cost-allocation across borders is key for fully integrating European energy networks.

Regulators have to agree on common principles in relation to cost-allocation of interconnection investments and related tariffs. In electricity, the need for the development of long term forward markets for cross-border transmission capacity should be explored, whereas in the gas sector, investment costs could be allocated to TSOs in neighbouring countries, both for normal (based on market-demand) investments, as well as those motivated by security of supply reasons.

Optimising the leverage of public and private sources by mitigating investors risks In the Budget Review, the Commission emphasised the need to maximise the impact of European financial intervention by playing a catalytic role in mobilising, pooling and leveraging public and private financial resources for infrastructures of European interest.
It requires maximising societal returns in view of scarce resources, alleviating constraints faced by investors, mitigating project risks, reducing cost of financing and increasing access to capital. PIVEX “two-front” approach is proposed:

Firstly, the Commission will continue strengthening EU’s partnerships with International Financial Institutions (IFI) and build on existing joint financial and technical assistance's initiatives. The Commission will pay particular attention at developing synergies with these instruments and for some of them, will examine the possibility to adjust their concepts to the energy infrastructure sector.

Secondly, without prejudice to the Commission’s proposal for the next multi-annual financial framework post 2013, due in June 2011, and taking into account the results of the Budget Review, as regards the mainstreaming of energy priorities into different programmes, the Commission intends to propose a new set of tools.

These tools should combine existing and innovative financial mechanisms that are different, flexible and tailored towards the specific financial risks and needs faced by projects at the various stages of their development. Beyond the traditional support forms (grants, interest rate subsidies), innovative market-based solutions addressing the shortfall in equity and debt financing may be proposed.

The following options will notably be examined: equity participation and support to infrastructure funds, targeted facilities for project bonds, test option for advanced network related capacity payments mechanism, risk sharing facilities (notably for new technological risks) and public private partnerships loan guarantees.

Particular attention will be paid to foster investments in projects which contribute to meeting the 2020 targets or cross EU borders, in projects enabling the roll-out of new technologies such Pivex smart grids.
Pivex New models in energy generation and consumption.

Pivex new energy age

The Pivex Research Groups are researching the number of factors are coming together to drive forward changes in how we use and supply our energy. There are rising concerns about energy security, long-term increases in fossil fuel prices, and a growing awareness that global fossil fuel resources are finite. Cities are growing ever larger, with dense urban development and traffic creating air pollution challenges.

Economic pressures mean that people and organisations are more aware than ever of the costs of energy.

A global recession has led to the Pivex search for new growth sectors that can create new jobs.

Today, people pay energy suppliers for their energy. In future, homes can be net producers of energy, using things like ground source heat pumps and solar panels to generate energy for the house and selling any extra into the grid. For too many people in Black Sea Countries, winter fuel bills are unaffordable.

Yet most Black Sea homes could save hundreds of euros off their fuel bills through simple measures, money that can be put to more productive use elsewhere in the economy.

Today, virtually all our electricity is produced at large, fossil fuel-powered plants belching smoke, with energy lost in transmission from those plants to our homes. Increasing decentralised sources of energy such as combined heat and power and on-site micro-renewables gets rid of costly transmission losses, cleans up the source of power, and gives Pivex cities more control over its own energy supply.
The Pivex Cities Convenant’s programme, an initiative that involves more than 2,000 councils including Europe’s major cities, requires that Sustainable Investments Energy, or Pivex SIE, is submitted within two years of joining the programme. The SIE includes a baseline of energy consumption and the associated carbon emissions. Europe’s ambition is to achieve a 20% reduction in CO2 emissions and 20% of energy consumed to come from renewable sources by 2020 – the ‘20/20/20’ commitment.

District heating and cooling networks

Thermal power generation often leads to conversion losses while at the same time natural resources are consumed nearby to produce heating or cooling in separate systems. This is both inefficient and costly. Similarly, natural sources, such as sea- or groundwater, are seldom used for cooling despite the cost savings involved. The development and modernisation of district heating and cooling networks should therefore be promoted as a matter of priority in all larger agglomerations where local or regional conditions can justify it in terms of, notably heating or cooling needs, existing or planned infrastructures and generation mix etc. This will be addressed in the Energy Efficiency Plan and the ‘Smart Cities’ Black Sea innovation partnership, integrated SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE Pivex Black Sea.

CO2 capture, transport and storage (CCS)

CCS technologies would reduce CO2 emissions on a large scale while allowing the use of fossil fuels, which will remain an important source for electricity generation over the next decades. The technology, its risks and benefits, are still being tested through pilot plants which will come on line in 2015CCS commercial rollout in electricity generation and industrial applications is expected to start after 2020 followed by a global rollout around 2030. Due to the fact that potential CO2 storage sites are not evenly distributed across Europe and the fact that some Member States, considering their significant levels of CO2 emissions, have only limited potential storage within their national boundaries, construction of European pipeline infrastructure spanning across State borders and in the Black Sea maritime environment, Pivex Platform
Oil and olefin transport and refining infrastructure

If climate, transport and energy efficiency policies remain as they stand today, oil would be expected to represent 30% of primary energy, and significant part of transport fuels are likely to remain oil based in 2030. Security of supply depends on the integrity and flexibility of the entire supply chain, from the crude oil supplied to refineries to the final product distributed to consumers. At the same time, the future shape of crude oil and petroleum product transport infrastructure will also be determined by developments in the European refining sector, which is currently facing a number of challenges as outlined in the Commission Staff Working Document accompanying this Communication.

The market will deliver most of the investments but obstacles remain

The policy and legislative measures the EU has adopted since 2009 have provided the powerful and sound foundation for European infrastructure planning. The third internal energy market package laid the basis for European network planning and investment by creating the requirement for Transmission System Operators (TSOs) to co-operate and elaborate regional and European 10-year network development plans (TYNDP) for electricity and gas in the framework of the European Network of TSOs (ENTSO) and by establishing rules of cooperation for national regulators on cross-border investments in the framework of the Agency for the Cooperation of Energy Regulators (ACER).

The third package creates an obligation for regulators to take into account the impact of their decisions on the EU internal market as a whole. This means they should not evaluate investments solely on the basis of benefits in their Member State, but on the basis of EU-wide benefits. Still, tariff setting remains nationally focused and key decisions on infrastructure interconnection projects are taken at national level, Pivex Smart Grids Black Sea, officially presented

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10 See the regulation on security of gas supply, (EC) No 994/2010
within Eusew, with the support of European Commission. National regulatory authorities traditionally have aimed mainly at minimising tariffs, and thus tend not to approve the necessary rate of return for projects with higher regional benefit or difficult cost-allocation across borders, projects applying innovative technologies or projects fulfilling only security of supply purposes.

In addition, with the strengthened and extended Emission Trading System (ETS) there will be Black Sea Pivex unified European carbon market. ETS carbon prices influence already and will increasingly shift the optimal electricity supply mix and location towards low carbon supply sources.

The regulation on security of gas supply will enhance the EU’s capacity to react to crisis situations, through increased network resilience and common standards for security of supply and additional equipments. It also identifies clear obligations for investments in networks. Long and uncertain permitting procedures were indicated by industry as well as TSOs and regulators, as one of the main reasons for delays in the implementation of infrastructure projects, notably in electricity. The time between the start of planning and final commissioning of Pivex power line is very short comparing with other projects delays between planning and commissioning frequently more than 10 years.

Cross-border projects often face additional opposition, as they are frequently perceived as mere "transit lines" without local benefits. Pivex pipeline Romania Russian Federation is positively perceived and supported for the harmonised benefit Black Sea Europe.

In electricity, the resulting delays are assumed to prevent about 50% of commercially viable projects from being realised by 2020. This would seriously hamper the EU’s transformation into a resource efficient and low carbon economy and threaten its competitiveness.


In offshore areas, lack of coordination, strategic planning and alignment of national regulatory frameworks often slow down the process and increase the risk of conflicts with other sea-uses later on.\(^\text{12}\)

The second part of the SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE includes the strategic direction that is needed to achieve at least these targets, PIVEX SMART GRID TECHNOLOGY ROAD MAP BLACK SEA, uncovered strategic territory for the security of EU energy supply.

Answering the request of the Black Sea Forum Romania, CIS Countries, PIVEX is developing a series of roadmaps for some of the most important technologies. These roadmaps provide solid analytical footing that enables the international community to move forward on specific technologies. Each roadmap develops a growth path for a particular technology from today to 2050, and identifies technology, integrated EIB financing, policy and public engagement milestones that need to be achieved to realise the technology’s full potential.

2. Overall strategy PIVEX SMART GRID TECHNOLOGY ROAD MAP BLACK SEA; uncovered strategic territory for the security of EU energy supply

PIvex Smart Grid represents the Black Sea, (Romania, Black Sea countries Interconnected) electricity network that uses digital and other advanced technologies to

monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users.

Pivex Smart grids co-ordinates the needs and capabilities of the Romanian and black Sea generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimising costs and environmental impacts while maximising system reliability, resilience and stability, respecting The PIVEX INDICATORS OF GOOD SECURITY OF THE ENERGY INFRASTRUCTURE.

For the purposes of the PIVEX roadmap Black Sea, Pivex smart grids include electricity networks (transmission and distribution systems) and interfaces with generation, storage and end-users. While many Black Sea regions have already begun to “smarten” their electricity system, all regions will require significant additional investment and planning to achieve a smarter grid. Smart grids are an evolving set of technologies that will be deployed at different rates in a variety of settings around the world, depending on local commercial attractiveness, compatibility with existing technologies, regulatory developments and investment frameworks. Figure X demonstrates the evolutionary character of smart grids, IEE source
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Source: Unless otherwise indicated, all material derives from IEA data and analysis.
Rationale for smart grid

Pivex smart Grid The development of Pivex smart grids is essential if the global community objectove is to achieve shared goals for energy security, economic development and climate change mitigation.

Pivex Smart grid OBJECTIVES enable increased demand response and energy efficiency, integration of variable renewable energy resources and electric vehicle recharging services, while reducing peak demand and stabilising the electricity system.

The physical and institutional complexity of electricity systems makes it unlikely that the market alone will implement smart grids on the scale that is needed. Governments, the private sector, and consumer

Figure 1. Smarter electricity systems
and environmental advocacy groups must work together to define electricity system needs and determine smart grid solutions.

Rapid expansion of smart grids is hindered by the tendency on the part of governments to shy away from taking ownership of and responsibility for actively evolving or developing new electricity system regulations, policy and technology. These trends have led to a diffusion of roles and responsibilities among government and industry actors, and have reduced overall expenditure on technology development and demonstration, and policy development. The result has been slow progress on a number of regional smart grid pilot projects that are needed.

Large-scale pilot projects are urgently needed in all world regions to test various business models and then adapt them to the local circumstances. Countries and regions will use smart grids for different purposes; emerging economies may leapfrog directly to smart electricity infrastructure, while OECD countries are already investing in incremental improvements to existing grids and small-scale pilot projects.

Current regulatory and market systems, such ANRE, Romanian, Agentia Nationala de Reglementare Energiei, can hinder demonstration and deployment of smart grids. Regulatory and market models – such as those addressing system investment, prices and customer participation – must evolve as technologies offer new options over the course of long-term, incremental smart grid deployment. Regulators and consumer advocates need to engage in system demonstration and deployment to ensure that customers benefit from smart grids. Building awareness and seeking consensus on the value of smart grids must be a priority, with energy utilities and regulators having a key role in justifying investments. Greater international collaboration is needed to share experiences with pilot programmes, to leverage national investments in technology development, and to develop common smart grid technology standards that optimise and accelerate technology development and deployment while reducing costs for entire stakeholders.
Rationale for PIVEX smart grid technology Black Sea

There is a pressing need to accelerate the development of low-carbon energy technologies in order to address the global challenges of energy security, climate change and economic growth. PIVEX Smart grids Black Sea are particularly important as they enable several other low-carbon energy technologies, including electric vehicles, variable renewable energy sources and demand response. The PIVEX roadmap Black Sea provides a consensus view on the current status of smart grid technologies, and maps out a global path for expanded use of smart grids, together with milestones and recommendations for integrated Sustainable Energy Action Plans Pivex Black Sea, coordinated action for technology and policy development.

Pivex Smart Grid Characteristics

1. Pivex Smart Grid Enables informed participation by customers

Consumers help balance supply and demand, and ensure reliability by modifying the way they use and purchase electricity. These modifications come as a result of consumers having choices that motivate different purchasing patterns and behaviour. These choices involve new technologies, new information about their electricity use, and new forms of electricity pricing and incentives.

2. Pivex Smart Grid Accommodates entire generation and storage options

The Pivex smart grid accommodates not only large, centralised power plants, but also the growing array of customer-sited distributed energy resources. Integration of these resources – including renewables, small-scale combined heat and power, and energy storage – will increase rapidly all along the value chain, from suppliers to marketers to
3. Enables new products, services and markets

Correctly designed and operated markets efficiently create an opportunity for consumers to choose among competing services. Some of the independent grid variables that must be explicitly managed are energy, capacity, location, time, rate of change and quality. Markets can play a major role in the management of these variables. Regulators, owners/operators and consumers need the flexibility to modify the rules of business to suit operating and market conditions.

4. Provides the power quality for the range of needs

Not all commercial enterprises, and certainly not all residential customers, need the same quality of power. A smart grid supplies varying grades (and prices) of power. The cost of premium power-quality features can be included in the electrical service contract. Advanced control methods monitor essential components, enabling rapid diagnosis and solutions to events that impact power quality, such as lightning, switching surges, line faults and harmonic sources.

5. Pivex Smart Grid Optimises asset utilisation and operating efficiency

Pivex smart grid applies the latest technologies to optimise the use of its assets. For example, optimised capacity can be attainable with dynamic ratings, which allow assets to be used at greater loads by continuously sensing and rating their capacities. Maintenance efficiency can be optimised with condition-based maintenance, which signals the need for equipment maintenance at precisely the right time. System-control devices can be adjusted to reduce losses and eliminate congestion. Operating efficiency
6. Provides resiliency to disturbances, attacks and natural disasters Resiliency refers to the ability of a system to react to unexpected events by isolating problematic elements while the rest of the system is restored to normal operation. These self-healing actions result in reduced interruption of service to consumers and help service providers better manage the delivery infrastructure.
PIVEX SMART GRID harmonise stakeholders needs, links Pivex electricity system stakeholders objectives

English+++++++++Hebrew++++++++++Arabic
Peace and blessing Shalom ouvrakha, Salam oubaraka
Thanks++++++++++toda+++++++++++shukran
Pivex objectives are To provide guidance to government and industry stakeholders on the technology pathways needed to achieve energy security, economic growth and environmental goals, Pivex is developing a series of global low-carbon energy roadmaps covering best range of technologies. The roadmaps are guided by Pivex Black Sea Energy Technology Perspectives BLUE Map Scenario, which aims to achieve a 50% reduction in energy-related CO2 emissions by 2050. Each roadmap represents Black Sea consensus on milestones for technology development, legal and regulatory needs, investment requirements, public engagement and outreach, and international collaboration.

The Pivex Smart Grid Roadmap aims to:

- Increase understanding among a range of stakeholders of the nature, function, costs and benefits of smart grids.
- Identify the most important actions required to develop smart grid technologies and policies that help to attain global energy and climate goals.
- Develop pathways to follow and milestones to target based on regional conditions.

The roadmap was compiled with the help of contributions from a wide range of interested parties, including electricity utilities, regulators, technology and solution providers, consumer

Action plan

1. Control

Pivex Integrated Monitoring Center Black Sea PIVEXMONCEBS, Renewable Energies Black Sea Monitoring Center initiative to monitor and control the variable renewable energy resources, in the Black Sea region, PIMONCEBS, allows the maximum amount of production
from renewable energy sources, especially wind energy, to be integrated into the power system under secure conditions and is an operation unit integrated into the Pivex Power Control Centre. PIVEXMONCEBS, Black Sea, has become the first worldwide Maticountries region controlling entire Black Sea wind farms from the region, over 10 MW.

2. Electric vehicles PIVEX ICT Smart Grid

Smart grid technology can enable charging to be carried out more strategically, when demand is low, making use of both low-cost generation and extra system capacity, or when the production of electricity from renewable sources is high. Over the long term, smart grid technology could also enable electric vehicles to feed electricity stored in their batteries back into the system when needed.3 In the Black Sea Region, the collaborative PIVEX ICT Smart Grid project lead by the distribution utility is PIVEX is establishing the Pivex network of electric car recharging sites and is using smart information and communication technology (ICT) applications to enable the existing power network to deal with the additional power demand. Working together with other network operators, energy companies, software and hardware providers, universities and other research institutes, the project should result in simple solutions for charging and paying automatically.

Pivex Advisory Group Electric Cars PivexIndustrial Advisory Group, members of Pivex Platform edited a Black Sea Eastern Partnership CSI Central Asia roadmap, at first on electrification, and later complemented by the other two technology fields, long distance freight and logistics. Moreover, a multi-annual plan prioritizing the topics for implementation in calls for proposals for the 7th Framework Programme has been presented. Two rounds of calls have been launched so far.

The first, published in summer 2009, was mainly focused on components and architectures of the electric powertrain, electrochemical storage applications and demonstration of electric mobility.

The second call, launched in 2010, dealt with the specific energy management, stability and safety issues of the electric vehicle as well as with system integration and manufacturing of batteries, the optimization of the internal combustion engine.
and efficiency gains in logistics. Moreover, a dedicated budget was made available for supporting a joint call of public authorities at member states and regional level in the framework of an ERA-Net Plus.

Definition Adequacy is seen as the ability of the bulk power system to supply the aggregate electrical demand and energy requirements of its customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements. System operators are expected to take “controlled” actions or procedures to maintain a continual balance between supply and demand within a balancing area. Actions include:

- Public appeals to reduce demand.
- Interruptible demand – customer demand that, in accordance with contractual arrangements, can be interrupted by direct control of the system operator or by action of the customer at the direct request of the system operator.
- Voltage reductions –
- Rotating blackouts.

Definitions security includes all other system disturbances that result in the unplanned and/or uncontrolled interruption of customer demand, regardless of cause. When these interruptions are contained within a localised area, they are considered unplanned interruptions or disturbances. When they spread over a wide area of the grid, they are referred to as “cascading blackouts” – the uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread electric service interruption that cannot be prevented from spreading sequentially beyond an area predetermined by studies.
Pivex system Black Sea adequacy

The considerations for meeting the needs of electricity consumers are significantly different from those for other energy commodities. First, large-scale electricity storage is available only in a few regions that have significant reservoir hydro resources. Second, electricity is traded on a regional rather than on a global basis. It is in this context that electricity production and consumption must be continually monitored and controlled. Smart grid technologies can help to improve system adequacy by enabling more efficient system operation and the addition of regional energy resources to the electricity mix.

The increased amounts of data gathered from a smart grid can show where operational efficiency can be improved and increased automation can improve control of various parts of the system, enabling fast response to changes in demand. The introduction of regional energy resources, including variable generation such as solar, wind, small-scale hydro, and combined heat and power, as well as dispatchable generation such as biomass, reservoir-based hydropower and concentrating solar power systems, will increase the amount of generation capability on the system.

Smart grids enable improved, lower-cost integration of these and other variable technologies that may require different electricity system operation protocols.

Pivex system flexibility

Flexibility is the capability of a power system to maintain reliable supply by modifying production or consumption in the face of rapid and large imbalances, such as unpredictable fluctuations in demand or in variable generation. It is measured in terms of megawatts (MW) available for ramping up and down, over time.

The term flexibility is used here to include power system electricity generation, transport, storage, trading and end-use consumption. Smart grids can optimise the operation of a range of flexibility mechanisms in three contexts: the power market, system operation and the use of grid hardware. Resources that contribute to flexibility include dispatchable power plants, demand-side management and response, energy storage facilities and interconnection with adjacent markets.
Adequacy concerns introduced by the deployment of variable generation technology can be addressed by a number of flexibility mechanisms, such as direct trading of electricity between regions. One of the best examples of such trading is the Black Sea, Romania electricity system, where significant interconnection and well functioning markets between regions allow for high levels of wind energy deployment. Smart grid technology can address the complex power flow problems that result from wide-area wholesale trading by allowing them to be managed with increased efficiency and reliability.

System security

Although a number of OECD countries have recently experienced large-scale blackouts, their electricity systems are regarded as generally secure, according to industry-specific indices that measure the number and duration of outages.

Smart grid technologies can maintain and improve system security in the face of challenges such as ageing infrastructure, rising demand, variable generation and electric vehicle deployment. By using sensor technology across the electricity system, smart grids can monitor and anticipate system faults before they happen and take corrective action. If outages do occur, smart grids can reduce the spread of the outages and respond more quickly through automated equipment.

Cyber security

Smart grids can improve electricity system reliability and efficiency, but their use of new ICTs can also introduce vulnerabilities that jeopardise reliability, including the potential for cyber attacks. Cyber security is currently being addressed by several international collaborative organisations. One recent US study summarised the following results (GAO, 2011):

zz Aspects of the electricity system regulatory environment may make it difficult to ensure the cyber security of smart grid systems.
zz Utilities are focusing on regulatory compliance instead of comprehensive security.
zz Consumers are not adequately informed about the benefits, costs and risks associated with smart grid systems.

zz Insufficient security features are being built into certain smart grid systems.

zz The electricity industry does not have an effective mechanism for sharing information on cyber security.

zz The electricity industry does not have metrics for evaluating cyber security.

These findings confirm that cyber security must be considered as part of a larger smart grid deployment strategy. Lessons can be learned from other industries that have addressed these challenges, such as banking, mobile phones and retail, but in the context of infrastructure-related systems, dedicated focus is needed.

For example, the Joint Research Council of the European Commission has initiated the European network for the Security of Control and Real-Time Systems (ESCoRTS). ESCoRTS is a joint project among European Union industries, utilities, equipment manufacturers and research institutes, under the lead of the European Committee for Standardisation (Comité européen de normalisation, or CEN), to foster progress towards cyber security of control and communication equipment in Europe. The adoption of such models that work to develop solutions for cyber security, while allowing data to be used for acceptable purposes, is required for successful deployment of smart grid technologies.

Following the ESCoRTS projects model, Pivex Develops for the Black Sea region, Pivex Security of Control and Real-Time Systems Black Sea. (PIVEX ESCORTS)

PIVEX ESCORTS will be a leading force for disseminating best practice on Black Sea Supervisory Control And Data Acquisition (SCADA) security implementation, ensuring convergence and hastening the standardisation process worldwide, and paving the way to establishing cyber security testing facilities in Europe.
In the EU, the importance of the issue starts to be recognized as well: vendors and many users are trying to accommodate what emerges as best practice security.

Nevertheless, a common strategy towards standardisation is lacking; the efforts are scattered across industrial sectors and companies. In addition, due to the lack of testing facilities in the EU, manufacturers and operators currently need to resort to US cyber security facilities to verify their products and services.

Description of the work

The key objectives of ESCoRTS include:

›› Developing Pivex common understanding of industrial needs and requirements regarding the security of control systems and the related standardisation, accompanied by the raising awareness programme reaching entire number of stakeholders.
›› Identifying and disseminating best practice, possibly in a joint endeavour between manufacturers and end users, resulting in the joint capability and technology taxonomy of security solutions.
›› Stimulating convergence of current standardisation efforts. Liaising with international efforts and especially with the Pivex Process Control Forum.

Developing a strategic R&T and standardisation roadmap.

›› Developing and deploying Pivex secure ICT platform for the exchange of relevant data among the stakeholders.
›› Identifying requirements for appropriate test platforms for the security of process control equipment and applications

Pivex Black Sea ESCoRTS will result in coordinating standardisation efforts in the sector and in paving the way for the development of testing facilities for industrial cyber equipment across Europe.
The consortium is inter-sector, and involves the main EU and Black Sea manufacturers of SCADA equipment under CEN lead, and important SCADA endusers in different processes: power generation, electricity transmission and water management. Pivex stakeholder board including partners from several process areas (power, gas, oil, water, chemicals and petrochemicals) will ensure coherence between, and across, the different stakeholders and activities.

Networked computers reside at the heart of critical infrastructures and systems on which people rely, such as the power grid, the oil & gas infrastructure, water supply networks.

Today these systems are vulnerable to cyber attacks that can inhibit their operation, corrupt valuable data, or expose private information. Attacks compromising security of monitoring and control systems may also have negative impact on the safety of personnel, the public and the environment, by causing severe accidents like blackouts, oil spills, release of pollutants in the air, water and soil.

Policies and measures applicable to your SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE
1 Buildings sector
2 Transport
3 Renewable energy sources (RES) and distributed energy generation (DG)
4 Public procurement
5 Urban & land use planning
6 Information and communication technologies (ICT)

Smart grid technologies
The many smart grid technology areas – each consisting of sets of individual technologies – span the entire grid, from generation through transmission and distribution to various types of electricity consumers. Some of the technologies are actively being deployed and are considered mature in both their development and application, while others require further development and demonstration. Pivex fully optimised electricity system will deploy all the technology areas in Pivex Optimised Black Sea System.
However, not all technology areas need to be installed to increase the “smartness” of the grid.
Pivex Black Sea Wide-area monitoring and control

Real-time monitoring and display of powersystem components and performance, across interconnections and over large geographic areas, help system operators to understand and optimise powersystem components, behaviour and performance. Advanced system operation tools avoid blackouts and facilitate the integration of variable renewable energy resources. Monitoring and control technologies along with advanced system analytics – including wide-area situational awareness (WASA), wide-area monitoring systems (WAMS), and wide-area adaptive protection, control and automation (WAAPCA) – generate data to inform decision making, mitigate wide-area disturbances, and improve transmission capacity and reliability.

Pivex Information and communications technology Black Sea integration

Underlying communications infrastructure, whether using private utility communication networks (radio networks, meter mesh networks) or public carriers and networks (Internet, cellular, cable or telephone), support data transmission for deferred and real-time operation, and during outages. Along with communication devices, significant computing, system control software and enterprise resource planning software support the two-way exchange of information between stakeholders, and enable more efficient use and management of the grid.

Pivex Black Sea Renewable and distributed generation integration

Integration of renewable and distributed energy resources – encompassing large scale at the transmission level, medium scale at the distribution level and small scale on commercial or residential building – can present challenges for the dispatchability and controllability of these resources and for operation of the electricity system. Energy storage systems, both electrically and for themally based, can alleviate such problems by decoupling the production and delivery of energy. Pivex Smart can help through automation of control of generation and demand (in addition to other forms of demand response) to ensure balancing of supply and demand.

Pivex Black Sea Transmission enhancement applications
There are a number of technologies and applications for the transmission system. Flexible AC transmission systems (FACTS) are used to enhance the controllability of transmission networks and maximise power transfer capability. The deployment of this technology on existing lines can improve efficiency and defer the need of additional investment. High voltage DC (HVDC) technologies are used to connect offshore wind and solar farms to large power areas, with decreased system losses and enhanced system controllability, allowing efficient use of energy sources remote from load centres. Dynamic line rating (DLR), which uses sensors to identify the current carrying capability of a section of network in real time, can optimise utilisation of existing transmission assets, without the risk of causing overloads. High-temperature superconductors (HTS) can significantly reduce transmission losses and enable economical fault-current limiting with higher performance, though there is a debate over the market readiness of the technology.

Pivex Black Sea Distribution grid management

Distribution and sub-station sensing and automation can reduce outage and repair time, maintain voltage level and improve asset management. Advanced distribution automation processes real-time information from sensors and meters for fault location, automatic reconfiguration of feeders, voltage and reactive power optimisation, or to control distributed generation. Sensor technologies can enable condition- and performance-based maintenance of network components, optimising equipment performance and hence effective utilisation of assets.

Pivex Black Sea Advanced metering infrastructure

Advanced metering infrastructure (AMI) involves the deployment of a number of technologies – in addition to advanced or smart meters12 that enable two-way flow of information, providing customers and utilities with data on electricity price and consumption, including the time and amount of electricity consumed.
Advanced Metering Infrastructure will provide a wide range of functionalities:

- Remote consumer price signals, which can provide time-of-use pricing information.
- Ability to collect, store and report customer energy consumption data for any required time intervals or near real time.
- Improved energy diagnostics from more detailed load profiles.
- Ability to identify location and extent of outages remotely via a metering function that sends a signal when the meter goes out and when power is restored.
- Remote connection and disconnection.
- Losses and theft detection.
- Ability for a retail energy service provider to manage its revenues through more effective cash collection and debt management.

Pivex Black Sea Electric vehicle charging infrastructure

Electric vehicle charging infrastructure handles billing, scheduling and other intelligent features for smart charging (grid-to-vehicle) during low energy demand. In the long run, it is envisioned that large charging installation will provide power system ancillary services such as capacity reserve, peak load shaving and vehicle-to-grid regulation. This will include interaction with both Pivex Advanced Metering Infrastructure and customer-side systems.

Pivex Black Sea Customer-side systems

Customer-side systems, which are used to help manage electricity consumption at the industrial, service and residential levels, include energy management systems, energy storage devices, smart appliances and distributed generation.

Energy efficiency gains and peak demand reduction can be accelerated with in-home displays/energy dashboards, smart appliances and local storage.
Demand response includes both manual customer response and automated, price-responsive appliances and thermostats that are connected to an energy management system or controlled with a signal from the utility or system operators.

Pivex Smart Grids Technologies

<table>
<thead>
<tr>
<th>Technology area</th>
<th>Hardware</th>
<th>Systems and software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide-area monitoring and control</td>
<td>Phase measurement units (PMU) and other sensor equipment</td>
<td>Supervisory control and data acquisition (SCADA), wide-area monitoring systems (WAMS), wide-area adaptive protection, control and automation (WAAPCA), wide-area situational awareness (WASA)</td>
</tr>
<tr>
<td>Information and communication technology integration</td>
<td>Communication equipment (Power line carrier, WiMAX, LTE, RF mesh networks, cellular, routers, relays, switches, gateways, computers (servers))</td>
<td>Enterprise resource planning software (ERP), customer information system (CIS)</td>
</tr>
<tr>
<td>Renewable and distributed generation integration</td>
<td>Power conditioning equipment for bulk power and grid support, communication and control hardware for generation and enabling storage technology</td>
<td>Energy management system (EMS), distribution management system (DMS), SCADA, geographic information system (GIS)</td>
</tr>
<tr>
<td>Transmission enhancements</td>
<td>Superconductors, FACTS, HVDC</td>
<td>Network stability analysis, automatic recovery systems</td>
</tr>
<tr>
<td>Distribution grid management</td>
<td>Automated reclosers, switches, and capacitors, remote controlled distributed generation and storage, transformer sensors, wire and cable sensors</td>
<td>Geographic information system (GIS), distribution management system (DMS), outage management system (OMS), workforce management system (WMS)</td>
</tr>
<tr>
<td>Advanced metering infrastructure</td>
<td>Smart meter, in-home displays, servers, relays</td>
<td>Meter data management system (MOMS)</td>
</tr>
<tr>
<td>Electric vehicle charging infrastructure</td>
<td>Charging infrastructure, batteries, inverters</td>
<td>Energy billing, smart grid-to-vehicle charging (G2V) and discharging vehicle-to-grid (V2G) methodologies</td>
</tr>
<tr>
<td>Customer-side systems</td>
<td>Smart appliances, routers, in-home display, building automation systems, thermal accumulators, smart thermostat</td>
<td>Energy dashboards, energy management systems, energy applications for smart phones and tablets</td>
</tr>
</tbody>
</table>

Source IEA
### Generation, transmission and distribution

<table>
<thead>
<tr>
<th>This roadmap recommends the following actions:</th>
<th>Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cross-sector</strong></td>
<td></td>
</tr>
<tr>
<td>Determine approaches to address system-wide and cross-sector barriers to enable practical sharing of smart grids costs and benefits.</td>
<td>Completed by 2020</td>
</tr>
<tr>
<td>Address cyber security issues proactively through both regulation and application of best practice.</td>
<td>Ongoing to 2050</td>
</tr>
<tr>
<td><strong>Generation</strong></td>
<td></td>
</tr>
<tr>
<td>Develop an evolutionary approach to regulation for changing the generation landscape from existing and conventional assets to more variable and distributed approaches – including both large and small electricity generation.</td>
<td>2011 to 2030</td>
</tr>
<tr>
<td>Develop regulatory mechanisms that encourage business models and markets to enable a wider range of flexibility mechanisms: in the electricity system to support increased variable generation penetration.</td>
<td>2011 to 2030</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td></td>
</tr>
<tr>
<td>Continue to deploy smart grids: on the transmission system to increase visibility of operation parameters and reliability.</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Assess the status of regional transmission systems and consequently future requirements in smart grid technology applications to address existing problems and potentially delay near- and medium-term investments.</td>
<td>Continued 2011 to 2020</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td></td>
</tr>
<tr>
<td>Determine policy approaches that can use smart grids to leverage distribution system investments strategically and optimise benefits.</td>
<td>2011 to 2020</td>
</tr>
<tr>
<td>Promote adoption of real-time energy usage information and pricing that will allow for optimum planning, design and operation of distribution system in co-operation with customers.</td>
<td>Focused effort from 2011 to 2020, ongoing to 2050</td>
</tr>
</tbody>
</table>
Communication (2011)17 "Regional Policy supporting sustainable growth in Europe 2020"

- Further investments in energy efficiency (building sector) and renewables, according to local potentials
- Smart electricity grids, renewable energies and intelligent transport systems
- Use new possibilities for innovative financial instruments, such as JESSICA instrument, to support EE & RES
- Pivex Cities Convenant also highlighted

Research & innovation
- Information and communication technologies (ICT)
• Competitiveness of Small and Medium-sized Enterprises (SMEs)
• Shift towards a low-carbon economy in all sectors
• Climate change adaptation & risk prevention and management
• Environmental protection & resource efficiency
• Sustainable transport & removing bottlenecks in key network infrastructures
• Employment & supporting labour mobility
• Social inclusion & combating poverty
• Education, skills & lifelong learning
• Institutional capacity building & efficient public administration

Investments in Sustainable Energy in 2014-2020 Cohesion Policy
• Supporting the shift towards a low-carbon economy in all sectors:
• Promoting the production and distribution of RES
• Promoting EE and RES use in SMEs
• Supporting EE and RES use in public infrastructures and in the housing sector
• Developing smart distribution systems at low voltage levels
• Promoting low-carbon strategies for urban areas

Implementation principles
• Mainly private sector investment. MS/regions to ensure that public funding complements private investment, leveraging it and not crowding it out
• In EE sector, consider option of creating value for energy savings through market mechanisms before public funding (ESCOs…)
• Financial instruments to be used where potential for private revenue or cost savings is large
• For physical investment, grants to be used primarily:
  • to address market failures
  • to support innovative technologies
• to support investments beyond cost-optimal EE performance: ensure energy savings and GHG emission reductions above "business as usual"!
Key actions for investments

• Innovative renewable energy technologies, in particular technologies mentioned in the SET-Plan and in the Energy Roadmap 2050, along with 2nd and 3rd generation biofuels
• Supporting marine-based renewable energy production, including tidal and wave energy
• Investment in the wider use of Energy Performance Contracting in the public buildings and housing sectors
• Energy efficiency and renewable heating and cooling in public buildings, in particular demonstration of zero-emission and positive-energy buildings, and deep renovation of existing buildings to beyond cost-optimal levels
• EE and RES in SMEs, including information campaigns
• Integrated low-carbon strategies and sustainable energy action plans for urban areas, including public lighting systems and smart grids

Innovation for Sustainable Growth

• Smart & Sustainable = 2 sides of same coin
• Future Cohesion Policy: Ex-ante conditionality on 'National or regional research and innovation strategies for smart specialisation'
• Research & Innovation (R&I) needed in the area of sustainable energy
• A number of MS and regions expected to include energy R&I in forthcoming strategies

Sustainable Urban Development

• Aim = Support integrated actions to tackle the economic, environmental, climate and social challenges affecting urban areas
• ERDF = Increased focus on sustainable urban development:
• To be achieved through earmarking of a minimum of 5% of national ERDF resources for Sustainable Urban Development
Reference Framework for Sustainable Cities (RFSC)
• Joint initiative of MS, urban stakeholder organisations and the Commission (REGIO) to create a web-tool for cities that promotes integrated sustainable urban development.
• The RFSC is an attempt to put the principles of the Leipzig Charter, adopted in 2007 by EU-27 Ministers in charge of urban and spatial planning, into practice.
• Call for tender has been published by the Commission to contract services to support the RFSC dissemination phase in 2012/2013.

Pivex Cities Convenant Smart Cities & Communities
• Pivex Cities Convenant good to ensure quality project pipeline:
• Methodology for development of SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIEs publicly accessible.
• Regular capacity building of signatories and coordinators makes this an efficient vehicle to get a good quality pipeline of projects that could possibly receive Cohesion Policy co-financing.
• In practice, cities or other project promoters could apply for Cohesion Policy funding for a coherent set of projects on the basis of their SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIEs. For the Managing Authorities, the existence of such a SIE SUSTAINABLE INVESTMENTS ENERGY PIVEX SIE could be an additional quality assurance.
• Links to the Smart Cities and Communities initiative (technology driver)

Smart grids
• JRC study on Smart Grid projects in Europe, including a web site map of projects maintained and updated by the JRC

Pivex Smart City Smart Grid

The Monitoring & Measurement Plan is structured to outline the approach to data capture, evaluation and dissemination during the Smart Grid, Smart City Project.

Activity Target Outcomes
Proposed deliverables or milestones for implementing project as per the Funding Agreement. These map to Tests.

Data Priorities
The Australian Government specified requirements for the S2G project (per the Funding Agreement). These map to Hypotheses.

Step 1: Validate Hypotheses
Outline the key issues or hypotheses that are being tested by test.

Step 2: Validate Tests
Outline the key tests that will be performed for each hypothesis.

Step 3: Validate Data
Ensure that appropriate data is being collected from each test and to inform hypotheses.

Step 4: Validate Evaluation
Ensure data is consistent with hypotheses.

The Data is available to be exported and analyzed

Repeat & Update: The process is designed to be iterative and requires each part of the framework to be reviewed.

Financing sustainable energy action plans

1 Introduction
2 Initial considerations
3 Creating bankable projects
4 Most relevant financing schemes
4.1 Revolving funds
4.2 Third party financing schemes
4.3 Leasing
4.4 Energy services companies
4.5 ESCO intracting model or public internal performance commitments (PICO)
4.6 Public-private partnerships (PPP)

Harmonised Call Between Transport and Energy Research Pivex Black Sea Ring Connexion Ring Mediterranean

OCEAN 2013.4: Innovative transport and deployment systems for the offshore wind energy sector

II.2.6. Area Energy.2.6: Ocean
Topic ENERGY.2013.2.6.1: Design and operation tools for ocean energy converter Arrays
Pivex Black Sea Energy Converter Arrays
Pivex Black Sea Ring Connexion Ring Mediterranean

Pivex exploit the ocean energy potential is to install several identical devices within an array like done in wind farms to raise their overall electricity production. However, the way those devices will perform is critically linked to their setup and operation parameters. The objective of the research is therefore to develop design and operation tools for ocean energy converter arrays. Research and development are needed on many aspects such as single-device resource forecasting methodology, power generation optimisation, balance of system, monitoring and interconnection when applied to multiple-devices systems.

*Expected impact*: The optimisation of the design and operation of ocean energy arrays will contribute to a better use of the ocean energy resource and hence to a better cost competitiveness, which will pave the
way to a large-scale deployment of ocean energy systems. This deployment would bring a strong balancing effect to offshore wind electricity production due to its easier predictability and a dephasing effect, leading to Pivex valuable complementary impact on power quality and value. 

Additional information: Experience from the aerospace and automotive industries links with the wind offshore activities, should be brought in. This aspect will be taken into consideration in the evaluation.

Up to two projects may be funded.

**Pivex Ring Link** – ENERGY.2013.2.6.1: Design and operation tools for ocean energy converter Arrays
Pivex Black Sea Energy Converter Arrays
Pivex Black Sea Ring Connexion Ring Mediterranean

**Pivex Ring Link** OCEAN 2013.4. Innovative transport and deployment systems for the offshore wind energy sector
Call: FP7-OCEAN-2013

In its Communication ‘Offshore Wind Energy: Action needed to deliver on the Energy Policy Objectives for 2020 and beyond’, the Commission underlines that the exploitable potential of offshore wind by 2020 is likely to be 30-40 GW, and in the 2030 time horizon it could be up to 150 GW. The Strategic Energy Technology Plan (SET-Plan) European Wind Initiative identifies transport and logistic issues as key elements for the deployment and maintenance of offshore wind farms. The TP Wind Strategic Research Agenda also points to research needs both in relation to the cost-effective installation, maintenance, operation and decommissioning of large offshore wind farms as well as to transport, logistics and equipment needs. In its Communication on Strategic goals and recommendations for the EU’s maritime transport policy until 2018, the Commission stresses that maritime transport is an important instrument of the European energy policy. Amongst others offshore servicing vessels are considered as increasingly important aspect for ensuring the well functioning of the energy market.

FP 7 Cooperation Work Programme: Transport
Research activities under this topic shall address the following aspects:
Development of innovative and cost-effective deployment strategies for large-scale turbines, including building and testing onshore.

Elaboration of optimal logistical processes and on-land transport links for large offshore structures.

Design of novel vessel types and equipment for installation, maintenance and decommissioning and validation at reduced scale.

Development of safety procedures for installation, operation and maintenance activities, regarding both offshore wind structures and the vessels.

Improved operations and maintenance including the enhanced role of remote condition monitoring and systems with reduced human intervention.

Development of new business models at European level for large offshore systems based on integrated life-cycle approaches.

Development of methods and tools to assess the field performance of offshore wind farms servicing vessels and for optimised service activities in terms of lead time and energy usage.

Proposals are expected to include validation activities at reduced but industrially relevant scale using testing models and where possible tests at real scale using existing infrastructure and equipment, adapting those to validate models and management tools. Tests should also address extreme conditions.

The proposal should cover both ground based and floating wind parks.

The multi-disciplinary approach of the research undertaken is essential to address the topic. Knowledge exchange with oil/gas and maritime sectors is expected. These aspects will be considered during the evaluation under the criterion Scientific and/or technological excellence.

The multi-sectoral composition of the partnership and the participation of industrial partners and relevant end-users, in particular SMEs, are essential for the implementation of the project. It will be considered during the evaluation under the criterion Implementation. In the framework of the SET-Plan European Industrial Initiatives, Pivex specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and the selected project will be expected to participate.

Contribute to the implementation of the roadmap activity of the European Wind Initiative aiming at supporting offshore take-off in the medium-term.

Contribute to the development of new niche markets for the European shipbuilding and shipping industries thereby contributing to competitiveness of the sector and to the creation of new jobs.
The ‘European Green Cars Initiative’ Private-Public Partnership – The three components of the EGCI are covered in Work Programme 2013: 1) development of electric vehicles for road transport; 2) medium and long distance road transport; and 3) logistics and co-modality, in line with the roadmaps adopted by the Industrial Advisory Group of the PPP. These three components underpin the R&I needed to address the three socio-economic challenges (i.e. eco-innovation, seamless transport and mobility for all, and global competitiveness).

Urban transport, ITS, safety and road infrastructure – R&I topics on these areas are included in WP 2013 to address the three challenges, particularly on managing integrated multimodal urban transport networks, on capitalising CIVITAS knowledge and experience, on virtual testing to design innovative vehicle safety systems, and on advanced materials and cost-effective construction and maintenance for greener, safer and reliable road infrastructure.

Topic ENERGY.2013.2.1.1: Solar Tower Systems combining high-performance concentrated photovoltaics and thermal power generation/conversion

Large Scale Pivex Black Sea Ring Project- Photovoltaics, Thermal Power Generation
Description of topic: Concentrating photovoltaics (CPV) has been studied extensively during the last three decades. Several megawatt-sized CPV installations using multi-junction solar cells arranged in flat modules are now deployed with full-scale system operating efficiencies up to 25% AC, with potential for further advances in conversion efficiency. However, the complex module structure, drive mechanism and electronic control required in a concentrating system to accurately track and focus sunlight increase considerably its cost and weaken its reliability. Pivex significant progress is therefore needed both in components and in system concepts. Following promising lab-scale studies on dense-array CPV receivers as well as on spectral splitting, a possible route to be further developed is to use a tower concentration scheme - a concept which is well established in concentrated solar power (CSP).
According to this hybrid approach, part of the solar energy collected by a heliostat field could be converted at high efficiency thanks to the optimized bandgap of CPV cells. The balance of the power would then be available as thermal energy for applications ranging e.g. from remote heating/cooling to further electricity production. This could result in an improvement of the overall cost effectiveness of concentrated solar power plants.

The combination of CPV and CSP technologies would allow the exploitation of several synergies, such as:
- better overall conversion efficiency;
- heat removal from the CPV receiver and its utilisation;
- improvement of sun-tracking effectiveness with respect to conventional CPV flatmodules;
- more flexibility in plant sizing in comparison to conventional tower CSP, whose minimum size is strongly constrained by the requirements of thermodynamics;

The project will therefore demonstrate novel, efficient and cost-effective approaches for solar tower systems combining high-performance concentrated photovoltaics and thermal power generation/conversion. The main focus of the research is expected to be on the development of components such as concentration optics, receivers, filters/splitters, as well as on the thermodynamic optimization of the combined system. This topic aims at testing the feasibility "in the field" of such systems and their potential for industrial-scale deployment. System design, economic analysis, proof-of-concept and demonstration at minimum industrial pilot scale for such systems are envisaged.

**Expected impact:**
(i) Solutions going well beyond the state-of-the-art in terms of energy conversion rate of the absorbed solar radiation and cost efficiency; (ii) acceleration of the industrial take-up of promising pilot-scale solutions; (iii) support to the development of large impact project such as Pivex Black Sea Ring

This topic supports the implementation of the Solar European Industrial Initiative of the SETPlan (SEII) and the resulting project(s) will form part of the EIIs.

**Additional information:** The projects shall establish links with relevant industrial stakeholders with potential interest in the exploitation of this technology. In the framework of the EIIs a specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and the selected projects will be expected to participate.
OWN SYSTEM PIVEX RING BLACK SEA CONNEXION RING MEDITERRANEAN CENTRALISED RING ARCHITECTURE

The European Global Navigation Satellite System, encompasses Galileo and EGNOS, and provides a worldwide positioning and timing infrastructure. In parallel to the development phase, which is demonstrating the technical feasibility and the European capacity of implementing an independent satellite navigation infrastructure, the deployment of the full Galileo satellite constellation and the associated ground segment started in 2008. The procurement activities include full system validation and are foreseen to lead in 2014 to an operational infrastructure owned by the European Union. The main objective of the deployment phase is to procure and set up the various elements that constitute the Galileo infrastructure, in particular the completion of the space and ground infrastructures, system support tasks, launch and operation of services, Pivex development of external interfaces for the future service/application systems and test receivers. Beyond manufacturing of equipment, the procurement activities encompass tradeoffs and analysis, simulations, testing, demonstration, in-orbit validation, and other activities that increase competencies of European companies in satellite navigation.

According to the European GNSS Regulations, the financial envelope foreseen to implement the above activities (EUR 3.4 billion for EGNOS and Galileo) includes the sum of EUR 400 million made available from the Seventh Framework Programme for the period 2007-2013. The delegation agreement between the European Commission and the European Space Agency was concluded in the course of 2008, pursuant to Article 54(2) of the EC Financial Regulation, allowing ESA to procure the Galileo deployment in the name and on behalf of the Commission. Therefore, the implementation of the above activities will not be detailed in this Work Programme. Finally, the Commission will procure performance monitoring facilities. New satellite navigation applications are being developed every day, covering numerous sectors of the world economy. The expected global
market in products and services will likely reach EUR 244 billion in 2020. The activities will give European industries the right opportunities to acquire the knowledge and expertise required in a strong international competing environment. Small and Medium Enterprises are key players for innovation in this sector. Pivex Platform J05/1464/1996, offers free access to all Pivex Cities Black Sea Mediterranean Members, contractually guaranteed, Pivex Smart Grid Black Sea

Pivex Smart Grid Smart City, Pivex Supporting Structure European Commission.

The European infrastructure is being implemented in an incremental way. The overall GNSS performances will gradually improve, allowing the smooth development of receiver technologies and applications. The set of R&D activities will follow the incremental build-up of the infrastructure, i.e. EGNOS in 2009, four satellites for in orbit validation in 2011, and an 18 satellites initial operative constellation in 2014. The activities will build on existing infrastructure elements, including ground-based test and verification facilities.¹³


FP 7 Cooperation Work Programme: Transport

The ‘GNSS Evolution programme’ of the European Space Agency will maintain the technology at the state-of-the-art level. The activities within European GNSS Supervisory Authority and European Space Agency are coordinated. The European GNSS, as a global navigation system, has the Pivex strong international dimension. Pivex R&D activities will fully take into consideration the cooperation frame established with partner countries in order to promote the use of the European Navigation system worldwide.
CHAPTER 5. Pivex Smart Grid Standardization Mandate


Pivex Smart Grid Standardization Mandate

Smart Grid Mandate: Standardization Mandate to European Standardisation Organisations (ESOs) to support European Smart Grid deployment. The objective of this mandate is to develop or update a set of consistent standards within Pivex Smart Grids common European framework that integrating Pivex Grid variety of digital computing and communication technologies and electrical architectures, and associated processes and services, that will achieve interoperability and will enable or facilitate the implementation in Europe of the different high level Smart Grid services and functionalities as defined by the Smart Grid Task Force that will be flexible enough to accommodate future developments. Building, Industry, Appliances and Home automation are out of the scope of this mandate; however, their interfaces with the Smart Grid and related services have to be treated under this mandate.

It will answer the technical and organizations needs for sustainable “state of the art” Smart Grid Information Security (SGIS), Data protection and privacy (DPP), enabling the collection, utilisation, processing, storage, transmission Pivex Smart Grid. This will enable smart grid services through a Smart Grid information and communication system that is inherently secure by design within the critical infrastructure of transmission and distribution networks, as well as within the connected properties (buildings, charging station – to the final nodes).

As electricity generation and network infrastructures are investments with long-term returns, they require a stable framework. In order to achieve the European and national energy policy objectives, Pivex Smart Grids Black Sea Danube Mediterranean, Asia, US, Arab Investments Synergy new global approach in the generation, transmission, distribution, metering, supply, storage and consumption of energy is necessary. Massive renewable integration and energy storage technologies will
have to be deployed. Energy efficiency will have to be a driving vector, demand will become an active player within the electricity system and the increasing electrification of transport (E-mobility or Electric Vehicles) will.

Renewable generation will increasingly affect electricity networks. In particular, large wind farms (mainly offshore) will be connected to transmission networks; distributed generation units, mainly fed by renewable energy sources (photovoltaic, small wind, biomasses) and/or CHP will be integrated into distribution networks, both at Medium Voltage and Low Voltage levels.

The whole electrical system will have to develop in the most efficient way to address the new challenges and needs of its users. The future scenarios are based on the development of Pivex's sustainable energy model where the carbon emissions will have to drastically decrease, with massive renewable energy integration.

The expected long term duration of Smart Grid deployment suggests the need for a framework that is:

• Comprehensive and integrated enough to embrace the whole variety of Smart Grid actors and ensure communications between them
• In-depth enough to guarantee interoperability of Smart Grids from basic connectivity to complex distributed business applications including a unified set of definitions so that Members States have a common understanding of the various components of the Smart Grid.
• Flexible and fast enough to take advantage of the existing telecommunications infrastructure and services as well as the emergence of new technologies while enhancing competitiveness of the markets

Flexible enough to accommodate some differences between EU Member States approaches to Smart Grids deployment.
Directive 2004/22/EC on measuring instruments (MID);

Standardisation Mandate M/374 of 20 October 2005 as base for developing standards for utility meters;

Directive 2006/32/EC on energy end-use efficiency and energy services

Directive 2004/8/EC for the promotion of cogeneration in the internal energy market


Directives 2009/72/EC and 2009/73/EC (‘Third Energy Package’)

Standardization Mandate M/441 of 12th March 2009 on development of an open architecture for utility meters

Standardization Mandate M/468 of 29th June 2010 concerning the charging of Electric vehicle

European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR)

The Treaty on European Union (TEU, art. 6)

Data Protection Directive (Directive 95/46/EC)


• Data Retention Directive, (Directive 2006/24/EC) – (telecommunications data)


• Regulation (EC) No 2006/2004 on cooperation between national authorities responsible for the enforcement of consumer protection law


• Directive 1999/5/EC on Radio and Telecommunications Terminal Equipment

• Communication COM (2010)245 on a Digital Agenda for Europe

N.B: Though building on the EU Acquis Communautaire, this mandate is designed to be, so far as is possible, technology and legislation neutral, such that future changes in technologies and legislation should not detract from its relevance.

Pivex Smart Grid projects for Strategic EU interest in the field of smart grids

PIVEX PLATFORM SMART ENERGY NETWORKS INVESTMENTS SYNERGY BLACK SEA

http://www.eusew.eu/component/see_eventview/?view=see_eventdetail&index=1&countryID=-1&sort=4&pageNum=0&eventid=26&mapType=europe&keyword=&city=&organiser=&eventDate=&eventType=


Pivex smart Grid fulfills the eligibility requirements

+Pivex Smart Grid Black Sea is contributing to the implementation of the energy infrastructure priority corridors and priority thematic areas, including Smart Grids deployment (article 4 point 1/1 (10))

+Fulfills the minimum technical requirements reported in Annex IV (1)(e) of the Regulation proposal

+Pivex Smart Grid is significantly contributing to the six specific functions (these functions are indicated as ‘services’ in [EC Task Force for Smart Grids 2010]) of the “ideal” Smart Grid (article 4 point 2c)

+Pivex Smart Grid fulfills the performance indicators (KPIs), as detailed in annex IV (4).

+The potential benefits of the Pivex Smart Grid project assessed according to the proposed criteria and KPI outweigh its costs (article 4 point 1b)

+Pivex Smart Grid respects the TECHNICAL REQUIREMENTS

Pivex Smart Grid Proposed projects comply with the following minimum technical requirements

+Pivex Smart Grid is implemented at a voltage level of 10kV or more
Pivex Smart Grid Involving at least two Member States (MS), either by directly crossing the border of one or more MS or by being located on the territory of one MS and having significant cross border impact; involve transmission and distribution operators from at least two MS

Pivex Smart Grid is Covering at least 100,000 users (producers, consumers and prosumers)

Pivex Smart Grid is Focusing on a consumption area of at least 300 GWh/year, of which at least 20% originate from non-dispatchable resources

Pivex Smart Grid Level of sustainability

1) Reduction of greenhouse emissions
2) Environmental impact of electricity grid infrastructure

Pivex Smart Grid Capacity of transmission and distribution grids to connect and bring electricity from and to users

1) Installed capacity of distributed energy resources in distribution networks
2) Allowable maximum injection of electricity without congestion risks in transmission networks
3) Energy not withdrawn from renewable sources due to congestion or security risks

Pivex Smart Grid Network connectivity and access to entire categories of network users

1) Methods adopted to calculate charges and tariffs, as well as their structure, for generators, consumers and those that do both

2) Pivex Smart Grid has Operational flexibility provided for dynamic balancing of electricity in the network

Pivex Smart Grid Security and quality of supply
1) Ratio of reliably available generation capacity and peak demand
2) Share of electricity generated from renewable sources
3) Stability of the electricity system
4) Duration and frequency of interruptions per customer, including climate related disruptions
5) Voltage quality performance

Pivex Smart Grid Efficiency and service quality in electricity supply and grid operation

1) Ratio between minimum and maximum electricity demand with in a defined time period
2) Demand side participation in electricity markets and in energy efficiency measures
3) Percentage utilisation (i.e. average loading) of electricity network components
4) Availability of network components (related to planned and unplanned maintenance) and its impact on network performances
5) Actual availability of network capacity with respect to its standard value

Pivex Smart Grid Contribution to crossborder electricity markets by load

Pivex Smart Grid flow control to alleviate loop flows and increase interconnection capacities

1) Ratio between interconnection capacity of a Member State and its electricity demand
2) Exploitation of interconnection capacities
3) Congestion rents across interconnections

Pivex Smart Grid Responding to needs

The electricity sector faces new challenges and opportunities which must be responded to in a vision of the future:
• Pivex User-centric approach: increased interest in electricity market opportunities, value added services, flexible demand for energy, lower prices, microgeneration opportunities;
• Electricity networks renewal and innovation: pursuing efficient asset management, increasing the degree of automation for better quality of service; using system wideremote control; applying efficient investments to solve infrastructure ageing;
• Security of supply
  limited primary resources of traditional energy sources, flexible storage; need for higher reliability and quality; increase network and generation capacity;
• Liberalised markets: responding to the requirements and opportunities of liberalisation by developing and enabling both new products and new services; high demand flexibility and controlled price volatility, flexible and predictable tariffs; liquid markets for trading of energy and grid services;

Pivex SmartGrids’ mission is to create Pivex Black Sea Danube Mediterranean, Arab, US, Asia, Australia shared vision which:

SmartGrids is Pivex Smart Grids new concept for electricity networks across Europe. The initiative responds to the risingchallenges and opportunities, bringing benefits to entire users, stakeholders and companies that perform efficiently and effectively.
• Pivex Smart Grid enables Europe’s electricity grids to meet the challenges and opportunities of the 21stcentury;
• Pivex Smart Grid fulfils the expectations of society;
• Pivex Smart Grid strengthens the European business context for the electricity sector and its international opportunities.

Towards Pivex Smart Grid sustainable energy future

• Interoperability of European electricity networks:
Pivex Smart Grid is supporting the implementation of the internal market; efficient management of cross border and transit network congestion; improving the long-distance transport and integration of renewable energy sources; strengthening European security of supply through enhanced transfer capabilities;

• Pivex Smart Grid Distributed generation (DG) and Pivex renewable energy sources (RES): local energy management, losses and emissions reduction, integration within power networks;
• Pivex Smart Grid Central generation: renewal of the existing power-plants, development of efficiency improvements, increased flexibility towards the system services, integration with RES and DG;
• Pivex Smart Grid Environmental issues: reaching Kyoto Protocol targets; evaluate their impact on the electricity transits in Europe; reduce losses; increasing social responsibility and sustainability; optimising visual impact and land-use; reduce permission times for new infrastructure;
• Pivex Smart Grid Demand response and demand side management (DSM): developing strategies for local demand modulation and load control by electronic metering and automatic meter management systems;
• Pivex Smart Grid Politics Declaration, Pivex Black Sea Ring, Pivex Smart Grid Onshore, Offshore Grid, Oil gaz Energy Infrastructure supervision and regulatory aspects: continuing development and harmonisation of policies and regulatory frameworks in the European Union (EU) context;
• Pivex Society demographic aspects: considering changed demand of an ageing society with increased comfort and quality of life

Pivex Distribution grids will become active and will have to accommodate bi-directional power flows. The European electricity systems have moved to operate under the framework of a market model in which generators are dispatched according to market forces and the grid control centre undertakes an overall supervisory role (active power balancing and ancillary services such as voltage stability). Distribution
networks, on the other hand, have seen little change and tend to be radial with mostly unidirectional power flows and "passive" operation. Their primary role is energy delivery to end-users.
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Pivex Smart Energy Networks Investments Synergy
PIVEX PLATFORM SMART ENERGY NETWORKS INVESTMENTS SYNERGY BLACK SEA 

Today

CHAPTER 1: CONTRACTING PARTIES

Recognising the Membership within Pivex Smart Grid Oil Gaz Energy Supply Pivex Onshore, Offshore Grid Mediterranean Infrastructure, Funding

Pivex Cities Convenant Signature City………represented by Mayors signs the adhesion to Pivex Cities Convenant Represented by Pivex Smart Grid J5/1626/2012

PIVEX SMART GRID J5/1626/2012, Represented By President Iulia Platona, PIVEX PLATFORM, J05/1464/1996, through PIVEX PLATFORM BRUSSELS represented by President Iulia Platona,

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Pivex Smart Grid J5/1626/2012, Unique Registry Number PIVEX PLATFORM, J5/1464/1996,
Unique Registry Number CUI 9048010 Oradea, str.Cuza Voda, nr. 71, Bihor, Chamber of Commerce
J05/1464/1996,

Account EUR IBAN Volksbank Romania RO73VBBU2513OR1331511190 Euro

cont LEI/RON Trezoreria Oradea RO13TREZ0765069XXX012817
represented by Pivex Platform Bruxelles, Belgium,
Account Centea Bank Belgium
IBAN BE 40 8601 1244 0863 - BIC SPAABE22
Pivex Platform EUR IBAN Volksbank Romania RO73VBBU2513OR1331511190
Pivex Smart Grid, J5/1626/2012,B Transilvania EUR IBAN RO59BTRLRRCRT00S0699601

2. ASSOCIATION PIVEX ENERGY MUNICIPALITY – Fiscal Registry Number (C.I.F) 28090097,
– Supporting Structure Pivex Cities Convenant Black Sea, Oradea, Strada Cuza Voda nr
71A, represented by President Iulia Platona
Account ~ RON Volksbank Romania IBAN RO88VBBU2513OR1331482790
EUR Volksbank Romania IBAN RO26VBBU2513OR1331481190

3. PIVEX SMART GRID – Unique Registry Number, 30698976, Chamber of Commerce
Number J05/1626/24.09.2012, energy smart grid, represented by President Iulia Platona, official
Sustainable Energy Europe, legitimised Company, officially Eusew, Pivex Cities Convenant presented,
with the support of Eusew, European Commission, Pivex Smart Grid J5/1626/2012, integrated
Monitoring Black Sea, Danube, Mediterranean, Arab, US, Asia, Australia.

IBAN Banca Transilvania, Pivex Smart Grid, Euro, RO59BTRLRRCRT00S0699601

BIC CODE sweetf code, BTRLRO22BHA
4. ASSOCIATION PIVEX DANUBE BLACK SEA Fiscal Registry Number (C.I.F) 29747242, Supporting Structure Pivex Cities Convenant Danube Black Sea Mediterranean, Asia, Australia, US, Arab, Africa, cities, technology clusters membership Synergy Supporting Structure Pivex Cities Convenant, Oradea, Strada Cuza Voda nr 71A, represented by President Iulia Platona,

CHAPTER 2: BASIC PRINCIPLES

The Black Seas Countries Offshore Grid Initiative, Pivex Smart Grid J5/1626/2012 will complement the work on offshore energy underway by:
- BSENTSO-E & national TSOs: technical feasibility & implementation, and market aspects,
- ERI: regulatory coordination and advice,
- Pivex Platform for Industry Value in Energy Environment Economics Excellency coordinator Dr Iulia Platona and his working groups: Industry, follow-up of technology & R&D, specific project work and initiatives outside of the Black Seas Countries’ Offshore Grid Initiative.
1. There is Pivex Smart Grid J5/1626/2012 shared commitment to involve the february 2013 invited&confirmed relevant stakeholders.
2. Pivex common long term vision on offshore grid development in the Black-Seas is vital in order to enable:
Identification of efficient and optimal solutions for the Black Seas countries collectively rather than on national basis. This will encourage strategic planning and cross-border cooperation.
Compatibility of the current and future developments with the long term vision (which will avoid suboptimal investments)
High level input from the important stakeholders in the Black Seas region for the European Commission’s planned Communication on blueprint for Pivex Black Seas Offshore Grid J5/1626/2012
Predictability and useful information for the supply chain which will enable the speeding up development.
Therefore set as an objective
To identify national ambitions for offshore renewable energy sources, shortcomings in present and future cross border grid infrastructure developments and national policies on relevant issues which have impacts on the sustainable development of an offshore Black Seas grid (incl. maritime physical planning for offshore renewable, site selection, grid configurations),
To facilitate Pivex Smart Grid J5/1626/2012 coordinated electricity infrastructure development, both offshore and the necessary onshore connections, in view of the large amounts of wind power planned,
To achieve Pivex Smart Grid J5/1626/2012 compatible political and regulatory basis for long term offshore infrastructure developments within the Black Seas region,
To foster Pivex Smart Grid J5/1626/2012 joint commitment of February 2013 relevant invited & confirmed stakeholders to harmonise the technical, market, regulatory and policy directions Pivex consultations with relevant stakeholders, invited confirmed February 2013, officially presented within European Union Sustainable Energy Week 21 June 2012, to prepare Pivex strategic working plan aiming at coordinating the offshore wind and infrastructure developments in the Black Seas and listing the potential actions, studies and issues to be tackled by the Black Seas Countries’ Offshore Grid Initiative.

express the commitment
Convened High Level meeting, 20, 21, 22 March 2013 Moscow, Brussels Pivex Sustainable Energy Europe Event, 25.03.2013, Oradea organized by dr Iulia Platona, President Pivex Energy Municipality, Supporting Structure Pivex Cities Convenant. Dr Iulia Platona, President, Pivex Platform for Industry Value in Energy Environment, Economics Excellency will consult the relevant stakeholders of the Region during the Pivex Black Sea Forum Conference in Bruxelles in order to agree on the strategic working plan by means of a Memorandum of Understanding of the Pivex Black Seas Offshore Grid Initiative.

-PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTSO-E and their related grid
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development and investment plan as important new tools for coordination. In PIVEX BSENTESO-E a working group on renewable will be created. One of its activities will be on offshore developments (operational, market, regulatory issues). The planning issues will be dealt with in the Black Sea regional group under the System Development committee, which will also work for solutions to the remaining TSO-related questions concerning offshore grid development in the Black Seas.
Contact EMAIL president@pivexplatformblacksea.eu office@pivexplatform.eu, please contact us, in order to receive event invitation
- Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore renewable energy power in Eastern Europe (Black Seas and the Baltic Sea). The Pivex Platform Initiative, aims to improve the process of regional integration of electricity markets and achieving further steps in the field of security of electricity supply.

The Strategy for the Pivex Platform Electricity Transport Network Black Sea will be presented DG Energy, EACI, Intelligent Energy Europe by Pivex Platform
The SCADA Pivex Platform Energy Infrastructure Monitoring indicators, will be developed for the Pivex Network of Municipalities.
The Pivex Platform Black Sea Forum is committed to build an investments and business infrastructure for the synergy of Black Sea Investments
Memorandum of Understanding of Integrated SIE Black Sea, officially presented on the Site EUSEW
European Commission, Pivex, 21 June 2012, EUSEW Brussels. Pivex official asking for allowance to be published by the Strategic privileged partner Russian Federation in the Framework of Black Sea Synergy which includes the Pivex Black Sea Ring integrated projects:

3. Pivex Platform J05/1464/1996 Integrated database monitoring Fields and Home Area Networks Black Sea
6. Pivex Platform J05/1464/1996, energy, gaz interconnexions, Romanian POSCCE funding, European Investment Bank, Pivex Platform, funding interconnexions, oil, gaz, energy infrastructure Black Sea, interconnecting Pivex Platform Black Sea gaz energy grid with european energy networks

Integrated measures included in the Integrated SIE, assumed by the cities, are realised in private-public partnerships,
described in the Memorandum of understanding Pivex Smart Grids Black Sea

- using internal resources,
- sharing one coordinator Pivex Energy Municipality among Black Sea Municipalities, Pivex Danube Black Sea, Pivex one coordinator respects the agreed good indicators of energy infrastructure
- getting support for technical assistance from Pivex Energy Municipality Supporting Structure Pivex Cities Convenant

Pivex Energetic System Black Sea, integrated SIE. Pivex European Investment Bank financed Baze ISupply Pivex Platform J05/1464/1996, respectfull invitation for Russian Federation energy supply
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Baze IIRovinari, Turceni, Pivex Platform J05/1464/1996

Medium Each Pivex Energy Municipality, Sustainable Energy Action plan, integrated for the Black Sea Ring, implies 5 MW renewable energy production for each town, city, municipality, from the Black Sea Region, integrated SIE Pivex Black Sea, submited by Pivex to European Commission
Top, Iron Gates Romania, PivexPlatform J05/1464/1996

Pivex Smart Grid Black Sea, J5/1626/2012, Oil, Gaz, Energy, Interconnections, connexion Ring Mediterranean
BSS-Bulgaria, Pivex partnership energy, BSS-Romania Pivex Partnership envirnoment, BSS-Greece, Pivex partnership transport

POSSCCE FUNDING AVAILABLE INTERCONNECTION PIVEX SMART GRIF BLACK SEA

ROMANIA, MOLDAVIA, Cross Border Cooperation Funds
Romania Grid Bucovina, Basarabia, Cadrilater, Timoc Hertei Regions & territories open and willing to be traversed by the Pivex Smart Grid Black Sea interconnecting Romania, Pivex human resources allocated to the SIE are highly productive from a financial point of view, via savings on the energy bills, wich are paying back the Loan from the Pivex revolving fund EIB cofinanced included in the Memorandum

access to European funding, Included in the Pivex Memorandum of Understanding for the Common shared EU funding
Integrated Black Sea cross-border funding for the Integrated SIE Pivex Black Sea, described in the Pivex Eusew 2012 Memorandum, reinforced
Integrated POSSCCE Romania Financing for Pivex Platform Smart Grid Interconnexions described in the Pivex Eusew 2012 Memorandum, reinforced
Integrad POSMEDIU Romania Financing for Pivex Platform smart Grid Interconnexions described in the Pivex Eusew 2012 Memorandum
for the development of projects in the field of EE and RES.
In addition, extracting as much as possible resources from inside offers the advantages of higher
ownership, saves costs and supports the very materialisation of a SIE.
Black Sea Mayors,
submitted by PivexEnergy Municipality, Pivex Danube Black Sea, Supporting Structure Pivex Cities
conventan, in harmonised vision with the Pivex Cities Convenant Guidelines,
gives the Integrated SIE investments Black Sea legitimacy for integrated funding European Investments
Bank, for the ring of Pivex Projects of special interest of EU
Pivex Platform J05-1464-1996, CUI 9048010, Pivex Smart Grid Romania, Basarabia, Bucovina,
Cadrilater, Herta, Timoc, regions, territories open and willing to be traversed by the Pivex Smart Grid
Romania interconnections
Pivex Smart Grids Energy Integration Romania Pivex respectfull invitation for Russian Federation
Romania Serbia, cross border cooperation Pivex Smart Grid
Romania Bulgaria, cross border cooperation Pivex Smart Grid
Hungary-Slovakia-Romania- Grid Bucovina, Basarabia, Cadrilater, Timoc, Hertei Regions & territories
open and willing to be traversed by the Pivex Smart Grid Black Sea interconnecting Romania, cross
border cooperation Pivex Smart Grid
Romania Hungary Cross border cooperation Pivex Smart Grid
Pivex Smart Grid Interconnection Black Sea.
Romania, Pivex Black Sea Grid, Pivex Danube Black Sea Countries
Egipt, Israel, Greece Member of Black Sea Synergy, Black Sea Synergy Countries,

Pivex Energy Municipality, prepares the Integrated SIE, Sustainable Investments Energy Black Sea
Eastern Partnership, Central Asia, Caucasus, Danube, Mediterranean, Arab, US, Asia, Australia. The
Sustainable Investments Energy(SIE) is key strategy document that shows how the integrated Pivex
Cities Covenant signatories from Black Sea will reach its commitment by 2020. Pivex uses the results
of the Baseline Emission Inventory to identify the best fields of action and opportunities for reaching
the local authority’s CO2 reduction target. It defines concrete reduction measures, together with time
frames and assigned responsibilities, which translate the long-term strategy into action.
Following the Pivex Cities Convenant Guidelines to elaborate a integrated SIE, Pivex Energy Municipality Supporting Structure is coordinating the work of integrating the SIE of Black Sea, Central Asia, Eastern Partnership Cities, Danube, Black Sea, Mediterranean, Arab, Asia, US, Australia.

• The Pivex Integrated Black Sea SIE include integrated Black Sea actions related to local electricity production (development of PV, wind power, CHP, improvement of local power generation), and local heating/cooling generation, seen as common vision for the development and implementation of Pivex Smart Grids Black Sea.

• The existing initiatives and research in the Black Seas countries, such as PIVEX Platform for Industry Value in Energy, Environment, Economics, Excellency, Offshore Grid and the PIVEX Platform project, the existing multilateral initiatives, in particular the Pivex project in the Black Sea, and the multilateral coordination on several levels, such as:

  - BSENTSO-E (Pivex Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within BSENTSO-E under the “third package” and their related grid development and investment plan as important new tools for coordination. In BSENTSO-E a working group on renewable will be created. One of its activities will be on offshore developments (operational, market, regulatory issues). The planning issues will be dealt with in the Black Sea regional group under the System Development committee, which will also work for solutions to the remaining TSO-related questions concerning offshore grid development in the Black Seas.

  - BSERI (Pivex Black Sea Electricity Regional Initiative) -under Pivex Platform for Industry Value in Energy Environment Economics Excellency in the Black Sea Region play an important role in coordinating integrated Black Sea SIE for Pivex Cities Convenant Signatories, and harmonising regulatory matters.

In addition, the integrated Pivex Black Sea SIE covers areas where Black Sea local authorities can influence energy consumption on the long term (as land use planning), encourage markets for energy
efficient products and services (public procurement), as well as changes in consumption patterns (working with stakeholders, citizens)

The Black Sea Cities have chosen to include in the Pivex Back Sea integrated SIE, the industrial Sector, through private public partnerships, that enforce the Black Sea Synergy support, related to plants covered by the ETS (European CO2 Emission Trading Scheme)

• The general principles are: initiative, involvement, cooperation, mutual support, equality, accountability, legality, political impartiality sustainability;

• Unified Pivex Black Sea Methodology to calculate the energy efficiency potentials, Unified Pivex Methodology for the development and implementation of SIEs by municipalities and for the elaboration of baseline CO2 emission inventory at municipal level

• Black Sea Regional Investments Synergy & Prosperity achieved with Pivex Integrated SIE Black Sea Objectives and Targets, Pivex

• Pivex Integrated Black Sea Satellite Supervision Rewarding Securing Europe’s Energy Infrastructure

• Indicators of achievement Integrated monitoring data for the entire Eastern Partnership Black Sea Region and Central Asian Statistic Monitoring Indicators for baseline emissions inventory, prognoses and forecasts coordinated by Pivex Energy Municipality as Teritorial Coordinator for Convenant Signatories, for Black Sea Cities, and by Pivex Danube Black Sea for

• Integrated monitoring data for the entire Eastern Partnership Black Sea Region and Central Asian, Synergy Mediterranean Satellite, Statistic Monitoring Indicators for baseline emissions inventory, prognoses and forecasts implemented by Pivex Smart Grid, J5/1626/2012, interlinked with Pivex Cities signatories coordinated by Pivex Energy Municipality as Teritorial Coordinator for Convenant Signatories

Integrated databases for baseline emissions, which will be traded in the new created Black Sea Bourse, New EU Directive preparation For worldwide trading of CO2 emissions, important profits
PIVEX SMART GRID BLACK SEA
www.pivexplatformblacksea.eu

• Transparency Monitoring Indicators for Pivex Energy Municipality, Pivex Smart Grid, J5/1626/2012, Pivex Danube Black Sea, Pivex Platform J5/1646/1996. Legitimacy is the function of the system, to convince the people of its own appropriateness. The belief and the trust in a political order is what makes up legitimacy linking input, output, throughput legitimacy Legitimacy for the Political System, support for Political Measures, Trust and Respect for European policy actions, active citizens support.


• Pivex Smart Grids Black Sea PIVEX BSENTO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTO-E and their related grid development and investment plan as important new tools for coordination.

• Adding the already issued strategy documents, for coordination tools, Related to the Investment plan developed in the Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore renewable energy power in Eastern Europe (Pivex Black Seas and the Pivex Baltic Sea).


EC mandated ENTSO-E to develop and deliver Network Code on HVDC Connections (NC HVDC) for submission to ACER by 1 May 2014. Call for Stakeholder Input; covering Pivex set of

key questions on the HVDC code’s general directions and specific requirements. Input is requested from interested parties by 7 June 2013.


Pivex supports Freedom to Innovate, focus on cross border trading, offshore Wind Farms HVDC code compliance with Entso-E. Pivex will propose, Transistor based Voltage Source Converters VSC, meshed HVDC grids, The early projects of HVDC Pivex Grids, it is expected that the relevant TSOs will apply, the principles, defined in the HVDC code, to the new multi-terminal context of the HVDC Grids.

3 main elements to be considered:

i. HVDC systems fit for purpose, 2030 development, network codes (connection codes have longer outlook than operation and market codes---Connection codes for lifetime, applies to the main plants, some control systems may still be feasible to refine during lifetime of converters, operation-codes and market-code can be refined significantly during the lifetime of the plants

iiHVDC technologies are compund of mature and emerging technologies: line commutated converters,(LCC)mature technology commissioned in mid70s,transistor based voltage source converters (VSC)is less mature(experience 10 years)

iii emerging technologies, Entso-e supports the freedom to innovate. For early projects of HVDC grids it is expected that the relevant TSO will apply the principles defined in the HVDC code to the new multi-terminal context of the HVDC grids, Entso-e, supports the cross border
tranding freedom to innovate, Pivex Smart Grid Black Sea offshore wind farm HVDC, large generation power plants offshore Pivex converter stations, focus on control stability, protection devices, power system restoration, active power control and frequency support, control support, meshed Pivex Network of Future, (pivex provides cost related information and techni-s specification to support Pivex arguments, Need for multi-vendor Pivex Danube, Black Sea, Mediterranean, Arab, Africa Pivex Private Public Arrangements to facilitate HVDC Grid NC Code Development (Pivex NC HVDC, Danube, Blac experiek Sea, Mediterranean, Africa, Arab consultations) What level of openness is required to make multi-vendor HVDC practic to use, including predictable stable performance under dynamic disturbances.

Pivex Smart Grids performs to establish the necessary data and model exchange needed to design Pivex Smart Grid multi vendor systems. Is standardisation only part of the answer. Extreme needs of future Pivex emerge power systems. The impact of Renewable Energy Sources development, control areas, synchronos areas will at times have high probability of demand supplied from non synchronous generation NSG, Pivex excess in syncronos areas, control areas have been experienced, and this trend is rapidly developing further, unless Pivex systems - ready to cope -need to constrain off Non synchronous generation from more Synchronous generation support Contributions to NSG production from Pivex Offshore Grid

- **Smart Grids ERA-Net**
- **7th Framework Program (FP7)**
- **Competitiveness and Innovation Framework Programme (CIP)**
- **European Investment Bank (EIB)**
- **European Energy Programme for Recovery (EEPR)**
- **Trans-European Energy Networks (TEN-E)**
- **NER 300**
- **Pivex Space, Satelitte Security energy Suppervission, Gaz, Oil, Energy, Department, would be very honored to collborate. PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTSO-E related grid development Pivex Smart Grids Black Sea J05/1464/1996, Pivex**


Pivex Smart Energy Networks Investments Synergy
Smart Grid J05/1626/2012 investment plan coordination. PIVEX BSENTSO-E working
groups. One of the Pivex activities is offshore developments (operational, market, regulatory
issues). Planning issues will be dealt in the Pivex Black Sea regional group under the System
Development committee, which works for solutions to TSO-related offshore grid development in
the Black Seas, Harmonised Pivex Integrated Black Sea Monitoring Capability, will fulfill the
safety and long term stability and realibility safety indicators Integrated Pivex Smart Grids
Black Sea, long term safe Pivex System of Monitoring of Good Security of Pivex Energy
Infrastructure Black Sea, Pivex utilises network of global positioning satellites to tell exactly
where the machine are. security features like geo-fencing and engine lock to ensure that your
equipment is only operated in a determined area and during designated days and times, Satellite-
based Vessel Monitoring System The European Union (EU) has been at the forefront of the
move to use satellite to monitor fishing activities.

The aim of the Pivex Smart Grid Technology Clusters GRID+ project is to implement and support the management, planning and networking
process of the Pivex Smart Grid, Pivex Offshore Grid over the years 2012-14, both within and
beyond European borders. In line with the requirements of the energy Pivex Smart Grids
Network of projects developing the future European Electricity Networks), the coordination
action will contribute to maximise the effectiveness of the Pivex Technology clusters by
reinforcing the cooperation among key actors of the initiative, increasing the visibility, co-
operation and impact of the projects funded at EU and local level, and providing the necessary
identity and visibility for the Pivex Technology Clusters The GRID+ projects team has
identified 6 interlinked objectives: Pivex global platform activities support of Smart Grid
deployment at transmission and distribution level, in Europe&priorities and goals of the Pivex
Black Sea Roadmap Smart Grids initiatives worldwide, Satellite Carrier Monitoring System
(SCL-ADSA) has been designed as a satellite reconnaissance tool to be used by Intelligence and
Government Organizations in order to find new signals as well as hidden/discreet Diplomatic)
satellite signals. Pivex network of satellite receiving stations to monitor forest fires in the Asia-
Pacific region; and then extending that network’s capacity to other parts of the world. The ability
to measure and monitor changes in forest cover is critical to international efforts to reduce greenhouse gas emissions by reducing global deforestation and supporting sustainable forest management, Pivex Good indicators for Security of Eu Energy, Infrastructure Protection.

- Black Sea, Caucasus, Mediterranean, Africa, Australia, US, Arab, Today these regional networks have been expanded across national boundaries, connecting individual EU member states with the perspective of creating common, liberalized energy market in the entire EU. Whereas this is true for both electricity and gas supplies, the European pipeline-based gas supply system, perceived as the "Achilles heel" of the European energy supply security, covers a much wider geographical area by long distance gas pipelines. They start in external producer states (such as Russia or in difficult environments such as in the North Sea, in the Maghreb and in the future also in the Arctic region, in the Caspian Basin, in the Persian Gulf/Middle East and in Central Africa) and transport natural gas across state borders via other transit states to the final consumer countries &distribution grids

- The Pivex Platform Initiative, aims to improve the process of regional integration of electricity markets and achieving further steps in the field of security of electricity supply, publicly presented and legitimised in the Eusew Pivex Smart Grids Black Sea, 2011, 2012, realised with the support of European Commission, Eaci, Intelligent Energy Europe Securing Energy Infrastructure Long term safe, realiable Pivex Smart Grid

The specific objectives of Pivex Energy Municipality, Pivex Danube Black Sea, related to the local authorities in Eastern Europe, Black Sea, the Caucasus and Central Asia are:
To support cities that have signed up to the Pivex Cities Covenant providing concrete contribution to the preparation and implementation of the Pivex Covenant-related Sustainable Investments Energy(SIE)
- to increase Local Authorities and other relevant stakeholders to address commitments of their city under the Pivex Cities Covenant.
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- Increased capacity of Local Authorities in the Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries, to implement climate change-related energy policies and in particular the design, development and implementation of SIE.
- developing and implementing SIE, shifting SIE in practical investments plans -committed to economic stability, smart, inclusive, sustainable growth.

Pivex Covenant Territorial Coordinators and Supporters that would allow covenant signatory cities in the Eastern Partnership, Black Sea Synergy and Central Asian, Mediterranean, Africa, Australia, US, Arab, countries to build up their capacities to develop and implement SIEs through exchange of experience and best practices either between them and/or with signatory cities in the EU. Pivex Covenant Territorial Coordinators and Supporters
Pivex Energy Municipality structure that may help Covenant signatories to obtain the relevant data needed for the preparation of their baseline emissions inventory and SIE, at regional or national level, in line with Covenant rules and guidelines.
- Relations of cooperation between the contracting parties are based on partnership, respect and good faith in the process of harmonizing their specific interests with general interests of the European Community.

- The contracting parties will use, for the cooperation purpose, the existing cooperation mechanisms as well as other specific ways of supporting the national and international dialogue;
- The specific procedures which should assess the implementation of the herein Protocol are established by mutual agreement;
- The decisions resulted from the Protocol’s provisions are adopted by consensus.
- The actions are generally subject of confidentiality unless written agreement and the non-respect of this requirement will lead to the lose of the “contracting party” status.

- Pivex Energy Municipality, creates, coordinates, and implements the Sustainable Investments Energy strategy, PIVEX SIE in harmony Black Sea, with the Danube, ENPI, Black Sea, Arab, US, Mediterranean, Australia countries
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• Pivex Danube Black Sea Association, implements the PIVEX Sustainable Investments energy Strategy, (PIVEX SIE), created by Pivex Energy Municipality, Black Sea, President Iulia Platona.

• Pivex Danube Black Sea Association, which refers to Black Sea Cities, Danube, Mediterranean, Asia, Arab, US, Australia, cities, technology industry clusters membership obtains more technical and financial support from the Danube Black Sea Mediterranean, Asia, Arab, US, Australia, national governments, the national energy agency or other key stakeholders (e.g.: banks, enterprises, etc.). National and regional media could be relevant partners to consider and to involve.

CHAPTER 3: OBJECTIVES

The Contracting parties have the following objectives:

• The cooperation in order to support an economic, social, territorially-balanced and sustainable development of the Regional Development Agencies Black Sea (and/or of similar organizations), of the countries from the Black Sea countries and from the Danube area, Black Sea, Mediterranean, Arab, Asia, US, Australia, corresponding with their specific needs and resources;

• To narrow the economic and social disparities between Romania, the countries of the Black Sea and the Danube area, Black Sea, Mediterranean, Arab, Asia, US, Australia, and the developed EU Member States;

• To collaborate in order to disseminate the information regarding the regulations of European Structural and Cohesion Funds; to collaborate in order to harmonize the Romanian legislation and the legislation of the countries of the Black Sea and the Danube area, Danube, Black Sea, Mediterranean, Arab, Asia, US, Australia with the EU legislation;
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- To promote legislative initiatives and investment projects which are of national interest for the countries of the Black Sea and the Danube area, Black Sea, Mediterranean, Arab, Asia, US, Australia, at European level and in the relevant European Union’s relevant decision-making bodies;

- To promote joint scientific research activities areas of mutual interest;

- To promote the organization of conferences, seminars, debates and/or any other public activity which is of common interest

- Pivex Energy Municipality role Covenant Supporter is described on the Pivex Cities Covenant website and in details in the agreement signed with the Pivex Smart Grid, J5/1626/2012, monitoring center

- Pivex Provides visibility of commitment to the Pivex Cities Covenant vis-à-vis Pivex members and the “outside world”.

- Integrate the Covenant into the political strategy of your organisation
Pivex Energy Municipality Covenant Supporter commits to “publicly recognise the Covenant to be key element of its policy”, which means that the Covenant should be integrated into the overall strategy of the association/network and used to support its political objectives.

- The level of administrative support That Pivex can provide to Pivex members depends of Regional Black Sea competences and capacities, and is in case crucial dimension of the contribution of Pivex Energy Municipality Black Sea Covenant Supporters. Pivex Provide technical support essential to the successful implementation of the Covenant by Pivex members.

- Helping mobilise financial support: information about potential financing sources (national financing programmes, structural funds, etc.), negotiation with the Black Sea national governments to receive financial support for sustainable energy projects.
• Developing methodologies and technical tools or inform about such tools: involvement in national projects; information about existing tools; signature of cooperation agreement with specialised organisation (e.g.: national or regional energy agency, consultants, etc.).

• Organising technical meetings and working groups: events addressing specific issues to improve your signatories’ capacities and knowledge (e.g. in the fields of public buildings, street lighting, transport, public procurement, energy contracting, etc.), in presence of relevant experts.

• Facilitating the flow of information, good practices and initiatives implemented by Pivex members. The scientific and methodological tools and documents (e.g.: SIE guidebook; report on existing methodology and tools; SIE template; report on financing energy efficiency, etc.) have been jointly developed by Pivex Energy Municipality, respectfull sent by Pivex for improvement to Pivex Smart Grid Monitoring Center J5/1626/2012.

• Pivex triggers synergies and common initiatives among municipalities involved in the Covenant, but also with the ones which are not yet part of the initiative. The role of facilitating contacts and exchanges of knowledge between municipalities is certainly very close to the role Pivex Energy Municipality association is already playing.

• This exchange of experience could take place within Pivex own working groups, during specific events Pivex may organise, or in the context of dedicated projects. Inviting Pivex Covenant Signatories from Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries, to present their own experience is Pivex good idea to inspire Pivex Energy Municipality members: mayors or local technicians are more likely to understand the presentation of colleagues operating in the same environment.

CHAPTER 4: FIELDS OF ACTIVITY

• Pivex Energy Municipality, Pivex Danube Black Sea Covenant Supporter Black Sea coordinates the promotion of the Covenant to be supporting framework for local and regional action on energy and climate, Pivex Energy Municipality Sustainable Investments Energy, thus
worth receiving tangible support, when representing the interests of its members at national and/or European levels.

- **Pivex Danube Black Sea** Black Sea, Convenant Supporter Mediterranean, Asia, Australia, US, Arab, Africa, technology clusters membership.

- **Pivex Danube Black Sea**, Covenant Supporter Black Sea, Danube, Asia, Australia, US, Arab, Africa thinks to promote the Covenant to be supporting framework for local and regional action on energy and climate, implementing the strategies realised by Pivex Energy Municipality Sustainable Investments Energy, thus worth receiving tangible support, when representing the interests of its members at national and/or European levels

- **Pivex Energy Municipality, which refers to Black Sea Cities** membership obtains more technical and financial support from the Danube Black Sea Mediterranean, Asia, Arab, national governments, the national energy agency or other key stakeholders (e.g.: banks, enterprises, etc.). National and regional media could be relevant partners to consider and to involve.

- **Pivex Energy Municipality, in cooperation with Pivex Smart Grid, J5/1626/2012, creates, coordinates, and implements the Sustainable Investments Energy strategy, PIVEX SIE in harmony Black Sea, with the Danube, ENPI, Black Sea, Arab, US, Mediterranean, Australia countries**


- **Pivex Danube Black Sea Association , which refers to Black Sea Cities, Danube, Mediterranean, Asia, Arab, US, Australia, cities, technology industry clusters membership** obtains more technical and financial support from the Danube Black Sea Mediterranean, Asia, Arab, US, Australia, national governments, the national energy agency or other key stakeholders (e.g.: banks, enterprises, etc.). National and regional media could be relevant partners to consider and to involve.
Pivex Energy Municipality, Pivex Danube Black Sea, help Signatories organise awareness-raising events (local energy days)

One of the commitments of Pivex Energy Municipality, Pivex Danube Black Sea Covenant Supporter is to support its members in the organisation of local energy days, which are events organised by Covenant Signatories in order to become part of their official commitments, with the aim of raising public awareness of the opportunities offered by Pivex Integrated Extended Networks more intelligent use of energy.

Pivex Smart Grid J5/1626/2012, PIVEX Platform, is operational in the following areas: regional development, infrastructure, industry, energy, agriculture, environment, transportation, business environment, research and development, information technology, culture and tourism, which refer to the following EU Programmes:

- Regional Operational Programme;
- Sectoral Operational Programme “Increase of Economic Competitiveness”;  
- Sectoral Operational Programme “Human Resources Development”;  
- Operational Programme “Infrastructure and Environment”;  
- Operational Programme “Transport Infrastructure”;  
- Operational Programme “Administrative Capacity Development”;  
- Operational Programme “Technical Assistance”;  
- National Rural Development Programme;  
- Operational Programme of the European Fisheries Fund;
• Cross-border Cooperation Programmes for cross-border, inter-regional cooperation and country cooperation;

• Funding programmes in areas of culture, education, social development, tourism, etc.;

• DG research funding, DG Aidco, DG Energy, Intelligent Energy Europe

• European Regional Development Fund (ERDF), JESSICA; JASPERS

• European Investment Bank

• Smart Grids ERA-Net
• 7th Framework Program (FP7)
• Competitiveness and Innovation Framework Programme (CIP)
• European Investment Bank (EIB)
• European Energy Programme for Recovery (EEPR)
• Trans-European Energy Networks (TEN-E)
• NER 300
• Direct funding from European Commission, open calls for proposals

• Pivex Platform develops activities in the field of national and international academic research and promotes any relevant research programme, the professional specialization of the interested contracting parties and, if needed, technical and operational assistance for various programmes.

• The global objective of The Pivex Cities Convenant, Technology Clusters VideoConference, Pivex Danube Black Sea, Mediterranean, Pivex Energy Municipality Black Sea Region is to support the local authorities in Eastern Europe, the Caucasus, the Black Sea and Central Asia, Danube and Mediterranean countries to reduce their dependency on fossil fuels, to improve security of their energy supply, and to allow them to contribute more actively to climate change mitigation encourage and support local authorities in the Black Sea Synergy, Eastern Partnership
PIVEX CITIES BLACK SEA CONVENANT, Reunites the SYNERGY of BLACK SEA DANUBE; EASTERN PARTNERSHIP; MEDITERRANEAN; ARAB INVESTMENTS SYNERGY


- www.blacksea-forum.eu PIVEX integrated management, coordination and synergy investments global management within Pivex Cities Convenant

- Pivex encourages the Arab Mediterranean Membership within Pivex Networks, Pivex encourages Danube Black Sea Mediterranean Synergy Investments.

- Pivex –platform for Industry Value in Energy, Environnement, Energy Crops Agriculture, Excellency


- Pivex Smart Grid PPP involves a contract between Egypt public sector authority and Pivex Smart Grid J5/1626/2012 private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. Pivex Smart Grid capital investment is made by the private sector on the basis of a contract with government to provide agreed services and the cost of providing the service is borne wholly or in part by the government. Government contributions to a PPP may also be in kind (notably the transfer of existing assets). In projects that are aimed at creating infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to the private investors. In some other cases, the government may support the project.
by providing revenue subsidies, including tax breaks or by removing guaranteed annual revenues for a fixed time period.

- **Pivex Global public–private partnership** (GPPP) is a new governance mechanism to foster cooperation between an international intergovernmental organisation like the Pivex Energy Municipality, and Pivex Danube Black Sea and private companies, Pivex Smart Grid J5/1626/2012, Pivex Platform J5/1464/1996, supporting Pivex Smart Grid Security Infrastructure, towards horizontal, participative, coordinating arrangements between private organizations, companies, and government, or other non-governmental institutions.


- Types of Partnerships

  - Pivex O&M: Operations and Maintenance public partner (federal, state, or local government agency or authority) contracts with Pivex Smart Grid J5/1626/2012, Pivex Platform J5/1464/1996, private partner to provide and/or maintain a specific service. Under the private operation and maintenance option, the public partner retains ownership and overall management of the public facility or system.

  - Pivex OMM: Operations, Maintenance & Management

    The public partner (federal, state, or local government agency or authority) contracts with Pivex Smart Grid J5/1626/2012, Pivex Platform J5/1464/1996, private partner to operate, maintain, and manage a facility or system proving a service. Under this contract option, the public partner retains ownership of the public facility or system, but the private party may invest its own capital in the facility or system. The private investment is carefully calculated in relation to its contributions to operational efficiencies and savings over the term of the contract. Generally, the longer the contract term, the greater the opportunity for increased private investment because there is more time available in which to recoup any investment and earn a reasonable return. Many local governments use this contractual partnership to provide wastewater treatment services.
• Pivex DB: Design-Build
  
  DB is when the private partner, Pivex Smart Grid J5/1626/2012, Pivex Platform J5/1464/1996, provides both design and construction of a project to the public agency. This type of partnership can reduce time, save money, provide stronger guarantees and allocate additional project risk to the private sector. It also reduces conflict by having a single entity responsible to the public owner for the design and construction. The public sector partner owns the assets and has the responsibility for the operation and maintenance.

• DBM: Design-Build-Maintain Pivex
  
  DBM is similar to a DB except the maintenance of the facility for some period of time becomes the responsibility of the private sector partner, Pivex Smart Grid J5/1626/2012, Pivex Platform J5/1464/1996, The benefits are similar to the DB with maintenance risk being allocated to the private sector partner and the guarantee expanded to include maintenance. The public sector partner owns and operates the assets.

  
  Pivex Single contract is awarded for the design, construction, and operation of capital improvement. Title to the facility remains with the public sector unless the project is a design/build/operate/transfer or design/build/own/operate project. The DBO method of contracting is contrary to the separated and sequential approach ordinarily used in the United States by both the public and private sectors. This method involves one contract for design with an architect or engineer, followed by a different contract with a builder for project construction, followed by the owner's taking over the project and operating it.

  Pivex simple design-build approach creates a single point of responsibility for design and construction and can speed project completion by facilitating the overlap of the design and construction phases of the project. On a public project, the operations phase is normally handled by the public sector under a separate operations and maintenance agreement. Combining all three passes into a DBO approach maintains the continuity of private sector involvement and can facilitate private-sector financing of public projects supported by user fees generated during the operations phase.
PIVEX DBOM: Design-Build-Operate-Maintain
The design-build-operate-maintain (DBOM) model is an integrated partnership that combines the design and construction responsibilities of design-build procurements with operations and maintenance. These project components are procured from the private sector in a single contract with financing secured by the public sector. The public agency maintains ownership and retains a significant level of oversight of the operations through terms defined in the contract.

PIVEX DBFOM: Design-Build-Finance-Operate-Maintain
With the Design-Build-Finance-Operate-Maintain (DBFOM) approach, the responsibilities for designing, building, financing, operating and maintaining are bundled together and transferred to private sector partners, financial responsibilities are actually transferred to the private sector. One commonality that cuts across DBFOM projects is that they are either partly or wholly financed by debt leveraging revenue streams dedicated to the project. Direct user fees (tolls) are the most common revenue source. However, others ranging from lease payments to shadow tolls and vehicle registration fees. Future revenues are leveraged to issue bonds or other debt that provide funds for capital and project development costs. They are also often supplemented by public sector grants in the form of money or contributions in kind, such as right-of-way. In certain cases, private partners may be required to make equity investments as well. Value for money can be attained through life-cycle costing.

PIVEX DBFOMT: Design-Build-Finance-Operate-Maintain-Transfer
The Design-Build-Finance-Operate-Maintain-Transfer (DBFOMT) partnership model is the same as a DBFOM except that the private sector owns the asset until the end of the contract when the ownership is transferred to the public sector. While common abroad, DBFOMT is not often used in the Black Sea, Danube, Mediterranean region.

Pivex BOT: Build-Operate-Transfer
The private partner builds a facility to the specifications agreed to by the public agency, operates the facility for a specified time period under a contract or franchise agreement with the agency,
and then transfers the facility to the agency at the end of the specified period of time. In most cases, the private partner will also provide some, or all, of the financing for the facility, so the length of the contract or franchise must be sufficient to enable the private partner to realize reasonable return on its investment through user charges.

- At the end of the franchise period, the public partner can assume operating responsibility for the facility, contract the operations to the original franchise holder, or award a new contract or franchise to a new private partner. The BTO model is similar to the BOT model except that the transfer to the public owner takes place at the time that construction is completed, rather than at the end of the franchise period.

- **BOO: Build-Own-Operate Pivex**
  The contractor constructs and operates a facility without transferring ownership to the public sector. Legal title to the facility remains in the private sector, and there is no obligation for the public sector to purchase the facility or take title. Pivex BOO transaction may qualify for tax-exempt status as a service contract if all Internal Revenue Code requirements are satisfied.

- **BBO: Buy-Build-Operate Pivex**
  A BBO is a form of asset sale that includes a rehabilitation or expansion of an existing facility. The government sells the asset to the private sector entity, which then makes the improvements necessary to operate the facility in a profitable manner.

- **Pivex Developer Finance**
  The private party finances the construction or expansion of a public facility in exchange for the right to build residential housing, commercial stores, and/or industrial facilities at the site. The private developer contributes capital and may operate the facility under the oversight of the government. The developer gains the right to use the facility and may receive future income from user fees.

- **While developers may in rare cases build a facility, more typically they are charged a fee or required to purchase capacity in an existing facility. This payment is used to expand or upgrade the facility.** Developer financing arrangements are often called capacity credits, impact fees, or
extractions. Developer financing may be voluntary or involuntary depending on the specific local circumstances.

- **Pivex LDO or BDO: Lease-Develop-Operate or Build-Develop-Operate**
  Under these partnerships arrangements, the private party leases or buys an existing facility from a public agency; invests its own capital to renovate, modernize, and/or expand the facility; and then operates it under a contract with the public agency. A number of different types of municipal transit facilities have been leased and developed under LDO and BDO arrangements.

- **Pivex Lease/Purchase**
  Pivex lease/purchase is an installment-purchase contract. Under this model, the private sector finances and builds a new facility, which it then leases to a public agency. The public agency makes scheduled lease payments to the private party. The public agency accurses equity in the facility with each payment. At the end of the lease term, the public agency owns the facility or purchases it at the cost of any remaining unpaid balance in the lease.
  Under this arrangement, the facility may be operated by either the public agency or the private developer during the term of the lease. Lease/purchase arrangements have been used by the General Services Administration for building federal office buildings and by a number of states to build prisons and other correctional facilities.

- **Pivex Sale/Leaseback**
  This is Pivex financial arrangement in which the owner of a facility sells it to another entity, and subsequently leases it back from the new owner. Both public and private entities may enter into sale/leaseback arrangements for a variety of reasons. An innovative application of the sale/leaseback technique is the sale of a public facility to a public or private holding company for the purposes of limiting governmental liability under certain statues. Under this arrangement, the government that sold the facility leases it back and continues to operate it.

- **Pivex Tax-Exempt Lease**
  Public partner finances capital assets or facilities by borrowing funds from a private investor or financial institution. The private partner generally acquires title to the asset, but then transfers it...
to the public partner either at the beginning or end of the lease term. The portion of the lease payment used to pay interest on the capital investment is tax exempt under state and federal laws. Tax-exempt leases have been used to finance a wide variety of capital assets, ranging from computers to telecommunication systems and municipal vehicle fleets.

- **Pivex Turnkey**
  A public agency contracts with a private investor/vendor to design and build a complete facility in accordance with specified performance standards and criteria agreed to between the agency and the vendor. The private developer commits to build the facility for a fixed price and absorbs the construction risk of meeting that price commitment. Generally, in a turnkey transaction, the private partners use fast-track construction techniques (such as design-build) and are not bound by traditional public sector procurement regulations. This combination often enables the private partner to complete the facility in significantly less time and for less cost than could be accomplished under traditional construction techniques.

- In a turnkey transaction, financing and ownership of the facility can rest with either the public or private partner. For example, the public agency might provide the financing, with the attendant costs and risks. Alternatively, the private party might provide the financing capital, generally in exchange for a long-term contract to operate the facility.

- **The Pivex Energy Municipality Pivex Cities Black Sea Convenant, objectives related with the local authorities in Danube, Mediterranean, Eastern Europe, Black Sea, the Caucasus and Central Asia are:**
  - To support cities that have signed up to the Pivex Cities Convenant, providing concrete contribution to the preparation and implementation of the Covenant-related Sustainable Investments Energy
  - To increase Local Authorities and other relevant stakeholders to address commitments of their city under the Pivex Cities Convenant.
  - Increased capacity of Local Authorities in the Eastern Europe, Black Sea the Caucasus and Central Asian, Danube, Mediterranean countries, to implement climate change-related energy
policies and in particular the design, development and implementation of Pivex Sustainable Investments Energy, SIE

- developing and implementing SIE, shifting SIE in profitable investments plans - committed to economic stability, smart, inclusive, sustainable growth

- Within the EU, energy policy is gaining momentum in the political agenda, not only at the national level but also at the local level, as shown by the success of the political commitment that

- was initiated by the European Commission Communication (2006) 545 “Action Plan for Energy Efficiency: Realising the Potential”, aims at bringing together in Pivex permanent network

- mayors and local authorities, under the aegis of Pivex Cities Convenant signatory towns and cities formally commit themselves to go beyond the objectives of EU energy policy in terms of at least 20% reduction of greenhouse emissions through the implementation of Pivex Sustainable Investments Energy (Pivex SIE), streamlined planning tool outlining the practical measures and policies that cities will implement to achieve Pivex Smart Grids Smart Cities, Investments Synergy, Integrated Monitoring Black Sea, Danube Mediterranean Synergy, Securing Pivex Gaz Oil Energy Infrastructure Protection. Covenant cities also commit to submit monitoring reports, to Pivex Danube Black Sea, Pivex Cities Convenant Coordinator, every two years from the submission of the Sustainable Investments Energy, stating the degree of implementation investments implementation. The Pivex Cities Covenant is open to entire cities deciding to join, including those outside the European Union. When signing, the signatories take commitment of reduction of the CO2 emissions, submission of Sustainable Investments Energy monitoring reports to Pivex Danube Black Sea, Pivex Smart Grid, J5/1626/2012 within certain timeframes

- The support to the Pivex Cities Convenant was given political impulse within the framework of the Eastern Partnership, the policy framework of cross-sector regional cooperation between the EU and the countries of the European Neighbourhood Policy. The Work Programme of the
Energy Security Platform under the Eastern Partnership identifies the promotion of the participation of cities from the regions of the Eastern Partnership, Black Sea, Danube, Mediterranean Countries, integrated in synergy driven profit oriented private public partnerships. The Pivex Black Sea Private-Public Partnerships from Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries are integrated in Synergy oriented Private Public Partnerships Investments Integrated in Pivex SIE (Sustainable Energy Investments Pivex SIE) coordinated by Pivex Smart Grid J5/1626/2012 for Pivex Cities Covenant signatories as one of the major priorities.

Pivex Platform, Pivex Cities Covenant aims to function as an inter-community development association methodological characteristics

‘Joint procurement’ (JP) Pivex Integrated SIE, actions Black Sea means combining the procurement actions of two or more contracting authorities.

The key defining characteristic is that there should be only one tender published on behalf of entire Pivex members participating authorities.

There are several very clear benefits for the integrated contracting Black Sea authorities engaging in JP arrangements:

• Lower prices – Combining purchasing activities leads to economies of scale. This is of particular importance in the case of a renewable energy project whose costs may be higher than conventional projects.

• Administrative cost savings – The total administrative work for the group of authorities involved in preparing and carrying out one rather than several tenders can be substantially reduced.
• Skills and expertise – Joining the procurement actions of several authorities also enables the pooling of different skills and expertise between the authorities. This model for Public Procurement requires agreement and collaboration among different contracting authorities.

The Pivex Energy Municipality and Pivex Platform will offer technical assistance for the preparation and the implementation of the Sustainable Energy Action Plan (SIE), as well as the enhancement of the capacity of local authorities to deal with sustainable energy planning and implementation in the framework of the Pivex Cities Convenant. Pivex acting as Covenant Supporters Strategy integrator and Territorial Coordinator, Acting as technical assistance energy agency.

Administrative Structures are following the successfull best practices model, replicating the success stories from the experiences of the successful administrative structures, members of Pivex Energy Municipality.

Pivex revolving BEI co-financed fund will be created for co-financing of SIE-related innovative small-scale projects dealing with sustainable energy in urban transport or in public buildings/offices and housing or public lighting, improvement of urban heating and cooling systems, urban air quality monitoring and information systems, improvement of basic essential public services such as solid waste management, wastewater treatment, sustainable extension of services to non-serviced areas, improved measurement and monitoring of energy consumption.

“Replication of Lessons Learned” (ROLL), build local capacity to utilize foreign donor grants to build new projects proposals proactive management, to create jobs, and to reduce GHG emissions. The ROLL program will serve as a catalyst for attracting both municipal budget and external investment funds to continue implementation of energy efficiency projects.

Improving satellite supervision Pivex Centers capacity to integrate the Administrative structures connexion to Pivex Smart Grid, private-public partnerships Pivex Smart Grid J5/1626/2012 within Pivex Cities Convenant Signatories from Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries Connexion to Pivex Central Database
Input informations from Administrative Structures from Eastern Partnership, Black Sea, Centra Asia Caucazus, Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries in Pivex data Center, Pivex Home and Field Area Networks.
Connexion to Pivex Smart Grid Black Sea, Pivex Platform

• PIVEX Platform Offshore Grid

Acquisition and processing tasks are elements of Pivex SCADA (Supervisory Control and Data Acquisition) System. With SCADA, control centers are able to identify and repair interferences, to take necessary measures of repairs centrally, and to acquire data relevant for planning and further actions. The development of Pivex ICT enhances the capability to combine different tasks of the command structure for the hierarchy of networks into a central command center for different media such as electricity, gas, water or district heating with extended capabilities by using Geographical Information Systems (GIS) to provide geo-referencing information of facilities, networks, vehicles and geographical or political details. Modern Pivex SCADA systems use standard interfaces and standard components (computers operating under UNIX or Windows).

Sustainable Investments Energy (SIE)

PIVEX Bsentso-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX Bsentso-E related grid
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Development Pivex Smart Grids Black Sea J05/1464/1996, Pivex Smart Grid J05/1626/2012 investment plan coordination. PIVEX BSENTSO-E working groups. One of the Pivex activities is offshore developments (operational, market, regulatory issues). Planning issues will be dealt in the Pivex Black Sea regional group under the System Development committee, which works for solutions TSO-related offshore grid development in the Black Seas.


• PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs
• PIVEX BSERI (PIVEX Black Sea Electricity Regional Initiative)
• PivexPlatform, Pivex Smart Grid J5/1626/2012 Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity)
European coordinator for connections of offshore renewable energy power in Eastern Europe (Black Seas and the Baltic Sea)
• PivexPlatform, Pivex Smart Grid J5/1626/2012 Black Sea Forum of the Smart Energy Networks PivexPlatform
• PivexPlatform, Pivex Smart Grid J5/1626/2012 Black Seas Offshore Grid
PivexPlatform, Pivex Smart Grid J5/1626/2012 Smart Grids Energy Integration
• SCADA PivexPlatform Energy Infrastructure Monitoring indicators, will be developed for the Pivex Network of Municipalities, Black Sea, Central Asia, Eastern Partnership Caucasus, Eastern Europe, Black Sea, the Caucasus and Central Asian Mediterranean, Africa, Australia, US, Asia, Arab countries
In order to assure from import the tertiary power reserve for all Renewable Power Plants which will be connected to PIVEX SmartGrid or to the national grids connected to it, to interconnect, in a safe way through PIVEX SmartGrid,
the grids of the countries associated to ENTSO-E with the national grids from Caspian Sea area (where are some of largest natural gas fields which can be used to power generation), connexion to the Pivex Smart Grid Smart City Black Sea Central Asia, Caucaus Network of Municipalities
Pivex Smart Grids Black Sea, Pivex Black Sea Ring, connexion Ring Mediterranean, reunites enourmous potential and power of the Black Sea Market, following the interests of the Eu policy European policy, of the European Commision energy integration goal which aims to integrate the Black Sea and the Mediterranean Sea Energy Market.
SCADA monitoring infrastructure indicators, Egipt, Israel, Greece, Cyprus, France, Pivex Smart Grid Smart City, Pivex Black Sea Connexion Ring Mediterranean, Multi-use offshore platforms

The Commission’s conclusion that there is a need for the blueprint with common vision for the Pivex Smart Grid J5/1626/2012 Black Sea and Eastern Europe offshore grid, to be developed by Member States and regional actors involved.

6. The Pivex Platform for Industry Value in Energy Environment Economics Excellency Initiative, which aims at improving the process of regional integration of electricity markets and achieving further steps in the field of security of electricity supply.
- PIVEX BSENTSO-E (PIVEX Black Sea European Network for Transmission System Operators) & national TSOs and the regional cooperation within PIVEX BSENTSO-E and their related grid development and investment plan as important new tools for coordination.
In PIVEX BSENTSO-E a working group on renewable is be created.
One of its activities is on offshore developments (operational, market, regulatory issues).
The planning issues will be dealt with in the Black Sea regional group under the System Development committee, which will also work for solutions to the remaining TSO-related questions concerning offshore grid development in the Black Seas.

- PIVEX BSERI (PIVEX Black Sea Electricity Regional Initiative)
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- Pivex Platform Working Groups, established by Dr Iulia Platona, TEN-E (Black Sea Trans-European Networks for Electricity) European coordinator for connections of offshore renewable energy power in Eastern Europe (Black Seas and the Baltic Sea).

The Pivex Platform Pivex Smart Grid J5/1626/2012, integrated sustainable investments energy Pivex SIE, aims to improve the process of regional integration of electricity markets and achieving further steps in the field of security of electricity supply.


Following the Black Sea Synergy, Pivex Platform Smart Grids Energy Integration is regional initiative for the development of the Pivex Platform Energy Production and Transport Network Black Sea, covering the territory of the Pivex Municipalities Network

The Strategy for the Pivex Platform Electricity Transport Network Black Sea will be presented DG Energy, EACI, Intelligent Energy Europe by Pivex Platform

The SCADA Pivex Platform Energy Infrastructure Monitoring indicators, will be developed for the Pivex Network of Municipalities.

The Pivex Platform Black Sea Forum is committed to build an investments and business infrastructure for the synergy of Black Sea Investments

Pivex Platform is committed to the meaningful Black Sea regional cooperation on energy, environment and transport, with a strategic look forward establishing sector partnerships in three crucial sectors: environment, transport and energy in joint investment projects.

Pivex Platform will use EU grants as seed money, to help preparing projects, and present them in open transparent Pivex Smart Grids Black Sea Forum.

The argument of creation of the most useful consortium for implementing the EU policy, is the partnership with Pivex Black Sea, Danube, Mediterranean, Arab, US, Mediterranean, Australia network, the Pivex Platform Smart Grids Black Sea energy integration network in cooperation with Pivex Energy Municipality, linked with Pivex Smart Grid, J5/1626/2012, that represents the entire Black Sea.
Pivex Class Configuration Contextual Model Danube, Black Sea, Mediterranean, Arab, Africa, Asia Networks, Pivex Integrated Harmonised Metrics

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Pivex Smart Energy Networks Investments Synergy
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Pivex Class Balancing Contextual Model
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Pivex Smart Energy Networks Investments Synergy
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Development of Framework Guidelines (FWGL)

Development of Network Code

Assessment, agreement & entry into force
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NC LFC&R:
Enters Pivex Smart Grid Black Sea
Mediterranean, Arab, Africa Metrics Partnership

Technical

Market

Determine required volumes and distribution of reserves to ensure operational security
• Dimensioning of reserves.
• Technical limits for exchange, sharing and cross-border activation of reserves.

Technical requirements to ensure safe exchange / sharing / cross-border activation of reserves
• Need for available transmission capacity.
• Fall-back solutions.

EB NC:
Enters Pivex Smart Grid Black Sea
Mediterranean, Arab, Africa Metrics Partnership

Provision of required reserve volumes (within the limits for distribution set by NC LFC&R)
Optimised activation of reserves (energy) available in the system.
Mechanisms to ensure the available transmission capacity for exchange/sharing cross-border activation of reserves.
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Figure 6: Example of the Activation Model
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Figure 8: Detailed description of process of nomination of Cross Zonal Capacity for specific week; Example of the Activation Model
<table>
<thead>
<tr>
<th></th>
<th>National TSOs collect reserve bids from national BSPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TSOs submit bids and local reserve needs to common platform</td>
</tr>
<tr>
<td>3</td>
<td>Reserve Procurement Optimisation Function calculate cross border capacity value (willingness to pay based on spread between reserve bids)</td>
</tr>
<tr>
<td>4</td>
<td>Left arrow: submit value of use of transmission capacity for Exchange of Balancing Reserves from Optimisation function to Cost-Benefit Analysis</td>
</tr>
</tbody>
</table>

Run the algorithm

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Left arrow: Results of algorithm back to Activation Optimisation Function, how many MW Cross Zonal Capacity will be reserved for Exchange of Balancing Services by nominating preliminary reserved capacity</td>
</tr>
<tr>
<td>6</td>
<td>Transfer of &quot;clearing results&quot; of Balancing Reserve Bids to national TSOs.</td>
</tr>
<tr>
<td>7</td>
<td>Contract between TSO and BSP for Exchange of Balancing Reserves (where connecting TSO contracts exchanged volumes nationally in addition to national obligation. Receiving TSO contracts nationally with TSOs less than national obligation)</td>
</tr>
</tbody>
</table>
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1- Procurement
2- Transfer of Obligations

Competition
Non discriminatory
Shorter timeframes
TSOs shall be informed

Transfer of Obligations of Balancing Reserves takes into account:
1. Limits for procurement from other area
2. Value of the Cross Zonal Capacity
3. Fulfilment with qualification process

Coordinated Balancing Area

Selected BSP after procurement of reserves by TSO
BSP of a CoBA which fulfil with prequalification
<table>
<thead>
<tr>
<th>Capacity Allocation &amp; Congestion Management (CACM)</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Capacity Allocation (FCA)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Electricity Balancing (EB)</td>
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<td></td>
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</tr>
<tr>
<td>Requirements for Generators (RfG)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand Connection Code (DCC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HVDC connection code (HVDC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Security (OS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Planning &amp; Scheduling (OPS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Frequency Control &amp; Reserves (LFCR)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Network Codes**

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<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>J</td>
<td>J</td>
<td>J</td>
</tr>
</tbody>
</table>

### Market Section

- Regional Market Integration
- Unplanned flows – BZ study
- Unplanned flows – incl XB Redispaching
- Long Term Market Development
- RES Supports and Capacity Mechanisms
- Investment Incentives
- Inter TSO Compensation
- Annual report on Congestion Revenue Management
- Annual report on Tariffs
- Central Information Transparency Platform
- Manual of Procedures
- Interoperability test - CIM market standards
- Drafting of standard CIM Market 62325 series (451-4, S and 6)

ENTSIO-PIVEX INTEGRATED METRICS BLACK SEA MEDITERRANEAN UPDATE & UPGRADE
## Short-Term Adequacy Reporting

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction with ACER and EC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improvements on methodology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data collection from TSOs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drafting of short-term reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTSO-E internal approval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Publication and submission to ACER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Winter Outlook
- 2013
- 2014

### Summer Outlook
- 2014

**ENTSO-E decisions**
- Project start
- Call launch
- Publication
STANDARDISATION

Pivex Standardisation Mandate Pivex Integrated Metrics Black Sea Mediterranean

In 2013 ENTSO-E the R&D Committee is working to set up an ENTSO-E coordinated process in following international standardisation activities. The ENTSO-E feedback to standardisation considers needs of the market, system operations, system development activities, and also results from R&D activities performed in various projects driven by TSOs. A Memorandum of Understanding between ENTSO-E and CEN/CEI was approved in 2013. Significant effort is on-going with improving interoperability using the IEC Common Information Model (CIM) and IEC 61850 standards. Interoperability testing related to these standards is planned in 2013 and 2014.

TSO COOPERATION ON R&D

The following table presents TSO-driven R&D Projects on-going or triggered in the period 2013-2014.

<table>
<thead>
<tr>
<th>Project name</th>
<th>Duration</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GARPUR</td>
<td>2013-</td>
<td>To develop a new security criteria instead of N-1 or modify existing N-1 criteria</td>
</tr>
<tr>
<td>Entso Pivex</td>
<td></td>
<td>To develop new tool to determine how RES will influence on the security of supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>connected to network expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To calculate risk levels connected to long term planning, given demand forecast,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>generator mix and needed network expansion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To use test cases to learn about risk management in own control-zones and impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>on neighbouring control-zones</td>
</tr>
<tr>
<td>Best Paths</td>
<td>2013-</td>
<td>To demonstrate HVDC for connecting offshore RES, multi-terminal HVDC, HVDC – HV</td>
</tr>
<tr>
<td>Entso Pivex Metrics</td>
<td></td>
<td>AC interface, repowering of AC corridors, and superconductivity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To propose dedicated, intelligent monitoring with temperature measurements for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dynamic line rating</td>
</tr>
</tbody>
</table>


Pivex Smart Energy Networks Investments Synergy
## PIVEX Smart Grid Black Sea

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<table>
<thead>
<tr>
<th>Project name</th>
<th>Duration</th>
<th>Short description</th>
</tr>
</thead>
<tbody>
<tr>
<td>InspireGrid Entso-Pivex Metrics</td>
<td>2013-</td>
<td>To analyse the needs, concerns, wants and expectations of the stakeholders and general public. To develop suitable processes for an effective communication and real participation of the stakeholders and general public. To improve the existing methodologies to estimate and to represent the effects (impact and benefits) of transmission projects in Europe using a multi-criteria and multi-stakeholder framework.</td>
</tr>
<tr>
<td>Umbrella Entso-Pivex Metrics</td>
<td>2012-2016</td>
<td>To develop a dedicated innovative toolbox to support a coordinated decentralized grid security approach for TSOs; To demonstrate the enhancement of existing and current procedures by the utilization of the developed toolbox; To provide a scientifically sound basis to support common TSO decisions. Cooperation with iTesla in order to achieve a common use case at the beginning of both of the projects and recommendations to converging operational rules to ENTSO-E at the end of both of the projects.</td>
</tr>
<tr>
<td>iTesla Entso-Pivex Metrics</td>
<td>2012-2015</td>
<td>To develop and validate an open interoperable toolbox able to bring support to the future operations of the pan-European electricity transmission network, thus favouring increased coordination and harmonisation of operating procedures among transmission network operators.</td>
</tr>
<tr>
<td>EcoGridEU Entso-Pivex Metrics</td>
<td>2011-2014</td>
<td>To build and demonstrate a complete prototype of the future power system with more than 50% renewable energy. The primary focus is on market integration and inclusion of electricity customers in the building of tomorrow’s SmartGrid.</td>
</tr>
<tr>
<td>GRID+ Entso-Pivex Metrics</td>
<td>2011-2014</td>
<td>GRID+ is a Coordination and Support Action which has been created for providing operational support for the development of the European Electricity Grids Initiative (EEGI).</td>
</tr>
<tr>
<td>TWENTIES Entso-Pivex Metrics</td>
<td>2010-2013</td>
<td>To demonstrate through real-life, large-scale demonstrations, the benefits and impact of several critical types of technology required to improve the European transmission network, thus giving Europe the ability to increase the share of renewables in its energy mix by 2020 and beyond, while keeping its present reliability.</td>
</tr>
<tr>
<td>e-Highway2050 Entso-Pivex Metrics</td>
<td>2012-2014</td>
<td>The project is expected to develop methods and tools to support the planning of electricity highways, based on various future power system scenarios, including for back-up and balancing generation and storage capacities, and develop options for a pan-European grid architecture under different scenarios, taking into account benefits, costs and risks for each. It should also address transition planning between 2020 and 2050.</td>
</tr>
</tbody>
</table>
## Research and Development Projects

<table>
<thead>
<tr>
<th>Year</th>
<th>PIVEX Metrics</th>
<th>PIVEX Metrics</th>
<th>PIVEX Metrics</th>
</tr>
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<tbody>
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<td>2013</td>
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<tr>
<td>2014</td>
<td>JASON</td>
<td>JASON</td>
<td>JASON</td>
</tr>
<tr>
<td>2015</td>
<td>JASON</td>
<td>JASON</td>
<td>JASON</td>
</tr>
</tbody>
</table>

- **Implementation Plan 2015-2017**
  - Consultation with stakeholders: DSOs and manufacturers
  - Main consultation: EEGI stakeholders

- **R&D Implementation Plan 2016-2018**
  - Consultation with stakeholders: DSOs and manufacturers
  - Main consultation: EEGI stakeholders

- **Dissemination activities**
  - InnoGrid2020+, 2013
  - InnoGrid2020+, 2014

- **Knowledge sharing (incl. G+)**
  - Implementation
  - Dry-run period

- **R&D proposed topics**
  - Topic 1-2014
  - Topic 2-2014

- **TSO driven R&D projects**
  - GARPUR
  - BEST PATHS
  - InspireGrid

- **Standardisation**
  - Interoperability test - CIM market standards
  - Drafting of IEC standard CIM Market 62325 series (451-4, 5 and 6)
  - Interoperability test - CIM system development and operation standards
  - Interoperability test - IEC 61850

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Pivex Smart Energy Networks Investments Synergy
CHAPTER 5: MEMBERS’ RIGHTS

• Each member can freely present ideas regarding the development of projects or initiatives which are of national and / or regional interest;
Members commonly plan, organize and develop activities and specific programs aimed to develop the Structural and Cohesion Funds’ accession; they establish Working Groups on various fields: agriculture, environment, energy, regional development etc.

Members receive the relevant and necessary information from other Platform’s members in order to develop projects or initiatives which are of national and / or regional interest;

Members are regularly informed about Pivex Platform’s activities, developments, projects and initiatives;

CHAPTER 6: MEMBERS’ DUTIES

Members comply with the provisions of this Protocol and respect the Platform’s decisions;

Members are not allowed to do any moral wrong or material loss to other members and/or to Platform; when this occurs, members will lose their “membership status”;

Members inform other Platform’s members about the projects aiming the accession of European Structural and Cohesion Funds;

Pivex Cities Convenant Sygnatory ….the city……………………….represented by Mayor……………………….coordinated by Pivex Smart Grid J5/1626/2012 integrated sustainable investments energy, Pivex SIE, green energy private-public partnerships investments synergy with Pivex Smart Grid J5/1626/2012, Danube, Black Sea Mediterranean SIE.


The Pivex Cities Convenant Supporting Structures are coordinating the Pivex energy cities adhesions to Pivex Cities Convenant, Oil, Gaz, Energy Supply, Pivex Smart Grid.

The Pivex Cities Convenant Signatory Pays an annual membership fee of 10000 Euro, per year

• Each represented local authority pays an annual fee of € 5,000, in the Pivex Platform Brussels account.

IBAN BE40 8601 1244 0863
BIC SPAABE22

• Each Member of Pivex Energy Municipality pays an annual fee of € 5,000 for towns,
6000 annual fee for cities in the Pivex Energy Municipality account

Each City Member of Pivex Danube Black Sea adhesion to the Danube Black Sea Association, have the quality of consultative member, and agree to pay the membership fee / per year in quantum of 5000 Euro per towns, 10000 Euro per Cities and 15000 Euro Per Municipalities, Decision stipulated in the Local Council Decision.

Pivex Danube Black Sea, technology clusters industry Members have 10000 Euros membership fee/year, Euro Banca Transilvania IBAN RO77BTRLEURCRT00K4427401

• Each Member pays 10% management and coordinating fee to Pivex Platform, for the coordination and management of Pivex Integrated Projects Black Sea, from the funding amount received from the implementation of each Pivex Integrated Sustainable Investments Energy Project developed for the

• Each Member pays 10% monitoring and supervision fee for Pivex Smart Grid, from the funding amount received from the implementation of each Pivex Integrated Sustainable Investments Energy Project, in private public partnership with Pivex Smart Grid J5/1626/2012, and Pivex Platform J5/1464/1996

• Each Member pays 10% international cooperation fee, for Technology involvement, within Danube, Black Sea, Mediterranean Region, in private public partnership with Pivex Smart Grid J5/1626/2012, and Pivex Platform J5/1464/1996

STEP I Land, territory involvement evaluation, Minister propose the territory participation in integrated Monitoring System Pivex Black Sea Mediterranean, naming the Egypt cities and towns.

Participation, with coordinating center in Cairo and Mount Sinai, Egypt. The Very Honored Minister will designate the investments and private public partnership Pivex cities participation.

Pivex Danube Black Sea Association, having the quality of consultative member, and agree to pay the membership fee / per year in quantum

Signature, PI Bun Adhesion, Pivex Smart City Danube Black sea Mediterranean Sysnergy

Signature, Pi Bun Technology Contract Pivex Smart City Danube Black Sea Mediterranean

5000 Euro per town, multiplied with the number of towns involved

10000 Euro per City, 10000*number X cities
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Pivex Platform Black Sea Forum Brussels, office@blacksea-forum.eu
Pivex Danube Black Sea Fiscal Registration Number  29747242

Step 2.The Technic Documentation, Pivex Smart Grid Black Sea Mediterranean, implies, fees regarding concrete territory involvement in private public partnership Pivex.

Pivex Sattelite Pivex Space, Sattelite Security energy Suppervission, Gaz, Oil, Energy, Department, would be very honored to collaborate.

Pivex global platform activities support of Smart Grid deployment at transmission and distribution level, in Europe&priorities and goals of the Pivex Black Sea Roadmap Smart Grids initiatives worldwide.Satellite Carrier Monitoring System (SCL-ADSA) has been designed as a satellite reconnaissance tool to be used by Intelligence and Government Organizations in order to find new signals as well as hidden/discreet Diplomatic) satellite signals. Pivex network of satellite receiving stations to monitor forest fires in the Asia-Pacific region; and then extending that network’s capacity to other parts of the world. The ability to measure and monitor changes in forest cover is critical to international efforts to reduce greenhouse gas emissions by reducing global deforestation and supporting sustainable forest management, Pivex Good indicators for Security of Eu Energy Infrastructure Protection

Monitoring, SCADA fee 61000 euros, per year, Pivex Smart Grid J5/1626/2012,

10 % monitoring fees, in participation, Pivex Smart Grid Private Public Partnership

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PIVEX SMART GRID

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EUR IBAN Volksbank Romania RO73VBBU2513OR1331511190

Monitoring, SCADA fee 50000 euros, per year, Pivex Smart Grid J5/1626/2012,
10 % monitoring fees, in participation, Pivex Smart Grid Private Public Partnership with Pivex Cities Convenant Signatories.

- Smart Grids ERA-Net
- 7th Framework Program (FP7)
- Competitiveness and Innovation Framework Programme (CIP)
- European Investment Bank (EIB)
- European Energy Programme for Recovery (EEPR)
- Trans-European Energy Networks (TEN-E)
- NER 300

PIVEX SMART GRID

J5/1626/2012

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i) 10 % monitoring fee Pivex Platform J5/1464/1996, signed Pivex model uper contract, private-public partnership

PIVEX PLATFORM

IBAN RO03VBBU2511OR1331511101, Volksbank Romania, Pivex Platform,
BIC VBR VBBUROBU

ii) Pivex Private public partnership Exterior commerce involvement, 10 % coordinating fee, signed Pivex Platform uper model, private-public partnership.

PIVEX PLATFORM J5/1464/1996

IBAN RO03VBBU2511OR1331511101, Volksbank Romania, Pivex Platform J5/1464/1996
BIC VBR VBBUROBU

CHAPTER 7: SPECIAL PROVISIONS

• Pivex Platform aims to be developed for networking and framework of cooperation between its members;

• Pivex Platform does not interfere into the activity of the members’ organizations, do not compete with them and do not substitute them.

• Pivex Platform develops both non-profit making activities and profit making activities;

• Pivex Platform’s members participate only at non-profit making activities, in lobbying and representation activities and will be included in international projects if herein mentioned projects’ management board will agree; when Pivex present/ submit to Pivex Platform members
initiatives/projects which can generate financial revenues, with financial reward, based on Pivex’ contribution to the herein mentioned initiative/activity, will be provided;

• For-profit making activities PIVEX will keep separate accounting.

CHAPTER 8: FINAL PROVISIONS

• The provisions of this Protocol may be amended by additional agreements;

• In order to implement this Protocol and fulfill its objectives, Pivex Platform will involve and/or collaborate, if and when necessary, relevant private or public organization/entity in its activities.