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# NoGAP

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Knowledge Transfer Community to bridge the gap between research, innovation and business creation

# **Deliverable 2.1**

Report based on the analysis of the existing policy strategies related to the societal challenge addressed

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#### 1. Introduction

This deliverable was prepared by the Union of Slovak Clusters as a task leader of Task 2.1 (WP2) within the FP7-INCO project NoGAP: *Knowledge Transfer Community to bridge the gap between research, innovation and business creation.* 

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- WP 2:Developing innovation support services to foster innovation partnership in the<br/>societal challenge secure, clean and efficient energy
- Task 2.1:Analysis of existing and planned policy strategies related to the societal<br/>challenge addressed (national energy plans, Danube Strategy, Black Sea<br/>Strategy, Baltic Sea Strategy, EU SET Plan)

The overall aim of deliverable 2.1 is the elaboration of report based on the analysis of the existing strategic documents related to the energy sector in the six Eastern Partnership countries (EaP): Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. This report is aimed at the overview of energy sectors in EaP countries. Special attention is paid to the renewable energy sources (RES), thus targeting the societal challenge secure, clean and efficient energy. It describes not only the main strengths and opportunities of the analysed countries but also challenges and barriers these countries are facing in the energy sector in general but mostly with regard to renewables. The analysis of strategic documents at national level helps us to identify the main fields of energy that play a key role in the EaP countries and to identify the opportunities related to energy efficiency and energy-related technologies in these countries.

This report shows the features that form the energy sectors and RES in individual countries, and through the guidelines for a framework policy document it prepares a ground for the elaboration of possible implications and recommendations, so innovation support services to foster innovation partnership services can be created in line with existing and future policies. EU and macro-regional approach enriches the national analyses with an overview of the strategies that exist at European level. This allows to identify the possibilities of broader involvement of EaP countries into the cooperation process and to take advantage of their participation in the macro-regional and EU strategies and initiatives.



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The specific objectives that lead to the fulfilment of the main aim include:

Analysis of EU level strategies, documents, initiatives and instruments related to the societal challenge addressed;

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- Analysis of existing strategies at macro-regional level;
- Identification of the most relevant strategies related to the societal challenge addressed at national level;
- Analysis of selected strategies at national level with primary focus on RES.

#### Based on the objectives, the report is structured in the following way:

- Sirstly, the method presents how the information were obtained and processed. It includes the description of single steps which were followed in order to achieve the main aim and specific objectives.
- ${ \bigtriangleup }$  Further, the most important results showing the outcomes of national and macroregional analyses are summarised. This chapter is divided into three sub-sections:
  - EU level focusing on the analysis of numerous strategies, documents, initiatives and instruments with relevance to energy.
  - Macro-regional approach covering the Baltic Sea Strategy, Danube Strategy and Black Sea Synergy.
  - National analyses covering the EaP countries which are partners of the project NoGAP, namely Belarus, Georgia and Ukraine. Additionally to the three EaP countries directly involved in the project, the intention was to cover also the other three EaP countries: Armenia, Azerbaijan and Moldova.

This provides a comprehensive overview of the situation regarding the societal challenge addressed at various levels.

- $\bigcirc$  In order to be able to draw the implications and recommendations based on the results of the analysis of strategic documents at various levels, the guidelines for a framework policy document are provided. These could help to EaP countries in the future development of their energy sectors in line with macro-regional strategies which provide advanced outline of activities that should take place in the respective region. Approaching these macro-regional strategies at national and regional level may bring various benefits not only in the form of financial incentives but also in the form of societal well-being and progress.
- S Finally, the deliverable is summarised in conclusions.



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Since NoGAP is a complex project consisting of various work packages (WPs) and activities, the **synergies and interdependencies with other deliverables and tasks** are necessary. The report provides a background for the preparation of Deliverable 2.2 (Task 2.1) which is a framework policy document, since it provides the guidelines in order to be able to draw the implications and recommendations based on the analysis of energy sectors in individual countries and at EU and macro-regional level. For this reason the content of the report was structured in a way to be able to identify opportunities in the field of energy efficiency and RES and to develop the specific services in this field (Task 2.2). This deliverable will serve for the selection of priorities regarding the energy-related technologies which will be further addressed by the project. It will be useful also for the identification of opportunities for the existing and establishment of new technology transfer centres (Task 2.3). Therefore, this deliverable will serve as a basis for all other tasks within WP2. Additionally, deliverable 2.1 is crucial also for WP4 which aims at the implementation of services developed within WP2. Finally, success of WP5 partially depends on this deliverable. It is aimed at practical use of information acquired mostly within WP1 and WP2.



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### 2. Method

In order to obtain the necessary information for further analysis, the crucial step was the selection of detailed method of data collection which is establishing a background for the whole process leading to the delivery of desired outcomes.

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First of all, the tasks have been assigned to the partners responsible for the delivery of all required inputs:

- A RCTT responsible for inputs from Belarus
- S ICARTI responsible for inputs from Georgia, Armenia and Azerbaijan
- S NTUU KPI responsible for inputs from Ukraine
- SIP Ukraine responsible for inputs from Moldova

Additional to this, the Union of Slovak Clusters was responsible for the identification of strategic documents at European and macro-regional level.

Further, the method is composed of the following steps:

1. Identification of the most relevant strategic documents in the energy sector at national and regional level.

The national / regional approach is focused on the key strategies at national and regional level which capture the main objectives of the energy sector in individual EaP countries, main development priorities and opportunities in the field of energy efficiency and main measures and financial instruments used for the fulfilment of the national / regional objectives in the energy sector. This approach involves mostly the identification of strategies and roadmaps in the field of renewable energy since the alternative energy sources can be seen as a future of energy sectors of most countries.

In this case, the identification of strategic documents has been carried out in all EaP countries as shown on the map below (Fig. 1; EaP countries marked in yellow).



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FIGURE 1: Eastern Partnership countries *Source: <u>http://www.euractiv.com</u>* 

First of all, the responsible partners have been asked to prepare the list of all strategic documents in the energy sector containing the following information:

- Full title of the document
- Organization responsible for the development of strategic document
- Year of publication
- Indication of national / regional level
- E-version of the document (if available)

Partners from Belarus (RCTT), Georgia (ICARTI) and Ukraine (NTUU KPI, NIP Ukraine) are directly involved in the project and they were responsible to provide the list of strategic documents from their respective countries. Moreover, the intention of the project is to



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invite representatives from the other three EaP counties – Armenia, Azerbaijan and Moldova. These are associated to the project and thus, are also analysed within this report.

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Based on the inputs provided by responsible partners, the identified strategic documents can be divided into the following categories:

- Stational level documents (energy strategies, action plans, sectorial programmes);
- A Regional level documents;
- Laws and rules.

Since all of the responsible partners provided extensive lists of strategic documents within the identification phase (see Annex 1), only the most relevant strategies were selected. These are further elaborated in the section 3.3 (mostly national energy strategies and roadmaps with regard to renewables).

2. Identification of strategic documents in the energy sector at EU level and macroregional level.

Since almost all of the countries involved in the project belong geographically to some of the European macro-regions, the macro-regional approach plays an important role in the comparison of the European targets in the energy sector with individual EaP strategies and in finding links between these strategies. As it is shown on the map below (Fig. 2), the report focuses on the three EU macro-regional strategies. These strategies cover the EaP counties participating in the NoGAP project (except of Belarus), wherein some of the countries are covered by more than one strategy.



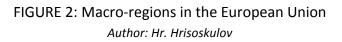


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The task leader was responsible to identify the most relevant EU macro-regional strategies, particularly:

- Baltic Sea Strategy
- Danube Strategy
- Black Sea Synergy

Additional to these macro-regional strategies, the analysis includes other relevant strategies, initiatives and instruments which support the development of energy sectors and imply various measures and sources of funding. These include the strategic and implementing documents (Europe 2030, EU SET Plan, Communication on Energy Technologies and Innovation, European Technology Roadmaps), international cooperation areas (DG Development and Cooperation - EuropeAid, Eastern Neighbourhood Policy), and financing instruments (Horizon 2020, KIC InnoEnergy and other financing instruments).



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3. Country energy report based on the identified strategic documents at national / regional level.

The responsible partners have been asked to prepare the country energy reports containing the most relevant information from their national / regional strategic documents identified within point 1 (the template for energy reports is in Annex 2). In all of the analysed countries, more strategic documents have been identified. Therefore, only the most relevant strategic documents have been selected and further analysed. The country energy reports help us to determine which are the most important aspects of the development of energy sectors and energy-related technologies in individual countries, and what are the priorities at the level of production and efficient energy use.

# 4. EU / Macro-regional energy report based on the identified strategic documents at EU and macro-regional level.

The task leader was responsible to prepare the EU / macro-regional energy report based on the identified documents within point 2. The EU / macro-regional energy report contains not only the general background information about the strategies but mainly the information relevant to all analysed countries. This allows us to identify the possible interconnections between the strategies of individual countries and macro-regional strategies, to find the common features that could be further developed within the framework policy document.

#### 5. Negotiation with responsible partners.

Based on the information provided within the country energy reports and the analysis of the EU and macro-regional strategies, negotiations were conducted in order to collect comments and additional missing information from responsible partners and to finalise the report.

#### 6. Synthesis of all findings into the final report.

The task leader was responsible for the collection of EU / macro-regional / national / regional reports and synthesis into one final report, containing guidelines for the policy framework document. These guidelines will be used to develop a framework document which will design the services regarding the cooperation and technology transfer between research and industry in the societal challenge addressed.



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#### 3. Results

This section provides the main findings that stem from the analysis of strategic documents at various levels. The information related to the societal challenge addressed was collected with the help of all partners involved in the project.

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#### 3.1. EU level

Based on the description of work of the project NoGAP regarding deliverable 2.1, the main intention was to conduct the analysis of strategic documents at EU level, mostly with regard to the EU Strategic Energy Technology Plan (EU SET Plan). Since the EU provides much broader range of strategies, documents, initiatives and instruments related to the societal challenge secure, clean and efficient energy, therefore these are also worth to mention in order to have complex and comprehensive overview of possibilities and opportunities in this field. Brief description of the identified documents in the societal challenge addressed is provided, including links (if available) to websites where additional information can be found.

Firstly, the following <u>strategic and implementing documents</u> have been identified at EU level:

Europe 2030 – It is a strategic framework for climate and energy policies in the EU aiming to higher competitiveness, security and sustainability of EU's energy system that ensures affordable energy for all consumers, increases the security of the EU's energy supplies, reduces our dependence on energy imports and creates new opportunities for growth and jobs.<sup>1</sup> Europe 2030 is a new policy framework presented in January 2014 setting the targets towards a low-carbon economy by 2030, mainly with regard to the reduction of greenhouse gas emissions by 40%, and increase of the share of RES to at least 27%.

Link: http://ec.europa.eu/clima/policies/2030/index\_en.htm

<sup>&</sup>lt;sup>1</sup> COM(2014) 15 final. A policy framework for climate and energy in the period from 2020 to 2030. [Electronic resource].-Access mode: <u>http://www.kowi.de/Portaldata/2/Resources/fp/2014-COM-framework-climate-energy.pdf</u>





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 Strategic Energy Technology Plan (EU SET Plan) - It is the research and innovation pillar of the European energy policy, which provides the strategic frame for addressing the following challenges: new, cleaner, low-carbon, efficient energy sources that are commercially attractive and combined with measures facilitating the market uptake of these energy technologies and services.<sup>2</sup>

The EU SET Plan 'Towards a low carbon future' is aimed at cooperation of Member States in the development of new energy technologies what could gain the Europe a world leadership in a diverse portfolio of clean, efficient and low-carbon energy.<sup>3</sup> Link: http://ec.europa.eu/energy/technology/set\_plan/set\_plan\_en.htm

- Communication on "Energy Technologies and Innovation" This document puts forward concrete measures to reinforce the EU SET Plan. The intention is to better equip the SET Plan to respond to the new challenges addressed and to more effectively consolidate research and innovation capacity and resources across Europe.<sup>4</sup>
- European Technology Roadmaps These roadmaps follow the low-carbon economy targets and define the European Industrial Initiatives (EIIs) that bring together industry, research, individual Member States of the EU and the Commission in risk-sharing public-private partnerships aiming at the rapid development of key energy technologies at the European level. The roadmaps put forward action plans aimed at raising the maturity of the technologies to a level that will enable them to achieve large market shares during the period up to 2050.<sup>5</sup> The priority technologies of the first EIIs include: wind energy, solar energy, bioenergy, carbon capture and storage, electricity grids, sustainable nuclear energy and smart cities.

*Link: <u>http://setis.ec.europa.eu/set-plan-implementation/technology-roadmaps</u>* 

<sup>&</sup>lt;sup>2</sup> Commission Decision C (2013)8631 of 10 December 2013. Horizon 2020 - Work Programme 2014 – 2015: Secure, clean and efficient energy. [Electronic resource].-Access mode:

 <sup>&</sup>lt;u>http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\_2015/main/h2020-wp1415-energy\_en.pdf</u>
 <sup>3</sup> COM 2007(723) final. A European Strategic Energy Technology Plan (SET-Plan) 'Towards a low carbon future'. [Electronic resource].-Access mode: <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0723:FIN:EN:PDF</u>

<sup>&</sup>lt;sup>4</sup> COM 2013(253) final. Energy Technologies and Innovation. [Electronic resource].-Access mode: http://ec.europa.eu/energy/technology/strategy/doc/comm 2013 0253 en.pdf

<sup>&</sup>lt;sup>5</sup> SEC(2009) 1295. Commission staff working document "A Technology Roadmap".



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Further, the <u>international cooperation</u> areas have been identified including instruments supporting the energy development policies:

• **DG Development and Cooperation – EuropeAid** – It is a new Directorate-General (DG) responsible for designing EU development policies and delivering aid through programmes and projects across the world.<sup>6</sup> It delivers aid through a set of financial instruments tackling various issues, including energy. The **Unit C5 Energy** is in charge of the management of the development and cooperation policies in the area of energy and the support and guidance to delegations and other services within development and cooperation, as well as the implementation of a portfolio of projects/programmes in the energy thematic area. The areas of activities of this Unit are the external dimension of the EU energy policy. They cover also the global initiatives such as "Sustainable Energy for All" focusing on sustainable energy services, energy security, sustainability of energy systems and increased mobilisation of RES.<sup>7</sup>

Link: <u>http://ec.europa.eu/europeaid/index\_en.htm</u>

 European Neighbourhood Policy (ENP) – It is implemented as a part of the DG Development and Cooperation and involves 16 of EU's closest neighbours, including all analysed EaP countries. ENP is mostly a bilateral policy between the EU and each involved country to which it offers a concrete set of opportunities through its sector policies, including energy security.

Link: <u>http://eeas.europa.eu/enp/index\_en.htm</u>

It is further complemented by regional and multilateral initiatives. The most important from the perspective of the project NoGAP are:

 Eastern Partnership – It includes the aspect of energy and transport which covers the cooperation of EaP countries and EU Member States leading to improved infrastructure, interconnections, integration of energy markets and transport services and enhanced cooperation among partners.

Link: http://eeas.europa.eu/eastern/index\_en.htm

• Black Sea Synergy – see section 3.2.3.

<sup>&</sup>lt;sup>6</sup> <u>http://ec.europa.eu/europeaid/index\_en.htm</u>[accessed 23.04.2014]

<sup>&</sup>lt;sup>7</sup> European Commission (2013). Directorate General for Development and Cooperation – EuropeAid: Main missions of DEVCO Directorates & Units. Version of 18/11/2013. [Electronic resource].-Access mode: <u>http://ec.europa.eu/europeaid/who/about/documents/devco-mission\_statement\_en.pdf</u>



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Finally, the relevant financing instruments have been analysed:

Horizon 2020 – It is the EU funding programme for research and innovation with almost €80 billion of funding available in the period 2014 – 2020. It consists of particular sections, including the Societal Challenges. This programme section includes numerous calls in the societal challenge secure, clean and efficient energy. It is split into the focus areas aimed at energy efficiency, low carbon technologies and smart cities and communities.

#### Link: <u>http://ec.europa.eu/programmes/horizon2020/</u>

Additionally, Horizon 2020 includes other instruments in the field of energy:

- Intelligent Energy Europe This programme of 2007-2013 which was aimed at helping the cities and regions to implement investment projects in the areas of energy efficiency, RES and sustainable urban transport has been transformed into Horizon 2020.
- JESSICA Joint European Support for Sustainable Investment in City Areas. It is the EC initiative developed in cooperation with the European Investment Bank (EIB) and the Council of Europe Development Bank. JESSICA promotes sustainable urban development by supporting projects in various areas, including urban infrastructures aimed at energy and energy efficiency. *Link: http://ec.europa.eu/regional\_policy/thefunds/instruments/jessica\_en.cfm*
- ELENA The European Local Energy Assistance. This facility launched by the EC in cooperation with EIB provides financial and technical assistance to help local and regional authorities attract funding for sustainable energy projects. It provides the public entities with specific support for the implementation of investment projects in the areas of energy efficient district heating and cooling networks, sustainable buildings, etc.

Link: http://www.eib.org/elena

 KIC InnoEnergy – Knowledge and Innovation Community (KIC) is addressing sustainable energy as its priority area with the strategic objective *"to become the leading engine of innovation in the field of sustainable energy"*.<sup>8</sup> KIC InnoEnergy is one of the first three KICs designated by the European Institute of Innovation and Technology (EIT). Leader of the project NoGAP - Steinbeis-Europa-Zentrum is one of its members. The core

<sup>&</sup>lt;sup>8</sup> <u>http://www.kic-innoenergy.com/</u> [accessed 23.04.2014]



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competencies of this instrument include energy storage, energy from chemical fuels, sustainable nuclear and renewable convergence, smart and intelligent cities and buildings, clean coal technologies, smart electric grid, RES and energy efficiency. *Link:* <u>http://www.kic-innoenergy.com/</u>

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- Other financing instruments EuropeAid is responsible for implementing the EU's external aid instruments financed from the European budget and the European Development Fund. These also touch upon the areas of energy and RES, e.g.:
  - Development Cooperation Instrument (DCI) DCI Environment and sustainable management of natural resources including energy
  - European Neighbourhood and Partnership Instrument (ENPI)
  - Nuclear Safety Cooperation Instrument
  - o Instrument for Stability
  - Instrument for Pre-accession Assistance
  - Macro-financial Assistance
  - Common Foreign and Security Policy
  - Neighbourhood investment facility

Additionally, one of the interesting initiatives aimed at the implementation of sustainable energy policies is the **Covenant of Mayors.** It is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of RES on their respective territories.<sup>9</sup> It involves ca 5 660 signatories wherein each of the analysed EaP countries is involved through one or more signatories. In order to move from political commitments towards concrete measures, the signatories prepare and submit Sustainable Energy Action Plans outlining the key actions they plan to undertake. The implementation of these action plans is supported by ELENA funding mentioned above.

Link: <u>http://www.covenantofmayors.eu/index\_en.html</u>

<sup>&</sup>lt;sup>9</sup> <u>http://www.covenantofmayors.eu/index\_en.html</u> [accessed 23.04.2014]



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#### **3.2.** Macro-regional approach

The intention of this section is to provide general background information about the EU macro-regional strategies which cover the countries involved in the project NoGAP. Currently, the EU is implementing two strategies at macro-regional level which are of concern of this analysis:

- The EU Strategy for the Baltic Sea Region
- The EU Strategy for the Danube Region

The strategies cover several policies and address common challenges faced by the countries located in the same geographical area, which thereby benefit from strengthened cooperation.

Additionally, the EU supports regional development in the South-East Europe through the Black Sea Synergy. It is based on similar principles as the macro-regional strategies, tackling common problems of the countries surrounding the Black Sea.

#### 3.2.1. Baltic Sea Strategy

Baltic Sea Strategy was adopted in 2009. It covers only Germany when considering the countries participating in the project NoGAP. However, it is also relevant for this analysis since it is aimed at strengthening cooperation and reinforcing EU policies in various areas, including the societal challenge addressed. The importance is placed at cooperation and partnerships addressing key challenges of the region, as well as opportunities that should be utilized by coordinated actions. The main objectives set in the Strategy are: to save the sea, to connect the region, and to increase the prosperity.<sup>10</sup>

The Strategy Action Plan comprises 17 priority areas and 5 horizontal actions with specific indicators and targets translated into concrete actions and flagship projects which could be implemented and thus, bring the expected results if linked to available financial resources. These include the European Regional Development Fund, the European Social Fund, Cohesion Fund, European Agricultural Fund for Rural Development, European Fisheries Fund, and research and innovation, as well as other existing programmes. Actions represent

<sup>&</sup>lt;sup>10</sup> COM(2012) 128 final. The European Union Strategy for the Baltic Sea Region. [Electronic resource].-Access mode: <u>http://ec.europa.eu/regional\_policy/sources/docoffic/official/communic/baltic/com\_baltic\_2012\_en.pdf</u>



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the main steps that are needed to achieve the agreed indicators and targets for that particular area, while flagship projects detail how to achieve the desired outcome.<sup>11</sup>

The area of energy is addressed by the Priority Area (PA) Energy "Improving the access to, and the efficiency and security of the energy markets". This PA is reflecting the core energy elements such as energy infrastructure, RES, energy efficiency, and security of energy supplies. Additionally, PA Innovation "Exploiting the full potential of the region in research and innovation" is also interesting in terms of further tasks and deliverables of the project NoGAP since it is aimed at exploring the potential for growth through cluster approach and combination of competencies in R&D in order to create partnerships with other innovative regions and enhance the technology transfer.

#### 3.2.2. Danube Strategy

The European Union Strategy for the Danube Region adopted in 2011 is covering Moldova and Ukraine when considering the analysed EaP countries. Additionally, part of Germany (Baden-Württemberg and Bavaria), Slovakia and Romania are concerned. These are also partners in the project NoGAP. This Strategy follows the welcome for the Baltic Sea Strategy. The Danube Strategy concerns mostly the countries along the Danube River. Since the river flows into the Black Sea, it is envisaged that this Strategy should be coherent with Black Sea perspectives.<sup>12</sup>

The main implications of this Strategy can be seen in the creation of consortia and preparation of future project proposals which may be submitted under the existing programmes and schemes since no new EU funds have been envisaged for the implementation of the Danube Strategy. These include the currently forming European Territorial Cooperation Programme Danube, Transnational Cooperation Programme Central Europe, Structural Funds, ENPI funds, the international financing institutions (e.g. EIB), Horizon 2020, etc. (see section 3.1 for more information).

<sup>&</sup>lt;sup>11</sup> SEC(2009) 712/2. Commission staff working document "Action Plan".

<sup>&</sup>lt;sup>12</sup> COM (2010) 715 final. European Union Strategy for Danube Region. [Electronic resource].-Access mode: <u>http://eur-</u> lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0715:FIN:EN:PDF



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The Strategy identifies the main challenges and opportunities of the region which are reflected in the pillars and priority areas of this Strategy. These create the **Action Plan of the Danube Strategy** which contains the examples of projects that could be implemented in order to address the development in the four pillars of the Strategy:

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- Connecting the Danube Region
- Protecting the Environment in the Danube Region
- Building Prosperity in the Danube Region
- Strengthening the Danube Region

The Action Plan identifies the concrete priorities for the macro-region which are summarised in 11 Priority Areas. These represent the main areas where the Strategy can contribute to improvement.<sup>13</sup> Regarding the sector of energy, the PA 2 *"To encourage more sustainable energy"* is addressing the needs of the region. It includes the following actions:

- Energy systems with regard to energy infrastructure and energy markets
- Energy efficiency and renewable energy

The actions are aimed at the investment in infrastructure, ensuring the security of supply, improved market organization, more effective balance of supply and demand, improved energy efficiency and increased use of RES.

Additionally, PA 7 **"To develop the knowledge society through research, education and information technologies"**, as well as PA 8 **"To support the competitiveness of enterprises, including cluster development"** are also relevant since they foresee actions with the aim to prepare the pilot projects for technology transfer and to support the development of clusters and cluster cooperation across borders and sectors – the areas of interest of the project NoGAP.

#### 3.2.3. Black Sea Synergy

As of the EC Communication from 2007, the Black Sea Synergy geographically concerns the following EaP countries which are analysed in this report: Moldova, Ukraine, Georgia, Armenia and Azerbaijan. In addition, considering other project countries, Romania belongs

<sup>&</sup>lt;sup>13</sup> SEC(2010) 1489 final. Commission staff working document "Action Plan".



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to this area. Even though Armenia, Azerbaijan and Moldova are not littoral states, their proximity to this region and historical ties have caused that they became natural part of this region. This Synergy was created under the framework of the European Neighbourhood Policy (see section 3.1 for more details) and is based on the common interests of the EU and the Black Sea Region in various cooperation areas.<sup>14</sup> Since almost all EaP countries are covered, it is this Synergy that has the highest relevance for this analysis.

The Black Sea Region requires coordinated actions in the key sectors in order to be able to respond to the opportunities it is facing. The Synergy reflects common priorities in various areas, including energy. Due to the geographical location and availability of rich deposits of energy sources, the Black Sea Region plays an important role in energy flows and its potential should be further exploited and developed. This region is of strategic importance for EU since it offers significant potential for energy supply diversification and it is an important production and transmission area. One of the main EC objectives regarding the energy sector in the Black Sea Region is *"to provide a clear, transparent and non-discriminatory framework, in line with the EU acquis, for energy production, transport and transit"*. The EU is also helping the countries of the region *"to develop a clearer focus on alternative energy sources and on energy efficiency and energy saving"*.<sup>15</sup>

The activities supporting the cooperation in the area of energy in the Black Sea Region were incorporated already in a 1997 EC Communication<sup>16</sup>. Various initiatives and cooperation programmes have been created and used by individual EaP countries as mentioned in the country energy reports (section 3.3). These include mostly:

- **The Baku Initiative** created mostly to enhance cooperation in the energy and transport and to stimulate progressive convergence towards EC principles.
- The INOGATE Programme The Interstate Oil and Gas to Europe pipelines aimed at improved security of energy supplies through multi-annual technical assistance programmes.
- Energy infrastructure aimed at projects on upgrading the energy infrastructure, including the Baku-Tbilisi-Ceyhan oil pipelines mentioned in the country energy report of Georgia (see section 3.3.4).

<sup>&</sup>lt;sup>14</sup> COM(2007) 160 final. Black Sea Synergy – A new regional cooperation initiative. [Electronic resource].-Access mode: <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0160:FIN:EN:PDF</u>

<sup>&</sup>lt;sup>15</sup> COM(2007) 160 final. Black Sea Synergy – A new regional cooperation initiative. [Electronic resource].-Access mode: <u>http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0160:FIN:EN:PDF</u>

<sup>&</sup>lt;sup>16</sup> COM(97) 597 final. Communication on Regional Cooperation in the Black Sea Area.



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Even though the Black Sea Region with its opportunities and challenges is of immediate concern to the EU, only little progress has been done and there is no follow-up ensuring further development of this Synergy.





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#### 3.3. **Country energy reports**

This section describes the main findings from the identified strategic documents at national level related to the societal challenge secure, clean and efficient energy. The results are presented for individual countries listed in alphabetical order. The results are provided with regard to the energy sector in general, as well as with regard to the area of RES. This section contains mainly the following information regarding the energy sector of individual EaP countries:

- -The strategies with the highest relevance for the energy sector that were analysed
- The main body / authority creating the regulatory framework of energy sector -
- Brief description of the situation in the energy sector in general -
- Description of RES with the highest importance for the country
- -Agencies responsible for the implementation of RES and implemented projects
- SWOT analysis of the energy sector (mostly with regard to RES)
- Financing instruments and measurable indicators related to the energy sector

#### 3.3.1. Armenia

The analysis of the energy sector of Armenia is based mostly on the review of the following strategic documents:

- S Energy Sector Development Strategy in the Context of Economic Development in Armenia (2005)<sup>17</sup>
- A Renewable Energy Roadmap for Armenia (2011)<sup>18</sup>

The main body which elaborates and implements the policies of the Republic of Armenia in the energy sector is the Ministry of Energy and Natural Resources of the Republic of Armenia.

<sup>&</sup>lt;sup>17</sup> Energy Sector Development Strategy in the Context of Economic Development in Armenia (2005). Adopted by the Government of Armenia at June 23, 2005. N1 resolution of N 24 protocol.

<sup>&</sup>lt;sup>18</sup> Renewable Energy Roadmap for Armenia (2011). Submitted to: Armenia Renewable Resources and Energy Efficiency Fund (R2E2). Prepared by Danish Energy Management A/S.



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#### Situation in the energy sector in general

In general, the situation in the energy sector of Armenia described in the above mentioned Energy Sector Development Strategy is based on a fact that *"domestic fuel resources are limited"* and that *"substantial portion of base load electricity is generated at nuclear power plants"*.

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Like many other countries, Armenia is mostly dependent on **nuclear energy**. However, the government of Armenia has made a commitment to its citizens and to the European Commission that the Armenian Nuclear Power plant (ANPP) will eventually close. This will necessitate the provision of adequate alternative sources which require substantial costs and thus, the closing of the ANPP will lead to significant increases in the bills of Armenian customers and further reliance on gas imports. In particular, if the ANPP is closed at the end of 2016, the country's 2017 power sector independence will decrease from 70% to 40% (based on the assessment of the independence and reliability of the energy system of Armenia carried out in the Energy Sector Development Strategy). If the capacity and generation of the ANPP is replaced by thermal generation, 60% of the country's electricity consumption will be generated using imported fuel (mainly natural gas). This will bring forth new ecological and social problems stemming from the increases of greenhouse gas emissions and from payments to foreign suppliers, as well as tariff increases.

It is assumed that during 2010-2020 energy intensiveness will stabilize since during the previous decade **new energy efficient technologies have been built** and operated in all sectors of economy. The government has already taken steps towards the improvement of the situation in Armenia:

- The electric energy and gas sectors have been restructured. The restructuring includes mostly the privatization of the gas supply system and electric distribution system and privatization of some hydro power plants (HPPs);
- The second Iran-Armenia electric transmission line has been constructed;
- Savings from optimization of generating plant operations permitted preservation of the lowest possible tariff for power generation, which greatly contributed to the efficient operation of the system;
- The Power System Operator and the Settlements Centre have been established, as has a system of direct wholesale power purchase and sale contracts between generators and the distributor;
- Etc.



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Additionally, considering the current reform and commercialization processes in the energy sector, the Armenian government is becoming more focused on *"financial support for projects that have nation-wide significance, are capable of ensuring an adequate level of energy security and independence, and can secure social and economic development"*.<sup>19</sup> Many of such projects and foreign investments have already been implemented and are contributing to the growing economic development in the country. These include:

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- Modernization of some of the HPP units and of the greater part of the 220 kV transmission network sub-stations by *German* and *World Bank loan resources*;
- The gas metering node has been built by the EU INOGATE project;
- The speed regulators at some HPPs were replaced with **EU TACIS assistance**;
- The SCADA system (Supervisory Control and Data Acquisition) has been implemented through **USAID technical assistance**;
- The *Japanese loan* permitted the modernization of thirty three 110 kV sub-stations of the distribution network and procurement of about 150 000 single-phase electronic meters, as well as the gradual implementation of the SCADA system in the energy sector;
- **Grant provided by Iran** permitted the construction of the first 2.6 MW wind power plant (WPP).

Analysis and assessment of opportunities to diversify supplies, achieve regional integration and increase electricity exports are a critical element of Armenia's energy sector development strategies. However, certain limitations bring problems to the further development of energy sector in this country. Armenia must attain further economic development and achieve international competitiveness. Some of the basic principles of the energy sector development strategies are as follows:

- Construction of a financially sustainable energy system encouraging the economically efficient operation of all energy suppliers, which would bring forth interest among the investors and private capital;
- Creation of an electric energy system that is export oriented and generates high added value;
- Ensuring ecologically sustainable energy supply in line with the principles of sustainable development;

<sup>&</sup>lt;sup>19</sup> Energy Sector Development Strategy in the Context of Economic Development in Armenia (2005). Adopted by the Government of Armenia at June 23, 2005. N1 resolution of N 24 protocol.



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 Development of research programmes targeted at the implementation of the goals and primary objectives specified in the key country energy strategies, with the use of the newest energy sector technologies known in the world, as well as the latest developments in the global energy system.

#### Renewable energy sources

Regarding RES it is necessary to notice that even despite the lack of domestic fuel resources, **Armenia has significant potential in renewables**. The future direction of energy sector in this country during the next 15-20 years should be focused mostly on the structure of power generation which maximises the use of domestic RES.

The most important renewables for Armenia are<sup>20</sup>:

#### Hydro energy

Regarding the production potential, the theoretical value is estimated at 21.8 billion kWh per year, while the technically available potential is 7-8 billion kWh per year and economically justified hydro potential is around 3.6 billion kWh per year. Generation of 3.6 billion kWh of hydro-electricity per year requires the use of existing HPPs including the small ones, but it also requires the construction of new major HPPs in other regions of Armenia. The economically justified potential from small HPPs amounts to 800-850 million kWh per year.

#### S Wind energy

The theoretic potential is estimated at 10 700 GWh per year and the technically available potential is estimated at 1 100 GWh per year. Armenia has substantial wind energy resources what has been confirmed by the Wind Energy Resource Atlas of Armenia<sup>21</sup>. Preliminary results show that the existing wind energy resources in Armenia are sufficient to build a network of WPPs with a total capacity of 1 000 MW in 8-10 locations in Armenia where wind energy resource analyses have already been carried out. Therefore, the wind energy potential is to be developed during the next 15-20 years.

<sup>&</sup>lt;sup>20</sup> Energy Sector Development Strategy in the Context of Economic Development in Armenia (2005). Adopted by the Government of Armenia at June 23, 2005. N1 resolution of N 24 protocol.

<sup>&</sup>lt;sup>21</sup> Elliot D. et al. (2003). Wind Energy Resource Atlas of Armenia. National Renewable Energy Laboratory.





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#### Solar energy

Armenia has a significant solar energy potential which, used for thermal energy, can substantially reduce the amount of imported energy. The average annual amount of solar energy flow per square meter of horizontal surface is about 1 720 kWh. Additionally, one fourth of the country's territory is endowed with solar energy resources of 1 850 kWh/m2. The portion of the direct annual radiation upon the entire territory is also significant: 65-70%, which is rather unique for the application of concentration collectors. With recent world-wide developments in the solar energy for power generation purposes, its deployment in Armenia is possible, assuming that reasonable and affordable tariffs are established.

Additional to these RES, Armenia has promising geothermal resources. If the results of current exploration and assessment are positive, the use of this resource might be attractive for international financial institutions and private investors. Finally, even though **biomass** is not widely used as an energy source in Armenia, some activities have commenced towards the creation of a major biogas plant with foreign investments.

#### SWOT analysis of Armenian energy sector

In order to be able to identify the economically and financially viable potential of energy sector, the main strengths, weaknesses, opportunities and threads Armenia is facing have been summarised in the SWOT analysis in the table below.

TABLE 1: SWOT analysis of Armenia

Strengths	Weaknesses	
<ul> <li>Experience in supporting the small HPP development through feed-in tariff policy</li> <li>Established education system</li> </ul>	<ul> <li>Country is possessing few raw materials and has no direct access to fossil energy and thus, has to rely on their imports</li> </ul>	
<ul> <li>supporting renewable energy and energy efficiency</li> <li>Good potential in solar resources: 1720 kWh/m2 annually</li> </ul>	<ul> <li>Renewable Energy Roadmap for Armenia developed in 2011 did not yield legislative measures despite of a number of recommendations</li> <li>Public awareness with regard to</li> </ul>	



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	<ul> <li>energy related issues</li> <li>Feed-in tariff support so far only in the small HPP area</li> </ul>
Opportunities	Threats
<ul> <li>Renewable Resources and Energy Efficiency Fund (R2E2) established few years ago and continuing its activity</li> <li>Banking system adopts more energy projects for financing</li> </ul>	<ul> <li>Imports of fossil fuel for transport by very few companies</li> </ul>

Source: Contribution of ICARTI

#### Financing instruments and measurable indicators

Since one of the most important targets for Armenia's energy sector is **energy independence and energy security**, it focuses on the diversification of imported and domestic energy resources and on ensuring maximum utilisation of generating capacity. One of the key elements in this regard is ensuring the efficient use of domestic energy sources and their combination with available alternative sources of energy. This can be achieved mostly with the help of private sources, private capital and financial resources from private investors, and technical assistance from donors.

Regarding the long-term indicators beyond 2020 leading to the achievement of the main target which is higher independence in power supply, these are illustrated in the table below.

Indicator	Unit of measurement	Base value	Planned output
Increase of the RES share to 15.4% of the total electric energy consumption by 2020 (without large hydro)	%	5.42% (in 2010)	15.4% (in 2020)
Transportation fuel - bioethanol	%	0%	1%

#### TABLE 2: Measurable indicators - Armenia





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% of total fuel		(in 2010)	(in 2020)
Thermal Energy: solar thermal,	%	0%	0.75%
heat pumps		(in 2010)	(in 2020)
% of total fuel			

Source: Renewable Energy Roadmap for Armenia (2011)

#### 3.3.2. Azerbaijan

Based on the identified strategic documents existing in Azerbaijan, the situation in the energy sector especially with regard to renewables has been analysed mostly with the use of the following strategies:

- △ A Roadmap for Renewable Energy in Azerbaijan (2009)<sup>22</sup>
- Azerbaijan: Alternative and Renewable Energy A Business Perspective (2013)<sup>23</sup>

The main body responsible for the energy sector of Azerbaijan and creating the regulatory environment of this sector is the **Ministry of Energy of the Republic of Azerbaijan**.

#### Situation in the energy sector in general

The energy sector dominates the economy of Azerbaijan and has played a key role in the recent economic boom. Azerbaijan belongs among the oldest **oil and natural gas suppliers** in the world. Oil and gas development and export is crucial to Azerbaijan's economic growth. The economy is heavily dependent on its energy exports. Natural gas accounted for about 66% of Azerbaijan's total domestic energy consumption in 2010, with oil consumption at 31% of total energy use. Country uses the natural gas and oil although this source of fuel is exhaustible and will become more expensive in the future.

Azerbaijan has always played a significant role in the development of today's oil industry. Even though this country is a net exporter of crude oil, some volume is imported from Turkmenistan and Kazakhstan because of the divergence between the high price for crude oil on the world market and the regulated low price for oil on the domestic market. Although

 <sup>&</sup>lt;sup>22</sup> Baker, R. and Safarzade, E. (2009). A Roadmap for Renewable Energy in Azerbaijan. Asian Development Bank R-CDTA
 7274: Azerbaijan Alternative Energy Sector Analysis and Roadmap.

<sup>&</sup>lt;sup>23</sup> Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013). Open for Business Series. Caspian Information Centre.



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the State Oil Company of Azerbaijan Republic is involved in all segments of the oil sector it produces only about 20% of Azerbaijan's total oil output, with the remainder produced by international oil companies.

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Although historically an oil producer, Azerbaijan's importance as a gas producer and exporter is growing. Natural gas plays a central role mostly domestically, and it likely will gain importance in the future, particularly in the electric power sector. This country became a net exporter of natural gas in 2007. Before that time it imported natural gas from Russia. Most of the natural gas produced in Azerbaijan is destined for Turkey, but a small volume of natural gas is supplied to Greece. Under a previous arrangement, Turkey was re-exporting Azerbaijani gas to Greece, but a new agreement allows to directly export to the EU. This may result in increased exports to the EU once the necessary infrastructure is completed.

Therefore, the economy of Azerbaijan strongly depends on the exploitation and export of traditional hydrocarbon resources. At the same time, the revenue, especially from hydrocarbons, accrues initially to the state sector in terms of royalties, including fees for the transfer of energy via pipelines through the national territory. The government has a major task of "making the revenue work" in terms of job creation, incentives, infrastructure creation, etc. Even though some jobs are generated, in the context of the size of the revenue their total number is still relatively low.

#### Renewable energy sources

In 2011, alternative energy sources accounted for 10% of the nation's electricity (nearly all from HPPs) and for 2.3% of all energy consumption. **Azerenergy** is a key player in paving the way for renewable and alternative energy to play its part in the nation's energy development in Azerbaijan. Azerenergy is wholly-owned joint stock company which has a monopoly over the provision of electricity in the country.<sup>24</sup> Its position has changed rapidly in the last few years. Azerenergy has been the locus of huge investments, especially from the World Bank, European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB) and others. In terms of alternative energy, it is the largest single functioning initiative in the country.

<sup>&</sup>lt;sup>24</sup> Baker, R. and Safarzade, E. (2009). A Roadmap for Renewable Energy in Azerbaijan. Asian Development Bank R-CDTA 7274: Azerbaijan Alternative Energy Sector Analysis and Roadmap.



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In the country profile of Azerbaijan from 2009<sup>25</sup>, commissioned for investment purposes, the EBRD stated that Azerbaijan has a large potential for renewable energy power generation in the areas of wind, hydro and biomass.

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Current situation regarding the renewable energy application and policy is the following<sup>26</sup>:

#### A Hydro energy

Hydro is the main RES contributing to the energy supply in Azerbaijan. Currently Azerbaijan's most developed alternative energy source - hydro power accounted for 18% of the country's total energy production in 2010, compared to 0.2% for all other renewables. Its full potential remains underexploited, however. The development of small HPPs is the most promising component in the RES sector. Report prepared by the Ministry of Energy suggests that the overall technical potential for hydropower generation of the rivers in Azerbaijan can go up to 40 TWh, the economically feasible potential amounts to less than 1 TWh, all of which is related to small HPPs of the river runoff type. In the near future, the construction of around 60 small HPPs is planned. Small HPPs are often located in the settlements that are far from the power lines and sub-stations of the unified energy system. However, it may meet the local power needs, which may also help to solve other problems.

#### S Wind energy

The development of this alternative energy source is prioritized by Azeri authorities due to its low cost, minimal environmental impact and unlimited availability. The possibilities for wind power development in Azerbaijan are considerable, with over 250 days of medium-to-strong wind per year. Calculations from governmental institutions suggest that the Republic of Azerbaijan has the economically feasible potential of about 800 MW of wind power, which is approximately equivalent to 2.4 TWh of electricity per year. This would allow for a yearly saving of about 0.8 million tons of standard fuel.

So far there have been few attempts to capitalise on the potential of wind power, and only two wind farms are currently operating in the country and three are under construction. However, interest has been growing and in 2009, USAID helped to develop a preferential tariff to incentivize the development of wind power.

<sup>&</sup>lt;sup>25</sup> The European Bank for Reconstruction and Development, *"Azerbaijan: Country profile"*, 2009.

<sup>&</sup>lt;sup>26</sup> Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013). Open for Business Series. Caspian Information Centre.



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#### Siomass

The rapid development of industry, agriculture and social services in Azerbaijan has opened up new possibilities for energy production from biomass. With 55% of Azeri territory suitable for agricultural production, there is a real potential for harnessing residues for biomass combustion or gasification, as well as waste products for biogas production from animal manure. Each year 2 million tons of solid municipal and industrial waste is produced in Azerbaijan (industrial waste, forestry and waste from wood processing, agricultural product and organic waste, domestic and municipal waste and waste from areas polluted by oil and petroleum products). The recycling of municipal solid and industrial waste would partially solve the problem of heating in public buildings in the capital and other large industrial cities. The government has also included the waste-to-energy process among its renewable energy development plans, with public investments directed towards the construction of solid and municipal waste incineration plants.

Although the biomass energy potential across the entire country is very high, only a few small pilot projects using biomass have been developed in Azerbaijan. However, a large project of €346 million is noteworthy in terms of waste processing. The construction of a waste-to-energy plant was decided in the Balakhani settlement near Baku. The plant will have a capacity of 500 000 tons and a turbine producing electricity with an installed capacity of 35 MW. It is considered to be the biggest waste-to-energy plant in the Eastern Europe and Commonwealth of Independent States (CIS) countries.

#### Solar energy

The climate conditions of Azerbaijan provide numerous opportunities for increasing the production of electricity and heat using solar energy. Although it has a diverse and unpredictable climate, Azerbaijan is well suited for solar-powered electricity and heat generation processes, with 2 400 - 3 200 hours of sunshine per year (equal to 1 300 kWh/m2). The development of solar energy can partially solve the problems with electricity shortage in remote regions of the country. Although the solar energy potential across the entire country is very high, no large-scale solar power installation exists and only pilot solar stations are installed (and planned). Due to its relatively high costs, adoption of solar energy has so far been slow, but Azerbaijan opened its first mass-production solar panel factory in April 2012.



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#### Geothermal energy

The territory of Azerbaijan is rich in thermal waters which cover large areas of the country. The current use of geothermal energy in Azerbaijan is entirely thermal, and there are no geothermal power plants for electricity production. The usage of thermal waters for greenhouse heating is found to be promising in some of the regions. The exploitation of geothermal waters could partially cover Azeri heat energy needs, especially in the Guba region where water temperatures can reach up to 90 degrees. Thermal extraction techniques have already been used as a part of an experimental heating policy in the northwest of the country.

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Even though the country's economy is still reliant on oil and natural gas, in recent years there has been a sharp increase in the number of alternative and renewable energy projects in Azerbaijan, including the establishment of agencies and preparation of various strategies in this field. The main steps leading to the advancement of this particular energy sector include:

- The establishment of the State Agency of Alternative and Renewable Energy • Sources (SAARES) within the Ministry of Energy in 2009. In collaboration with the UN Development Programme, SAARES has already spent over \$90 million in four years on piloting of renewable energy projects and identifying suitable sites for biomass, wind and solar centres. The government has demonstrated its commitment to improve the use of RES by increasing the budget of SAARES from \$1 million in 2010 to \$14 million in 2011. In February 2013, the Agency was officially acknowledged as an independent entity from the Ministry of Energy, and received a \$31 million subsidy from the Azeri government.<sup>27</sup>
- The establishment of the International Renewable Energy Agency in 2009 as a basis for the successful strategic development of energy policy in the country.
- In 2011, the government of Azerbaijan called for a second long-term government strategy on alternative and renewable energy sources for the years 2012-2020 in line with the EU's Climate and Energy Policy on worldwide 2020 targets.
- Plans to create a government Agency for Energy Efficiency in order to enhance the development of RES.

<sup>&</sup>lt;sup>27</sup> http://www.abc.az "State Agency for Alternative & Renewable Energy in Azerbaijan restored" [accessed 25.04.2014]



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In addition, Azerbaijan offers numerous opportunities for companies interested in investing in alternative energy, preferably in collaboration with a local partner. Potential areas of investment include<sup>28</sup>:

Construction of WPPs and commissioning of a national wind velocity map to identify \_ optimal areas for the installation of wind turbines;

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- Production of electricity and heat from solar radiation; \_
- Construction of small HPPs; -
- Recycling of solid waste and development of waste combustion plants to supply \_ residential settlements with electricity and heat;
- Production of domestic heat energy from thermal waters;
- Development and production of renewable energy technology, including \_ photovoltaic panels and wind turbines, taking advantage of the financial incentives, tax exemption and infrastructure offered by the state;
- Provision of modern technology and expertise for improving energy efficiency in the \_ industrial residential sectors.

#### SWOT analysis of Azeri energy sector

Based on the above analysis, the main findings with regard to energy sector of Azerbaijan are summarised in the table below.

TABLE 3: SWOT analysis of Azerbaijan

Strengths		Weaknesses		
•	Existing institutional support (through the government agency SAARES)	•	Low feed-in tariff for independent power producers	
•	Financial support (state investments)	•	Purchase of all produced energy is not	
•	Strong private sector, enough		yet guaranteed	
	competitors	•	No promotion of RES	
		•	Limited industry for production of	
			hydropower equipment, high	
			dependency from foreign countries	

<sup>&</sup>lt;sup>28</sup> Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013). Open for Business Series. Caspian Information Centre.



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	<ul> <li>Inefficient cooperation and complex administrative procedures between different institutions</li> </ul>
Opportunities	Threats
<ul> <li>Replacing fossil fuels by RES would allow for significant income generation through export earnings from gas and oil since they are presently the main energy sources of electricity producers in Azerbaijan</li> <li>High RES potential, especially for hydropower and wind energy, often in close vicinity of the grid</li> <li>Interesting market through growing electricity demand</li> <li>Investors for RES projects</li> <li>Available technical assistance</li> </ul>	<ul> <li>Lack of capacities in the private sector (most of the available human resources with an academic degree is absorbed by the government)</li> <li>Azerbaijan has its own oil resources and thus, the costs of fuel are very low. If the oil price falls it is difficult for RES to compete.</li> </ul>

Source: A Roadmap for Renewable Energy in Azerbaijan (2009)

#### Financing instruments and measurable indicators

The main incentives for the development of alternative energy sources of Azerbaijan come from SAARES which was established within the Ministry of Energy. In addition, external financing significantly contribute to the development and exploitation of the country's alternative energy possibilities:

In 2008, CNIM, a leading French provider of turnkey solutions for the energy and environment sectors, negotiated a €346 million contract for the design, construction and 20-year operation of a waste-to-energy plant in the capital of Azerbaijan. With a capacity of 500 000 tons of municipal solid waste per year, the plant is considered to be the largest in the Eastern Europe.<sup>29</sup>

<sup>&</sup>lt;sup>29</sup> Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013). Open for Business Series. Caspian Information Centre.





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- IIAN Tech Co., a South Korean solar power provider has invested \$2.25 million in a hybrid solar power plant in Azerbaijan. The plant should be able to supply generated energy to the public service network.<sup>30</sup>
- In 2006, ADB signed a grant agreement for \$900 000 of which \$200 000 came from the *Finnish government* - to assess the potential for RES development in the country. In addition, **EBRD** provided a \$200 million loan to modernize the largest natural gas, dual-and heavy-oil fuelled thermal power station in Azerbaijan.
- In 2011, SAARES in cooperation with the United Nations Development Programme (UNDP) launched a new project on "Promoting the Development of Sustainable Energy in Azerbaijan", backed by €500 000 from the *European Commission* and \$790 000 provided by the *Norwegian government*.<sup>31</sup>
- The SAARES Experimental Polygon and Training Centre opened in September 2011, providing specialist training to Azeri workers on the implementation of alternative energy technologies, and incorporating a 5.5 MW hybrid wind and solar station.<sup>32</sup>
- The Caspian Technology Company has launched a dedicated Training Centre. Additionally, several wind and solar power pilot projects aimed at the manufacturing of wind turbines and solar panels have been prepared.<sup>33</sup>
- Other notable external investors in alternative energy projects in Azerbaijan have been involved. These opt to explore the country's alternative energy possibilities.

Regarding the measurable indicators, the Ministry of Energy announced in January 2013 that Azerbaijan plans to raise RES capacity to about 20% of the nation's overall power needs by 2020, with \$7 billion investments, and to increase the total renewable capacity to 2 000 MW.<sup>34</sup> This is reflected in the table below.

<sup>&</sup>lt;sup>30</sup> <u>http://www.abc.az</u> "IIAN Tech Co presents a project of hybrid solar power plant in Azerbaijan" [accessed 22.04.2014]

<sup>&</sup>lt;sup>31</sup> http://www.thebusinessyear.com "Azerbaijan: On the Rise" [accessed 22.04.2014]

<sup>&</sup>lt;sup>32</sup> <u>http://www.news.az</u> "President stresses importance of modern technology" [accessed 22.04.2014]

<sup>&</sup>lt;sup>33</sup> Caspian Technology Company (2009). *Renewable Energy: International Best-Practice and Prospects for the Development* in Azerbaijan.

<sup>&</sup>lt;sup>34</sup> http://www.bloomberg.com/news/2013-01-30/azerbaijan-plans-7-billion-boost-for-renewable-energy-by-2020.html [accessed 25.04.2014]





#### TABLE 4: Measurable indicators – Azerbaijan

Measurable indicator	Unit of measurement	Base value	Planned output
Share of renewables in electrical	%	10%	20%
energy production		in 2011	in 2020

Source: Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013)

#### 3.3.3. Belarus

The following documents have been taken into account while preparing the analysis of the energy sector of Belarus:

- State Programme of Energy System Development in Belarus until 2016 (2012)<sup>35</sup>
- On Renewable Energy Sources (2010)<sup>36</sup>

The main body that exercises state regulation of the electricity, gas and peat sectors and arranges the development of the main energy policy guidelines and the implementation is the Ministry of Energy of the Republic of Belarus.

#### Situation in the energy sector in general

Belarus has limited domestic primary energy resources, therefore optimization of development and operation of the energy sector is one of the priority lines of the legislative, regulatory and organizational reforms.

The following key aspects were identified as the main directions for the development of the energy sector as a basis of national economy:

- Decrease of energy intensity of the economy;
- Electricity savings;
- Search for diversity of energy imports to ensure stable operation of the existing energy enterprises;

<sup>&</sup>lt;sup>35</sup> State Programme of Energy System Development in Belarus until 2016. Resolution N194 of the Council of Ministers of the Republic of Belarus, 2012.

<sup>&</sup>lt;sup>36</sup> On Renewable Energy Sources. Law of the Republic of Belarus N204-Z, 2010.



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- Development and retrofitting of existing fossil fuel fired power plants and facilities by introducing energy efficient technologies;

**Document type:** 

**Project end date:** 

- Partial covering of electric and heat energy shortages through introduction of energy sources using domestic energy sources (first of all wood and peat) and RES;
- Development of nuclear power.

These aspects of development have been reflected in the national strategies and programmes at national level.

Three national "Republic programmes for energy savings" were adopted for the periods 1996-2000, 2001-2005 and 2006-2010. These programmes were successfully implemented. In December 2010, a new National Programme for 2011-2015 was adopted<sup>37</sup>. The main goal of these programmes lies in the **reduction of energy intensity and improvement of energy efficiency** on the supply and demand sides. Current programme poses new tasks for energy efficiency and attaches particular importance to the development of renewable energy. The programmes and strategies aimed at the energy sector and RES can be seen as a response of the Republic of Belarus to the **growing international concern about shortages of energy supplies, environmental problems and fuel price rises**.

#### Renewable energy sources

The development of RES, together with energy efficiency is a part of the general national policy of Belarus in the area of energy supply, energy saving and energy security, as well as environmental protection and climate change mitigation.<sup>38</sup> The consumption of RES in gross energy consumption was 5.2% in 2010. Biomass, biogas, municipal waste, wind and hydro energy are the main RES that are currently economically feasible for use in Belarus.

Strategic documents which determine the energy policy of Belarus and the state programmes highlight the importance of RES and local energy sources development for the security of the energy supply. One of the main aims is to achieve an **increase in the use of local fuel and energy, including RES**.

<sup>&</sup>lt;sup>37</sup> National Programme of Local and Renewable Energy Sources Development for 2011–2015. Approved by Resolution of Council of Ministers No. 586, 2011.

<sup>&</sup>lt;sup>38</sup> In-Depth Review of the Energy Efficiency Policy of the Republic of Belarus (2013). Energy Charter Secretariat. ISBN 978-905948-119-0.



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The National Programme of Local and Renewable Energy Sources Development for 2011–2015 summarised and specified all programme documents on local fuels and RES use, set forth the areas of activities, and indicated the specific measures required to achieve the necessary results. The main areas of use of local fuels and RES in the next few years are specified as follows<sup>39</sup>:

Document type:

Project end date:

- Putting into operation of wood fuel and peat based energy sources;
- Deployment of biogas plants;
- Construction of new and rehabilitation of existing HPPs;
- Construction of WPPs;
- Introduction of solar water heaters and solar plants;
- Introduction of heat pumps for use of secondary energy resources of low potential and geothermal energy.

The potential of RES in Belarus can be summarised as follows<sup>40</sup>:

#### Siomass energy

Forests cover 38% of the territory of Belarus. The potential of biomass resources available for the energy generation include mostly wood and wood waste. Recently, foreign investors have started to invest in the production of biomass for electricity and heat generation. There are about 15 enterprises in Belarus producing fuel pellets for wood fuel. The country is developing the infrastructure and arranging the production of equipment for the production, processing and delivery of wood fuel to consumers.

Additionally, Belarus initiated the construction of plants and other installations for waste processing and utilization of gas for energy purposes. Moreover, the EBRD financed the feasibility study for the construction of biogas installations.

## S Wind energy

Since there is quite good potential for the use of wind energy, the plan is to construct new WPPs and to improve the level of wind energy potential use for farms, greenhouses and other agricultural facilities. The total installed capacity of WPPs in Belarus equalled 3.47 MW in 2011.

<sup>&</sup>lt;sup>39</sup> National Programme of Local and Renewable Energy Sources Development for 2011–2015. Approved by Resolution of Council of Ministers No. 586, 2011.

<sup>&</sup>lt;sup>40</sup> In-Depth Review of the Energy Efficiency Policy of the Republic of Belarus (2013). Energy Charter Secretariat. ISBN 978-905948-119-0.



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# S Hydro energy

In the last two decades, Belarus has carried out the renovation and rehabilitation of existing and small HPPs and constructed new ones. Currently, the country has over 45 HPPs with a total capacity of 16.1 MW. The potential capacity of all flows in Belarus in total is 850 MW, including 529 MW that is technically feasible and 250 MW that is economically feasible.

Document type:

**Project end date:** 

The connection of RES-based installations to state power grids is carried out under energy purchase contracts between producers of RES-based energy and state energy supplying organizations.

## SWOT analysis of Belarusian energy sector

Belarus has extensive number of strategic documents and laws dealing with energy policy. These describe the situation in the energy sector of the country and, at the same time, highlight the main priorities and areas of improvement which can be summarised in the SWOT analysis.

Strengths	Weaknesses		
<ul> <li>High educational level and energy experts training system</li> <li>The existence of laws and programmes to stimulate the development of RES</li> </ul>	<ul> <li>Weak involvement in global energy communities</li> <li>Weak involvement of SMEs in the energy market</li> <li>Low volume of foreign investment</li> <li>Lack of advanced technologies in energy sector</li> </ul>		
Opportunities	Threats		
<ul> <li>Liberalization of energy market</li> <li>Expansion of cooperation with the EU countries in the frame of Horizon 2020, European Neighbourhood</li> </ul>	<ul> <li>Energy sector investment decrease due to global economic or political crisis</li> </ul>		

#### TABLE 5: SWOT analysis of Belarus



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Policy	у,	Initiative	of	the	Eastern
Partn	ners	ship, etc.			

Source: Contribution of RCTT

#### Financing instruments and measurable indicators

Since one of the main objectives of Belarussian energy sector is improved energy efficiency, the identified financing instruments are related mostly to this area. The energy efficiency financing includes mostly the state budget.

Since the 1990s, one of the areas covered by the state energy saving and energy efficiency policy has been the planning and exploring of financing sources for energy saving measures and the use of domestic energy resources. The system of financial support for energy savings in the country is regulated by the government's Law on Budget and Resolutions on the implementation of the Law on Budget for respective years. Investments in energy savings are increasing annually<sup>41</sup> given the importance of energy efficiency for the national economy and the need to transfer from low-cost organizational and economic measures to more expensive ones with longer payback periods.

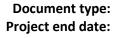
From 1996–2000, energy saving measures were financed from the equity capital of enterprises (42-44 %), innovation funds (42-45%) and other sources (about 7%). From 2001–2005, the main sources of financing included state funding sources (national and local budgets – 13%, the innovation fund of the Ministry of Energy for energy saving purposes – 14.9%, sectorial innovation funds - 24.3%), and the equity capital of enterprises - 44.7%. Loans and borrowings accounted only for 3.1%. From 2006–2010, the equity capital of enterprises was the main source of financing for energy efficient projects and accounted for 45%. The share of state sources was reduced to 35%, and the borrowings increased to 20% of the total financing. In 2010, loans and borrowings accounted for about one third of the total financing for energy saving measures and the use of domestic fuel and energy, while the state funding sources were about 25%.<sup>42</sup>

<sup>&</sup>lt;sup>41</sup> Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012.

<sup>&</sup>lt;sup>42</sup> In-Depth Review of the Energy Efficiency Policy of the Republic of Belarus (2013). Energy Charter Secretariat. ISBN 978-905948-119-0.



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In the area of energy saving, Belarus is actively co-operating with international organizations, financial institutions and funds, such as the World Bank, the Global Environmental Facility, the UN Economic Commission for Europe, and the UNDP.

Together with other CIS and Eastern Europe countries, Belarus is participating in the international project "Financing Energy Efficiency and RES Investments for Climate Change Mitigation" implemented under the Energy Efficiency 21 Programme<sup>43</sup>, which is aimed at improving energy efficiency, developing respective infrastructure and using the energy saving potential in member countries.

Regarding the measurable indicators, the main have been identified mostly with regard to RES. These are summarised in the table below.

Indicator	Unit of measurement	Base value (in 2010)	Planned output (in 2015)
Fuel chipped wood	%	12,80	20
Wood waste	%	13,30	20
Wind / Wind power plants	%	0,40	7
Hydro / Hydro power plants	%	0,02	4
Peat in construction sector	%	4,30	35
Biogas installation in agriculture	%	0	4
Fuel crops	%	0	5
Fuel oil coke	%	0	20
Solar installations for hot water	%	0	0
Heat pumps	%	0	0
Waste biogas	%	0	3

#### TABLE 6: Measurable indicators - Belarus

*Source:* State Programme of Energy System Development in Belarus until 2016 (2012)

<sup>&</sup>lt;sup>43</sup> <u>http://www.ee-21.net</u> [accessed 22.04.2014]





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## 3.3.4. Georgia

Regarding the situation in the energy sector of Georgia, the following strategic documents have been analysed:

- Sasic Directions of the State Policy in Energy Sector of Georgia (2006)<sup>44</sup>
- A Renewable Energy Roadmap for Georgia (2013)<sup>45</sup>

The main body responsible for the energy sector of Georgia and creating the regulatory environment of this sector is the Ministry of Energy and Sustainable Development of Georgia.

## Situation in the energy sector in general

Ever since Georgia gained independence in 1991, energy has been among its vulnerable assets. However, active measures taken by the government brought significant improvements to the energy sector. Georgia has also made notable progress towards energy security and independence as gas imports have been diversified and steps are being made to make the country self-sustainable in terms of electricity supply.<sup>46</sup>

Georgia plays an important role as a strategic crossroad for hydrocarbon transit in the Caspian region.<sup>47</sup> The construction of the strategic Baku-Tbilisi-Ceyhan oil and the South-Caucasus gas pipelines that transport the Caspian energy resources from Azerbaijan through Georgia to Turkey and further western countries has made a significant contribution to the energy security of Georgia. Significant investments into the energy sector both by the government and by private investors including the rehabilitation of hydro and thermal power plants, electricity transmission lines and distribution networks, gas and electricity metering systems and better regulation of the entire sector has made it more efficient and stable. During the past ten years, \$5 billion was invested by British Petroleum and its partners to develop the oil and gas pipelines that cross Georgia. These represent the source of future energy security and supply diversity for Georgia.

<sup>&</sup>lt;sup>44</sup> Basic Directions of the State Policy in Energy Sector of Georgia (2006). Ministry of Economy and Sustainable Development of Georgia.

<sup>&</sup>lt;sup>45</sup> Potash, D. (2013). *Renewable Energy Roadmap for Georgia*. USAID Hydropower Investment Promotion Project (HIPP), contract number EEM-I-00-07-00005-0. Deloitte Consulting LLP. USAID/Caucasus Office of Energy and Environment.

<sup>&</sup>lt;sup>46</sup> Invest in Georgia (2009). Georgian National Investment Agency: Georgian Energy Sector Overview 2009.

<sup>&</sup>lt;sup>47</sup> <u>http://www.georgianenergy.com</u> "Oil & Gas in Georgia" [accessed 25.04.2014]



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As the economy of Georgia continues its strong growth, the domestic consumption of energy is expected to grow rapidly. Thus, the **energy sector is reflected among the top priorities** for the government which continues to further reform and improve the functioning of the sector to make it even more productive and sustainable.

Georgia is introducing a competitive power market, and otherwise enhancing and reforming its electric power sector for four main reasons:

- To secure domestic power supply for Georgia's population and industry;
- To avail significant private investment for export-oriented HPPs located in Georgia;
- To engage in beneficial electricity trade with Georgia's immediate neighbours Turkey, Azerbaijan, Armenia, and Russia;
- To harmonize and connect with the EU for mutually beneficial electricity trade.

Further, some electricity sector reforms were successfully developed and implemented by the Ministry of Energy and Sustainable Development of Georgia. These have considerably limited the state's involvement in this sector. The Ministry of Energy has retained only the following functions:

- Development and implementation of the energy policy in the country;
- Approval of the annual energy balances;
- Approval of market rules;
- Participation in the approval process of strategic projects in the sector.

Additionally to the Ministry, two important structures were created:

- Georgian National Electricity and Water Regulatory Commission (GNEWRC) It is an independent legal body headed by the chairman being appointed by the president of Georgia for a 6-year period. GNEWRC has the authority to grant licenses and regulate licenses in the power and natural gas sectors in Georgia.
- Electricity System Commercial Operator (ESCO) It is a legal entity of private law (Ltd.) where the government is a 100% owner. The shares are distributed among the energy sector licensees: 30% is owned by distributing companies and direct consumers, 35% goes to power generating organizations, 35% belongs to the licensees for production control. ESCO purchases and sells the balance of the power and a reserve capacity in order to ensure the balance.



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#### Renewable energy sources

Georgia has vast resources of almost all types of RES – solar, wind, geothermal, hydro, and biomass. The achievable annual potential of all RES can be estimated at 10-15 TWh or around one million tons of oil equivalent energy. This is enough to satisfy Georgia's annual energy needs. However, only a very small part of this potential is currently used. The share of renewable energy in Georgia's energy balance is approximately 1%. Currently, the amount of electricity generated from RES is approximately 3% of the total amount of electricity produced (excluding large hydro power generation).

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Nowadays, Georgia is applying "Georgian Electricity Market Model," according to which renewable energy in this discussion means generation of electricity from large and small hydroelectricity, wind, solar, biomass, and geothermal energy.<sup>48</sup>

At present, the situation in the sector of renewable energy is the following<sup>49</sup>:

#### Hydro energy

Relative to existing demand, there is a significant potential for hydro energy in Georgia. Currently, there are 33 small HPPs and their total capacity is 85 MW. The share of small HPPs in total hydro capacity is 3.1%, while generation amounts to 5.35%. In Georgia, 360 rivers can be considered as having significant energy potential. The total theoretical hydro energy potential of small rivers is estimated at 40 TWh per year, while the technical potential is estimated at 19.5 TWh per year. The achievable small HPP potential is estimated to be 20-25% of this value. The analyses indicate that adding new hydro will provide excess power that may be exported. However, a problem with hydro energy relative to serving domestic Georgian demand is that hydro fluctuates seasonally. As a result of this seasonality of natural hydro flows, Georgia has to import power in winter and, on the other hand has excess capacity so as to export in the summer.

#### S Wind energy

Georgia has quite interesting wind energy potential. The research conducted on the territory of Georgia revealed some suitable areas for the construction of wind power stations. Based on the wind energy potential, about 60% of today's electricity consumption

<sup>&</sup>lt;sup>48</sup> Potash, D. (2013). *Renewable Energy Roadmap for Georgia*. USAID Hydropower Investment Promotion Project (HIPP), contract number EEM-I-00-07-00005-0. Deloitte Consulting LLP. USAID/Caucasus Office of Energy and Environment.

<sup>&</sup>lt;sup>49</sup> Invest in Georgia (2009). Georgian National Investment Agency: Georgian Energy Sector Overview 2009.



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in Georgia can be obtained. This estimate covers the most promising areas with the highest wind potential. Additionally, according to the scientists, the share of the wind power stations in the world power engineering will be 10% by the year 2025.

## Solar energy

Due to its geographic location, Georgia receives plenty of sun exposure. In most regions of the country, there are 250-280 sunny days per year, which is approximately  $6\ 000 - 6\ 780$  hours per year. The annual radiation of the sun varies depending on the region. For example, the East Georgia is sunnier than the West. Solar energy is basically used in remote areas in high mountains where infrastructure is not developed. There is no reliable data on the current state of solar energy utilization. However, there is an upward trend in the annual number of installations conducted over the last few years. This type of RES can substantially contribute to the reduction of energy dependence by replacing the need for gas currently used for hot water supply throughout the year.

#### Geothermal energy

The use of geothermal energy is currently quite limited. There are approximately 200 wells and 4 springs of geothermal water with temperatures between 30 and 110°C located in 44 deposits in Georgia. About 80% of this geothermal potential is located in West Georgia. The temperatures of geothermal deposits are mostly suitable for heating and hot water supply. The total theoretical thermal capacity of all geothermal sources was estimated at 300 MW of thermal capacity. Total achievable potential is estimated at 30% or 100 MW of thermal capacity.

Looking into the future, Georgia needs state programmes for RES development. This is a necessary condition for utilizing the country's renewable energy reserves. Georgia's programmes should contain realistic numerical parameters for RES capacity and output, and have clear and achievable benchmarks.

One of the first steps in this regard is that Georgia requested to join the **Energy Community of the European Union** in 2013. This will provide Georgia with energy roadmap concerning all aspects of legal and regulatory energy framework (including renewable energy), such as generation, transmission, energy for transport, energy efficiency, etc. However, Georgia will have to comply with numerous directives and regulations in order to meet the key elements



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of the Energy Community.<sup>50</sup> On the other hand, the participation in this Community will bring interesting benefits for Georgia, e.g. due to joint cooperation with EU Member States and states outside the EU, joint projects regarding the production of electricity from RES, etc.

Additional to this, various international institutions are playing the leading role in the development of energy sector in Georgia, mostly with regard to RES:

- **UNDP** conducted a project to promote the use of RES for local energy supply. The project was implemented by the Ministry of Environment and Natural Resources.
- The financial assistance was provided by USAID. Winrock International in cooperation with PA Consulting and some of Georgian NGOs implemented energy programme called Georgia Rural Energy Program<sup>51</sup>. This is a four-year, \$12.7 million programme focusing on small hydro power rehabilitation and construction.
- **EBRD** has started a new credit line framework for energy efficiency and renewable energy projects. The framework consisted of loans to participating banks in Georgia, Armenia and Azerbaijan in the amount of up to \$60 million.

## SWOT analysis of Georgian energy sector

The main factors influencing the development of energy sector in Georgia are summarised in the below SWOT analysis.

TABLE 7: SWOT analysis of Georgia

Strengths	Weaknesses
<ul> <li>Regional energy hub</li> <li>Reliable transit country</li> <li>High amounts of alternative &amp; renewable energy sources (green energy)</li> <li>Diversified import of energy</li> </ul>	<ul> <li>Dependency on neighbouring countries</li> <li>Lack of energy sources such as gas and oil</li> <li>Old power stations</li> </ul>

<sup>&</sup>lt;sup>50</sup> Potash, D. (2013). *Renewable Energy Roadmap for Georgia*. USAID Hydropower Investment Promotion Project (HIPP), contract number EEM-I-00-07-00005-0. Deloitte Consulting LLP. USAID/Caucasus Office of Energy and Environment.

<sup>&</sup>lt;sup>51</sup> <u>http://www.eecgeo.org</u> "Rural Energy Program" [accessed 22.04.2014]





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	Opportunities	Threats
•	Construction of new transmission lines and pipelines	<ul> <li>Increasing dependency on imported sources</li> </ul>
•	Electricity export growth in Europe	
•	New electricity trade mechanism	
•	Huge potential for renewable energy development	
•	Strategic location of Georgia – access	
	to neighbouring and regional power markets	

Source: Contribution of ICARTI

#### Financial instruments and measurable indicators

Regarding the energy sector of Georgia, one of the most important financing instruments is foreign direct investment. Even though the amount has declined over the last few years, the foreign direct investments in the energy sector are still at a high level. During the last 7 years, 60% of investments were made in renewable energy sector, the main share of which implies energy of HPPs.

#### TABLE 8: Measurable indicators – Georgia

Indicator	Unit of measurement	Base value	Planned output
Share of hydro power plants in	%	76 %	83 %
energy generation		(in 2006)	(in 2013)

Source: Basic Directions of the State Policy in Energy Sector of Georgia (2006)

#### 3.3.5. Moldova

In case of Moldova, the following strategic documents are crucial for the below analysis of the energy sector:



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- Energy Strategy of the Republic of Moldova until 2030 (2013)<sup>52</sup>
- National Energy Efficiency Action Plan for 2013-2015 (2013)<sup>53</sup>

Moldova's state energy institutions have been undergoing substantial restructuring since 2000. From 2008, the **Ministry of Economy** took over the responsibility for the energy sector and became the central public authority responsible for developing policies in energy field.

Document type:

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## Situation in the energy sector in general

The energy sector in Moldova faces several problems: strong dependence on the import of natural gas, oil and oil products, outdated technology for the generation and distribution of electricity and high historical debts. Many district heating systems work inefficiently and are badly maintained. The accumulated gas debts require long-term solutions. For further development, access to the trans-European electricity grid and gas pipelines is necessary.

Moldova is dependent on energy imports to cover 98% of its energy needs. Natural gas is exclusively imported from Russia, and is the main fuel for electricity generation and district heating. The electricity produced locally is insufficient and the excess demand is compensated by imports from neighbouring Romania and Ukraine. In 2010, Moldova's primary energy consumption was dominated by the use of natural gas, consisting of 60% of the overall energy consumption, followed by oil consumption at 29%. Electricity (5%), biomass (3%) and coal and lignite (3%) made up the rest of Moldova's primary energy consumption. The residential and tertiary sector is the main consumer, with 54% of consumption, followed by transport (25%) and industry (21%). Households absorb approximately 30% of the electricity and transport almost two-thirds of the oil products.

International agreements have set up the basic foundations for the structure and operation of various segments of the Moldavian energy market:

- Energy Charter Treaty entered into force on 16 April 1996.
- In April 2009, negotiations were concluded on the Energy Community Treaty and in December the Moldavian Parliament passed law on Accession to the Energy Community Treaty of the Republic of Moldova. In May 2010, Moldova became the full member of the Energy Community. As part of its obligations pursuant to its membership, the Republic of Moldova is required to ensure compliance with the EU

<sup>&</sup>lt;sup>52</sup> Energy Strategy of the Republic of Moldova until 2030 (2013). National Agency for Energy Regulation of Moldova.

<sup>&</sup>lt;sup>53</sup> National Energy Efficiency Action Plan for 2013-2015 (2013). National Agency for Energy Regulation of Moldova.



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legislation pertaining to the Energy Community and to meet the deadlines laid down in the Accession Protocol and the 2009 Law on Accession to the Energy Community Treaty.<sup>54</sup>

**Document type:** 

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In 2011, the European Commission adopted the Annual Action Programme 2011 for the Republic of Moldova, worth €78.6 million. The funding contributes to the country's development in the energy and justice sector. Regarding the energy sector, the programme promotes the research of renewable energy potential in Moldova and supports public awareness campaigns on energy efficiency and renewables.<sup>55</sup> Funds allocation is provided through the EU's ENPI (see section 3.1), which sets aside assistance funds annually to the Republic of Moldova and 16 other partner states along the EU's Eastern and Southern borders.

In 2013, the Government of Moldova approved the Energy Strategy until 2030. The main direction of Moldova's energy strategy is *"to enhance security of its energy supplies and to ensure quality and affordable energy supply to all consumers"*.<sup>56</sup> The first of the above objectives implies, among other things, integration of the country's energy system in the European system. Additional to this, the Government of the Republic of Moldova has defined three main strategic objectives for 2013-2030:

- To ensure the energy supply security;
- To develop competitive markets and ensure their regional and European integration;
- To ensure the energy sector's sustainability and combat climate changes.

#### Renewable energy sources

The policy in the field of RES is regulated by the Renewable Energy Law adopted by the Parliament of the Republic of Moldova in 2007<sup>57</sup>. The renewable energy objectives of state policy include the following:

- Diversification of the local primary energetic basis;
- Improvement of the environment security, population health and labour protection while using RES;

<sup>&</sup>lt;sup>54</sup> Decision 2009/03/MC-EnC. Decision of the Ministerial Council of the Energy Community of 18 December 2009 approving the accession of the Republic of Moldova to the Energy Community.

<sup>&</sup>lt;sup>55</sup> <u>http://www.europa.eu</u> "European Union allocates new funding to boost energy and justice reform in the Republic of Moldova" [accessed 25.04.2014] IP/11/879

<sup>&</sup>lt;sup>56</sup> Energy Strategy of the Republic of Moldova until 2030 (2013). National Agency for Energy Regulation of Moldova.

<sup>&</sup>lt;sup>57</sup> Renewable Energy Law 160-XVI/12.07.2007. National Agency for Energy Regulation of Moldova, 2007.



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- Creation of the system of production, distribution, commercialization and rational consumption of renewable energy and fuels;

Document type:

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- Attracting the investments in the field of RES;
- International technical-scientific cooperation, implementation of international technical and scientific performances in the field of RES;
- Informational support of the activities in the field of RES.

The specifically important types of RES for Moldova include the following<sup>58</sup>:

#### Siomass energy

Biomass in the Republic of Moldova is represented by the following categories: wood, waste products of agriculture, waste from processing industry (sunflower, grape, sugar beet, and waste wood treatment), as well as solid and liquid waste. While there is some experience with small scale rural biomass applications in Moldova, there is no experience of larger scale or more efficient use. Time of return on investment, depending on the technology transformation and types of waste, is ranging from 4 to 12 years. There is a good potential for biomass to be included in the social infrastructure and energy system development programmes, also developing cross-border cooperation, especially with Ukraine.

#### 💪 Biogas

The potential of biogas production in Moldova is estimated at 3 700 thousand  $m^3$  or 1.8 ktoe. Two biogas functional projects are operating on the territory of Moldova with a total installed capacity of approximately 2 MW.

#### Hydro energy

The economic potential of small hydro power is 200 kWh. There are two medium sized HPPs and six small HPPs in private ownership with a total capacity of 141 kWh. The greatest potential for hydropower development in Moldova is in small hydro construction. The Dniester River basin and the Prut and the Danube River basin cover the vast majority of Moldova's territory and technically represent the best areas for development.

<sup>&</sup>lt;sup>58</sup> <u>http://www.marketinfo.dk</u> "Moldova: Energy sector" [accessed 25.04.2014]



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Regarding the main agencies operating in the area of energy sources and RES, and funds focused on energy efficiency and RES, the government of Moldova established the following authorities:

- Agency for Energy Efficiency administrative body in the field of energy efficiency and RES.
- National Agency for Energy Regulation state body designed to regulate the energy • sector.
- Energy Efficiency Fund focused on the identification, evaluation and financing of the projects on energy efficiency and RES.

## SWOT analysis of Moldavian energy sector

The main characteristics of Moldavian energy sector are summarised in the SWOT analysis.

TABLE 9: SWOT analysis of Moldova

Strengths	Weaknesses
<ul> <li>Close attention to the energy transformation/transition sector</li> <li>Substantial internal generation capacity related to the real and predicted consumption</li> <li>Clear option for integration into the European Union and its internal energy market</li> <li>Signing the Energy Community Accession Protocol</li> </ul>	<ul> <li>High greenhouse gas emissions</li> <li>High energy consumption by endusers</li> <li>Excessive prices for energy and energy resources</li> <li>Energy supply safety</li> <li>Worn out equipment and old technologies of the energy sector</li> <li>No real competition in the energy market</li> </ul>
Opportunities	Threats
<ul> <li>Create an optimal energy mix</li> <li>Increase the share of renewable energy in the energy balance</li> <li>Diminish energy intensity and reduce</li> </ul>	<ul> <li>Economic and financial crisis</li> <li>GDP evolution</li> <li>Banking system reticence to support energy projects and grant lending</li> </ul>



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losses in the system of heat and power transmission	operations
<ul> <li>Restructure and upgrade the combined heat and power plants</li> </ul>	<ul> <li>Management of RES not compliant with market requirements</li> </ul>

*Source:* National Energy Efficiency Action Plan for 2013-2015 (2013)

#### Financing instruments and measurable indicators

Regarding the financing related to energy sector in Moldova, the country relies mostly on the following instruments that help to the fulfilment of the national objectives and that provide substantial funding to the projects and reforms in the period 2013-2020:

- EBRD and EIB access to ENTSO-E network (€219 million);
- EBRD Moldovan Sustainable Energy Financing Facility Project (MoSEFF; €20 million)<sup>59</sup>;
- EU grants support to reforms (€2.6 million);
- Budget programme support to reforms (€40 million);
- EU and UNDP Moldova Energy and Biomass Project (€14.56 million);
- USAID and Greek government SYNENERGY Programme (€8 million).

Considering the measurable indicators, the analysed strategies reflect to the main objectives of the country's energy sector. These should lead mostly to the primary energy savings, diminishing dependency on imported energy sources, exploitation of the energy savings potential in a cost-efficient manner, decreasing impact of energy sector on climate changes, efficient use of energy, etc. These factors can be seen as impacts that the strategies expect from the application of indicators as stated in the table below.

#### TABLE 10: Measurable indicators - Moldova

Indicator	Unit of measurement	Base value	Planned output
Reduction of the primary energy consumption in all national economy sectors	%	-	1.8% (annually within 2013-2015)

<sup>59</sup> http://www.moseff.org





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Increase the efficient use of	%	-	20%
overall primary energy			(in 2020)
Cut the greenhouse gas	%	-	25%
emissions			(in 2020)
Curbing losses in power	%	13%	7-10%
distribution grid		(in 2011)	(in 2020)

Source: National Energy Efficiency Programme 2011-2020 (2011)

In addition, taken into account Moldova's commitments undertaken upon accession to the **Energy Community Treaty**, the national energy targets of the Republic of Moldova for 2020, with an intermediary pillar set for 2015, are defined by the National Development Strategy "Moldova 2020"<sup>60</sup> and by the National Energy Efficiency Programme 2011-2020:

- In the energy security specific domain:
- To perform energy interconnectors: 139 km of power lines and 40 km of natural gas pipelines in 2020;
- To stimulate the use of energy produced from renewable sources, in relation to the total internal gross consumption: 20% in 2020, with an intermediate objective of 10% in 2015;
- To ensure a 10% share of biofuels in the total fuels by 2020, with an intermediate objective of 4%;
- To increase the internal power production capacities up to 800 MW by 2020;
- To ensure a 10% annual share of power produced from renewable sources by 2020.
- In the energy efficiency specific domain:
- To reduce the energy intensity by 10% in 2020;
- To reduce losses in the transmission and distribution networks by up to 11% in 2020 (up to 13% in 2015) for power, by 39% in 2020 (by 20% in 2015) for natural gas, and by 5% in 2020 (by 2% in 2015) for thermal energy;
- To reduce greenhouse gas emissions (compared with 1990) by 25% in 2020;
- To reduce the energy consumption in buildings by 20% in 2020;
- To achieve a 10% share of refurbished public buildings in 2020.

<sup>&</sup>lt;sup>60</sup> Moldova 2020. National Development Strategy: 7 Solutions for Economic Growth and Poverty Reduction.



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## 3.3.6. Ukraine

Since in case of Ukraine, the extensive list of strategic documents in the energy sector at various levels has been provided by the responsible partner, mostly the following strategies and documents have been further analysed:

**Document type:** 

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- Energy Strategy of Ukraine for the Period up to 2030 (2006; latest changes 2014)<sup>61</sup>
- On Approval of the State Target Economic Program for Energy Efficiency and Development of Energy Production from Renewable Energy Sources and Alternative Types of Fuel for the Period of 2010-2015 (2010; latest changes 2013)<sup>62</sup>

The main authority in the field of energy is represented by the **Ministry of Energy and Coal Industry of Ukraine**.

#### Situation in the energy sector in general

The energy sector constitutes an important industry for Ukraine. It is based on traditional types of power plants (thermal and hydro) with a deviation from the world average statistics which show a greater use of nuclear power. Most of the existing power facilities were established as a result of efforts of the Ukrainian Soviet Socialist Republic, and are currently in the need of modernization.

**Energy security** is one of the most important aspects in the development of the energy sector of Ukraine. The Chernobyl disaster has turned much of the country in the zone of ecological disaster and the radioactive contamination affected the quality of soil, forests and water resources.

At the end of 2012, the energy balance of Ukraine was as follows<sup>63</sup>:

- Natural gas 34.8%
- Coal and peat 34.6%
- Nuclear energy 19.2%
- Oil and petroleum products 9.4%

<sup>&</sup>lt;sup>61</sup> Energy Strategy of Ukraine for the Period up to 2030 (2006). Ministry of Energy and Coal Industry of Ukraine. Latest revision 2014.

<sup>&</sup>lt;sup>62</sup> On Approval of the State Target Economic Program for Energy Efficiency and Development of Energy Production from Renewable Energy Sources and Alternative Types of Fuel for the Period of 2010-2015 (2010). State Agency on Energy Efficiency and Energy Saving of Ukraine. Latest revision 2013.

<sup>&</sup>lt;sup>63</sup> <u>http://www.ukrstat.org</u> State Statistics Service of Ukraine (2012)



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- Other types of energy - 2%

In the economic sector of Ukraine, electricity plays a very important role. The total installed capacity of electricity generating stations in Ukraine by the end of 2012 amounted to 53.8 GW, of which 51% comes from thermal power plants, 25.7% from nuclear power plants, 10.2% from hydroelectric power plants and pumped storage power plants, 13.1% from combined heat and power stations and other facilities.<sup>64</sup> In addition, the sector of renewables has been actively developed in recent years. Ukraine has strong energy potential for the development of renewables. Since 1994, there are various state programmes for the development of renewable energy. Additionally, since 2009, with the adoption of the law on "green" feed-in electricity tariffs on renewable energy the process of development of renewable energy.

In 2011, Ukraine joined the **Energy Community**. In order to implement the Agreement of Establishing the Energy Community the Government of Ukraine should have prepared the National Action Plan for Energy Efficiency 2020.<sup>65</sup>

Regarding the energy intensity of GDP in Ukraine, it is several times higher than in developed countries in Western and Eastern Europe. High energy intensity of Ukraine is a consequence of structural features of the national economy displaced towards a more energy-intensive significant technology gap of most industries in developed countries, as well as price distortions in domestic energy markets. **Reducing the energy intensity** of the economy should be a priority public policy objective in the field of energy.

#### Renewable energy sources

The development of alternative and renewable energy sources is an important factor in improving energy security, reducing the use of fossil fuel resources (including imported), the development of industry and agriculture, the increase of employment in sectors related to the use of renewable energy and reducing the negative impact of energy on the environment and quality of life of citizens.

<sup>&</sup>lt;sup>64</sup> <u>http://www.imepower.wordpress.com</u> *"Ukraine: Sector overview"* [accessed 25.04.2014]

<sup>&</sup>lt;sup>65</sup> <u>http://www.unn.com.ua</u> "In Brussels, presented the National Action Plan for Energy Efficiency Ukraine in 2020" [accessed 22.04.2014]



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The effective Energy Strategy of Ukraine for the period till 2030 adopted in 2006 establishes that RES development should be considered as an important factor for strengthening energy security and reducing manmade impact of the energy sector on environment. The large-scale use of RES potential in Ukraine is not only of domestic, but also of international importance as a significant factor to prevent global climate change at our planet, in general, and to improve the general state of energy security in Europe, in particular. In particular, the Strategy envisages that the development of renewable energy will bring a significant effect due to lower use of conventional energy sources, reduction of hazardous and greenhouse gas emissions and improvement of the general state of environment.

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Despite rather dynamic development of legislative and regulatory framework facilitating higher share of RES use, the development of this sphere have been rather slow before 2009. Private companies and farms built the most power plants that use RES. The state encouraged it at the legislative level but it did not invest significant capital into construction of these plants.

Total annual technically achievable potential of RES in Ukraine is quite significant, amounting to 68.9 Mtoe per year. The most important RES in Ukraine are: solar energy, wind energy, hydro energy and biomass energy. Regarding the energy-related technologies, the following indicative objectives of the energy sector for 2020 are important for Ukraine in a view of the commitments undertaken by Ukraine having joined the Energy Community, as well as respecting the policy documents approved by the government in the field of energy:

#### Solar energy

The potential of solar energy in Ukraine is high enough for widespread use of photovoltaic and thermal power equipment. Annual average solar radiation in the territory of Ukraine is in the range from 1 070 kWh/m<sup>2</sup> in the northern part, up to 1 400 kWh/m<sup>2</sup> in the south. The total installed capacity of solar photovoltaic systems in Ukraine at the beginning of 2014 is 748 MW. Taking into account the experience of implementation of solar power plants (SPPs) in the European countries with similar levels of solar radiation, as well as in a view of the global trend of a steady decline in the cost of construction of SPPs as a result of technological developments, in Ukraine, by improving the technology and commissioning of the new facilities the generation of electricity by SPPs shall be up to 1 050 GWh in 2015 (with their total capacity of 1 140 MW) and up to 2 750 MW in 2020 (with their total capacity of 2 800 MW).



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## S Wind energy

Ukraine has a significant potential for wind energy development. The most promising are the southern and south-eastern regions of the country, where the average wind speed exceeds 6 m/s. However, this potential is now barely used. The total installed capacity of wind power stations in Ukraine at the beginning of 2014 amounted to 334 MW. One of the reasons for this low level of installed capacity is that until 2009, when the "green" tariff<sup>66</sup> was established, there were no incentives for potential investors. At the same time, the potential for development of wind energy generation in Ukraine, according to various estimates, is up to 15 GW. However, the construction of so many WPPs would require substantial investments.

Based on the experience of most European countries regarding the introduction of WPPs through the use of more powerful wind generators and commissioning of new facilities, in Ukraine the WPP electricity production can be increased up to 2 100 GWh in 2015 (with their total capacity of 1 000 MW) and up to 6 700 GWh in 2020 (with their total capacity of 3 000 MW).

#### Hydro energy

Ukraine has significant potential for hydropower. The largest hydropower growth can be seen in the central and western regions of Ukraine, with many large and small rivers. Ukraine has 90 small and micro-hydropower plants with total installed capacity of 75 MW.

When using the hydro potential of small rivers in Ukraine, it is possible to achieve significant saving of fuel and energy resources, and the development of small hydropower will foster the decentralization of the general energy system, which would eliminate several problems in the energy supply to the remote and inaccessible rural areas. The micro-, mini- and small HPPs can be a powerful base for energy supply to all regions of Western Ukraine as a source of full energy self-supply.

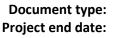
By upgrading the existing facilities, restoring the previously operational small hydro power plants and construction and commissioning of the new hydropower generating facilities in Ukraine, the production of electricity can be as follows:

• *micro- and mini- HPPs* - up to 110 GWh in 2015 (with their total capacity of 33 MW) and up to 170 GWh in 2020 (with their total capacity of 55 MW);

<sup>&</sup>lt;sup>66</sup> Special "green" tariff is applied to electricity generated by wind, solar, biomass energy and by small HPPs. The National Energy Regulatory Commission establishes the prices per one kWh of each type of electricity generated from alternative sources on the monthly basis. The "green" tariff rates are established based on the capability to ensure economic efficiency.



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- *small HPPs* up to 220 GWh in 2015 (with their total capacity of 65 MW) and up to 330 GWh in 2020 (with their total capacity of 95 MW);
- *large HPPs* up to 11 700 GWh in 2015 (with their total capacity of 4 800 MW) and up to 12 650 GWh in 2020 (with their total capacity of 5 200 MW).

## Siomass energy

The distinctive feature of Ukraine is the predominance of agricultural land, covering 70.9% of the territory. The country has great potential of biomass available for energy production. The main components of this potential are waste from agriculture and utilities, waste wood, and in the future - energy crops, cultivation of which started to develop rapidly in the recent years. However, the dynamics of the production of electricity from biomass is lagging behind the generation of electricity from other RES.

At the beginning of 2014, the total installed capacity of thermal power stations based on biomass and biogas was 722 MWth. At the beginning of 2014, the total installed capacity of biomass plants for the production of electrical energy in Ukraine amounted to 17 MW, and biogas stations to 6.5 MW.

Given the experience of implementation of bioenergy plants in the European countries with similar bioenergy potential, as well as in a view of the reduction in the cost of construction of bioenergy power plants due to the improvement of technologies, in Ukraine through the construction and commissioning of the new biogeneration capacities the production of electricity from biomass can be increased to 430 GWh in 2015 (with a total capacity of bio power plants of 110 MW) and up to 2 350 MWh in 2020 (with their total capacity of 530 MW).

Except the main authority creating the regulatory framework of the energy sector in Ukraine, which is the Ministry of Energy and Coal Industry of Ukraine, the **State Agency on Energy Efficiency and Energy Savings of Ukraine** has been established. It is a part of the executive authorities and ensures the implementation of the state policy in the field of efficient use of energy resources, energy efficiency, renewable energy and alternative fuels.

#### SWOT analysis of Ukrainian energy sector

Based on the above analysis of Ukrainian energy sector, SWOT analysis have been prepared reflecting the main features with regard to energy sector in general and to renewables in particular.



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## TABLE 11: SWOT analysis of Ukraine

Strengths	Weaknesses
<ul> <li>Developed scheme of electric grids</li> <li>High potential of reducing the energy intensity of GDP and optimising the energy mix of the state</li> <li>Increasing energy and ecological security</li> <li>Legal and financial support from the state</li> <li>A system of scientific and technical support of energy efficiency programmes and renewable energy</li> </ul>	<ul> <li>Depreciation of capital assets of Ukrainian energy sector and lack of flexible capacities in the energy system</li> <li>High level of energy intensity in GDP</li> <li>Lack of system solutions in attracting investment in energy efficiency and renewable energy projects</li> <li>Lack of own energy resources, dependence on their imports</li> <li>Low level of energy efficient technologies and equipment</li> </ul>
Opportunities	Threats
<ul> <li>High technical and economic potential for energy sector development and renewable energy projects</li> <li>High potential of energy efficiency of RES in all fields of use</li> <li>Availability of transit potential and opportunities to export electricity</li> <li>Legislative framework to stimulate energy-efficient use of energy resources and RES development</li> </ul>	<ul> <li>Unstable political and economic situation in the country</li> <li>Investment climate in Ukraine</li> </ul>

Source: Contribution of NTUU KPI

#### Financing instruments and measurable indicators

The Energy Strategy of Ukraine for the period up to 2030 designed **to use state budget funds and investments to energy sector of Ukraine**. Strategy includes steps for attracting foreign investment in the energy sector, the sector of energy efficiency and renewable energy. The



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largest donors in this field are international financial organizations that either support local initiatives in development programmes or develop their own programmes for Ukraine. Nowadays, the main sources of funding of energy efficiency projects and renewable energy in Ukraine are as follows:

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- EU funds Direct support of budget programmes for energy efficiency (through State Agency on Energy Efficiency and Energy Saving of Ukraine). EU financial support in energy efficiency and conservation in Ukraine is dispersed in a certain amount of small projects aimed at improving efficiency of small and medium-sized enterprises (SMEs), industrial and municipal heating companies that belong to municipalities.
- EBRD Energy efficiency and renewable energy projects funded through UkrESCO, Energy Alliance and Ukraine Energy Efficiency Programme (UKEEP)<sup>67</sup>. UKEEP is one of the major programmes of the EBRD in energy efficiency and it is designed to provide credits and technical assistance to SMEs through selected Ukrainian banks. In 2014, EBRD planned \$100 million investment in energy efficiency and renewable energy projects in Ukraine.
- UNDP Projects Project "Transforming the Market for promoting efficient lighting"<sup>68</sup> is aimed at new efficient technologies in lighting and phasing out of inefficient lighting products in residential and public buildings. Total funding of the project is \$31 million during 2010 2015.
- UNIDO It is aimed at co-funding of energy efficiency and renewable energy projects, educational support, training programmes, etc. The practical evidence of such state policy in the sphere of renewable energy is "improving the energy efficiency and promoting renewable energy in the agro-food and other SMEs in Ukraine".
- **USAID** Municipal heating reform projects (MHRP). Currently, USAID contributes to 36 municipalities across Ukraine under the MHRP, with the funding of \$16 million.

The international financial support has an important role as a source of financing for energy efficiency projects in Ukraine, especially for those sectors that have limited access to financial markets (e.g. SMEs and utility companies).

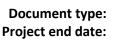
The analysed strategies are responding mostly to the efficient use of energy sources and strengthening the competitiveness of national economy, reducing the share of imported

<sup>67</sup> http://www.ukeep.org

<sup>68</sup> http://www.ua.undp.org



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fossil energy resources, including natural gas, and their replacement by alternative types of energy. These are the main expected impacts of the measurable indicators summarised in the table below.

TABLE 12: Measurable indicators – Ukraine

Indicator	Unit of measurement	Base value	Planned output
Reducing the energy intensity in GDP by 20% compared to 2008	%	-	20% In 2015
(3.3% annually)			11/2013
Optimisation of the energy mix of the state in which the proportion of energy received from RES and alternative fuels in 2015 will be not less than 10%	%	_	10%
Demand for electricity for the implementation of baseline GDP	TWh	94	116 in 2020 134 in 2030
Renewable energy development (wind, solar, small hydro)	GW	-	8 in 2030
Wind energy development	GW	-	3-4 in 2030
Solar energy (photovoltaic) development	GW	-	4 in 2030
Small HPP development	GW	-	4 in 2030
Bioenergy (heating) development	$GW_{therm}$	-	10-15 in 2030
Bioenergy (electro) development	GW	-	1-1.5 in 2030

Source: Energy Strategy of Ukraine for the Period up to 2030 (2006; latest changes 2014)



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# 4. Guidelines for policy framework document

These guidelines should serve to prepare a framework policy document (deliverable 2.2) containing implications and recommendations based on the above analysis of the energy sectors of EaP countries and EU and macro-regional strategies mostly with regard to renewables. Using the information provided in this report, the policy framework document will design the services regarding the cooperation and technology transfer between research and industry in the societal challenge addressed. The specific services in the field of energy efficiency and renewable energy in a bio-based economy will be created in line with existing and future policies at national and macro-regional level.

The policy framework document could serve as some kind of action plan drawing from the identification of opportunities in the field of energy efficiency and renewable energy. It could propose the future direction of EaP countries regarding the development of RES and technology transfer including the identification of calls in this area, thus bringing benefits not only in the form of financial incentives but also in the form of improved cooperation and stronger innovation partnerships.

Therefore, the proposed structure of the policy framework document should include:

- Interactions and complementarities between EU strategic documents and national energy strategies based on the SWOT analyses of individual countries and on the objectives regarding the energy-related technologies.
- **Design of innovation support services** regarding the cooperation and technology transfer between research and industry in the societal challenge addressed.
- Identification of potential challenges, risks and barriers in cooperation.
- Identification and exploitation of possibilities regarding the **potential relevant instruments and calls for cooperation** in different areas, such as strategic support / cooperation, research and development, innovation, SME support, international cooperation including networking, technology transfer, trainings, etc.
- Identification of potential major partners for future cooperation (e.g. delegation, agencies, transfer centres, etc.).
- **Recommendations** for the existing and eventually new technology transfer centres in the area of secure, clean and efficient energy in EaP countries.



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Based on the available instruments described in section 3.1 of this report (e.g. Horizon 2020, EuropeAid, etc.), the added value of the framework policy document could be represented by the **pilot proposals** that would aim at exploiting the existing possibilities and thus, would help to bridge the gap between research and innovation. Preparing the ground for the preparation of project proposals and identifying future calls related to the societal challenge addressed could help to further develop and advance the energy sector and RES in the analysed countries.

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# 5. Conclusions

Energy is one of the key sectors of economic and social development. The topics related to energy are getting even more importance in the current times since energy consumption is increasing and there is a need to find alternative sources based on the use of natural resources which are naturally renewed. Therefore, RES represent real perspective for the future, even though they are still used only marginally.

This report was aimed at the overview of all EU and macro-regional strategies, documents, initiatives, and instruments which are to some extent relevant to the societal challenge addressed. Drawing from the results, the sector of energy and RES is among the priority areas of all analysed strategies at EU and macro-regional level. The strategies include actions and measures with the aim to support the development of energy efficiency, the use of RES, energy security, low-carbon technologies, smart grids and energy sustainability. Even though the macro-regional strategies do not foresee any additional funds for the implementation of particular actions, numerous existing financial instruments at EU level can be used to achieve tangible results.

Secondly, this report includes the analysis of energy sectors mostly with regard to renewables in the six Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. Within the national analyses, the attention was paid to the overview of the situation in the energy sector and RES in general, to instruments and measures supporting energy policy in the countries under examination, to financing instruments necessary for the fulfilment of the national and regional objectives in the energy sector and measurable indicators with their expected impacts on the energy sector but in many cases also on the economy as a whole.

The results of national analyses show that the countries have significant potential in renewables, mostly in hydro energy, wind energy and solar energy. However, this potential is in most cases underexploited. The aspects of development of the energy sector mostly with regard to RES in EaP countries are summarised in the SWOT analyses of individual countries.



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Strengths	Weaknesses
Armenia	Armenia
<ul> <li>Experience in supporting the small HPP development through feed-in tariff policy</li> <li>Established education system supporting renewable energy and energy efficiency</li> <li>Good potential in solar resources: 1720 kWh/m2 annually</li> <li>Azerbaijan</li> </ul>	<ul> <li>Country is possessing few raw materials and has no direct access to fossil energy and thus, has to rely on their imports</li> <li>Renewable Energy Roadmap for Armenia developed in 2011 did not yield legislative measures despite of a number of recommendations</li> <li>Public awareness with regard to energy related issues</li> </ul>
<ul> <li>Existing institutional support (through the government agency SAARES)</li> </ul>	<ul> <li>Feed-in tariff support so far only in the small HPP area</li> </ul>
<ul> <li>Financial support (state investments)</li> <li>Strong private sector, enough competitors</li> <li>Belarus</li> <li>High educational level and energy experts training system</li> <li>The existence of laws and programmes to stimulate the development of RES</li> <li>Georgia</li> <li>Regional energy hub</li> <li>Reliable transit country</li> </ul>	<ul> <li>Azerbaijan</li> <li>Low feed-in tariff for independent power producers</li> <li>Purchase of all produced energy is not yet guaranteed</li> <li>No promotion of RES</li> <li>Limited industry for production of hydropower equipment, high dependency from foreign countries</li> <li>Inefficient cooperation and complex administrative procedures between different institutions</li> </ul>
<ul> <li>High amounts of alternative &amp; renewable energy sources (green energy)</li> <li>Diversified import of energy</li> <li>Moldova</li> <li>Close attention to the energy transformation/transition sector</li> <li>Substantial internal generation capacity related to the real and</li> </ul>	<ul> <li>Belarus</li> <li>Weak involvement in global energy communities</li> <li>Weak involvement of SMEs in the energy market</li> <li>Low volume of foreign investment</li> <li>Lack of advanced technologies in energy sector</li> </ul>



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<ul> <li>predicted consumption</li> <li>Clear option for integration into the European Union and its internal energy market</li> <li>Signing the Energy Community Accession Protocol</li> <li>Ukraine</li> </ul>	<ul> <li>Georgia</li> <li>Dependency on neighbouring countries</li> <li>Lack of energy sources such as gas and oil</li> <li>Old power stations</li> <li>Moldova</li> </ul>
<ul> <li>Developed scheme of electric grids</li> <li>High potential of reducing the energy intensity of GDP and optimising the energy mix of the state</li> <li>Increasing energy and ecological security</li> <li>Legal and financial support from the state</li> <li>A system of scientific and technical support of energy efficiency programmes and renewable energy</li> </ul>	<ul> <li>High greenhouse gas emissions</li> <li>High energy consumption by endusers</li> <li>Excessive prices for energy and energy resources</li> <li>Energy supply safety</li> <li>Worn out equipment and old technologies of the energy sector</li> <li>No real competition in the energy market</li> </ul>
	<ul> <li>Ukraine</li> <li>Depreciation of capital assets of Ukrainian energy sector and lack of flexible capacities in the energy system</li> <li>High level of energy intensity in GDP</li> <li>Lack of system solutions in attracting investment in energy efficiency and renewable energy projects</li> <li>Lack of own energy resources, dependence on their imports</li> <li>Low level of energy efficient technologies and equipment</li> </ul>

# Georgia

Document type:

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Opportunities	Threats
Armenia	Armenia
<ul> <li>Renewable Resources and Energy Efficiency Fund (R2E2) established few years ago and continuing its activity</li> </ul>	<ul> <li>Imports of fossil fuel for transport by very few companies</li> </ul>
<ul> <li>Banking system adopts more energy projects for financing</li> <li>Azerbaijan</li> </ul>	<ul> <li>Azerbaijan</li> <li>Lack of capacities in the private sector (most of the available human resources with an academic degree is absorbed by the government)</li> </ul>
<ul> <li>Replacing fossil fuels by RES would allow for significant income generation through export earnings from gas and oil since they are presently the main energy sources of electricity producers in Azerbaijan</li> </ul>	• Azerbaijan has its own oil resources and thus, the costs of fuel are very low. If the oil price falls it is difficult for RES to compete.
• High RES potential, especially for	Belarus
hydropower and wind energy, often in close vicinity of the grid	• Energy sector investment decrease due to global economic or political
<ul> <li>Interesting market through growing electricity demand</li> </ul>	crisis
Investors for RES projects	Georgia
Available technical assistance	<ul> <li>Increasing dependency on imported sources</li> </ul>
Belarus	Moldova
<ul> <li>Liberalization of energy market</li> <li>Expansion of cooperation with the EU countries in the frame of Horizon</li> </ul>	<ul> <li>Economic and financial crisis</li> <li>GDP evolution</li> </ul>
2020, European Neighbourhood Policy, Initiative of the Eastern	<ul> <li>Banking system reticence to support energy projects and grant lending operations</li> </ul>
Partnership, etc. Georgia	<ul> <li>Management of RES not compliant with market requirements</li> </ul>
<ul> <li>Construction of new transmission lines and pipelines</li> </ul>	Ukraine
<ul> <li>Electricity export growth in Europe</li> </ul>	Unstable political and economic
New electricity trade mechanism	situation in the country
<ul> <li>Huge potential for renewable energy</li> </ul>	<ul> <li>Investment climate in Ukraine</li> </ul>



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	development
•	Strategic location of Georgia – access
	to neighbouring and regional power
	markets
IVI	oldova
•	Create an optimal energy mix
•	Increase the share of renewable
	energy in the energy balance
•	Diminish energy intensity and reduce
	losses in the system of heat and power
	transmission
•	Restructure and upgrade the
	combined heat and power plants
UK	kraine
•	High technical and economic potential
	for energy sector development and
	renewable energy projects
•	High potential of energy efficiency of
	RES in all fields of use
•	Availability of transit potential and
	opportunities to export electricity
•	Legislative framework to stimulate
	energy-efficient use of energy
	resources and RES development

In order to provide clear picture of the potential of the main RES used currently in the EaP countries, the total installed capacity is summarised in the table below. The data for individual countries are quite heterogeneous, depending on various sources and analyses prepared by different agencies. Regarding solar energy, the data in the below table include the average annual solar radiation per square meter.





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Potential of RES per country	Armenia	Azerbaijan	Belarus	Georgia	Moldova	Ukraine
Total installed renewable electricity capacity (2010)	1.2 GW	0.99 GW	0.021 GW	2.85 GW	0.064 GW	5.5 GW
Hydro power capacity	100 MW (2012)	1 GW (2012)	16.1 MW (2012)	85 MW	64 MW (2010)	75 MW (2014)
Wind capacity	-	2 MW (2012)	3.47 MW (2011)	-	-	334 MW (2014)
Solar energy (annual solar radiation)	1 720 kWh/m <sup>2</sup>	1 300 kWh/m <sup>2</sup>	-	1 550 kWh/m <sup>2</sup>	-	up to 1 400 kWh/m <sup>2</sup>

In order to develop the area of RES, international financial support and foreign direct investments are necessary. Numerous projects have already been implemented in this regard, mostly with the help of the World Bank, ADB, USAID, UNDP, EBRD, etc. Additionally, the countries have developed numerous strategies which follow similar aims and targets, such as energy independence, energy security, sustainability of energy sector, diversification of energy supplies, etc. These national level strategies usually comply with the EU legislation and targets set in the strategies at EU level. However, there is further need for state programmes for RES development.

Finally, the guidelines for policy framework document are concluding the report. These should serve as a starting point for the preparation of deliverable 2.2 and include the proposed structure that should be adopted in order to summarise the knowledge obtained through this analysis in comprehensive recommendations for future development, not only in the area of energy but also in the field of technology transfer.



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# Annex 1: List of identified strategic documents

## Armenia

Full title of the document:	Energy Sector Development Strategy in the Context of	
	Economic Development in Armenia	
Responsible organization:	Government of Armenia	
Year of publication:	2005	
Indication of national / regional	National	
level:		

Full title of the document:	Renewable Energy Roadmap for Armenia
Responsible organization: Danish Energy Management, via World Bank fina	
Year of publication:	2011
Indication of national / regional National	
level:	

# Azerbaijan

Full title of the document:	A Roadmap for Renewable Energy in Azerbaijan
Responsible organization:	ADB
Year of publication:	2009
Indication of national / regional	National
level:	

Full title of the document:	Azerbaijan: Alternative and Renewable Energy – A
	Business Perspective
Responsible organization:	Caspian Information Centre
Year of publication:	2013
Indication of national / regional	National
level:	



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#### Selarus

Full title of the document:	State Programme of Energy System Development in
	Belarus until 2016 (Resolution N194 of the Council of
	Ministers of the Republic of Belarus)
Responsible organization:	Ministry of Energy
Year of publication:	2012
Indication of national / regional	National
level:	

Full title of the document:	"On Renewable Energy Sources" (Law of the Republic
	of Belarus N204-Z)
Responsible organization:	Ministry of Energy
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	On Approval of the State Programme of Hydro Power
	Plants Construction in 2011–2015 in the Republic of
	Belarus (Resolution N1838 of the Council of Ministers
	of the Republic of Belarus)
Responsible organization:	Ministry of Energy
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	On Approval of the Economic Potential Development
	Strategy of the Republic of Belarus (Resolution N1180
	of the Council of Ministers of the Republic of Belarus)
Responsible organization:	Ministry of Energy
Year of publication:	2010
Indication of national / regional	National
level:	



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Full title of the document:	On Approval of the State Programme of Construction
	of Generation Facilities Using Local Fuels Sources for
	2010–2015 (Resolution N1180 of the Council of
	Ministers of the Republic of Belarus)
Responsible organization:	Ministry of Energy
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	On Approval of the State Programme "Peat" for
	2008–2010 and until 2020 (Resolution N94 of the
	Council of Ministers of the Republic of Belarus)
Responsible organization:	Ministry of Energy
Year of publication:	2008
Indication of national / regional	National
level:	

# 💪 Georgia

Full title of the document:	Basic Directions of the State Policy in Energy Sector of
	Georgia
Responsible organization:	Ministry of Economy and Sustainable Development of
	Georgia
Year of publication:	2006
Indication of national / regional	National
level:	

Full title of the document:	Renewable energy roadmap for Georgia
Responsible organization:	USAID / Deloitte Consulting
Year of publication:	2013
Indication of national / regional	National
level:	

Full title of the document:	Georgian Law on Electricity and Natural Gas
Responsible organization:	Ministry of Energy
Year of publication:	2006
Indication of national / regional	National
level:	



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# Moldova

Full title of the document:	Energy Strategy of the Republic of Moldova until 2030	
Responsible organization:	National Agency for Energy Regulation of Moldova	
Year of publication:	2013	
Indication of national / regional	National	
level:		

Full title of the document:	National Energy Efficiency Action Plan for 2013-2015	
Responsible organization:	National Agency for Energy Regulation of Moldova	
Year of publication: 2013		
Indication of national / regional	National	
level:		

Full title of the document:	Law on Natural Gas
Responsible organization:	National Agency for Energy Regulation of Moldova
Year of publication:	2009
Indication of national / regional	National
level:	

Full title of the document:	Renewable Energy Law	
Responsible organization:	National Agency for Energy Regulation of Moldova	
Year of publication:	2003	
Indication of national / regional	National	
level:		

Full title of the document:	Law on Oil Products Market	
Responsible organization:	National Agency for Energy Regulation of Moldova	
Year of publication: 2001		
Indication of national / regional	National	
level:		

Full title of the document:	Law on Energy	
Responsible organization:	National Agency for Energy Regulation of Moldova	
Year of publication:	1998	
Indication of national / regional	National	
level:		





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Document type: Project end date:

Full title of the document:	w on Electricity	
Responsible organization: National Agency for Energy Regulation of Mo		
Year of publication:	2009	
Indication of national / regional	National	
level:		

### **G** Ukraine

Full title of the document:	Energy Strategy of Ukraine for the period up to 2030	
Responsible organization:	Cabinet of Ministers of Ukraine	
Year of publication:	2006	
Indication of national / regional	National	
level:		

Full title of the document:	On Approval of the State Target Economic Program for Energy Efficiency and Development of Energy	
	Production from Renewable Energy Sources and	
	Alternative Types of Fuel for the period of 2010-2015	
Responsible organization:	Cabinet of Ministers of Ukraine	
Year of publication:	2010	
Indication of national / regional	National	
level:		

Full title of the document:	The Concept of the State Target Scientific and	
	Technical Program for Development of Biological Fuel	
	Types Production and Use	
Responsible organization:	Cabinet of Ministers of Ukraine	
Year of publication:	2009	
Indication of national / regional	National	
level:		

Full title of the document:	On Approval of Action Plan for Fulfillment of	
	Obligations under the Energy Community Treaty	
Responsible organization:	Cabinet of Ministers of Ukraine	
Year of publication:	2011	
Indication of national / regional	National	
level:		





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Full title of the document:	Rules for Connecting Electrical Installations to Power
	Supply Networks
Responsible organization:	Cabinet of Ministers of Ukraine
Year of publication:	2013
Indication of national / regional	National
level:	

Full title of the document:	Rules for Connecting Wind Power Stations to Power Supply Network
Responsible organization:	Ministry for Energy and Coal Industry
Year of publication:	2009
Indication of national / regional	National
level:	

Full title of the document:	Rules for Electric Energy Use
Responsible organization:	Cabinet of Ministers of Ukraine
Year of publication:	1996
Indication of national / regional	National
level:	

Full title of the document:	Approval of Rules for Connecting Cogeneration
	Installations to Power Supply Networks
Responsible organization:	National Electricity Regulatory Commission of Ukraine
Year of publication:	2006
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Alternative Energy Sources
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2003
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Energy Saving
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	1994
Indication of national / regional	National
level:	



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Full title of the document:	Law of Ukraine On Electric Energy
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	1997
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Heat Supply
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2005
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Combined Production of Heat and
	Electric Energy (Cogeneration) and Use of Faulting
	Energy Potential
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2005
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Private Public Partnership
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine On Lands in EnergyIndustry and Legal
	Status of Special Areas of Energy Facilities
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	Law of Ukraine on Alternative Types of Fuel
Responsible organization:	Verkhovna Rada of Ukraine
Year of publication:	2000
Indication of national / regional	National
level:	



Grant Agreement Number:	609531
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*Deliverable 2.1* 29/02/2016

Full title of the document:	On the Procedure of Issuing by the National Energy Regulation Commission of Licenses for Carrying out Activities related to Production, Transmission and Supply of Electric Energy, Combined Production of Heat and Electric Energy, Production of Heat Energy at Cogeneration Plants and Installations with the Use of Non-conventional or Renewable Energy Sources.
Responsible organization:	Cabinet of Ministers of Ukraine
Year of publication:	1999
Indication of national / regional	National
level:	

Full title of the document:	On Approval of Terms and Conditions and Rules for
	Carrying Out Business Activities related to
	Transmission of Electric Power by Local Power Supply
	Networks
Responsible organization:	National Electricity Regulatory Commission of Ukraine
Year of publication:	1996
Indication of national / regional	National
level:	

Full title of the document:	Approval of the Procedure for Control of Licensees
	Compliance with Terms and Conditions and Rules for
	Carrying Out Activities related to Production,
	Transmission and Supply of Electric Energy, Combined
	Production of Heat and Electric Energy, Production of
	Heat Energy at Cogeneration Plants and Installations
	with the Use of Non-conventional or Alternative
	Energy Sources
Responsible organization:	National Electricity Regulatory Commission of Ukraine
Year of publication:	2011
Indication of national / regional	National
level:	



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Full title of the document:	Approval of the List of Projects in Priority Areas of
	Social-Economic and Cultural Development (National
	Projects). Energy of Nature national project
Responsible organization:	Cabinet of Ministers of Ukraine
Year of publication:	2010
Indication of national / regional	National
level:	

Full title of the document:	On Implementation of Investment Projects related to
	Construction of Wind Power Stations in Autonomous
	Republic of Crimea and Mykolayiv region.
Responsible organization:	Cabinet of Ministers of Ukraine
Year of publication:	2009
Indication of national / regional	Regional
level:	

Full title of the document:	Program for Renewable Energy Development in
	Kherson Region up to 2030
Responsible organization:	Kherson Regional State Administration
Year of publication:	2013
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme for 2011-2015
Responsible organization:	Rivne Oblast State Administration
Year of publication:	2011
Indication of national / regional	Regional
level:	

Full title of the document:	Strategy of Sustainable development of Kharkiv region till 2020
Responsible organization:	Kharkiv Oblast State Administration
Year of publication:	2010
Indication of national / regional lev:	Regional



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Full title of the document:	Program of Energy Efficiency and energy saving of for
	Transcarpathian region2012-2015
Responsible organization:	The Regional State Administration of Transcarpathia
Year of publication:	2012
Indication of national / regional	Regional
level:	

Full title of the document:	Program of energy efficiency and reducing energy consumption in Dnipropetrovsk Oblast for 2010-2015
Responsible organization:	Dnipropetrovsk Oblast State Administration
Year of publication:	2010
Indication of national / regional	Regional
level:	

Full title of the document:	Crimea's development strategy for 2011-2020
Responsible organization:	Council of Ministers of the Autonomous Republic of
	Crimea
Year of publication:	2010
Indication of national / regional	Regional
level:	

Full title of the document:	Strategy of economic and social development of the Volyn Oblast for 2012-2015
Responsible organization:	Volynska Oblast State Administration
Year of publication:	2007
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme of Lugansk Oblast 2011 - 2015
Responsible organization:	Lugsnsk Oblast State Administration
Year of publication:	2010
Indication of national / regional	Regional
level:	



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Full title of the document:	Regional Energy Efficiency Programme of Lugansk
	Oblast 2011 - 2015
Responsible organization:	Lugansk Oblast State Administration
Year of publication:	2007
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme Vinnitsa Oblast 2011 - 2015
Responsible organization:	Vinnitsa Oblast State Administration
Year of publication:	2007
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme of Zhitomir Oblast in 2011-2015
Responsible organization:	Zhitomir Oblast State Administration
Year of publication:	2007
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme of Odeska Oblast in 2011-2015
Responsible organization:	Odeska Oblast State Administration
Year of publication:	2007
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme of Ivano- Frankivsk Oblast in 2011-2015
Responsible organization:	Ivano-Frankivsk Oblast State Administration
Year of publication:	2013
Indication of national / regional	Regional
level:	



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Grant Agreement Number:	609531
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Full title of the document:	Regional Energy Efficiency Programme of Lvivska
	oblast in 2011-2015
Responsible organization:	Lvivska Oblast State Administration
Year of publication:	2011
Indication of national / regional	Regional
level:	

Full title of the document:	Regional Energy Efficiency Programme of
	Khmelnitska Oblast in 2011-2015
Responsible organization:	Khmelnitska Oblast State Administration
Year of publication:	2010
Indication of national / regional	Regional
level:	

Full title of the document:	Energy efficiency program and reduce energy
	consumption of Cherkasy Oblast in 2011-2015
Responsible organization:	Cherkassy Oblast State Administration
Year of publication:	2011
Indication of national / regional	Regional
level:	

Full title of the document:	A comprehensive program of energy efficiency,
	energy saving and rational use of energy resources
	Chernivtsi Oblast for 2011-2015
Responsible organization:	Chernivtsi Oblast State Administration
Year of publication:	2011
Indication of national / regional	Regional
level:	

Full title of the document:	Energy efficiency program of Mykolaiv oblast for
	2010-2015
Responsible organization:	Mykolaiv Oblast State Administration
Year of publication:	2010
Indication of national / regional	Regional
level:	





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Full title of the document:	Energy Efficiency Program of the Donetsk Oblast
	2010-2015
Responsible organization:	Donetsk Oblast State Administration
Year of publication:	2010
Indication of national / regional	Regional
level:	





01/09/2013

**Document type: Project end date:** 

## Annex 2: Template for EU / Macro-regional/ Country energy report

#### 1. Title of the document

Indicate the full title of analysed document.

#### 2. Responsible organization / institution

Indicate the organization responsible for the development and implementation of analysed document, provide the contact details: name, type of organization/institution, official address, webpage, e-version.

Name: Type: Address: Webpage of the organization: E-version of the document (if available; any language version):

### 3. Year of publication, period of validity

Indicate the year when the document was published and for what period (if relevant; e.g. 2008 - 2015).

Year of publication: Period of validity:

#### 4. SWOT analysis

SWOT of the country / region / macro-region in the energy sector – max 5 bullet points for each S, W, O, T.

Strengths	Weaknesses
•	•
•	•
•	•
•	•





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Opportunities	Threats
•	•
•	•
•	•
•	•
•	•

#### 5. Objectives / targets of the energy sector

Indicate the main objectives of the energy sector in your country / region / macro-region. When thinking about the objectives please keep in mind the energy-related technologies mentioned in the project's Description of Work, i.e.:

- Renewable energy for mobility
- Biomass energy
- Geothermal energy
- Smart grids
- Wind power energy
- Solar energy
- Hydro power energy
- Smart cities, energy efficient buildings
- Energy efficient manufacturing
- Innovative storage technologies

These should be taken into account also when making the SWOT analysis of the country / region / macro-region.

#### 6. Instruments / measures to support the policy

Provide short description of the main measures (1 paragraph each) supporting the energy policy in your country / region / macro-region including the main beneficiaries. e.g. Intelligent Energy Europe, KIC-Energy, ELENA, JESSICA, etc.





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#### 7. Financing instruments

Indicate the main financing instruments used and the budget (in EUR) necessary for the fulfilment of the national / regional / macro-regional objectives in the energy sector.

2010	2011	2012
x EUR		
(thsd., mil.)		
	x EUR	x EUR

add rows if necessary

#### 8. Measurable indicators

Indicate the measurable indicators from the analysed strategic document related to the energy sector in your country / region / macro-region.

Indicator	Unit of measurement	Base value	Planned output	Expected impact
e.g. increase of the RES	%	8,5%	20%	lower prices of
share to 20% of the total		(in 2005)	(in 2020)	electricity, low
energy consumption by				costs of
2020				production, etc.

add rows if necessary