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NoGAP

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

Deliverable 2.2

A FRAMEWORK POLICY DOCUMENT

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List of acronyms and abbreviations

EaP	the Eastern Partnership
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EIB	European Investment Bank
GW	Gigawatt
GWh	Gigawatt hour
HPPs	Hydro Power Plants
kW	kilowatt
kWh	kilowatt hour
LCE	Low Carbon Energy
mtoe	Million tonnes of oil equivalent
MW	Megawatt
MWh	Megawatt hour
MWth	Megawatt thermal
RE	Renewable Energy
RES	Renewable Energy Sources
SAARES	State Agency of Alternative and Renewable Energy Sources
SMEs	small and medium-sized enterprises
TACIS	Technical Assistance to the Commonwealth of Independent States
TWh	Terrawatt hour
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WPPs	Wind Power Plants

Introduction

This deliverable was prepared by the Slovak University of Agriculture in Nitra as a task leader of Task 2.2 (WP2) within the FP7-INCO project NoGAP: *Knowledge Transfer Community to bridge the gap between research, innovation and business creation*.

WP 2: Developing innovation support services to foster innovation partnership in the societal challenge secure, clean and efficient energy

Task 2.2: A Policy framework document

The overall aim of deliverable 2.2 is to develop a policy framework document in the field of energy efficiency and renewable energy in a Bio-based Economy, so innovation support services to foster innovation partnership services can be created in line with existing and future policies. This document is based on an analysis of existing and planned energy policy strategies related to the societal challenge addressed (national energy plans, Danube Strategy, Black Sea, Strategy, Baltic Sea Strategy, EU Set Plan) and 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. The policy framework document deals with the identification of opportunities in the field of energy efficiency and renewable energy in case of EU and EaP countries. It identifies potential challenges and barriers in cooperation and potential major partners for future cooperation. Document also includes identification and exploitation of possibilities regarding the potential relevant instruments and calls for cooperation. Recommendations for creating transfer centres in the area of secure, clean and efficient energy in EaP countries are presented.

1. Energy policy strategies in EU level and macro-regional level

Renewable energies sources (RES) hold the key to a climate friendly energy future and an energy supply that is sustainable and secure in the long term. Since the Bonn Renewable Energy Conference in 2004, numerous developed and developing countries have increasingly set targets for the utilisation of renewable energies in meeting their power supply needs. In order to reach their targets, many countries have designed and implemented a variety of policies, strategies and instruments.

1.1. Energy policy strategies in EU level and macro-regional level

The current EU policy framework

The use of renewable energies (wind power, solar and photovoltaic energy, biomass and biofuels, geothermal energy and heat-pump systems) undeniably contributes to limiting climate change. Furthermore, it plays a part in securing energy supply and creating employment in Europe, thanks to the increase in the production and consumption of local energy. Renewable energies, however, remain on the fringe of the European energy mix as they still cost more than traditional energy sources.

To increase the use of renewable energy sources, in its Renewable Energies Roadmap the EU has set itself the objective of increasing the proportion of renewable energies in its energy mix by 20 % by 2020.

This objective requires progress to be made in the three main sectors where renewable energies are used: electricity (increasing the production of electricity from renewable sources and allowing the sustainable production of electricity from fossil fuels, principally through the implementation of CO2 capture and storage systems), biofuels, which should represent 10 % of vehicle fuels by 2020, and finally heating and cooling systems.

Central to the current policy framework are the three headline targets to be achieved by 2020:

(1) an EU based target for GHG emission reductions of 20% relative to emissions in 1990;

(2) a 20% share for renewable energy sources in the energy consumed in the EU with specific target for the Member States;

(3) 20% savings in energy consumption compared to projections. In addition, there are specific 2020 targets for renewable energy for the transport sector (10%) and decarbonisation of transport fuels (6%).

The framework also recognises Member States' different energy mixes, economic wealth and capacity to act, and therefore includes mechanisms to ensure a fair distribution of effort between them. It includes measures to address the risk of carbon leakage and its impacts on energy-intensive industry sectors. It is supported by a broad set of Union financial instruments and a Strategic Energy Technology plan (the SET-Plan). Furthermore the Commission has proposed revising the EU legislation on taxation of energy products and electricity[2] to remove overlaps between existing fiscal instruments. The framework for 2020 is complemented by the Energy 2020 Strategy[3] which assesses the challenges and measures to ensure a competitive, sustainable and secure energy system.

The 20% GHG reduction target and implementing measures

The 20% GHG reduction target for 2020 compared to 1990 is implemented through the EU Emissions Trading System (EU ETS) and the Effort Sharing Decision which defines reduction targets for the non-ETS sectors, and its achievement is supported through EU and national policies to reduce emissions. In 2011 GHG emissions as covered by the climate and energy package were estimated at 16% below 1990 levels.

The ETS delivers a uniform carbon price for large industrial installations, the power sector and in the aviation sector. It covers more than 10.000 installations and nearly 50% of all EU GHG emissions. This uniform price ensures that climate goals are met cost-effectively and that business across the EU has a level playing field. The carbon price is now part of EU businesses' operational and investment decisions and has contributed to substantial emissions reductions. But it has not succeeded in being a major driver towards long term low carbon investments. Despite the fact that the ETS emission cap decreases to around -21% by 2020 compared to 2005 and continues to decrease after 2020, in principle giving a legal guarantee that major low carbon investments will be needed, the current large surplus of allowances, caused in part by the economic crisis, prevents this from being reflected in the carbon price. The low carbon price is not providing investors with sufficient incentive to invest and increases the risk of "carbon lock-in". Some Member States are concerned with this evolution and have taken, or are considering taking national measures, such as taxes for carbon intensive fuels in ETS sectors. There is an increasing risk of policy fragmentation threatening the Single Market, with national and sectoral policies undermining the role of the ETS and level playing field it was meant to create. The Carbon Market Report assesses in more detail the functioning of the ETS[4].

The Effort Sharing Decision (ESD) sets national targets for GHG emissions in the sectors not covered by the ETS. The aggregate target is a 10% emission reduction at EU level in 2020 compared to 2005. Many EU policies, including sector specific legislation and initiatives, have contributed to reducing emissions in these sectors. They range from policies that improve CO_2 and energy efficiency for cars, the residential sector and energy consuming equipment,

to specific waste, environmental, agricultural and land use policies (see annex). The implementation of policies to achieve the renewables and energy efficiency target also contributes to emissions reductions. National targets are distributed between Member States according to economic capacity. Some need to reduce emissions compared to 2005 whilst others are permitted a limited growth in emissions. In aggregate the EU is on track to achieve the 10% reduction target, but significant differences exist between Member States. Half of them still need to take additional measures. Additionally the ESD enables Member States to meet their targets flexibly, be it through the acquisition of international credits or through trade with Member States outperforming their targets.

The renewable energy target and implementing measures

The EU is making progress towards meeting the 2020 target of 20% renewable energy in gross final energy consumption. In 2010, the renewables share in the EU was 12.7% compared to 8.5% in 2005. In the period 1995-2000 when there was no regulatory framework, the share of renewable energy grew by 1.9% a year. Following the introduction of indicative targets (2001-2010), the share of renewable energy grew by 4.5% per annum. With legally binding national targets growth has increased but needs to average 6.3% per year to meet the overall 2020 target. The share of renewables in transport reached 4.7% in 2010 compared to only 1.2% in 2005. In the heating and cooling sector, renewable energy continues to grow and its share should nearly double by 2020. However, new measures will be needed for most Member States to achieve their 2020 targets reflecting the scaling back of support schemes and more difficult access to finance in the context of the economic crisis.

The Commission provided a state of play on renewable energy in the EU in 2012[5]. An updated progress report is published alongside this Green Paper. Investments in research and development, innovation and large scale deployment in the sector have contributed to significant reductions in the cost of renewable energy technologies. There are key challenges associated with large scale deployment such as the full integration of renewables into the EU's electricity system in a way that deals with intermittency, and improving co-operation among Member States in meeting targets. The coupling of the EU's wholesale electricity markets will help to integrate renewable energy into the electricity system as will the roll-out of smart grids which provide opportunities to adapt generation, grid control, storage and consumption to the changing situation on markets. However, massive investments in transmission and distribution grids, including through cross-border infrastructure, to complete the internal energy market will also be needed to accommodate renewable energy. Another important challenge is to ensure over time that renewable energy sources become more cost-efficient so as to limit the use of support schemes only to those technologies and areas that still need it. Such schemes should be designed to avoid overcompensation, improve cost efficiency, encourage high GHG reduction, strengthen innovation, ensure sustainable use of raw materials, to be adaptable to cost developments to avoid subsidy dependence, be con-

sistent across Member States and, in particular with regard to biofuels, ensure WTO compatibility.

Share of renewable energy in gross final energy consumption

In the European Union, the current momentum driving the renewable energy share of gross final energy consumption is in phase with the indicative trajectories defined in Annex I of the Renewable Energies Directive (table 1, Fig. 1), and this applies to most countries. Many of them are a long way ahead of their targets, such as Sweden, Finland, Denmark, Estonia, Lithuania, Bulgaria, Austria, Spain, Germany and Italy. The European Union renewable energy share has already increased by 5 points since 2006, from 9% to 14%. Thus the EU could achieve its 2020 target if the annual rate of increase stays within 0.7 to 0.8 of a point. However while it is not out of reach, it must be remembered that the investment (and investment decision) level has plainly dropped since 2012. It follows that the rate of progress by renewable energies is bound to slow down in the coming years. Yet it is hard to be totally pessimistic about achieving the European targets in the next eight years, as they seem to be both technologically and industrially within reach. In this respect, the level of ambition for renewables energies that the European Union must set itself for 2030 in the new framework will be decisive.

The energy savings target and implementing measures

The 2020 target of saving 20% of the EU's primary energy consumption (compared to projections made in 2007) is not legally binding for Member States, but significant progress has nevertheless been made. After years of growth, primary energy consumption peaked in 2005/2006 (around 1825 Mtoe) and has been slightly decreasing since 2007 (to reach 1730 Mtoe in 2011). This trend is partly due to the economic crisis and partly due to the effectiveness of existing policies. It is also due to reduced energy intensity of EU industry which was 149 toe per million euro in 2010, down from 174 in 2000 and 167 in 2005.

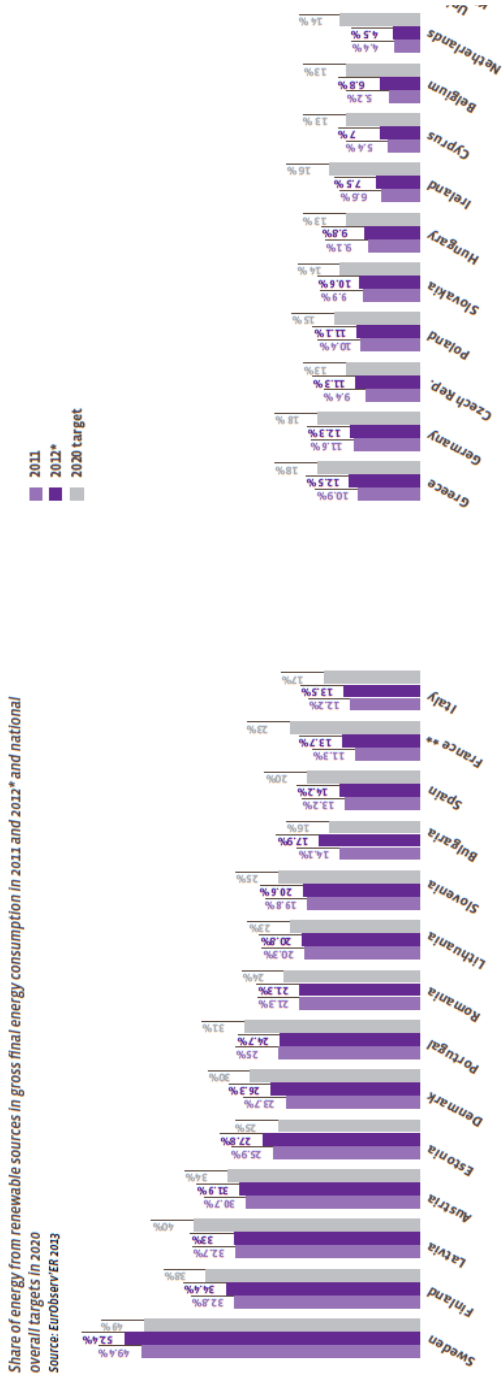
With the adoption of the Energy Efficiency Directive (EED) in 2012 there is now a comprehensive legislative framework at EU level. This needs to be fully implemented by Member States. The EED will help to drive progress in this area, although the Commission's preliminary analysis suggests that with current policies the 2020 target will not be met. The

Table 1 Share of renewable energy in gross final energy consumption

	2011 (%)	2012* (%)	Indicative trajectory 2011-2012** (%)
Sweden	49.4	52.4	41.6
Finland	32.8	34.4	30.4
Latvia	32.7	33.0	34.1
Austria	30.7	31.9	25.4
Estonia	25.9	27.8	19.4
Denmark	23.7	26.3	19.6
Portugal	25.0	24.7	22.6
Romania	21.3	21.3	19.0
Lithuania	20.3	20.8	16.6
Slovenia	19.8	20.6	17.8
Bulgaria	14.1	17.9	10.7
Spain	13.2	14.2	11.0
France***	11.3	13.7	12.8
Italy	12.2	13.5	7.6
Greece	10.9	12.5	9.1
Germany	11.6	12.3	8.2
Czech Republic	9.4	11.3	7.5
Poland	10.4	11.1	8.8
Slovakia	9.9	10.6	8.2
Hungary	9.1	9.8	6.0
Ireland	6.6	7.5	5.7
Cyprus	5.4	7.0	4.9
Belgium	5.2	6.8	4.4
Netherlands	4.4	4.5	4.7
United Kingdom	3.8	4.2	4.0
Luxembourg	2.9	3.1	2.9
Malta	0.2	0.3	2.0
Total EU	**12.9**	**14.0**	–

** EurObserv'ER estimates, calculated on the basis of the project's data collection campaigns. ** All percentages originate from Annex I of Directive 2009/28/EC. The indicative trajectory has been calculated from Part B of the Annex. *** Results for France calculated by EurObserv'ER don't include the overseas territories but for the purpose of Directive 2009/28/EC the accounting of energy from renewable sources for France has to include French overseas territories. According preliminary estimation published in July 2013 in the "Bilan énergétique de la France pour 2012", Service de l'Observation et des Statistiques, the preliminary figure including the overseas territories was 13.7 % in 2012.* **Note:** *Calculations, defined by the Directive, use a normalized hydro and wind generation.* ***Source: EurObserv'ER 2013***

Figure 1 Share of renewable energy in gross final energy consumption



lack of appropriate tools for monitoring progress and measuring impacts on the Member State level is part of the problem. Another major challenge is to mobilise the funds needed to ensure continued progress.

Since 2009-2010, implementing measures have been adopted under the Ecodesign and Energy Labelling Directives on energy related products. These measures reduce the energy demand of industrial and household products leading to savings for end-users. Measures have been adopted for a number of electronic appliances, including domestic dishwashers, refrigerators, washing machines, televisions and tyres as well as industrial products such as motors, fans and pumps. The estimated impact of the adopted ecodesign and labelling measures are energy savings in the range of 90 Mtoe in 2020.

To address the energy consumed in the building stock, in particular for heating and cooling purposes, the EU adopted a revised Energy Performance of Buildings Directive (EPBD) in 2010. Besides the obligation for Member States to apply minimum energy performance requirements for new and existing buildings, the Directive requires them to ensure that by 2021 all new buildings are "nearly zero-energy buildings." However, delays and incomplete national measures to implement this directive risk undermining the necessary contribution of the buildings sector towards lower GHG emissions and reduced energy consumption. The cost-effective savings potential in the building sector is estimated to be 65 Mtoe by 2020. The EU has supported the development of energy efficient technologies, including through public partnerships on energy efficient buildings, green cars and sustainable manufacturing.

In the transport sector, the Regulations establishing performance standards for light duty vehicles have led to substantial reductions in GHG emissions reflected in the fleet average CO_2 emission of new cars from 172 g per kilometre in 2000 to 135.7 g per kilometre in 2011.

Security of supply and affordability of energy in the internal energy market

The 2009 climate and energy package is not the only work stream in this area. In 2009 and 2010, the EU adopted comprehensive legislation on the internal energy market for electricity and natural gas and, in the wake of two gas supply crises, the Regulation on security of gas supplies. As none of the energy policy objectives can be reached without adequate grid connections, the Commission has also proposed a Regulation on Trans European Energy Infrastructure Guidelines on which political agreement has been reached by the European Parliament and by Council. It addresses infrastructure challenges to ensure true interconnection in the internal market, integration of energy from variable renewable sources and enhanced security of supply.

Other EU measures, such as the European Strategic Energy Technology plan are in place to encourage a technological shift through development and demonstration projects for new

and innovative technologies: e.g. second generation biofuels, smart grids, smart cities and intelligent networks, electricity storage and electro-mobility, carbon capture and storage technologies and next generation nuclear and renewable heating and cooling. In early 2013, the Commission also proposed a directive on the deployment of alternative fuels infrastructure which will be supported by the proposed revision of the TEN-T Guidelines.

A number of challenges were not addressed at the time of the 2009 climate and energy package. For example, the necessary transmission and distribution infrastructure were not defined. The management challenges linked to the introduction of renewables, including dealing with the variable supply of certain renewables (e.g. wind and solar) were also not fully considered and the impact of a large number of national support schemes for renewables on market integration was underestimated.

The Third Energy package addressed the issue of how to stimulate competition on the market, but did not address the issue of whether the market offered the necessary incentives to invest in generation, distribution and transmission, and storage capacity in a system with greater shares of renewables. Until renewable energy sources become cost-competitive, the objective of a more sustainable energy system must go hand in hand with the need for a fully liberalised and integrated energy market capable of mobilising and allocating investment efficiently.

Important developments and trends taking place inside and outside the EU include the growing energy import dependency of the EU and the technological progress of our main competitors, the new supply routes, as well as the rise of new energy producers in Africa and Latin America. This will all have an impact on the energy cost and security of supply in the EU.

1.2. The 2030 framework for climate and energy policies

The EU has a clear framework to steer its energy and climate policies up to 2020. This framework integrates different policy objectives such as reducing greenhouse gas (GHG) emissions, securing energy supply and supporting growth, competitiveness and jobs through a high technology, cost effective and resource efficient approach. These policy objectives are delivered by three headline targets for GHG emission reductions, renewable energy and energy savings. There are additional targets for energy used by the transport sector. In parallel, the EU has put in place a regulatory framework to drive the creation of an open, integrated and competitive single market for energy which promotes the security of energy supplies. While the EU is making good progress towards meeting the 2020 targets, creating the internal market for energy and meeting other objectives of energy policy, there is a need now to reflect on a new 2030 framework for climate and energy policies. Early agreement on the 2030 framework is important for three reasons:

- First, long investment cycles mean that infrastructure funded in the near term will still be in place in 2030 and beyond and investors therefore need certainty and reduced regulatory risk.
- Second, clarifying the objectives for 2030 will support progress towards a competitive economy and a secure energy system by creating more demand for efficient and low carbon technologies and spurring research, development and innovation, which can create new opportunities for jobs and growth. This in turn reduces both directly and indirectly the economic cost.
- Third, while negotiations for a legally binding international agreement on climate mitigation have been difficult, an international agreement is still expected by the end of 2015. The EU will have to agree on a series of issues, including its own ambition level, in advance of this date in order to engage actively with other countries.

This framework for 2030 must be sufficiently ambitious to ensure that the EU is on track to meet longer term climate objectives. But it must also reflect a number of important changes that have taken place since the original framework was agreed in 2008/9:

- the consequences of the on-going economic crisis;
- the budgetary problems of Member States and businesses who have difficulty mobilising funds for long term investments;
- developments on EU and global energy markets, including in relation to renewables, unconventional gas and oil, and nuclear;
- concerns of households about the affordability of energy and of businesses with respect to competitiveness;
- and the varying levels of commitment and ambition of international partners in reducing GHG emissions.

The 2030 framework must draw on the lessons from the current framework: what has worked, what has not worked and what can be improved. It should take into account international developments and spur stronger international climate action. And it must identify how best to maximise synergies and deal with trade-offs between the objectives of competitiveness, security of energy supply and sustainability.

The framework should also take into account the longer term perspective which the Commission laid out in 2011 in the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap 2050, and the Transport White Paper. The European Parliament has adopted resolutions on each of the Roadmaps[1]. These Roadmaps were developed in line with the objective of reducing GHG emissions by 80 to 95% by 2050 compared to 1990 levels

as part of necessary efforts by developed countries as a group. The scenarios in these Roadmaps suggested the following key findings:

- By 2030 GHG emissions would need to be reduced by 40% in the EU to be on track to reach a GHG reduction of between 80-95% by 2050, consistent with the internationally agreed target to limit atmospheric warming to below 2°C.
- Higher shares of renewable energy, energy efficiency improvements and better and smarter energy infrastructure are "no regrets" options for transforming the EU's energy system.
- For renewables, the policy scenarios in the Energy Roadmap 2050 indicate a share of around 30% in 2030.
- Significant investments are needed to modernise the energy system, with or without decarbonisation, which will impact the energy prices in the period up to 2030.

The aim of this Green Paper is to consult stakeholders to obtain evidence and views to support the development of the 2030 framework. It begins with an overview of the current framework and what has been achieved and then presents the issues where stakeholder input is sought. In parallel, the Commission is consulting on issues relating to the international negotiations of a new legally binding agreement for climate action as well its policy to enable the demonstration of the carbon capture and storage technology.

Key issues for 2030 framework

The 2030 framework for climate and energy policies will build on the significant progress already made in this area. It must draw on the lessons from the current framework and identify where improvements can be made. The experience and views of stakeholders, backed up where possible with sound evidence, are essential on four broad issues: targets; other policy instruments; competiveness; and the different capacity of Member States to act.

Targets

Fundamental issues for a new 2030 framework for climate and energy policies relate to the types, nature and level of targets and how they interact. Should the targets be at EU, national or sectorial level and be legally binding? There are diverging views on the need for targets and types of targets. While experience with the current framework shows that targets provide political momentum, a long term vision for investment, and a benchmark for measuring progress, some stakeholders argue that the existing targets and policies to reach them are not necessarily coherent or cost efficient, or that they do not take competitiveness and the economic viability and maturity of technologies sufficiently into account. The 2030 frame-

work should recognise the evolution of technology over time and promote research and innovation. There is a need, therefore, to assess which targets can best, and most simply and cost effectively, drive energy and climate policies up to 2030, and whether the current approach can be streamlined particularly with reference to the need for various sub-targets such as those in the transport sector. This analysis should also address the issue of whether having only a GHG emissions target for 2030 would be appropriate, taking into account other objectives such as security of supply and competitiveness.

The current climate and energy targets for GHG reduction, the share of renewable energy sources and energy savings were designed to be mutually supporting and there are indeed interactions between them. Higher shares of renewable energy can deliver GHG reductions so long as these do not substitute other low-carbon energy sources while improved energy efficiency can help reduce GHG emissions and facilitate attainment of the renewables target. There are obvious synergies but there are also potential trade-offs. For example, more than anticipated energy savings and greater than expected renewable energy production can lower the carbon price by weakening the demand for emission allowances in the ETS. This in turn can weaken the price signal of the ETS for innovation and investments in efficiency and the deployment of low-carbon technologies whilst not affecting attainment of the overall GHG reduction target. A 2030 framework with multiple targets will have to recognise these interactions explicitly. It should also recognise that higher shares of renewable energy sources and greater energy savings will not alone ensure greater competitiveness or security of supply. Dedicated policies will remain necessary and there may also be a need for additional indicators that more directly capture these objectives.

There is a broad consensus that interim targets for GHG emissions reductions will be necessary to reach the aspiration of an 80-95% reduction by 2050. The key issue is deciding on the most appropriate level for such an intermediate target. The 2050 Low carbon Economy Roadmap suggests that a 40% reduction in emissions by 2030 compared to 1990 would be cost-effective. A reduction of less than 40% would increase the costs of decarbonising the economy over the longer term. While the roadmaps suggest that GHG reductions of 40% by 2030 can be achieved without unduly increasing the costs for our energy system, mobilising the funds necessary to cover the capital costs for significant up-front investments will, however, be a challenge.

The Energy Roadmap for 2050 has shown that the share of renewables in the energy system must continue to increase after 2020. A 2030 target for renewables would have to be carefully considered as many renewables sources of energy in this time frame will no longer be in their infancy and will be competing increasingly with other low-carbon technologies. Consideration should also be given to whether an increased renewable share at EU level could be achieved without a specific target but by the ETS and regulatory measures to create the right market conditions. The shape of a possible renewables target will depend on (i) whether a

target is considered necessary to ensure increased shares in renewables post 2020 and thereby contribute to more indigenous energy sources, reduced energy import dependence and jobs and growth; and (ii) if and how this can be achieved without undesirable impacts of renewables support schemes on energy markets and energy prices and public budgets. It must be established whether objectives on renewable energy can be best met with a new headline target with or without sub-targets for sectors such as transport, industry and agriculture, and/or other specific measures. Any target or policy for renewables will have to take into account the growing evidence-base on sustainability, costs, the state of maturity of technologies and its innovation potential.

The EU framework for energy efficiency policy has just been updated through the adoption of the EED and a review will be carried out in 2014 with respect to the 2020 target. Discussions on a 2030 energy savings target must be seen in this context. There are a number of issues to consider. First, energy efficiency, and the resulting energy savings, are acknowledged in the Energy Roadmap 2050 as a "no-regrets" option for the energy system. While evidence on how the current system is performing will not be fully available until 2014 or later, ensuring consistency of a possible energy savings target with any other targets will be essential. Consideration will also have to be given to whether progress on energy efficiency would best be driven by targets for Member States or by sector specific targets.

It will also be necessary to consider if the metric for such a target should continue to be absolute energy consumption levels or whether a relative target related to energy intensity would be more appropriate (e.g. energy consumption relative to GDP or gross value added). While an absolute target might better ensure the overall savings objective, a relative target might better take into account the dynamics of the EU economy and the reality of economic development.

Unlike for GHG emissions reductions and renewables, the current approach to energy efficiency is based on a combination of aspirational targets and binding measures. The need for EU legislation (e.g. ecodesign framework, the EED, the EPBD) under the 2020 framework is linked, at least partially, to the absence of legally binding energy savings targets for Member States. Any legally binding target for energy savings/intensity would need to leave room for manoeuvre for Member States for meeting the target with possibly fewer binding measures at EU level. However, such an approach would have to take into account that much of the EU legislation which contributes to reduced energy consumption also plays a fundamental role in creating the internal market for these products (e.g. the ecodesign framework). If targets remain aspirational, consideration will have to be given to whether current concrete measures are sufficient or whether new measures would be necessary. A key issue will be to what extent energy markets, through the price signal and demand response, will themselves sufficiently incentivise energy efficiency improvements, including behavioural change of consumers, and whether the ETS and its impact on electricity prices will provide incentives for

energy savings also in the absence of specific targets or measures. The relatively low price elasticity of energy demand in many important sectors of the economy and projected future levels as well as the variability of the ETS price will have to be taken into account.

Coherence of policy Instruments

The 2020 targets are implemented through policy instruments at EU level which are closely related to the internal market. Member States have larger room for manoeuvre when implementing EU legislation for renewable energy and energy efficiency, and GHG emissions outside the ETS such as in the road transport sector. This has resulted in different national approaches for renewables support schemes, energy and CO_2 taxation, energy performance standards for buildings and other energy efficiency policies.

A combination of instruments is likely to be needed to address the different policy goals and market barriers. These instruments will interact with one another as described above. Some stakeholders have criticised the lack of overall consistency between policies because of such interactions and have pointed to the need to improve the cost-efficiency of various climate and energy measures, considering technological feasibility. In addition, national measures should not lead to fragmentation of the internal market. A strong accent should be put on investments in infrastructure, in particular in networks, that will deepen EU market integration and ensure sustainability, competitiveness and security of supply.

The 2030 policy framework should, therefore, strike a balance between concrete implementing measures at EU level and Member States' flexibility to meet targets in ways which are most appropriate to national circumstances, while being consistent with the internal market. The current balance of the approach between EU level instruments and Member States targets/national instruments will have to be assessed in more detail, including the impacts of fossil fuels subsidies. As before, the distribution of efforts will need to be considered as well.

Beyond regulatory instruments, the EU also provides significant financial support linked to climate change and sustainable energy, in particular through Cohesion Policy, the EU Research Programmes, and in the future the Connecting Europe Facility. Climate action objectives will represent at least 20% of EU spending in the period 2014-2020 and therefore be reflected in the appropriate instruments to ensure that they contribute to strengthen energy security, building a low-carbon, resource efficient and climate resilient economy that will enhance Europe's competitiveness and create more and greener jobs.

Future access to international credits after 2020 will need to be assessed. The use of international credits can limit costs but they also contribute to uncertainty on what is required domestically, and have contributed to the surplus of allowances in the ETS. Furthermore, EU

industry and governments via the Clean Development Mechanism have subsidised competing sectors especially in emerging economies such as in China, India and Brazil. Shifting away from project-based offsets towards emission trading and other market mechanisms might better incorporate the different capacities of countries to act on climate change and support progress towards developing a more global carbon market with wide international participation.

For sectors like shipping and aviation, the policy efforts also include a coordinated push for globally agreed standards and policies to effectively deliver global emission reductions. As a first step, the Energy Efficiency Design Index agreed at the International Maritime Organization entered into force in 2013 and is expected to slow the increase of GHG emissions from global shipping.

2. Energy policy strategies in Eastern Partnership Countries

2.1. Energy report

In this section, the analysis, related to energy sector and RES in the six Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine, is provided. A number of case studies on identification of significant potential in renewables are presented. The results show that the countries have significant potential in renewables, more specifically in hydro energy, wind energy and solar energy.

2.1.1. Armenia

Key aspects:

- Small and medium-size hydropower plants: over 250 MW of capacity could be added;
- Wind energy potential estimated at 470 MW with an annual generation of 1360 GWh;
- Solar water heaters are the most economical options;
- Established education system supporting renewable energy and energy efficiency;
- Need support mechanism to be based on feed-in tariff support experienced only in case of small HPP area;
- In power sector, the lack of direct access to fossil energy and heavily reliance on imported fuels;
- Biomass is not widely used as an energy source, opportunity in biogas from animal husbandry wastes and from landfill.

Armenia needs to use existing HPPs including the small ones and to construct new major HPPs in other regions of Armenia in order to generate economically justified hydro potential of 3.6 billion kWh per year. The economically justified potential from small HPPs is 800-850 million kWh per year. There are 70 small hydroelectric plants with an installed capacity of 89 MW; in 2009, building licences were issued for 64 plants.

Armenia shows 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, solar energy represents a good potential about 1720 kWh/m2 annually. 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.

In Armenia, the Jermaghbyur region shows the potential for extracting geothermal power. The water temperature is about 250^{o}C at 2500-3000 m and the electric power of approximately 25 MW can be produced. There are other potential geothermal energy sources: Karkar and Gridzor under investigation by the WB/Geofund.

Armenia shows the significant potential in biomass energy by producing forest residues and agricultural residues including crop residues and animal waste which could be used as fuel for biomass combustion or gasification, as well as biogas production through anaerobic digestion.

2.1.2. Azerbaijan

Key aspects:

- Hydro power, accounted for 9.8% of electricity production against only 0.2% for other renewables in 2011, is the most developed alternative energy source;
- Only two wind farms are currently operating in the country and three are under construction;
- Harnessing residues for biomass combustion or gasification, waste products for biogas production from animal manure are a good potential;
- Solar-powered electricity and heat generation processes are promising due to 2 400 – 3 200 hours of sunshine per year;
- The usage of thermal waters for greenhouse heating is promising in some of the regions;
- Alternative energy representing only 2.3% of total energy consumption;
- High potential for geothermal development.

In Azerbaijan, the development of small HPPs is the most promising component in the RES sector; therefore, 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.

Azerbaijan has over 250 days of medium-to-strong wind per year, which may generate 2.4 billion kWh of electricity; therefore the wind energy is the country's preferred option due to lower cost, environmental soundness and unlimited availability. 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.

Azerbaijan produces each year 2 million tons of solid municipal and industrial waste (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. Few small pilot projects have been developed and a large project of €346 million for waste processing and usage of biomass was decided in order to build the biggest waste-to-energy plant in the Eastern Europe and Commonwealth of Independent States (CIS) countries.

In Azerbaijan, no large-scale solar power installation exists and only pilot solar stations are installed (and planned). Due to relatively high costs, adoption of solar energy has so far been slowed; however, Azerbaijan opened its first mass-production solar panel factory in April 2012.

In Azerbaijan, the current usage of geothermal energy is entirely thermal, and there are no geothermal power plants for electricity production. 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 north-west of the country.

2.1.3. Belarus

Key aspects:

- Forest-based biomass resources are available for the energy generation;
- The usage of wind energy is quite a good potential;
- There are over 45 HPPs with a total capacity of 16.1 MW;
- 80 % of the energy consumption is currently imported.

In Belarus, 38% of its territory is covered with forests, 13 million m^3 of wood is harvested annually and half of it is used in biomass applications. The investment in the production of biomass for electricity and heat generation by foreign investors results in the establishment of about 15 enterprises 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. The feasibility study of construction of biogas installations has been launched and financed by the EBRD.

In Belarus, there are 20 wind power stations and the construction of the new WPPs is planned and the total installed capacity of WPPs equals 3.47 MW in 2011.

Belarus has carried out the renovation and rehabilitation of existing and small HPPs and constructed new ones. 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. Additionally, 4 stations for 102 MW are going to be built on river Neman and river Dvina in a few years.

2.1.4. Georgia

Key aspects:

- The achievable annual potential of all RES can be estimated at 10-15 TWh or around one million tons of oil equivalent energy;
- Need state programmes for RES development;

- A huge potential for hydropower production (360 rivers; 32 TWh or 7.27 MWh per capita);
- An upward trend experienced in the annual number of installations dedicated to solar energy;
- The usage of geothermal energy is currently quite limited;
- Net importer of electricity before 2003, currently self-sufficient and became a net exporter of electricity to Turkey, Azerbaijan, Russia and Armenia after 2007.

Georgia has 33 small HPPs and their total capacity is 85 MW. The seasonality of natural hydro flow results in the import of power in winter and in the export in the summer. The share of small HPPs in total hydro capacity is 3.1%, while generation amounts to 5.35%. 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.

Georgia has wind energy potential; about 60% of today's electricity consumption in Georgia can be obtained (estimated achievable potential of 5 TWh).

In Georgia, there are 250-280 sunny days per year in most of regions, which is approximately 6 000 – 6 780 hours per year. Solar energy is 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. 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.

In Georgia, the usage 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. 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.

2.1.5. Moldova

Key aspects:

- Experience in small scale rural biomass applications;
- The potential of biogas production estimated to be 3.7 million m^3;
- The small hydro construction is the greatest potential for hydropower development;
- Estimated potential of wind power equal 1,000 MW;
- The energy intensity is around 3 times higher than in the EU and the use of renewable energy is still limited.

In Moldova, biomass 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. There is not any experience with large scale biomass applications. Time of return on investment is estimated from 4 to 12 years. There is a good potential for biomass to be included in the social infrastructure and energy system development programmes, to develop straw-fired heating systems for 100,000 private houses and, also developing cross-border cooperation, especially with Ukraine.

Moldova estimates the potential of biogas production 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.

In Moldova, there are two medium sized HPPs and six small HPPs in private ownership with a total capacity of 141 kW. The economic potential of hydro power is 200 kW. 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.

2.1.6. Ukraine

Key aspects:

- Wind energy , hydropower, solar energy and biomass are promising resources;
- A good potential for biomass energy from wood and agriculture waste, energy crop;
- Total annual technically achievable potential of RES in Ukraine is amounted to 68.9 Mtoe per year;
- The law on "green" feed-in electricity tariffs on renewable energy has been adopted since 2009;
- The share of renewables in total energy supply is below 2%.

In Ukraine, the annual average solar radiation is in the range from 1 070 kWh/m^2 in the northern part, up to 1 400 kWh/m^2 in the south. The total installed capacity of solar photovoltaic systems in Ukraine at the beginning of 2014 is 748 MW. The generation of electricity by SPPs is estimated 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).

Ukraine has low level of installed capacity due to the fact that until 2009, when the "green" tariff[1] was established, there were no incentives for potential investors. The southern and

[1] 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.

south-eastern regions of the country, where the average wind speed exceeds 6 m/s, are suitable areas for the further wind energy development. The total installed capacity of wind power stations is amounted to 334 MW at the beginning of 2014. The potential for development of wind energy generation is estimated up to 15 GW. 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).

Ukraine has 90 small and micro-hydropower plants with total installed capacity of 75 MW. 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. The production of electricity is estimated 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);
- 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).

In Ukraine, the main components of the biomass 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. 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 is amounted to 17 MW, and biogas stations to 6.5 MW. 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).

Ukraine has considerable geothermal resources that can be used mainly for heat supply. There are also prospects for binary geothermal power plant creation based on existing wells at abandoned oil and gas fields. Currently, thermal water is used for municipal heat supply and in agriculture.

Table 2 Potential of RES per country

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	1 GW	16.1 MW	85 MW	64 MW	75 MW

Potential of RES per country	Armenia	Azerbaijan	Belarus	Georgia	Moldova	Ukraine
	(2012)	(2012)	(2012)		(2010)	(2014)
Wind capacity	470 MW	2 MW (2012)	3.47 MW (2011)	5 TWh	-	334 MW (2014)
Solar energy (annual solar radiation)	1 720 kWh/m^2	1 300 kWh/m^2	-	1 550 kWh/m^2	-	up to 1 400 kWh/m^2

Source: NoGAP: Deliverable 2.1

Table 3 The overview of EaP countries´ needs and interest

Country	EaP countries' needs and interest
Armenia	- Great interest in energy statistics and capacity building, in system of standardization in harmonization with EU and cross-border trade
Azerbaijan	- Interested in developing renewables (wind energy), EU assistance and best practice - Development of Biogas
Belarus	- Interest in turning into green economy
Georgia	- Maximization of the use of renewable sources, diversification of imports
Moldova	- Interest in energy statistics and unbundling
Ukraine	- Development of biomass potential - Emphasis on awareness-rising campaigns to disseminate EU practices in energy savings

Source: DG for External Policies, Policy Department, Workshop: EU- Eastern European Partners Cooperation in Energy Security: Achievements, Barriers and Prospects. EP/EXPO/B/AFET/FWC/2009-01/Lot1/39

2.2. Regulatory policy reforms

Each country is characterized by establishment of legislative basis, institutional framework, ongoing reforms and national energy efficiency programmes that are aimed to improve and strengthen energy sector. A number of countries have established agencies on piloting of renewable energy projects to promote the usage of RES, support successful strategic development of energy policy and ensuring their implementation in a country.

In Armenia, The Law on Energy Savings and Renewable Energy created a legal basis for alternative energy in 2004. The following steps have been already taken by the government for the improvement of the energy sector:

- 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;
- The financial supports 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".[2]

In Azerbaijan, 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.[3]

[2] 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.

[3] http://www.abc.az *„State Agency for Alternative & Renewable Energy in Azerbaijan restored"* [accessed 25.04.2014]

- The establishment of the International Renewable Energy Agency in 2009 as a basis for the successful strategic development of energy policy.
- 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.

In Belarus, three national "Republic programmes for energy savings" were adopted for the periods 1996-2000, 2001-2005 and 2006-2010 and successfully implemented. In December 2010, a new National Programme for 2011-2015 was adopted[4]. The main goal of these programmes lies in the reduction of energy intensity and improvement of energy efficiency on the supply and demand sides. The target is to cover 32% of energy demand in Belarus from renewable sources by 2020. Current programme poses new tasks for energy efficiency and attaches particular importance to the development of renewable energy. The main body which is responsible for implementation of the State Programme of Technical Control, Standardisation and Approval of Energy Efficiency for the period 2011-2015 is the State Committee for Standardisation. The development of state standards for implementation of energy efficiency programmes is considered to be based on the European Union system. Furthermore, multilevel system of education in energy efficiency and energy savings has been established. The law on Tax Relief for Renewable Energy Investors was passed in 2009. Advantages for investors also include Feed-in Tariffs for Electricity Generated from RES (adopted in 2011). The government of Belarus has adopted the thermal rehabilitation and modernization of residential buildings.

In Georgia, reforms were successfully developed and implemented by the Ministry of Energy and Sustainable Development of Georgia. 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.

[4] National Programme of Local and Renewable Energy Sources Development for 2011–2015. Approved by Resolution of Council of Ministers No. 586, 2011.

The Law on Energy and Natural Gas, adopted in 2006, is the primary legislation dedicated to energy sector that has been amended in order to be in line with the European Union model. The government targets the improvement of energy efficiency in industrial and residential sectors, rehabilitation and upgrading of the infrastructure and of the thermal and hydro-power stations.

In Moldova, Action Programme 2011 for the Republic of Moldova was adapted by the European Commission in 2011, 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.[5] 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"*.[6] The first of the above objectives implies, among other things, integration of the country's energy system in the European system. 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.

In Ukraine, the Ministry of Energy and Coal Industry of Ukraine and the State Agency on Energy Efficiency and Energy Savings of Ukraine belong to the main authorities of the regulatory framework. The State Agency on Energy Efficiency and Energy Savings of Ukraine 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. The updated Energy Strategy of Ukraine has been approved until 2030. The authority, that is responsible for licensing, transmission and distribution of energy, development and tariff policy, is the National Commission for Utility Services Regulations of Ukraine set up in 2010. Government focuses on the following priority areas:

- Reduction of energy consumption by 9% and an increase the share of renewables up to 11%;
- Improvement of legislative framework;
- Raising public awareness and promotion of alternative technologies;
- Capacity building for stimulation and monitoring of energy efficiency.

[5] http://www.europa.eu *„European Union allocates new funding to boost energy and justice reform in the Republic of Moldova"* [accessed 25.04.2014] IP/11/879

[6] Energy Strategy of the Republic of Moldova until 2030 (2013). National Agency for Energy Regulation of Moldova.

Table 4 The overview of renewable energy support policies in EaP countries.

Country	A supportive legal and regulatory framework	Policy instruments			
Armenia	- Law on Energy Savings and Renewable Energy (2005)	Feed-in tariffs (HPPs)	Mandatory off – take of the electricity generated 15 years after receipt of an operating license	Exemption from custom duties on equipment	Reduction in Vat for wind energy (3 years)
Azerbaijan	- Law on Use of Energy Resources of Azerbaijan - State Programme on the Use of Alternative and Renewable Energy Sources (2005-2013) - State Agency on Alternative and Renewable Energy (SAARES 2009) - Renewable Energy Strategy (2012-2020) - Experimental Polygon and Training Centre (2011)	Feed-in tariffs			
Belarus	- Law on Energy Savings of Belarus (1998) - Law on Renewable Energy Sources (2010) - National Energy Saving Programme (1996-2000, 2001-2005, 2005-2010) - National Program of Local and Renewable Energy Sources Development (2011-2015) - State Social and Economic Development Programme of Belarus (2011-2015) - Concept of Energy Security (2007) - Programme of Design, Construction, and Refurbish-	Green tariffs Feed-in tariffs	Low land rent and a simplified procedure for lease	Exemption from custom duties on some equipment	Tax relief for RE investors

Country	A supportive legal and regulatory framework	Policy instruments			
	ment of Energy Efficiency Resident Buildings (2009-2020) - Programme of Technical Control, Standardisation and Approval of Energy Efficiency (2011-2015) - Mitigation of Climate Change Aftermath (2013-2020)				
Georgia	- Law on Energy and Natural gas (2006) - Program "Renewable Energy 2008" (list of HPPs to be built under Build –Own-Operate model) - international agreements: Energy Charter Treaty, PEEREA1 - Framework Convention on Climate Change, Clean Development Mechanism under Kyoto Protocol, EC "Green Paper"	Elimination of tariffs	Grid connection fees and export license requirements for new HPPs	No license requirements for HPPs of less than 13MW	Guaranteed purchase for 3 winter months
Moldova	- Energy Strategy until 2020 (2007) - National Program on Ensuring Environmental Security (2007-2015) - Law Renewable Energy (2007) - Law on Energy Efficiency (2010) - National Energy Efficiency Programme (2011-2020) - Energy Efficiency Agency - National Programme of En-	Feed-in tariffs established for a 15-year period			

Country	A supportive legal and regulatory framework	Policy instruments			
	ergy Conservation (2003-2010)				
Ukraine	- Energy Strategy until 2030 (2006) - National Environmental Policy until 2020 (2010) - State Agency for Energy Saving and Energy Efficiency - Treaty Establishing the Energy Community (2010) - Programme of Economic Reforms (2010-2014) - Law on Energy Savings (1994) - Law on Electricity Industry(1997) - Law on Alternative Energy Sources (2003) - Law on Heat Supply (2005) - Law on Combined Production of Heat and Electricity and Waste Energy Potential (2005) - Law on Coalbed methane (2009)	Green tariffs	Tax exemptions for: enterprises generating electricity from RES, biofuel producers and coal bed methane extractors (until 2020), the sale of energy –saving equipment of own production (80% of the income), the implementation of energy –saving projects (on 50% of the income)	Exemption from custom duties and VAT on equipment imported	

Source: *http://www.east-invest.eu/*
Notes*: [1]PEEREA-Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects*

2.3. Financial support schemes

The development and successful implementation of projects and programmes related to renewable energy rely on financial support mechanism and funding. In all cases, co-operation with European Union, international financial institutions, organizations, and funds is the first step towards implementation of energy efficiency policies. The promotion of se-cure clean and efficient energy, implementation of energy efficiency policies and achieve-ment of renewable energy objectives in EaP countries is provided through regional loans or credit lines to local banks accompanied by grants or subsidies and/ or technical assistance.

In Armenia, several projects and foreign investments have already been implemented and have contributed to the growing economic development with the investment made by EBRD, World Bank (WB) and USAID. Modernization of some of the HPP units and of the greater part of the 220 kV transmission network sub-stations was supported by *German* and *World Bank loan resources*. The speed regulators at some HPPs were replaced with *EU TACIS assistance*. The gas metering node has been built by the *EU INOGATE project*. 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). Considerable investment into retrofitting and reduction of energy consumption in schools, kindergartens, hospitals, public buildings and streetlights are planned under the Global Environment Facility Trust Fund.

In Azerbaijan, the main financial support comes from *SAARES* which was established within the Ministry of Energy. In addition, external financing significantly contribute to the devel-opment 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, negoti-ated 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 sol-id waste per year, the plant is considered to be the largest in the Eastern Europe.[7] *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 ser-vice network.[8] 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 2011, SAARES in cooperation with the

[7] Azerbaijan: Alternative and Renewable Energy – A business Perspective (2013). Open for Business Series. Caspian Infor-mation Centre.

[8] http://www.abc.az *„IIAN Tech Co presents a project of hybrid solar power plant in Azerbaijan"* [accessed 22.04.2014]

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*.[9] 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.[10]*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.[11] Other notable external investors in alternative energy projects in Azerbaijan have been involved.

In Belarus, 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[12] 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 savings 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%, sector 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%.[13] 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*.
- Other CIS and Eastern Europe countries in the international project "Financing Energy Efficiency and RES Investments for Climate Change Mitigation" implemented under the Energy Efficiency 21 Programme[14], which is aimed at improving energy efficiency, developing respective infrastructure and using the energy saving potential in member countries.

[9] http://www.thebusinessyear.com *„Azerbaijan: On the Rise*" [accessed 22.04.2014]
[10] http://www.news.az *„President stresses importance of modern technology"* [accessed 22.04.2014]
[11] Caspian Technology Company (2009). *Renewable Energy: International Best-Practice and Prospects for the Development in Azerbaijan*.
[12] Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus, 2012.
[13] In-Depth Review of the Energy Efficiency Policy of the Republic of Belarus (2013). Energy Charter Secretariat. ISBN 978-905948-119-0.
[14] http://www.ee-21.net [accessed 22.04.2014]

In 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. Winrock International and Advanced Engineering Association International (AEAI) are sponsored by USAID and implements projects in the field of energy efficiency and renewable energy. *Winrock International* in cooperation with *PA Consulting* and some of Georgian NGOs implemented energy programme called Georgia Rural Energy Program[15]. This is a four-year, $12.7 million programme focusing on small hydro power rehabilitation and construction. AEAI provides energy education and training programmes. Furthermore, various international institutions are playing the leading role in the development of energy sector in Georgia, mostly with regards 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.
- *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.

In Moldova, financing of energy sector 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)[16];
- *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).

In Ukraine, direct support of budget programmes for energy efficiency (through State Agency on Energy Efficiency and Energy Saving of Ukraine) has been made by *EU funds*. 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. Energy efficiency and renewable energy projects funded through *UkrESCO*, Energy Alliance and Ukraine Energy Efficiency Programme (UKEEP)[17]. 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

[15] http://www.eecgeo.org *„Rural Energy Program"* [accessed 22.04.2014]
[16] http://www.moseff.org
[17] http://www.ukeep.org

energy efficiency and renewable energy projects in Ukraine. Project "Transforming the Market for promoting efficient lighting"[18] , funded by *UNDP*, is aimed at new efficient technologies in lighting and phasing out of inefficient lighting products in residential and public buildings and . Total funding of the project is $31 million during 2010 - 2015. *UNIDO* 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". With support of *USAID,* Municipal heating reform projects (MHRP) have been implemented. Currently, USAID contributes to 36 municipalities across Ukraine under the MHRP, with the funding of $16 million.

Table 5 Overview of financial support mechanism of renewable energy in EaP countries.

Country	Financial support mechanism			
	EBRD	**USAID**	**World Bank**	**Other**
Armenia	- through local banks: RE projects -through the local Cascade Credit loan company: 22 mini- and micro hydro-power projects	- SCADA system	- Energy Efficiency project (2012-2015) -Urban Heating Project	- Global Environment Facility Trust Fund

[18] http://www.ua.undp.org

Country	Financial support mechanism			
	EBRD	**USAID**	**World Bank**	**Other**
Azerbaijan	- AGT[7] Projects on modernization and upgrading of existing thermal power stations	- AGT Power bridge project (2009) also supported by US Energy Association		- MCCF[5]established by EBRD and EIB - ERSP funded by EU - SAARES in partnership with Norsk Energy (Norway): " Sustainable buildings in Azerbaijan: technical Assistance and Capacity Building - SAARES with the Black Sea Economic Cooperation Hellenic Development Fund: supply of energy efficient equipment - IFC[6]: loan to finance RE in SMEs - European Investment Bank
Belarus	-BELSEFF[8]: improvement and implementation of energy policies		- Additional Financing Belarus Energy Efficiency project (2013) - Energy Efficiency Programme (2009-2016) - Prevention of Climate Change (2002-2008) - Modernization of Infrastructure (2002-2008), (2008-2010) - Chernobyl loan	- UNDP: improve energy efficiency in residential sector (2011-2015); develop wind energy potential (2011-2015)

Country	Financial support mechanism			
	EBRD	**USAID**	**World Bank**	**Other**
Georgia	- through Bank of Georgia: energy efficiency projects and energy efficiency expertise among banks, companies, household	-project NATELI[2] (2009) - sponsored Winrock International: RE projects - sponsored AEAI[3]- energy capacity project for enhancement of energy policy and promoted stakeholder dialogues on policy issues (2008-2011), energy education and training programmes - Clean Energy for internally displaced people project		- EEC[1] with support of Norwegian Ministry of Foreign Affairs (Greenfield hydropower projects) - GEF/UNDP/KwF: "Promoting the Use of Renewable Energy Resources for Local Energy Supply (2012) - KwF via Renewable Energy Fund in Georgia: CDM[4] - IBRD: "CDM- Small Hydro Rehabilitation project" of EEC
Moldova	- MoSEFF[10] - with ESIB: residential and property businesses in field of energy efficiency standards		- support to rehabilitation of the infrastructure in the energy sector	
Ukraine	-UKEEP[9]	- Municipal heating reform projects		- National project "Energy of Nature" - National project "Biomass energy" - International Finance Corporation: residential energy efficiency project

Source: *EXPO/B/AFET/FWC/2009-01/Lot1/48. 2013. Eastern Partnership Prospects on Energy Efficiency and Renewable Energy*

Notes: *[1]EEC- the non-government Energy Efficiency Centre of Georgia; [2] NATELI- New Applied technology Efficiency and Lighting Initiative;* [3]AEAI-Advanced Engineering Association International; [4]CDM- Clean Development Mechanism programme; [5]MCCF- Multilateral Carbon Credit Fund; [6]IFC- International Finance Corporation; [7]AGT- Azerbaijan-Georgia-Turkey; [8]BelSEFF- Sustainable Energy Financial Facility for Belarus; [9]UKEEP-Ukraine Energy Efficiency Programme; [10]MoSEFF- Sustainable Energy financial Facility of Moldova;

3. Identification of major barriers in the field of energy efficiency and RES in Eastern Partnership Countries

The efforts of the governments are aimed to promote more efficient energy use, to transfer to low-carbon economy with a use and support of RES, to ensure secure energy supply and cost-effective technology solutions in a sustainable way. Several factors play a significant role in case of successful implementation of energy efficiency policies and programmes. Therefore, if the fundamental barriers to RE exist and are not targeted and removed or overcome, the progress in field of secure, clean and efficient energy and RE support becomes difficult to obtain. In all eastern Partnership countries, a more favourable regulatory environment with transparent and stable legal framework is needed for the long-scale development of RES. In most countries, support policy options for renewable energy are incomplete and the most common support instruments are not provided, such as: feed-in tariff, net metering, rebate programmes, renewable portfolio standards, tradable renewable energy certificates (REC), etc. Absence of efficient cooperation and complex administrative procedures between different institutions is also one of the major issues in some countries. Additionally, there is lack of system solutions in attracting investment in energy efficiency and renewable energy projects. Furthermore, funding of renewable energy development projects is provided mostly by external financial support in some countries. Therefore, establishment of innovative finance mechanism and monitoring mechanism for energy efficiency and RE projects is needed to remove barriers. In EaP countries, investment in development of infrastructure for the connection of renewables to grid is one of the priority issues to be solved. Low level of energy efficient technologies, equipment and lack of advanced technologies hinder the achievement of energy efficiency goals in some countries. Poor investment climate results in low volume of foreign investment and week involvement of SMEs in the energy sector in most EaP countries. In some countries, the banking sectors is reticent to support energy projects and grant lending operations or RE projects from funding institutions are limited to only large-scale projects. Some countries are forced to face a lack of relevant technical standards and insufficient scientific base in case of implementation of projects dedicated to RES. Along with this; countries lack skills and knowledge to prepare fundable energy efficiency projects. Energy management system is weak or not applied.

Table 6 The major barriers to energy efficiency policies in EaP countries

Country	Regulatory barriers
Armenia	- Bureaucratic permitting procedures for land and water use, - The Renewable Energy Roadmap, developed in 2011, does not yield legislative measures despite of a number of recommendations, - Feed-in tariff support so far only in the small HPP area - Insufficient monetary incentives
Azerbaijan	- Purchase of all produced energy is not yet guaranteed, - Feed-in tariff is set at low level for independent power producers, - RE technology projects remain more expensive to install and operate, - Funding institutions tends to be limited to only large-scale projects - Financing terms are unfavorable - Feed-in' tariffs exists only for wind generation as is too low to attract investment to the sector
Belarus	- Failure to educate energy users about energy saving measures - Insufficient domestic funding and experience in the implementation of RE projects - Insufficiently developed scientific and technical base - Fear of foreign investors caused by the negative image of Belarus and poor knowledge of the market
Georgia	- No relevant technical standards and operational procedures
Moldova	- All energy efficiency and renewable energy projects have been done by state institutions - Lack of public tendering - Weak competitive environment for private companies - No national or municipal funds for development of energy efficiency projects - High interest rates on bank loans
Ukraine	- Energy Strategy is not connected to other spheres in the country's economy - Lack of economic strategy and strategic planning in general - Failure in full implementation of the strategy

Source: http://www.reegle.info/policy-and-regulatory-overviews/AM

4. Identification and exploitation of possibilities regarding the potential relevant instruments and calls for cooperation

Cooperation among countries is considered as an opportunity for reaching national RES targets in a cost-efficient way. It could be based on exchanging best practices or information. The following suggestions for the cooperation mechanism are based on the RSE Directive[19].

Joint projects

For RES-E only and under strict conditions, member states may also co-operate with third countries. As in the member states joint projects, private operators may be involved.

The RES-E produced in third countries may be taken into consideration for reaching the national RES targets if:

- It is physically transported to and consumed within the EU territory;
- The RES-E has been produced by a new installation or a newly refurbished one (i.e. post June 2009);
- The exported RES-E did not benefit from a support scheme.

In the context of the construction of an interconnector with a long lead time and under strict conditions, RES-E produced and consumed in a third country may count for reaching the RES national target of member states.

As above, the EU Commission must be notified of agreements between member states and third countries.[20]

Joint support schemes

Two or more member states may decide on joint or partly coordinated support schemes. Member states may thus choose to harmonise their support schemes and for example recognise, where they exist, certificates issued in other member states. This mechanism applies to both RES-E and RES-H and must be notified to the EU Commission. [21]

Statistical transfers

Statistical transfers between member states are only possible where they do not affect the achievement of the RES national target of the member state which makes the transfer. It is a

[19] Directive 2009/28/EC on the promotion of the use of energy from renewable sources (hereafter the RES Directive)

[20] Art. 9 & 10, Directive 2009/28/EC

[21] Art. 11, Directive 2009/28/EC

bilateral agreement covering RES-E, RES-H and/or RES-T of a duration of one year or more, to be notified to the Commission (Y+3 months) with the quantity and the price of the energy involved.[22]

Another opportunity in the field of energy efficiency, that could also strengthen cooperation among countries include:

Transfer centres for renewable resources with the following aims:
- To support exchange of information, training and development of pilot projects
- To encourage knowledge management, technological innovations
- To provide cutting edge analysis on costs and benefits of renewable energy, political recommendations
- To bring together and integrate public, stakeholders and training centers, research laboratories

Horizon 2020

According to the European Commission proposal for "Horizon 2020" the societal challenge: *Secure, Clean and Efficient Energy* will encompass the following broad lines of activities:

- Reducing energy consumption and carbon footprint by smart and sustainable use;
- Low-cost, low-carbon electricity supply;
- Alternative fuels and mobile energy sources;
- A single, smart European electricity grid;
- New knowledge and technologies;
- Robust decision making and public engagement;
- Market uptake of energy innovation

In the HORIZON 2020 Strategic Programme for the 2014-2016 Work Programme three focal areas are defined for the energy challenge:

1. Energy efficiency (buildings and industry) (EE)
2. Competitive low carbon energy (renewable technologies, smart grid, storage, fossil fuels) (LCE)
3. Smart cities and communities (Integration of transport, energy and ICT aspects)

[22] Art. 6, Directive 2009/28/EC

4.1 Open calls for cooperation

This section displays currently open calls, defined by the European Commission proposal for "Horizon 2020" in the field of renewable energy, innovation and technology transfer, available for the application.

CALL FOR COMPETITIVE LOW-CARBON ENERGY (H2020-LCE-2015-1)

Publication date	2013-12-11
Budget	€ 94,000,000
Deadline	2014-09-03 +17:00:00 (Brussels local time)
Stage 2	2015-03-03 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Developing the next generation technologies of renewable electricity and heating / cooling (LCE-02-2015)

Scope: Proposals should address one or more of the technology-specific challenges (Developing very low-cost PV cells and modules, Improving the environmental profile of the CSP technology**,** Ocean energy, Substantially reduce the costs of wind energy, Increasing flexibility of hydropower, Development of new technologies and concepts for geothermal energy, Solar heating for industrial processes, Improving efficiency of low emission biomass CHP systems while widening the feedstock base) including between renewables areas, where new, innovative ideas are welcome. They should bring technology solutions to a higher TRL, from TRL 3-4 to 4-5. Technical issues, synergies between technologies, regional approaches, socio-economic and environmental aspects from a life-cycle perspective (including public acceptance, business cases, pre-normative and legal issues, pollution and recycling) need to be appropriately addressed where relevant. Environment, health and safety issues shall be considered in all developments and appropriately addressed. An important element for the entire area of renewables will be the need for an increased understanding of risks in each area (whether technological, in business processes, for particular business cases, or otherwise), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter. Proposals shall explicitly address performance and cost targets together with relevant key performance indicators, expected impacts, as well as provide for development of explicit exploitation plans. Proposals should also indicate the current Manufacturing Readiness Level and the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal to ensure the potential for exploitation.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 6 million would allow this specific challenge to be addressed appropriately.

Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Technological innovation related to the integration of renewable generation in the industrial and residential sectors can be addressed in the Energy Efficiency call or Smart Cities and Communities call. Improving the energy efficiency of district heating and cooling networks is addressed in the Energy Efficiency call.

Expected impact: The proposals are expected to have one or more of the general impacts listed below:

- Significantly increased technology performance.
- Reducing life-cycle environmental impact.
- Improving EU energy security.
- Making variable renewable electricity generation more predictable and grid friendly, thereby allowing larger amounts of variable output renewable sources in the grid.
- Increasing the attractiveness of renewable heating and cooling technologies by improving cost-competitiveness, reducing complexity and increasing reliability.
- Bringing cohesion, coherence and strategy in the development of new renewable energy technologies.
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities.
- Strengthening the European industrial technology base, thereby creating growth and jobs in Europe.
- Reducing renewable energy technologies installation time and costs.
- Increasing the reliability and lifetime while decreasing operation and maintenance costs.
- Contributing to solving the global climate and energy challenges.

Type of action: Research & Innovation Actions[23]

Topic: Developing the next generation technologies for biofuels and sustainable alternative fuels (LCE-11-2015)

Specific challenge: Europe has limited biomass and land resources to cope with an increased demand for fuels and other uses. Thus, in the long-term perspective, new technologies of sustainable biofuels and alternative fuels need to be developed that radically improve the state-of-art, notably in regards to the following sub-challenges:

a) Improving conversion efficiency and/or enlargement of the biomass feedstock basis.

b) Developing alternative fuels through use of new and sustainable resources from non-biomass non-fossil sources.

[23] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1138-lce-02-2015.html

c) Improving the economic, environmental and social benefits relative to fossil fuels and currently available biofuels, notably regarding cost reduction, minimisation of demand on natural resources (land and water in particular), enhanced energy balance, reduced GHG emissions (including carbon stock changes) and development of rural areas.

Scope: Proposals focusing on the long-term perspective should aim at developing the next wave of alternative and sustainable fuels by moving technologies from TRL 3-4 or to TRL 4-5. In each case, they should address the c) sub-challenge described above.

Environment, health and safety issues, regional and social dimension, shall be considered in all developments and appropriately addressed. An assessment of alternative uses of the used feedstocks outside the bioenergy sector should also be done.

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

An important element will be an increased understanding of risks (whether technological, in business processes, for particular business cases, or otherwise in each area), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter.

Proposals shall explicitly address performance and cost targets together with relevant performance indicators, expected impacts, as well as provide explicit exploitation plans. Proposals should also indicate the current Manufacturing Readiness Level (MRL) and the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal to ensure the potential for exploitation.

Opening the project's test sites and pilot facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 6 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The new developed technology pathways should permit the use of new feedstock sources that do not compete directly or indirectly with food or feed production for resources, or a more efficient conversion of the current ones. A favourable energy balance is expected, as well as a significant potential for cost reduction, which would permit these fuels to eventually compete favourably with fossil or older-generation equivalent fuels. The development of new technologies will permit robust and reliable assessment of the environmental and social benefits with respect to current technologies, notably in terms of GHG performance, energy balance, efficient use of natural resources, decentralised energy production, and job creation in rural areas, as well as secure and affordable energy supply in Europe or worldwide.

Type of action: Research & Innovation Actions[24]

[24] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1139-lce-11-2015.htm

CALL FOR COMPETITIVE LOW-CARBON ENERGY (H2020-LCE-2014-2)

Publication date	2013-12-11
Budget	€ 86,500,000
Deadline	2014-09-10 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Demonstration of renewable electricity and heating/ cooling technologies (LCE-03-2014)

Specific challenge: Complementing the global challenges outlined above, the following technology-specific challenges have to be addressed in 2014:

1. Photovoltaic: *Accelerating the development of the EU Inorganic Thin-Film (TF) industry* – Inorganic TF technologies offer new application possibilities and additional benefits, such as flexibility, low weight, partial transparency, better low-irradiance performance, short energy pay-back time, and integrated manufacturing. To fully benefit from these, however, TF technologies need to achieve module efficiencies higher than 12-16% (depending on the technology) while developing low-cost, high-volume manufacturing routes.
2. Concentrated Solar Power (CSP): *Improving the flexibility and predictability of CSP generation* – The major asset of the CSP technology is to be able to produce predictable power, which provides the flexibility to adapt the demand from the grid. Only a few CSP technologies allowing this predictability have reached commercial maturity. The challenge is to demonstrate solutions that can significantly improve the dispatchability of CSP plants.
3. Wind energy: *Demonstrating and testing of new nacelle and rotor prototypes* - There is a need for demonstration and testing of new nacelle and rotor prototypes with a significant lower mass and material intensity and applicable to several types of large-scale wind turbines.
4. Ocean energy: *Demonstration of ocean energy technologies* - Demonstrate advance full scale devices in real world conditions in order to gain further understanding and certainty over installation, operations and decommissioning costs, as well as of high levels of reliability and survivability.
5. Renewable Heating and Cooling: *Shallow geothermal energy: Improved vertical borehole drilling technologies to enhance safety and reduce costs* – Shallow geothermal energy systems are ideally suited to meet the ambitious energy saving targets of the EU. They can provide heating and/or cooling or both. Further improvement of the efficiency of shallow geo-

thermal systems and reduction of installation costs are needed to increase deployment of these geothermal systems for the heating & cooling market.

Scope: The proposals should address one or more of the specific technology challenges described above bringing the proposed technology solutions to a higher TRL level, aiming at "demonstration" of these solutions, accompanied, where appropriate, by supporting research activities and activities targeting market uptake. The proposals should bring the proposed technology solutions from TRL 5-6 to TRL 6-7.

Technical issues, synergies between technologies, regional approaches, socio-economic and environmental aspects from a life-cycle perspective (including public acceptance, business cases, pre-normative and legal issues, pollution and recycling) need to be appropriately addressed where relevant.

Environment, health and safety issues should be considered in all demonstrations and appropriately addressed.

An important element for the entire area of renewables will be the need for an increased understanding of risks in each area (whether technological, in business processes, for particular business cases, or otherwise), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter.

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators and expected impacts. Industrial involvement in the consortia and explicit exploitation plans are a prerequisite. All proposals will have to include a work package on 'the business case' of the technology solution being addressed. This work package has to demonstrate the business case of the technology solution and has to identify potential issues of public acceptance, market and regulatory barriers including standardisation needs, financing and other supply-side issues of relevance. It should also address, where appropriate, synergies between technologies (including those for storage), regional approaches and other socio-economic and environmental aspects from a life-cycle perspective (e.g. pollution and recycling). The current Manufacturing Readiness Level (MRL) and the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal should also be indicated to ensure the potential for exploitation.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Technological innovation related to the integration of renewable generation in the industrial and residential sectors can be addressed in the Energy Efficiency call or Smart Cities and Communities call. Improving the energy efficiency of district heating and cooling networks is addressed in the Energy Efficiency call.

Expected impact: The proposals are expected to have one or more of the general impacts listed below:

- Bringing costs of renewable energy down by increasing technology performance, decreasing costs of production, installation time and costs, decreasing of operation and maintenance costs, and increasing reliability and lifetime.
- Reducing life-cycle environmental impact.
- Improving EU energy security.
- Making variable renewable electricity generation more predictable and grid friendly, thereby allowing larger amounts of variable output renewable sources in the grid.
- Increasing the attractiveness of renewable heating and cooling technologies by improving cost-competitiveness, reducing complexity and increasing reliability.
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities.
- Strengthening the European industrial technology base, thereby creating growth and jobs in Europe.
- Contributing to solving the global climate and energy challenges.

Type of action: Innovation Actions[25]

Topic: The human factor in the energy system (LCE-20-2014)

Specific challenge: *To better understand the human factor:* Managing the transition to a more sustainable energy system is a challenging task, going beyond mere technological aspects. Consumer's and other actor's awareness, attitudes, risk perception, consumption behaviour and investment decisions have a strong influence on the development of our energy system and are a crucial factor in the dissemination of energy relevant technologies, but are on the other hand shaped by the social environment. We need to explore the factors triggering the behaviour of the different stakeholders, including consumers, policy makers, industrial strategists, regulators, technology developers, investors, etc. This includes the question, whether gender aspects play a significant role in the development of the energy system. Furthermore we need to develop appropriate means to facilitate and actively stimulate the public engagement in transforming our energy system and to foster the dialogue with the public on this matter.
Developing the skills needed: The ambitious goals of the SET-Plan require the mobilisation of appropriate resources. This applies in particular to the availability of skilled workforce. As recommended by the SET-Plan Education and Training Roadmap we need to foster European cooperation in this area by building European networks, both in the university based education sector and in the vocational education and training sector, establishing close links to business and research.

[25] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1127-lce-03-2014.html#tab1

Scope: Proposals should cover one or several of the following aspects:
- Awareness, perceptions, behaviour and attitudes to energy relevant technologies (including nuclear) and to transition pathways to a low carbon economy of actors in the energy system, including perception of risks and benefits. Analysis of the role and the significance of gender aspects related to energy and its consequences for the development of an efficient and reliable low carbon energy system.
- Public engagement in the transformation process to a more efficient, low carbon energy system. Development of measures, methods and tools to launch and stimulate a dialogue with the public on energy policy and energy innovation on European level.
- Development and support of a) vocational education and training networks in domains with potential shortages/domains needing new or upgrade of existing competences or b) networks linking relevant actors in the field of energy related education and training such as universities, other research institutions, business etc. to address knowledge, skills and competences needs and gaps. Both types of networks need to be in line with the scope described in the SET-Plan Education and Training Roadmap and need to involve the relevant stakeholders along the technology value chain (appropriate instrument: Coordination and Support Action).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Support to the implementation of the SET-Plan by better understanding the complex links, interdependencies and interactions of the various actors in the energy system, their motivation, attitudes and perceptions. Development of options and strategies to address these factors with a view to facilitate and support the transition towards a sustainable energy system.

Development of strategies and measures to enhance public engagement in this transformation process and to establish a structured dialogue with the public on this matter including Europeanization of existing national energy dialogues.

Support the provision of appropriately skilled workforce to implement the SET-Plan by identification of needs and gaps, and by improving and accelerating the existing education and training activities in the vocational and in the university sector.

Type of action: Research & Innovation Actions, Coordination and Support Actions[26]

[26] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1130-lce-20-2014.html

CALL FOR COMPETITIVE LOW-CARBON ENERGY (H2020-LCE-2015-2)

Publication date	2013-12-11
Budget	€ 93,000,000
Deadline	2015-03-03 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Demonstration of renewable electricity and heating/ cooling technologies (LCE-03-2015)

Scope: The proposals should address one or more of the specific technology challenges *(P*V integrated in the built environment, Demonstrating innovative substructure and floating concepts, Demonstration of ocean energy technologies, Testing of enhanced geothermal systems in different geological environments, Demonstration of solar technologies for residential and non-residential buildings) bringing the proposed technology solutions to a higher TRL level, aiming at "demonstration" of these solutions, accompanied, where appropriate, by supporting research activities and activities targeting market uptake. The proposals should bring the proposed technology solutions from TRL 5-6 to TRL 6-7. Technical issues, synergies between technologies, regional approaches, socio-economic and environmental aspects from a life-cycle perspective (including public acceptance, business cases, pre-normative and legal issues, pollution and recycling) need to be appropriately addressed where relevant. Environment, health and safety issues should be considered in all demonstrations and appropriately addressed.

An important element for the entire area of renewables will be the need for an increased understanding of risks in each area (whether technological, in business processes, for particular business cases, or otherwise), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter.

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators and expected impacts. Industrial involvement in the consortia and explicit exploitation plans are a prerequisite. All proposals will have to include a work package on 'the business case' of the technology solution being addressed. This work package has to demonstrate the business case of the technology solution and has to identify potential issues of public acceptance, market and regulatory barriers including standardisation needs, financing and other supply-side issues of relevance. It should also address, where appropriate, synergies between technologies (including those for storage), regional approaches and other socio-economic and environmental aspects from a life-cycle perspective (e.g. pollution and recycling). The current Manufacturing Readiness Level (MRL) and

the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal should also be indicated to ensure the potential for exploitation.
Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.
The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
Technological innovation related to the integration of renewable generation in the industrial and residential sectors can be addressed in the Energy Efficiency call or Smart Cities and Communities call. Improving the energy efficiency of district heating and cooling networks is addressed in the Energy Efficiency call.
Expected impact: The proposals are expected to have one or more of the general impacts listed below:
- Bringing costs of renewable energy down by increasing technology performance, decreasing costs of production, installation time and costs, decreasing of operation and maintenance costs, and increasing reliability and lifetime.
- Reducing life-cycle environmental impact.
- Improving EU energy security.
- Making variable renewable electricity generation more predictable and grid friendly, thereby allowing larger amounts of variable output renewable sources in the grid.
- Increasing the attractiveness of renewable heating and cooling technologies by improving cost-competitiveness, reducing complexity and increasing reliability.
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities.
- Strengthening the European industrial technology base, thereby creating growth and jobs in Europe.
- Contributing to solving the global climate and energy challenges.
Type of action*:* Innovation Action[27]

Topic: Modelling and analysing the energy system, its transformation and impacts (LCE-21-2015)

Specific challenge: In order to ensure efficient follow up of the integrated roadmap, following the Communication on Energy Technologies and Innovation, the complex links, interactions and interdependencies between the different actors, the available technologies and the impact of the different interventions on all levels from the individual to the whole energy system need to be better understood. Furthermore, due to the central role of energy

[27] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1142-lce-03-2015.html

for our societies, the choice of a particular portfolio of energy technologies has far reaching impacts not only on the energy system, but also on the environment, the economy and the society. It is necessary to provide model based decision support tools for the different actors in the energy system in order to facilitate handling the complex system.
Scope: Proposals should cover one or several of the following aspects:
- Comparative assessment of the impacts and the sustainability performance of all relevant energy technologies, including renewable, fossil, and nuclear technologies. Comparative assessment of transformation paths towards a sustainable energy system and the related impacts on environment, society and economy.
- Analysing and modelling the impacts of technological development and innovation on the energy-system and its dynamics. Analysing and modelling of technology policy measures in the framework of the SET-Plan to promote the transition towards a sustainable energy system, assessment of the impact of these measures on society, environment and economy, including safety and access to clean, reliable and affordable energy.
Where appropriate this will include development of new or refinement of existing modelling tools.
The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
Expected impact: Support to the scientific underpinning for the implementation of the SET-Plan by strengthening the knowledge base for decision-making concerning feasibility, effectiveness, costs and impacts of related measures and options. The results should assist policy makers in identifying and analysing effective strategies for a transition to an efficient low carbon energy system.
Type of action: Research & Innovation Actions[28]

Topic: Demonstrating advanced biofuel technologies (LCE-12-2015)
Specific challenge*:* In the short-term and medium-term perspective, due to different issues (such as the limited distribution infrastructure of the electrification option, or the unsuitability of such option for certain transport modes), biofuels are expected to be increasing contributors to the de-carbonisation of the transport sector. In order to achieve the EU targets regarding renewable energy in transport and CO2 abatement (set out in the RES and Fuel Quality Directives), and to address concerns regarding indirect and direct environmental impacts of biofuels, new and advanced biofuels using sustainable feedstock need to reach the market. To this end, the following sub-challenges should be addressed:

[28] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1145-lce-21-2015.html

- Proving that advanced biofuels and bioenergy carriers technologies, as identified in the Implementation Plan of the European Industrial Bioenergy Initiative (EIBI), are technically viable, environmentally and socially sustainable, and potentially cost-competitive at commercial scale.
- Developing logistic systems for a sound, safe and sustainable feedstock supply.

Scope: Proposals should address the medium-term challenges for market penetration of advanced biofuels as presented above. In each case, they should address one of the respective sub-challenges, or a combination of them. They should bring technology solutions to a higher TRL level (please see part G of the General Annexes), in line with the Implementation Plan of the European Industrial Bioenergy Initiative (EIBI)[2]. Proposals shall aim at moving technologies that reached already TRL 5-6 to TRL 6-7 through industrial demonstration projects[3].

Environment, health and safety issues in the whole life cycle should be considered in all demonstrations and appropriately addressed. An assessment of alternative uses of the used feedstocks outside the bioenergy sector should also be done.

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

An important element for the entire area of renewables will be an increased understanding of risks (whether technological, in business processes, for particular business cases, or otherwise in each area), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter.

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators and the expected impacts. Industrial involvement in the consortium and explicit exploitation plans are a prerequisite.

All proposals have to include a work package on the business case of the technology solution being addressed. This work package has to demonstrate the business case of the technology and identify potential issues of public acceptance, market and regulatory barriers, including standardisation needs. It should also address, where appropriate, synergies between new and existing technologies, regional approaches and other socio-economic and environmental aspects from a life-cycle perspective.

The current Manufacturing Readiness Level (MRL, see Annex to this work programme) and the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal should also be indicated to ensure the potential for exploitation.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Testing advanced biofuel technologies at large industrial scale reduces the technological risks, paving the way for subsequent first-of-a-kind, commercial-scale

industrial demonstration projects. For this purpose, the scale of the proposals should permit obtaining the data and experience required so that a first-of-a-kind, commercial-scale industrial demonstration project can be envisaged as a next step. The industrial concepts demonstrated should have the potential for a significant social and economic impact, notably in terms of job creation, economic growth and safe and affordable energy supply in Europe and beyond.
Type of action: Innovation Actions[29]

Topic: Supporting coordination of national R&D activities (LCE-19-2015)

Specific challenge: Without a technological shift in our current energy system, the EU will fail on its 2050 ambitions to largely decarbonise the energy and transport sectors. The EU needs to accelerate innovation in cutting edge low carbon technologies and innovative solutions, and bridge the gap between research and the market. A European approach is essential to realise the ambition of seeing low carbon technologies effectively developed in view of bringing them to the market: it allows key players to come together on a continental scale; it helps to identify and to tackle the barriers holding back innovative products and services in the single market; and it allows different sources of private and public funding to be brought together. Today, EU funding remains a limited part of the overall funding across Europe. Implementation needs to be increasingly based on partnerships that build the necessary scale and scope, and achieve greater impact from scarce public and private resources. The challenge is to drive synchronisation of funding processes by fostering cross-border cooperation among partners supported by national projects and programmes.
Scope: As a pilot case, the scope will be on the areas and challenges targeted in this 'Competitive low-carbon energy' call. Research and Innovation activities in the proposals should focus on bringing technology solutions from TRL 3 to TRL 5. Activities should focus on supporting either:
- The transfer of knowledge among participants and other dissemination activities, activities to foster the use of research outcomes by industry of a project resulting from synchronised funding processes of at least three Member States, or
- The coordination of call for proposals of at least three Member States, for instance, through support to networking activities of public funding bodies, leading to the promotion of the use of single peer-reviewed evaluations, development and use of harmonised monitoring and review methodologies, support to the preparation of high risk, high cost large scale pilots for joint actions with or without EC funding, linking national research programmes and other funding mechanisms and building partnerships with the necessary scale and scope etc.

[29] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1143-lce-12-2015.html

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.1 to 0.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact:

- Reinforcing the European dimension of multinational projects resulting from synchronised funding processes of at least three Member States,
- Increasing coordination and alignment of national research and innovation programmes, overcoming gaps, duplication and fragmentation, creating a leverage effect, enhancing coherence and efficiency of energy research in Europe.

Type of action: Coordination and Support Actions[30]

CALL FOR COMPETITIVE LOW-CARBON ENERGY (H2020-LCE-2015-3)

Publication date	2013-12-11
Budget	€ 175,350,000
Deadline	2015-03-03 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Market uptake of existing and emerging renewable electricity, heating and cooling technologies (LCE-04-2015)

Specific challenge: The legal framework established by the Renewable Energy Directive (2009/28/EC, 'RES Directive')) sets binding targets for all Member States to contribute to the overall 20% target for renewable energy in the EU final energy consumption by 2020, and the 'Energy Roadmap 2050' shows that renewables will have to play a much greater role in all future scenarios beyond 2020. As well as putting in place legal obligations, the RES Directive also makes recommendations for specific actions to be taken by the public and private sectors across the EU. However, in many areas, it leaves open the ways in which Member States may implement policies and support measures aiming to increase use of renewable energy at national, regional and local level.

Consequently, although some Member States have already made good progress in incentivising renewable energy, there are still many opportunities for common learning and sharing of best practices on the cost-effective mobilisation of new investments in renewable energy across the EU. Moreover, such investments contribute to the European 2020 strategy for growth, job creation, industrial innovation, and technological leadership as well as re-

[30] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1144-lce-19-2015.html

ducing emissions, improving the security of energy supplies and reducing EU's energy import dependence.

Since the adoption of RES Directive in 2009, most Member States have experienced significant growth in renewable energy consumption. However, currently, we are seeing a deceleration of this growth, partly due to the economic crisis, but also because there are a number of market uptake barriers that remain or persist for both established and innovative renewable energy technologies.

Scope: To ensure the level of growth needed to deliver the EU targets for renewable energy, and to create the appropriate business environment for EU industrial leadership in low-carbon energy technologies, a number of important market-uptake challenges still need to be addressed, notably:

- Ensuring sustained public acceptance of renewable energy projects and renewable energy overall, while taking into account the implications of the substantial increase in RES share in the final energy consumption;
- Ensuring speedy and user friendly permitting procedures;
- Implementing renewable energy policies, codes and legislations at EU, national, regional and local levels in a coordinated manner using best practice examples with significant replication potential;
- Capacity building and contributing to the further development of renewable energy policy, legislation and regulation, and informing the debate on post-2020 horizons;
- Capacity building and facilitating the deployment of improved business models and innovative financing schemes for mobilising investments in innovative and established renewable energy systems and services.

Proposals should address one or several of the challenges mentioned above for technologies and systems which are at TRL 7-9. Regional specificities, socio-economic, spatial and environmental aspects from a life-cycle perspective shall be considered. For all actions, the consortia should involve and/or engage relevant stakeholders and market actors who are committed to adopting/implementing the results.

For RES electricity, actions which address exchanges of information or cooperation among different actors (e.g. on future business models for aggregators), must demonstrate that they are promoting best practices. Actions which are developing new recommendations or which are contributing to the debate on costs and benefits of specific options must provide quantified indicators of the market impacts of future policy options.

For RES heating and cooling, proposals must demonstrate that they are adopting an integrated approach which fully respects the requirements and recommendations given in the energy efficiency and EPBD directives. Actions aimed at promoting the use of geothermal, bio and/or solar heating for individual, industrial or district heating applications must involve / engage with the responsible policy makers and regulators as well as industry and potential financing bodies, and must include relevant capacity building and adoption of best practices.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Increasing the share of renewable electricity, heating and cooling in the final energy consumption. Reductions in the time taken to authorise the construction of renewable energy plants and related infrastructure. Substantial and measurable reductions in the transaction costs for project developers as well as for the permitting authorities, whilst still fully addressing the needs for environmental impact assessments and public acceptance. Development of better policy, regulatory, market support and financing frameworks, including at regional and local level.

Type of action: Coordination and Support Actions[31]

Topic: Supporting Joint Actions on demonstration and validation of innovative energy solutions (LCE-18-2015)

Specific challenge: Without a technological shift in our current energy system, the EU will fail on its 2050 ambitions to largely decarbonise the energy and transport sectors. The EU needs to accelerate innovation in cutting edge low carbon technologies and innovative solutions, and bridge the gap between research and the market. A European approach is essential to realise the ambition of seeing low carbon technologies effectively developed in view of bringing them to the market: it allows key players to come together on a continental scale; it helps to identify and to tackle the barriers holding back innovative products and services in the single market; and it allows different sources of private and public funding to be brought together. Today, EU funding remains a limited part of the overall funding across Europe. Implementation needs to be increasingly based on partnerships that build the necessary scale and scope, and achieve greater impact from scarce public and private resources.

Scope: The proposals should aim at coordinating the research efforts of the participating Member States, Associated States and Regions in the areas and challenges targeted in this 'Competitive low-carbon energy' call or in the 'Smart Cities and Communities' call and to implement a joint transnational call for proposals resulting in grants to third parties with EU co-funding to fund multinational innovative research initiatives in this domain. Proposers are encouraged to implement other joint activities including additional joint calls without EU co-funding.

Activities should focus on demonstrating and validating solutions that reached already TRL 5-6 and bringing them to TRL 6-7. Lower TRL research activities necessary to support this work and forming an integral part of these proposals, will be in scope for funding, provided

[31] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1146-lce-04-2015.html#tab1

the bulk of the activities in the proposal remains focused on demonstrating and validating solutions. Appropriate user and general public acceptance, regulatory, market up-take (e.g. e.g. regulatory issues, capacity building and access to finance), social, environmental and resource efficiency aspects should be included. Opening up demonstration facilities for practice-oriented education and training is encouraged. As regards a possible ERA-NET in the area of 'Smart Cities and Communities', cooperation with emerging countries (e.g. China) is encouraged, without prejudice of their participation as partners in other initiatives, such as in call for Smart Cities and Communities.

The Commission considers that proposals requesting a contribution from the EU in the range of 10 to 20 million Euro would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Acceleration of the time to market of, affordable, cost-effective and resource-efficient technology solutions to decarbonise the energy system in a sustainable way, secure energy supply and complete the energy internal market. Reduction of the environmental footprint and the energy payback time. Strengthening the European industrial technology base, thereby creating growth and jobs in Europe.

Type of action: ERA-NET Cofund[32]

Topic: Market uptake of existing and emerging sustainable bioenergy (LCE-14-2015)

Specific challenge: Actions are still needed to foster the development of the bioenergy sector and to ensure its sustainability (Renewable Energy Progress Report [COM(2013)175]). One way to do it is to use more and sustainable bioenergy. However, the EU needs to expand the supply of bioenergy produced in the EU, by encouraging the EU farmers and foresters to produce also energy and energy intermediaries.

In the short- and medium-term perspective, sustainable bioenergy in all its forms is expected to be the main contributor to the de-carbonisation. In order to achieve the EU targets set out in the RES and Fuel Quality Directives, and to address concerns regarding indirect and direct environmental impacts, sustainable bioenergy technologies (both existing and emerging) need to further penetrate the market.

Scope: Proposals should address one or several of the following bullet points using technologies and systems which are already at TRL 7-9:

- Setting up or strengthening sustainable local bioenergy supply chains that meet highest environmental criteria and quality standards, including consideration for indirect impacts and energy balances;
- Ensuring development and / or implementation of quality and sustainability standards for bioenergy in all its forms;

[32] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1151-lce-18-2015.html

- Creating a market for sustainable intermediate bioenergy carriers to enable better technology competitiveness through economies of scale;
- Encouraging European farmers and foresters to produce non-food bioenergy or bioenergy carriers alongside food, feed and other products.
- Development of methodologies for the traceability of biomass feedstocks from which bioenergy is produced (e.g. to distinguish first-generation from advanced biofuels);
- Removing non-technical barriers to widespread production and use of biogas/biomethane from manure and other wastes as one of the most sustainable fuels available today for use in transport and for incorporation into the grid;
- Ensuring sustained public acceptance of sustainable advanced biofuels;
- Exchange of information on best practices for bioenergy policy, regulations and support schemes to allow the most sustainable and energy efficient use of bio-resources.
- Cooperation between different policy areas at national / regional level (e.g. energy, etc.) needs to be increased to optimise the regulatory framework and implementing measures for the bioeconomy through exchange of information and best practices;
- All Member States must possess the necessary capacity to enact the EU legislation, while the businesses must make full use of the opportunities that these new markets create for them. Therefore specific capacity building activities targeting the main stakeholders (e.g. biomass suppliers and users, decision makers, financial institutions,…) are needed.
- Tailored financing schemes for supporting investments in innovative and established bioenergy technologies must be implemented, and the most successful schemes replicated.

Regional specificities, socio-economic and environmental aspects from a life-cycle perspective shall be considered.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Increasing the share of sustainable bioenergy in the final energy consumption. Substantial and measurable reductions in the transaction costs for project developers as well as for the permitting authorities, whilst still fully addressing the needs for environmental impact assessments, including considerations for indirect impacts and energy balance, and public engagement. Development of better policy, market support and financial frameworks, notably at national, regional and local level.

Type of action: Coordination and Support Actions[33]

[33] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/1150-lce-14-2015.html

ENERGY EFFICIENCY – MARKET UPTAKE PDA (H2020-EE-2015-4)

Publication date	2013-12-11
Budget	€ 18,5000,000
Deadline	2015-06-10 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Project development assistance for innovative bankable and aggregated sustainable energy investment schemes and projects (EE-20-2015)
Specific challenge: Significant efforts are required to mobilise all relevant stakeholders, carry out investment inventories, develop feasibility studies, financial engineering instruments, and to address legal and procurement issues.

In this context, it is necessary to support project promoters through dedicated project development assistance facilities and capacity building and thus demonstrate the viability and positive impacts of large-scale, sustainable energy investments.
Scope: Project development assistance support will be provided to public and private project promoters such as public/private infrastructure operators, retail chains, cities and SMEs/industry, leading to innovative, bankable and aggregated sustainable energy investment schemes and projects of EUR 6 million – EUR 50 million. The support will be conditional to mobilized investments. The focus should be on public and private buildings, retail energy market infrastructure, commercial and logistic properties and sites. The major objective of supported projects will be to demonstrate the financial viability and sustainability of large-scale sustainable energy investments. Proposals must have a 'lighthouse' dimension as well as deliver organisational innovation in the mobilisation of the investments and/or the financial approach. Innovation should be demonstrated taking into account the situation in the targeted country. Proposals from applicants coming from one single country are eligible, but proposals must also include a clear action plan to communicate across Europe towards potential replicators. Further, supported project will be required to participate in the monitoring and evaluation exercise run by the Commission.
Project development assistance activities implemented through this topic will be complemented by the continuation of the ELENA facility implemented by the EIB.
The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
Expected impact: Development of credible pipeline of bankable large-scale projects and financial schemes and display of innovative financing solutions, leading to improved inves-

tor confidence. Every million Euro of Horizon 2020 support must trigger investments worth at least EUR 15 million.
Type of action: Coordination and Support Actions[34]

ENERGY EFFICIENCY – MARKET UPTAKE (H2020-EE-2015-3)

Publication date	2013-12-11
Budget	€ 40,800,000
Deadline	2015-06-10 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Enhancing the capacity of public authorities to plan and implement sustainable energy policies and measures (EE-07-2015)

Specific challenge: Public authorities play a key role in the reduction of EU energy consumption and the increase of renewable energy capacity. For instance Member States must produce and implement National Energy Efficiency Action Plans (NEEAPs) and National Renewable Energy Action Plans. They also have the obligation to produce detailed action plans in specific sectors such as the renovation of buildings or the application of high-efficiency cogeneration and efficient district heating and cooling systems. Local and regional authorities are also developing plans at their own level and other public authorities play an important role too; national energy regulatory authorities for instance should provide incentives for grid operators (heat, cold, and electricity) to enable network users to produce renewable energies and implement energy efficiency measures.
Doing this requires multidisciplinary skills to e.g. assess different cross-sector sustainable energy options, according to technical, environmental, economic and social criteria. It also requires skills to engage stakeholders in both the definition and implementation of the solutions, and to secure funding.
The situation regarding the availability of these skills depend from country to country; e.g. while certain public authorities have a long tradition of using energy performance contracting, others have not tried yet; or while a few Member States impose to large cities to develop urban mobility plans, such plans are not common practice in other countries.
Scope: Proposals empowering public authorities to plan, finance and implement ambitious sustainable energy policies and plans (for instance under the Covenant of Mayors initiative), on the basis of reliable data and analyses. Public actors should be encouraged to look

[34] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2381-ee-20-2015.html

at sectors with high energy saving potential such as buildings, industry and urban mobility. The geographical coverage should be well justified on the basis of European added-value. Capacity building should be an integral part of project proposals.
The following actions are part of the scope:
- Raising the capacity of Member States to fulfil their obligation under the new Energy Efficiency Directive.
- Enabling national energy regulatory authorities to address demand issues (e.g. demand response, tariff design, assessment of generation adequacy assessment).
- Capacity building on integrated energy, transport mobility and land-use planning at community and city-level.
- Supporting public authorities in better linking up local, regional and national levels for delivering integrated sustainable energy action planning and projects to achieve synergies and economies of scale.
- Establishing new or exploiting existing networks and other mechanisms to spread knowledge and facilitating the exchange of experiences and best practice on sustainable energy.
- Large-scale capacity building on innovative financing to specific groups of public authorities, such as national, local and regional authorities, energy agencies, structural and cohesion funds managing authorities.
- Defining and implementing standard energy saving packages for households, public sector and industry in particular under Article 7 of the Energy Efficiency Directive.
The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
Expected impact: Impacts must be measured in terms of number of public officers influenced and number of new or improved policies and plans. The number of final consumers impacted should also be measured in millions of people. In addition, proposals targeting governments should also demonstrate that they accelerate the implementation of the new Energy Efficiency Directive.
Type of action: Coordination and Support Actions[35]

Topic: Enhancing the capacity of public authorities to plan and implement sustainable energy policies and measures (EE-07-2015)

Specific challenge: Public authorities play a key role in the reduction of EU energy consumption and the increase of renewable energy capacity. For instance Member States must produce and implement National Energy Efficiency Action Plans (NEEAPs) and National Re-

[35] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2372-ee-07-2015.html

newable Energy Action Plans. They also have the obligation to produce detailed action plans in specific sectors such as the renovation of buildings or the application of high-efficiency cogeneration and efficient district heating and cooling systems. Local and regional authorities are also developing plans at their own level and other public authorities play an important role too; national energy regulatory authorities for instance should provide incentives for grid operators (heat, cold, and electricity) to enable network users to produce renewable energies and implement energy efficiency measures.

Doing this requires multidisciplinary skills to e.g. assess different cross-sector sustainable energy options, according to technical, environmental, economic and social criteria. It also requires skills to engage stakeholders in both the definition and implementation of the solutions, and to secure funding.

The situation regarding the availability of these skills depend from country to country; e.g. while certain public authorities have a long tradition of using energy performance contracting, others have not tried yet; or while a few Member States impose to large cities to develop urban mobility plans, such plans are not common practice in other countries.

Scope: Proposals empowering public authorities to plan, finance and implement ambitious sustainable energy policies and plans (for instance under the Covenant of Mayors initiative), on the basis of reliable data and analyses. Public actors should be encouraged to look at sectors with high energy saving potential such as buildings, industry and urban mobility. The geographical coverage should be well justified on the basis of European added-value. Capacity building should be an integral part of project proposals.

The following actions are part of the scope:

- Raising the capacity of Member States to fulfil their obligation under the new Energy Efficiency Directive.
- Enabling national energy regulatory authorities to address demand issues (e.g. demand response, tariff design, assessment of generation adequacy assessment).
- Capacity building on integrated energy, transport mobility and land-use planning at community and city-level.
- Supporting public authorities in better linking up local, regional and national levels for delivering integrated sustainable energy action planning and projects to achieve synergies and economies of scale.
- Establishing new or exploiting existing networks and other mechanisms to spread knowledge and facilitating the exchange of experiences and best practice on sustainable energy.
- Large-scale capacity building on innovative financing to specific groups of public authorities, such as national, local and regional authorities, energy agencies, structural and cohesion funds managing authorities.
- Defining and implementing standard energy saving packages for households, public sector and industry in particular under Article 7 of the Energy Efficiency Directive.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Impacts must be measured in terms of number of public officers influenced and number of new or improved policies and plans. The number of final consumers impacted should also be measured in millions of people. In addition, proposals targeting governments should also demonstrate that they accelerate the implementation of the new Energy Efficiency Directive.

Type of action: Coordination and Support Actions[36]

Topic: Consumer engagement for sustainable energy (EE-10-2015)

Specific challenge: residential use of energy is responsible for 28% of EU energy consumption. The barriers to consumer energy saving have been known for more than 30 years but are still present, in particular split incentives (e.g. tenants vs. landlords), lack of information, high initial investment in energy-efficient equipment and habits of energy users. Likewise, while awareness of the existence of renewable energies has improved considerably in the last years, there is still a lack of understanding of how to use them in practice.

Scope: Project proposals should focus on changing the behaviour of consumers in their everyday life (e.g. at home, at work, at school), using market segmentation and focussing on 'action', the last step of the AIDA (Awareness – Interest – Desire – Action) framework. Equipment responsible for main energy consumption (e.g. heating and cooling, lighting, domestic appliances, and consumer electronics), as well as products from the small scale renewable energy market, should be addressed in priority. Educational activities or tools (such as comparative ones) may be necessary, e.g. to help consumers read and understand their energy bills or labels; to help them take advantage of ICT devices and tools to monitor and analyse their energy use; to increase trust in individual smart meters or energy audits; or to help them participate in community renewable energy projects (e.g. RES consumer cooperatives, community-owned projects, etc.). Actions should take gender issues into account when relevant and involve manufacturers, retailers and consumer associations when these can play a decisive role. The use of social innovations and innovative technologies (e.g. smart meters/appliances/ICT) should be considered when it brings added value, especially when addressing the younger generation. More fundamental activities aimed at a better understanding of consumers' and other stakeholders' perception, motivation and behaviour are part of the scope (e.g. understanding of product labels and building certificates, difference in patterns of consumption for women and men) provided their results can directly lead to improvements in the effectiveness of consumer-driven initiatives.

[36] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2372-ee-07-2015.html

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Bigger market share of the most energy-efficient products (from the highest energy class) and/or of high quality renewable energy products. For example, each million € of EU support in energy efficiency actions is expected to deliver annual energy savings of around 10% for at least 5,000 households[4] (around 8 GWh/year of savings[5]). In any case proposals should demonstrate significant impacts in terms of number of people changing their behaviour and taking informed investment decisions.

Type of action: Coordination and Support Actions[37]

Topic: Improving the financeability and attractiveness of sustainable energy investments (EE-19-2015)

Specific challenge: Suboptimal level of investments in sustainable energy (in particular energy efficiency) is linked to a lack of trust of investors and financiers in the financial viability of sustainable energy measures, lack of capacity of the public and private sector in their structuring, split incentives (e.g. rental buildings), and the lack of large-scale successful flagship projects. New bank capital requirements have decreased banks´ lending capacity and willingness to invest in the sustainable energy sector, still deemed by many to be risky.

The financial sector needs to be drawn to develop new financing products and practices that can respond to the constraints of the market.

Scope: Project proposals and activities should foster dialogue with and between financial market actors, standardisation and valuation entities, industry, public authorities, consumers and property owners. They should lead to development of new business models and financial products, ensuring synergies of public and private finance.

- Proposals focusing on the development of frameworks for standardisation and benchmarking of investments, such as labelling and standardisation of sustainable energy investments / portfolios, or valuation techniques integrating the 'green value' of buildings. Proposals integrated in a broader approach such as socially responsible investment or 'green buildings' should focus on the energy component.
- Proposals targeting public institutional investors (e.g. public or semi-public pension schemes) in order to increase the share of their funds invested into sustainable energy, or to develop specific funds or investment products.
- Proposals aiming to create EU and national sustainable energy financing platforms to organise dialogue with the relevant stakeholders and (among others) develop roadmaps, propose improvements in the legal frameworks and develop template documents and contracts

[37] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2374-ee-10-2015.html#tab1

leading to better understanding of market fundaments. Proposals must include a clear action plan to communicate across Europe towards potential replicators.
The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
For all proposals, at least three legal entities must participate in the action; each of the three legal entities shall be established in a different eligible country; and all three legal entities shall be independent of each other within the meaning of Article 7 of the rules of participation. The only exception is for proposals aiming to create national sustainable energy financing platforms. These proposals may be submitted by one or more legal entity(-ies) from the same country.
Expected impact: Reduced uncertainty, increased investors' confidence, trust towards and reliability of energy efficiency investments. Valuation methodologies agreed by the market. Standardised descriptions of sustainable energy investments or measures/contracts. Labelling schemes or harmonised frameworks for sustainable energy investments. National strategies for financing sustainable energy investments.
Type of action: Coordination and Support Actions[38]

Topic: Development and market roll-out of innovative energy services and financial schemes for sustainable energy (EE-21-2015)

Specific challenge: The public sector has an exemplary role to play (in particular as regards the management of public assets) in addressing the market deficiencies by setting the stable regulatory environment and engaging in dialogue with the key stakeholders to improve the legal and financial framework and to put in place innovative financing schemes. However, the deployed public funds have to be matched and multiplied by the private sector capital, to address the financing gap.
The energy services industry together with the financial sector also need to develop new business models in order to better monetise future energy savings and tackle new sectors to reach its potential turnover of some EUR 25 billion per year.
Scope:
- Proposals focusing on the roll-out of business models for innovative energy efficiency services (e.g. energy performance contracting), enabling to fully monetise the resulting energy savings.
- Proposals replicating successful innovative financing solutions already implemented across the EU as well as successful innovative energy services. Particular attention should be given to innovative solutions enabling aggregation, securitisation, project bundling, structuring of

[38] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2379-ee-19-2015.html

clearing houses, or developing new investment mechanisms (e.g. crowd-funding for sustainable energy).
- Proposals implementing large-scale capacity building for public authorities and SMEs to set-up or use innovative financing schemes for sustainable energy.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impacts: Every million Euro of EU support invested into the relevant activities is expected to deliver savings of at least 25 GWh/year. All proposals should demonstrate a significant impact in terms of larger investments made by stakeholders in sustainable energy; primary energy savings; generated renewable energy; better implementation of energy-efficiency policies; number of policy makers influenced; number of people with increased skills; and/or number of people changing their behaviour.

Type of action: Coordination and Support Actions[39]

Topic: Empowering stakeholders to assist public authorities in the definition and implementation of sustainable energy policies and measures (EE-09-2015)

Specific challenge: While public authorities have an important role to play to develop energy efficiency policies and plans, the latter require the full involvement of private stakeholders and the civil society for their effective implementation. However there is a general lack of capacity and coordination among those stakeholders to guarantee their full involvement and to effectively convert policies and plans into concrete actions.

Scope: Proposals should target specific actors among a wide spectrum of stakeholders (utilities, industry, financing institutions, non-governmental organisations, consumer associations, interest groups, trade unions, etc). They should provide large-scale capacity building or engagement activities to those specific groups playing a key role in the definition and/or implementation of sustainable energy policies and measures initiated by public authorities. Proposals should demonstrate a strong European added value and put in place mechanisms ensuring the continuation of the activities beyond the project duration.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact*:* Each project must prove to influence hundreds of stakeholders playing a key role in the definition and successful implementation of national, regional or local poli-

[39] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2380-ee-21-2015.html

cies. As a result the number of final consumers impacted should be measured in thousands of people.
Type of action: Coordination and Support Actions[40]

ENERGY EFFICIENCY RESEARCH & INNOVATION (H2020-EE-2015-2)

Publication date	2013-12-11
Budget	€ 21,850,000
Deadline	2015-06-10 +17:00:00 (Brussels local time)
Main Pillar	Societal Challenges
OJ reference	OJ C361 of 11. December 2013
Status	Open

Topic: Technology for district heating and cooling (EE-13-2015)

Specific Challenge*:* District heating and cooling systems need to be more efficient, intelligent and cheaper. It is necessary to develop and deploy intelligent systems using smart metering and control solutions for optimisation and consumer empowerment and exploiting multiple energy resources, including waste heat recovery, heat pumps, thermal storage, cogeneration and renewable energy integration, and to roll-out solutions for the integration of intelligent thermal network with smart electricity grids.
Scope: Project proposals should address one or more of the following areas:
- Develop, demonstrate and deploy a new generation of highly efficient, intelligent district heating and cooling systems which are capable of integrating multiple efficient generation sources, including different kinds of renewable energy, cogeneration, waste heat from industrial or other sources and storage, and which can be operated at different temperature levels. Such systems can be new schemes or refurbished and optimised existing DH systems. These systems might combine hybrid technologies and/or new thermal carrier fluids to improve the overall efficiency; help decrease the end user cost of transporting thermal thermal/cold energy, be compatible and connected with intelligent electricity and gas networks; and utilize surplus electricity from the grid. Such systems should be compatible with and capable of integration with low-energy buildings, including nearly zero energy buildings (low-temperature district heating).
- Bring down heat distribution losses and integrate storage through the use of innovative pipe and capacity design, high performance insulation materials, reduced operating temperatures, intelligent, efficient system for fluid handling carriers or intelligent metering, control

[40] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2373-ee-09-2015.html

and grid optimisation strategies, including from analysing smart meter data, consumer interaction and behaviour.
- Develop optimisation, control, metering, planning and modelling tools such as intelligent thermal agile controllers embedding self-learning algorithms helping optimise the overall efficiency of technology-hybrid systems and IT supervision systems capable of delivering real performance indicators likely to modify consumption behaviour.
- Develop new solutions for low temperature heat recovery and recirculation.
The activities are expected to be implemented at TRL 4-6.
The Commission considers that proposals requesting a contribution from the EU of between EUR 1.5 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.
Innovative energy systems integrating the electricity grid and the heating/cooling grid (and possibly also energy storage) should be addressed in LCE7 and/or LCE8.
Expected Impact:
- Reduce the energy consumption of space and water heating by 30 to 50% compared to today's level.
- Contribute to wider use of intelligent district heating and cooling systems and integration of renewables, waste and storage.
Type of action: *Research &* Innovation Actions[41]

4.2 Identification of potential major partners for future cooperation

ARMENIA

Armenian companies and other institutions operating in the field of renewable energy include:
- SolarEn LLC, a manufacturing, project development, and consulting company which developed projects in Armenia and in the CIS countries in partnership with several foreign partners such as InterSolarCenter (Russia), Fraunhofer Solar Institute (Germany), INETI (Portugal), AWEA (USA) and NREL (USA).
- **Transistor Plus** Ltd, an engineering company involved in clean energy technologies. It carries out design, installation and maintenance of renewable energy systems including bioenergy, solar thermal and PV. It also manufactures components for solar energy systems (PV modules, DC to AC power inverters, solar tracking systems, UPS).

[41] http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2370-ee-13-2015.html

- **Orange Armenia**, an affiliate of France Telecom/ Orange (France) launched the first solar energy-operated base station in Armenia in the Syunik region in 2012, as part of a global programme aiming at reducing the group's footprint.
- **Scientific Research Institute of Energy**, a government agency, responsible for research and development in power engineering and renewable energy, energy saving projects etc.
- **Armenia Renewable Resources and Energy Efficiency Fund,** a state agency operating since 2005, promotes the development of EE and RE markets in Armenia and increases the use of clean, efficient, safe and affordable heating technologies in multi-apartment buildings and schools in Armenia

AZERBAIJAN

Companies and other organizations operating in the field of renewable energy in Azerbaijan are as follows:

- **CNIM** (France), a leading provider of turnkey solutions for the energy and environment sectors, won the EUR 346 million public tender for the design, construction and 20-year operation of a waste-to-energy plant with a capacity of 500,000 tons of municipal solid waste per year in Baku. It is considered to be the biggest waste-to-energy plant in Eastern Europe and CIS countries.
- **Caspian Technology Company** (Azerbaijan) is the country's first company to engage in alternative energy. It launched a Vestas V39-500kW Training Center, several wind and solar power pilot projects and started manufacturing wind turbines and solar panels.
- **State Agency on Alternative and Renewable Energy Sources of Azerbaijan (SAARES),** a coordinator of national programme implementation, formed by presidential decree in 2009, an independent entity since 2013.

BELARUS

The list of companies and other institutions operating in the field of renewable energy sector in Belarus includes:

- **TDF Ecotech** (Switzerland) builds a 2.1 MW biogas facility in Snov and has a similar project under development in Sluzk. The investment, around EUR 10 million for each project, should be earned back after 12 years.
- **Strabag** (Austria) developed several projects in Belarus, such as a wastewater plant producing biogas in Brest, inaugurated in June 2011 and another one in Minsk (contract signed in November 2011).
- **The Belarusian Academy of Sciences,** responsible for development of the scientific and technical background for implementation of RES projects

GEORGIA

Companies and other organizations operating in the field of renewable energy in Georgia are as follows:

- **Energo-Pro** (Czech Republic), which established its Georgian subsidiary in 2007, now owns 10 HPPs and has 5,200 employees.
- **Georgian Urban Energy**, the Georgian subsidiary of the Turkey's Anadolu Group, will build and operate a 87 MW HPP in Paravani, with co-financing from EBRD and IFC. The company will also build a 32-kilometer transmission line connecting the HPP to the power distribution system at a new substation near Agara that will be constructed as part of another project.
- **Georgia Power,** an energy efficiency service company providing energy audit, retrofitting and consultancy services.
-**Georgian National Electricity and Water Regulatory Commission (GNEWRC)**, 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)**, 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.
- **Energy Efficiency Centre (EEC),** a non-governmental entity operating since 1998, responsible for promotion of energy efficiency projects, preparation of investment proposals and organization of trainings.

MOLDOVA

The list of companies doing business and other institutions involved in the field of renewable energy in Moldova includes:

- National Agency for Energy Regulation, established in 1997, responsible for energy tariffs, licensing and promotion of competitive energy market, provides consulting and informational assistance to entities engaged in EE and RES and assistance in drafting programmes.
- **Institute of Power Engineering of the Academy of Sciences of Moldova (IPE),** a governmental organisation carrying out research in energy sector (energy security and efficiency)
- **Carbon Finance Unit (CFU),** monitoring and implementation of CDM projects.
- **Mercando Green Technology** (Switzerland) plans to launch the first biogas production plant in Moldova for a total estimated investment of EUR 25 million. The project will be located in the village of Tsarigrad in the district of Drochia. It will be implemented in partnership with local company BioEnerAgro.

- **Debut-Sor SRL** (Moldova) produces sausages and meat products in Soroca. The company recognised energy efficiency as a viable cost reduction strategy, which will increase its competitiveness. With a MoSEFF loan of EUR 147,497, Debut-Sor invested in the replacement of several units in its production process. The new machines use less energy than the old ones and facilitate higher quality production. The company saves 23% energy and 11 tons carbon emissions annually. The payback period is 7 years.
- The hotel **Vila Verde** in Ungheni was built in 1976 and was closed from 2003 to 2011. After undergoing a complete refurbishment, the hotel re-opened in the summer of 2011. The hotel now consists of 3 conference rooms and 58 guest rooms for the building rehabilitation. The company invested in one of the largest solar thermal systems in Moldova with a surface of 200 m2, in advanced condensing boilers and in building insulation. With these measures, financed with a MoSEFF loan of EUR 280,000, the hotel has reduced its energy consumption by 80% and its CO2 emissions by 133 tons per year.
- Moldovan entrepreneur **Eugeniu Scurtu** purchased a pellet production technology for a total of MDL 500,000 (around EUR 30,000), of which MDL 200,000 have been financed in the framework of "Pare 1 + 1" programme implemented by ODIMM, the Moldovan public organisation in charge of the Business Portal for SMEs in Moldova.
- **One Network Energies** (France) set up, in 2012, a new company in Moldova named **Solartech Energy** in order to bring its expertise to the Moldovan market. It specialises in solar solutions for both in-grid and off-grid power supply, and energy efficiency by using the technology of ceramic paint. Solartech Energy deployed a technical consulting staff to help customers through their R&D projects and established "Sun Academy" sessions in order to train local solar professional installers and providers.

UKRAINE

Companies operating in the field of renewable energy in Ukraine include:
- **Fuhrlander** (Germany), a pioneer in the use of wind energy, started maunifacturing wind turbines in Eastern Ukraine in 2011, at the Kramatorsky Heavy Machine Factory (KZTS). KZTS will produce around 40 generators in 2012.
- **WKN** (Germany), a leading developer of turn-key energy projects, signed a cooperation agreement with the Ukrainian authorities to build and operate a 400-MW wind plant in Crimea's Dzhankoy and Krasnoperekopsk districts for a USD 1 billion investment. Production is scheduled to start in 2013.
- **Aktiv Solar** (Austria) is the developer and operator of the 7.5 MW Rodnikovo photovoltaic power plant, the 80 MW Ohotnikovo solar plant and the 100 MW Perovo solar station, all 3 located on the Crimea Peninsula.

- **National Commission for Utility Services Regulations of Ukraine** set up by government of Ukraine in 2010, responsible for licensing of economic operations in the field of production, transmission, distribution of energy and development of tariff policy.
- **State Agency on Energy Efficiency and Energy Savings of Ukraine**, providing activities regarding to coordination and management of energy efficiency policies of government.

5 Recommendations for creating transfer centres for renewable resources in Eastern Partnership Countries

This chapter describes the process of establishing transfer centres (or transfer offices) in greater context emphasizing different socio-economic, political and cultural environment in Old Member Countries (OMC), New Member Countries (NMC) and Eastern Partnership Countries (EaPC), and, (ii) offers practical advice for creating these units in EaPC.

5.1 General context

Transfer of technologies and innovations is an important and beneficial process for all involved actors – universities, research institutions, business entities and public. It brings new products, services, and supports also creation of new jobs. Technology transfer centres (TTCs) or Technology transfer offices (TTOs) are usually located at universities[42] (they could be also business communities owned by universities). This model has been adopted from Great Britain where it has occurred since 80s of the 20th century. TTCs/TTOs are responsible for protection and commercialisation of the intellectual property (IP). The commercialisation is realized by these main activities:

- Screening and evaluating of new inventions;
- Protecting the IP (licences, patents etc.);
- Selling the licences to commercial sphere;
- Consulting and supporting the establishment of spin-offs;
- Offering professional consultancies to external business partners;
- Administrating of so called *seed funds* (funds for commercialisation of new/starting projects).

The international Association of University Technology Managers (AUTM)[43] has identified four key reasons for public universities and research organisations to advance technology transfer:

1. Facilitate the commercialisation of research results for public goods;
2. Reward, retain, and recruit high-quality researches;
3. Build closer ties to industry;
4. Generate income for further research and education, and, thus, promote economic growth.

[42] Entrepreneurial universities – universities which realize also entrepreneurial activities.
[43] Available at: www.autm.net

Through technology transfer the university could demonstrate the innovative character. Establishing a TTC/TTO has crucial influence on the organisational and academic culture because it requires implementation of new systems, rules, processes, and internal directions. Transfer of knowledge and technology transfer is a benefit for both researchers and students. Students can participate in projects of applied research and/or work on "real" orders. It determines also further interest of companies to offer jobs to graduates, and on the other hand it increases the interest of young people to study at such innovative university. According to Nelsen (2007) these benefits include also (i) more willingness from central and regional/local governments to support university research for economic development, (ii) students exposure to the commercial opportunities of research, thus influencing their future career aspirations and ultimately impacting the country's economy, (iii) financial support from grateful alumni and other entrepreneurs who have grown wealthy from companies started from university research. Such programmes can have a major impact on the economy of the surrounding region and can lead to the formation of other new companies. Governments most frequently support technology and knowledge transfer in universities directly and after few years then they expect the programmes to be self-supporting. It is unrealistic and will not happen in four or five years. Building a regional economy based on entrepreneurialism is a slow, gradual process. Therefore the author has stated *Ten things to know about setting up a TTO* (Nelsen, 2007:538):

THE ECONOMIC FIVE

1. **Technology transfer will not make your university rich.**
2. **Building a robust technology transfer programme takes sustained financial investment.**
3. **It will likely take eight to ten years before your programme stops losing money – and it may never make your institution any substantial amount.**
4. **It may take two decades or more before a university technology transfer programme (including entrepreneurial spinouts) substantially affects the local economy.**
5. **The ultimate impact may be very large – both economically and culturally – for the university, its graduates, and the community.**

THE IMPLEMENTATION FIVE

1. **Sustained effort requires visible support – fiscals and otherwise – from senior administration.**
2. **Only senior administration can set the mission, policies, and priorities for the programme.**
3. **Clear policies on IP ownership, the roles of researchers in interaction with industry, and other ground rules should be set up before the programme begins.**
4. **Conflicts of interests, both real and perceived, are inevitable.**
5. **Technology transfer is a talent-based business.**

The mutual cooperation between universities and business entities enables universities to solve new technical problems, to enhance local/regional/national development by knowledge and technology transfer and to obtain financial support from companies to support study programmes. It could be funded by:
- Projects supported from the state funds and/or the EU funds;
- Private investment – technology partnership;
- Cooperative research (agreement-based) and development agreements;
- Expert consultancies and “work for others”;
- Targeted placement of company employees at universities and vice versa;
- Establishing a spin-off company;
- Seeking technologies available for licensing and selling licences.

Technology transfer and transfer of innovations represent an important public mission of universities and through technology partnership it is possible to reduce private sector risk and enable investment in the adoption of new technologies. Developing and implementing partnership of private sector and universities require to follow these standard principles:
- balancing public and private interest
- focusing on outcomes
- respecting for a duty and reflecting core values (honesty, integrity, fairness, quality)
- creating transparency
- ensuring confidentiality
- seeking continuous improvement.

The conditions for technology transfer and innovations vary widely from country to country. There is no unique way to set up a technology transfer system and TTCs/TTOs. It depends upon many factors, the most important being the entrepreneurial culture of the academic and research institutions, and of the region or nation. Each model has developed to fit the cultural, political and economic conditions of the corresponding country. Many countries or regions may have no choice to establish TTCs/TTOs for these reasons: (i) insufficient budget (a lack of finances necessary to establish TTCs/TTOs), (ii) insufficient quantity and quality of institutions' research results. National and regional policies and objectives also should serve as a framework for shaping the system and directing priorities. In a knowledge-based economies (usually represented by OMC), access to know-how and "external" use of knowledge (from research institutions and universities) is a valuable commodity. There are many mechanisms which link the academic and business world and many informal as well as formal networks and ties. In the post-socialist countries (usually represented by NMC and EaPC) and emerging economies (developing countries) the situation is very similar and the research and innovation capabilities are highly concentrated within public research institutes and universities. The modernisation of the "traditional" model of these public institutions - in terms of promoting commercialisation of their research results – requires changes in policies, in distribution of financial resources, but particularly in academic culture[44]. "*Successful and meaningful technology transfer is demand driven, so it is important to understand the external partner's needs. If the internal academic community does not support the technology transfer process, there will be a scope for failure at various stages of the process*." (Campbell, 2007:560)

The working group Innovation and Technology transfer (I&TT)[45] (summarized by Loeffler-Höptner-Chiran 2013) has identified the needs and barriers to I&TT in EUSDR countries in several categories:

[44] According to Campbell 2007, Fernandez 2007, and Young 2007.
[45] Priroty area 8 of the EU strategy of the Danube region (EUSDR) – 2nd Annual meeting in Bucharest, October 2013.

Actors' characteristics	**Technology developers: universities & R&D organizations**	
	Needs	**Barriers**
	- long term strategy for collaboration with companies	- lack of contacts with companies - academic approach limits the information transfer to business
	Technology recipients: companies	
	Needs	**Barriers**
	- internationalization of SMEs	- SMEs underestimate the potential of innovation - companies are afraid to participate in R&D projects - low exploitation through SMEs - (not enough) equipment
Relationship characteristics (between technology developer and recipient)	**Direct relationship**	
	Needs	**Barriers**
	- incentives for contacts with SMEs/university - broaden the TT to non-high-tech companies - mentality shift to applied research, incentives for contact with SMEs - brokerage events (Business, innovation-technologies) - need for more Public-Private-Partnership - need & exchange of best practices, focus on good practices from others - trust “what how with whom” - handbook on basic topics - motivational structures/incentives + promotion systems	- lack of common links between university- research-innovation-business environment, of joint responsibilities and of community cohesion - (no) trust in collaboration - (no) common methodology/data basis - different language (Business vs. academic) - lack of language and understanding - large multi-national companies are less interested in acquiring new technologies if the Return on Investment is not quick enough

		- pressure of big companies on research transfer to market - separation between R&D entities and private companies
	Indirect relationship (via intermediary)	
	Needs	**Barriers**
	- operational network of DTC - exchange between the nodes - labelling of TT & innovation centres - partnership for EU projects with Steinbeis - wishes for central structures - access to finance for support structures - DTC should be a facilitator for a better management of resources vs. priorities	- lack of central point of dissemination & contact for R&D facilities - no national business centres network committed to innovative activities - limited knowledge about the TTOs activities
Know-how technology	**Needs**	**Barriers**
	- smart energy grids, C-mobility, H2 Technology, Energy storage - cross cutting technologies (IT mechatronics to agriculture) - design sector	- destroyed agricultural sector - projects are not fitting to market needs
Framework conditions	**Political framework**	
	Needs	**Barriers**
	- standards - specific approaches for different levels (service, process, organization level) - what/who/how - tools to identify the industry needs (vertical & horizontal) - better implementation of smart specialization	- bad communication of authorities - lack of clear rules and practices

	- focus on specific sectors (wood, agriculture…) - measurement of innovation (company, city, national level), common evaluation of competitiveness/innovation - need for priorities and resources (people, skills) - government policy and strategy, instruments - more flexible structure of communication with EU - need for smart research	
	Legal framework	
	Needs	**Barriers**
	- Intellectual Property EU harmonization - Intellectual Property Management - standards - clustering issues: regulation - specific rules for the new product to enter on the market	- Private-Public Partnerships: unclear/non favourable regulations - lack of standards - legislation: lack of facilities for innovation oriented companies or technology companies

5.2 Process of establishing a TTC/TTO for renewable resources

The TTCs/TTOs can be set up in many different ways. They exist in all shapes and sizes around the world. The funding sources, formal/organizational structure, scope of activities, and many other characteristics vary from region to region and country to country. The renewable energy TTC/TTO in EaPC has to strengthen the position of universities/research institutions in the field of renewable energies, to improve their situation on a sustainable basis, to become well-known internationally, and particularly to support the introduction, distribution and application of renewable energies in EaPC. To achieve these long-term objectives, following activities have to be realized:

- To research relevant business entities and development agencies for future cooperation;
- To set up a database with relevant information about target groups;
- To create networks and partnerships and to apply for funding them;
- To participate in international projects in the area of renewable energies;
- To create ideas for new calls;
- To monitor/observe national/regional/local institutions for activities regarding renewable energies;
- To promote the activities;
- To diversify the core business and to enhance the capacity of employees individually

The long-term and sustainable support of knowledge-oriented networks as well as the promotion of local scientific actors also contributes positively to local and national economy. As a result, these countries will be enable to develop and implement their local energy needs efficiently and in a resource-oriented way. Additionally, sustainable solutions for the local energy supply will be developed and implemented self-sufficiently. Through a consistent focus on local conditions, the TTCs/TTOs make an important contribution to a sustainable, “on the spot” energy supply. Consequently, this focus leads to local as well as regional added value and therefore contributes to the creation and preservation of jobs, as well as to the reduction in detrimental emissions.

The study of Tornatsky (2000) highlighted seven characteristics that were common to exemplary TTCs/TTOs:

1. A clearly stated mission.
2. Transparent policies and procedures.
3. Entrepreneurial staffing and environment.
4. Customer-friendly relations with both internal and external constituents by TTC/TTO staff.

5. A highly supportive university administration and community (local, regional, and national).
6. Strong TTC/TTO links to potential commercial partners.
7. TTC/TTO access to risk, or venture, capital.

The establishment of TTC/TTO is a complex process that requires a decision making in preparatory period. The basic questions are: what kind of legal form the TTC/TTO should have, how it will be funded and managed, what kind of services will it provide etc. "*Success or failure will depend mostly on the human resources and physical infrastructure available to the office*." (Dodds – Somersalo, 2007:575) The legal form of the TTC/TTO could be different and it depends on the legal system of the country as well as on the decision of the establisher. It is important to underline that without respect for the legal form the crucial success factors will be human potential and initiative management.

Business plan of the TTC/TTO represents an essential component and document which does not serve only for internal use, but also for external use. Initially it allows to structure the ideas, thoughts and actions and to analyze the key elements necessary for a successful business. Later, it is also a communication vehicle describing the business concept to others.
Here is a proposed outline for the business plan of TTC/TTO:

1. ***Executive summary***

(introduction of basic facts about establishing TTC/TTO, overview of key parts of the plan)

2. ***Mission***

(presentation of short-term, mid-term and long-term objectives and vision, description of needs and benefits, description of competitive advantages and experiences)

3. ***Products and services***

(how they will be made, delivered, and developed, internal/external services)

4. ***Intellectual property or other protection***

(patents, copyrights, trademarks, service marks, licences, internal directions on protection of IP rights, information-communication system, information security)

5. ***Market analysis***

(size, growth, location, characteristics, important segments, possible partners for cooperation/clusters)

6. ***Customers***

(categories of customer group, identification of influencer and decision-maker)

7. ***Marketing strategy/plan and PR***

(internal and external marketing, marketing communication channels, invention marketing, project activities, plan of business development)

8. Infrastructure

(human and organisational infrastructure – positions, or sections/departments, key responsibilities, human resources policy)

9. Operational plan

(description of physical infrastructure and IT infrastructure, functioning, networking, quality assessment, risk management, etc.)

10. Financial plan

(costs for human infrastructure, administrative costs, fees, required cash flow, sources of income, profit/loss projection).

5.3 Key sustainability issues

Clear and understandable IP policy is the most important precondition for the knowledge and technology transfer. The internal directions have to define IP rights, its protection, and appropriate forms of its commercialisation. Technology transfer is a long-term process which has to be supported at the beginning as well as during the process of implementation and further development of research results. Research institutions in post-socialist countries and EaPCs usually declare a lack of:

- Financial sources for starting up and realisation of entrepreneurial activities in knowledge and technology transfer;
- Support and leadership of senior management during creation of the internal system of IP protection;
- Practical skills and experiences in the field of knowledge and technology transfer;
- Interest, and/or motivation of researchers in doing applied research.

From the beginning it is necessary to create partnership between researchers and TTC/TTO employees based on trust. They have also to monitor the feedback of internal and external marketing activities to improve the services and to plan further priorities, activities, and investment. TTCs/TTOs should be very active in looking for financing possibilities from public sources, structural EU funds[46] and private sources and capital. From the long-term view, the

[46] E.g. using schemes and programmes for cross-border cooperation or internships and exchange programmes.

financial resources from successful commercialisation projects should be essential. Other success factors for sustainability of TTC/TTO are following:

- Further education of employees (TTC/TTO and researchers/academics);
- Cooperation with external organisations;
- Cooperation with other TTCs/TTOs;
- International networking;
- Cooperation with companies and experts in the field of knowledge and technology transfer.

6 Conclusions

Project NoGAP addresses selected countries of the Eastern Partnership (EaP) which has been launched in 2009 at a summit in Prague in order to strengthen the relationship between the EU and EaP countries and to enhance political co-operation and economic integration. It works in the frame of the ENP. The project strives to foster a systematic and strong interaction between research and innovation from EU and EaP: Its aim is to build sustainable innovation partnerships between actors from all steps of the value chain in both regions in order to develop effective instruments for successful commercialisation of research results and thus bridging the gap between research and innovation.

The policy framework document provides reports on energy policy strategies related to energy sector and RES in the EU and six Eastern Partnership countries: Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine. A number of case studies on identification of significant potentials, challenges and barriers in renewables are presented. The results show that the countries have significant potential in renewables, more specifically in hydro energy, wind energy and solar energy.

Identification and exploitation of possibilities regarding the potential relevant instruments are presented and currently open calls for cooperation, defined by the European Commission proposal for “Horizon 2020” in the field of renewable energy, innovation and technology transfer, available for the application, are listed.

The document describes the process of establishing transfer centres (or transfer offices) in greater context emphasizing different socio-economic, political and cultural environment in Old Member Countries (OMC), New Member Countries (NMC) and Eastern Partnership Countries (EaPC), and, offers practical advice for creating these units in EaPC.

7 Literature review

Directive 2009/28/EC on the promotion of the use of renewable energy and defining the 20% renewables target per Member State.

Directive 2003/87/EC as amended by 2009/29/EC reviewing the EU emission trading scheme by defining an emissions cap and harmonising allocation of allowances to companies.

Decision No 406/2009/EC (Effort Sharing Decision) defining the targets per Member State for GHG reductions in sectors not included in the ETS.

Regulation (EC) No 443/2009 (CO2 & Cars) on CO2 standards for new passenger cars

Regulation (EU) No 510/2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO2 emissions from light-duty vehicles

Directive 2009/30/EC (Fuel Quality Directive) to reduce the life cycle carbon content of fuels.

Directive 2009/31/EC creating an enabling framework for carbon capture and storage.

Directive 2012/27/EU on energy efficiency defining required actions at Member State level

Directive 2010/31/EU on the energy performance of buildings

Directive 2009/125/EC on ecodesign requirements for energy-related products, incl. standards

Regulation No. 2006/842/EC on F-gases and Directive 2006/40/EC on F-gases from mobile air conditioning

Directive 99/31/EC gradually phasing out the use of landfills for waste disposal, reducing CH4 emissions

Directive 1991/676/EEC on Nitrates, contributing to limit N2O emissions

Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles

Directorate - General for External Policies, Policy Department, Workshop: Eastern Partnership Prospects on Energy Efficiency and Renewable Energy. EXPO/B/AFET/FWC/2009-01/Lot1/48

Directorate - General for External Policies, Policy Department, Workshop: EU- Eastern European Partners Cooperation in Energy Security: Achievements, Barriers and Prospects. EP/EXPO/B/AFET/FWC/2009-01/Lot1/39

Council Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity

East West. Available at http://www.east-invest.eu/en/about-east-invest

Horizon 2020 - Work Programme 2014-2015 (EC)

Joint Staff Working Document: Implementation of the European Neighbourhood Policy in 2012 Regional Report: Eastern Partnership (EC). 2013

Regulation 1222/2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters

Regulation 228/2011 amending Regulation (EC) No 1222/2009 of the European Parliament and of the Council with regard to the wet grip testing method for C1 tyres

The state of renewable energies in Europe edition 2013, 13th EurObserv'ER Report, Printed by Imprimerie New Goff, December 2013, ISSN 2101-9622

Campbell, A. F. 2007. How to Set up a Technology Transfer Office: Experiences from Europe. In: *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at www.ipHanbook.org.

Clean Energy Info Portal – reegle. Available at http://www.reegle.info/index.php

CVTI SR [Centre of Research and Technical Information of the Slovak Republic] 2012. *Metodický postup na zriadenie a prevádzku centra transferu technológií na vysokých školách, vrátane návrhu štandardného modelu fungovania* [Methodical procedure of establishing and

functioning of the technology transfer centre at universities, including a proposal of standard operation model]. NPTT [National infrastructure for support of technology transfer in Slovakia]: Bratislava.

Dodds, J. – Somersalo, S. 2007. Practical Considerations for the Establishment of a Technology Transfer Office. In: *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at www.ipHanbook.org.

Fernandez, C. 2007. How to Set up a Technology Transfer System in a Developing Country. In: *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at www.ipHanbook.org.

Loeffler, J. – Höptner, N. – Chiran, D. 2013. *Synopsis Results Workshop I&TT – 2nd Annual Forum Danube Strategy – Bucharest, 30.11.2013* (working material)

Nelsen, L. 2007. Ten Things Heads of Universities Should Know about Setting up a Technology Transfer Office. In: *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at www.ipHanbook.org.

Seventh Framework Programme: Knowledge Transfer Community to bridge the gap between research, innovation and business creation (NoGAP). FP7-INCO-2013-9. Deliverable D.2.1

Tornatsky, L. G. 2000. Building State Economies by Promoting University-Industry Technology Transfer. National Governors Association: Washington D.C.

Young, T. A. 2007. Establishing a Technology Transfer Office. In: *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at www.ipHanbook.org.