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Co-ordination of Research Policies with the Western Balkan Countries

National background report on Energy for Albania

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Executive Summary

This report provides an analysis and evaluation of the current and prospective profitability, liquidity and financial stability of energy system in Albania.

Albania Economic Competitiveness. Although the recovery in the world economy and social life since the early 1990's is remarkable, an innovation system integrating business corporations, universities, government initiatives, in line with the European standards would still demand remarkable efforts.
European Union integration process is challenging, particularly when concerning innovation system, relating to areas and sub-areas of crucial importance which require intellectual pursuits and their integration for some of the most vital areas for the benefit of humanity, particularly of transition economies and third countries. Contribution that interaction within the EU institution can make to economic prosperity, quality of life and environmental sustainability is obvious, as it helps foster knowledge creation and dissemination. Relations among different EU and non -EU stakeholders who are active in S&T already exist. Several EU member states are engaged politically with different non-EU countries due to common historical, cultural, linguistic, and geographical background. Setting up relations with the third countries into a more systematic institutional framework would be of a great benefit for ERA due to relations that might be created among the countries. Access to the best knowledge grounds would help Albania become one of the most attractive countries in the area of science, technology and economy.

Albania responding to global challenges. EU respective entities are the greatest financial supporters in the area of R&D. Consequently, EU priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society. Knowledge should not be considered only a source of economic development, but it also prompts quality life and invigorates wellbeing of humanity. In addition, it complements European identity and are to promote the progress of developing countries and cultural values.

Albania promoting political cooperation, dialogue and trust. Political cooperation, dialogue and trust i.e. a still political climate is one most effective ways of influencing and assisting science institutions and creating real bridges between the them and government. Since the very beginning, European integration has been based on values, which balance state sovereignty and supranational integration. EU integration process imposes engagement towards economic, social and political criteria. As a knowledge-based society, access to scientific and technological infrastructures is of a crucial importance. Collaboration in the area of science and technology between EU and other countries is a political strategy.

Albanian respective government bodies' mission is recognizing promoting, and supporting excellence in science and encouraging the development and use of science for the benefit not only of the country but of humanity as well. On the other hand, science and technology institutions aim at: i) providing scientific advice for policy-making institutions, ii) investigating on science tendencies and establishing the skeleton of the future goals of science, iii) investigating on science priorities.

Their advisory work relates to the reinforcing institutions in the country.

It is clear that the opportunities to be seized by an effective ERA are very important. Actually, the instruments under the European Union institutions disposal are rather limited. Nevertheless, the existing instruments are to be better integrated with those of the developing countries. Once reviewing the existing instruments, this report intends to make few recommendations on prospective profitability, liquidity and financial stability of energy system in Albania so that EU standards could be met.

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Introduction

Albanian continuous political commitment towards EU is required in parallel with its engagement in the area of research and technology and mutual cooperation with Albanian and foreign institutions.

The European Council meeting in Thessaloniki in June 2003 is a strong foundation on which to renew momentum for cooperation in the research area among Western Balkan countries. The, heads of states and government stated that the future of the Balkans lies in the EU. In addition, Ministers of Science also endorsed a 'Shared Vision' and a 'Science and Technology Action Plan' aiming at placing research cooperation with the five Western Balkan countries at the heart of political agenda. Implementation of the Action Plan has unavoidably led to increased research opportunities and support for capacity building.

The new approach to international cooperation under the Seventh Framework Programme for Research, Technological Development and Demonstration activities (2007-2013) (hereafter referred to as FP7), together with the ongoing process of future integration into the EU, demands extensive dialogue. Stakeholders should be committed to supporting research capacity in the Balkan region, meeting common interest and exchanging ideas.

Since 1 January 2009, the Western Balkan countries (Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro and Serbia) area associated member countries to FP7. This is an excellent opportunity for all the countries, as it helps get acquaintance with EU research policy. Research entities in Kosovo (1) can also participate in FP7 as International Cooperation Partner.

Each country is going to be individually called up for membership status due to different political characteristics. As is evident from the country profiles, the level of development of Albania partner is very different, as is their status vis-à-vis the EU. In addition, is individually engaged with the FP7. Nevertheless, all the countries have common priorities the EU membership status and transforming the society into knowledge- based society. Consequently, efforts in the research area ought to be increased. For both objectives, increased research efforts are necessary. Investigating on science tendencies and establishing the skeleton of the future goals of science is of great importance.

Due to its specificity, the *acquis* in the field of science and research does not require any transposition in the national legal order. Implementation capacity does not relate to the application and enforcement of legal provisions but rather to the existence of the necessary conditions for effective participation in the Framework Programmes. In order to ensure the successful implementation of the *acquis* in this domain, notably the successful association to the Framework Programmes, Albania will need to create the necessary implementing capacities in the field of research and technological development including a qualitative personnel related to Framework Programmes' activities.

The Albanian Ministry of Education and Science is the supreme governing authority in the area of science and technology. This governance system comprises the Academy of Sciences of Albania, Universities, Ministries' Scientific Research Directorate and the R&D private sector. The technology policy is drafted upon the Albanian Strategy of Research, Technological Development and Innovations (ASTDI) (2009-2015). National Research Development Programs for Innovative and Technological Development are under the responsibility of Agency of Research, Technology and Innovation (ARTI).

The Albania research system made up of 11 public and 38 private universities, 4 public researches institutes, 11 research centres related to the industry and agriculture area, agencies and other scientific research legal entities.

In Albania, the annual gross domestic expenditure on R&D (GERD) for 2009 stood at EUR 15 million, which is less 0.2% of the GDP. Being part of the ASTDI, the government priorities emphasizes financing with 0.6% of GDP on research by 2015.

Full participation in the Framework Programmes should be the first step towards the implementation of *acquis* in the field of research. In addition, improvement of research policy, infrastructure and the appropriate institutional set-up is important. Moreover, an appropriate financial scenario for the payment of the association fee would be important.

Scenarios of making Albanian science and technology in Albania an important component of the European Research Area defined by the Strategy for Development of Science in the Republic of Albania and the Act on Scientific Activity and Higher Education are the 21st Century goals.

These documents provide information on changes that might be made, which help create an efficient and stimulating system of science and technology based on the EU model. Integration into the European Research Area is supported through the EU and other European Research Programmes and Initiatives (FP 6, COST, EUREKA, CARDS). The TEMPUS programme supports the integration into the European Higher Education Area**.**

Albania Profile

Situated in the south-eastern Europe, in the western Balkan Peninsula, the Republic of Albania is small country of 3.1 million people and is characterized by a typical Mediterranean climate, consisting of mild winters with abundant precipitation and hot, dry summers. Precipitation is a key factor for national electricity production as Albania produces most of its electricity from hydropower plant and for agriculture. Over half of the workforce is employed by the agriculture sector.

Remittances from abroad are an important source of income and economic development. As the banking system has matured and economic conditions have improved some migrants have returned with their

savings to invest in property and other businesses. The growing services sector supported by an expanding energy sector is one axis of progress and development.

Albania marks a rapid and uneven reformation process concerning the transition to a free market economy. Albania is fully committed to becoming an EU member state and great efforts are being made to improve the economy and to make it survive in the single market.

In 1992, the authorities run a programme which would have establish a modern banking system. The reforms proved effective and led to an increase in formal private sector credit and a rise in the number of private banks. Banking sector is continuously developing, due to a full privatization process and international private banks being part of banking sector.

Continuous progress is ensured by improved fiscal discipline, effective resource allocation and in the management of public expenditure with incentives for development of natural resources and a reform process to create a business friendly environment to facilitate inward investment.

Albanian Government has undertaken an impressive set of initiatives and reforms to improve governance on key priorities. The Government's integrated planning system and the establishment of administrative 'one stop shops' exemplify successful top-down and bottom-up approaches with a strong customer or service orientation.

Brief country overview

Situated in south-eastern Europe, in the western part of Balkan Peninsula and with a sandy shore to the Adriatic Sea and a rocky shore to the Ionian Sea, the Republic of Albania has a surface area of 28,745 km^2. About 77% of the country is mountainous and the average altitude is 708m, twice as the European average. Its borderline is transected by Montenegro, Kosovo to the north-east, to the east by Macedonia; south and southeast by Greece. It is administratively divided into 12 prefectures, 36 districts, 315 communes and 2900 villages, and there are about 3.1 million inhabitants in Albania, with 600,000 living in Tirana capital city.

The climate of Albania is typically Mediterranean, consisting of mild winters with abundant precipitation and hot, dry summers. Along the coastal lowlands, the annual mean temperature is 12–14°C. Annual mean maximum air temperature varies from 11.3°C in the mountainous zones up to 21.8°C in the low and coastal zones, while annual mean minimum air temperature varies from – 0.1°C up to 14.6°C. Average rainfall is about 1,485mm per annum. However, this is unevenly distributed, with the southeast receiving less. The heaviest rainfall is in the Albanian Alps up to 2,800-3,000mm/year. About 70% of rainfall is from October to March, peaking in November, and the driest months are July and August.

Precipitation is a key factor for national electricity production as Albania produces most of its electricity from hydropower plants. It is also very important for agriculture in which over half the workforce is employed.

On a national scale, the structure of land use in Albania has remained almost the same for the last decade. In 2002 the land use structure was reported to be: 24% of total land area for agriculture, 36% for forests, 15% for pastures and 25% for other uses. The amount of land used for agriculture has remained approximately constant over the period from 1990 to 2005 (700,000 ha), and at present approximately 60% of this area (400,000 ha) is cultivated, with the remaining being left idle due to its location at 300m above sea level and its rocky conditions which make it unsuitable, both for irrigation and pasture.

Albania is a constitutional republic with a democratically elected parliament. The president is the Head of State and has general powers as Commander-in-Chief of the army and Chair of the National Security Council. He is also the head of the High Council of Justice. Legislative power is concentrated in the Albanian Parliament. The executive branch of government is maintained by the Council of Ministers, headed by the prime minister. He exercises every state function that is not specifically delegated to other organs of state or to local government. Apart from being the highest executive body, the Council also adopts and promulgates certain acts delegated by legislation - decrees, ordinances, regulations, resolutions and instructions, and is entitled to initiate the adoption of laws by drafting, deliberating and forwarding bills to Parliament.

With the move to democracy, Albania has experienced large scale political, institutional and socio-economic changes. From a deeply isolated country of constitutionally denied freedoms and rights, as well as imposed atheism, it has been transformed to embrace political pluralism where the freedoms and rights of individuals and minorities are respected and guaranteed.

Economic background

Albania is economically characterized by an average annual growth rate of around 6% over the past decade. After the slowdown in the second half of 2009 and the beginning of 2010 characterized by weak export sector and of domestic demand, the economy bounced back to positive growth rates of above 3% since the second quarter of 2010, mainly as a result of strong export recovery. The recovery period experienced during 2010 appears to have moderated in the first half of 2011, possibly reflecting concerns about contested local elections and the situation in neighboring Greec**e.**

1. PURPOSE OF THE NATIONAL BACKGROUND REPORT AND METHODOLOGY/SUMMARY OF THE CONSULTATION PROCESS

Reformation process started in 2006 with the reorganization of the Academy of Sciences aimed at strengthening economy and becoming an EU member state. Former institutes of the Academy are now part of public universities. With this reform, the role of the Academy is now, as is the case in most European countries. The research institutes which belonged to the line ministries were also restructured and merged into 12 newly created technology transfer centres and agencies.

Science, technology and innovation (STI) are clearly of fundamental importance for the knowledge-driven economy at all stages of development, albeit in different forms or features. The capacities to undertake scientific and applied industrial research, transfer them, adapt and assimilate new technologies into economic structures and disseminate them into society, and to creatively develop new products and services using technologies (product and service innovation), as well as through marketing, design and organizational change (non-technological innovation), are fundamental to national competitiveness. The European Union (EU), member of which Albania wants to be, set clear objectives related to research and innovation as part of its 'Lisbon Strategy': to make the EU the most competitive economy in the world. Albania, like other Western Balkan candidate and associated countries, has lagged behind such developments due to the need to focus on laying the foundations for growth (through education, legal frameworks, alleviating poverty, etc.). However, the time has come to invest more in creating, diffusing and applying knowledge if Albania is to meet its long-term development goals.

Albania is a small geographic country, even in regards to population. It is characterized by low income, even after two decades of rapid growth. The progress made in the economy and productivity growth is clear. Nevertheless, competitiveness is still low and based on factor (labour) costs rather than high value added products or services. There are only about 750 medium and larger companies in the country, and the sectors' composition is heavily skewed towards low technology activities (agricultural employment remains relatively high), while exports are low in both absolute and relative terms. To assist a structural adjustment towards more knowledge intensive economic activities, an effective STI policy is necessary to complement other measures supporting economic modernization. In 2006, the Albanian government undertook a deep reform of the scientific research system. The prime minister nominated an expert group from the academic community, which, based on a deep assessment of the research system, drafted a platform for reform. The recommendations of the expert group were analyzed by the Higher Education and Science Council (KALSH). On such basis Albanian government took several decisions concerning reorganization of Albania's network of scientific research institutions.

The legal framework governing STI issues has evolved in the last few years, notably through the adoption of the 2007 Law on Higher Education and the revisions of the Scientific System in Albania. A 1994 Law on Science and Technological Development remains in force as well. The 1994 Law created a Council for Science Policy and Technological Development (CSPTD) as the body that defines and proposes a Science and Technological Development Policy to be approved by the Council of Ministers, reviews it, and takes decisions on the National Programmes. In line with the law, CSPTD is chaired by the Prime Minister and has up to 15 members from the scientific community and governmental institutions. However, this Council has never functioned effectively or been given there sources (e.g. a staffed secretariat) to fulfill its mandate, as noted in several reports and in discussions for the preparation of the strategy. The 1994 Law should be repealed or revised to bring it in line with international standards, notably taking into account opening of national programmes in line with EU priorities, State aid rules for R&D and innovation funding, researchers mobility, etc.

Today, it is difficult to make firm statements about the level of investment in favor of STI the performance of the public, academic or business organizations performing research or about the functioning of the 'innovation' system in general. R&D and innovation statistics are not collected currently to international (OECD, EUROSTAT or UNESCO) standards. However, a first questionnaire survey to public and academic institutes has been made, in the first semester of 2009, and a business R&D and innovation survey will be launched by summer 2009, both with the support of UNESCO. Nevertheless, in terms of investment, the estimates, corroborated during discussions held for the preparation of the strategy, suggest that the annual Gross Expenditure on R&D (GERD) will be close to 15 million Euros in 2009, i.e. below 0.2 per cent of GDP. This expenditure is almost exclusively funded by the public sector and by foreign sources. Government is committed to increasing funding, and the 2009 budget for higher education and scientific research is 2.2 times higher than that for 2005. For the first time, the higher education budget reached $100 million in 2009, of which $6million are for 'institutional funding' of scientific research (compared to $800,000 in 2005).

Data on the number of researchers in the country or the Diaspora elsewhere are not available, but as in other countries of the region, scientists are in short supply. To reverse the brain drain phenomenon, the Albanian government, with the support of the United Nations Development Programme (UNDP), set up a

'Brain Gain Programme' focusing on the Albanian Diaspora by granting incentive packages to returning individuals with foreign degrees to apply for leadership positions in universities and public administration in Albania. The programme also helps identify the Albanian student community abroad.

The STI plan also aims at boosting the innovation capacity of the business sector, for example through partnerships with academia and industry and by attracting more business investment from international partners. Albania has also identified the need to concentrate research efforts on thematic areas of strategic interest for modernizing the economy, and will finance research as a matter of priority in the agro-food industry and other areas contributing to increased tourism, as well as improving energy supply and water resource management.

The Albanian scientific infrastructure is limited and largely outdated, making the progress in science and research area difficult and competitiveness hinder. There are many incentives and efforts to create better infrastructure firstly with the support for the development of communication networks and IT systems, and investments in advanced technologies. Albania is strongly believes in the merits of regional centres of excellence.

The Ministry of Education and Science (MoES) oversees strategic planning and legislative issues of S&T as well as the development of national programmes and international cooperation. The MoES is also responsible for preparing the calls for proposals and assessing the implementation of national funded projects.

The internationalisation of Albania's research efforts is an integral part of the vision behind the STI plan: Enhanced cooperation with the EU, notably through association to FP7 and preparing for integration into the ERA, are tools to make the country reach to the goals set out in its national strategy.

2. The *Energy* S&T system in Albania

The Science and Technology (S&T) system in Albania was highly decentralized and based on the principles of self management. Albania research and development (R&D) was well integrated in EU R&D system, internal and international research projects.

In the area of science, the Ministry of Science, Education carries out administrative and other tasks related to the development of scientific research activity and scientific-technical information and communication, foundation and development of scientific research and other legal entities, development of science and application of scientific achievements, harmonization in financing programs of permanent research activity and contracted projects as well as in financing scientific projects of special interest, planning, harmonization and implementation of development of IT activity and its integration into an overall information system in the Republic of Albania, monitoring, documenting and implementing scientific, technical and technology cooperation with foreign countries and international organizations according to international agreements.

2.1 Albania Energy policy framework

Albania is working for a reliable and sustainable energy sector, development of which shall be based on using all energy options in order to meet own energy demand and to create added value for Albania citizens, in alignment with principles of environmental, economic and social responsibility.

Timely and efficient investments are important for achieving a continuous development in the energy system area. Albanian Government plays a key role in creating a stimulating environment for investments into energy structure, especially into new production capacities, and in decreasing the risks for investors by its activities and transparent, unambiguous and firm strategic energy policy framework.

The Strategy has analyzed a number of development scenarios for the energy sector, recommending the following of an active scenario, which provides a quantitative description of the necessary measures to increase efficiency and to introduce other alternative sources in the energy system. This active scenario shows that these measures will transform the energy system into a supporting sector for the development of the Albanian economy and the growth of welfare.

The Ministry of Economy, Transport and Energy (METE) aims to guarantee a stable and reliable energy supply for the economy, because especially the reliability of energy supply is one of the most important preconditions for sustainable growth of all sectors of the economy. The difficult energy situation, which the country faced for a relatively long period of time, as well as the price increase of oil, gas and other energy sources in the international market, evoked a series of important objectives for METE's energy policy of: strengthening the reliability of the energy supply, increasing the efficient use of energy, diversifying the energy sources, and creating an effective regulatory and institutional framework according to EU standards.

2.1.1 The overall Energy policy framework

The strategy for the development of the energy sector is part of the national general strategy for the economic development of Albania. This document has analyzed and included the necessary changes that should occur in order to increase the security of the energy supply and the optimization of the energy resources in order to meet the demands and achieve a sustainable economic development in the future. The Strategy contains a number of specific objectives, including:

- Strengthening the reliability of the energy supply by making proper use of the existing energy sources, building of new generating plants, diversifying the energy supply as well as connecting the country to the regional networks of electric energy and oil and gas pipelines;
- Efficient and optimal use of energy by ensuring its lowest possible impact on the environment, which could render the energy sector a supporting sector for the sustainable development of all other economic and social sectors;
- Creation of an effective regulatory and institutional framework in line with EU standards and pursuant to the international agreements signed by Albania;

- Continuation of the restructuring of the Albanian energy sector, based on market economy principles and on the development of a contemporary energy policy, as well as on the complete restructuring of public energy companies, in view of their rapid and effective privatization;
- Energy system orientation towards the consumer and the optimization of the energy supply based on the planned use of energy at a low cost and minimum impact on the environment;
- Further liberalization of the market of oil products and the improvement of the state's regulatory role in this regard;
- Encouragement of the use of renewable energy sources (solar, small hydro power plants (HPP), wind and biomass) to ensure the maximum use of local energy sources;
- Creation of an attractive environment for foreign investors that would enable through the use of modern technology and techniques the efficient utilization of internal energy sources and consequently the increase of the domestic production.

2.1.2 The elements of Energy research policy making

- Lack of the primary energy resources;
- The existing electricity production capacity is insufficient to cover the electricity demand;
- The limited interconnection capacities with neighboring countries;
- Lack of diversification of electricity production;
- The high level of technical and non-technical electricity losses;
- Lack of interconnection gas network;
- High electricity consumption for heating;
- Non-liberalization of the of electricity price continues to have an impact on its massive use;
- Low energy efficiency consumption in economic sectors;
- Low penetration of the solar panel systems for hot water.

NATIONAL STRATEGIES THAT EXIST OR THAT ARE BEING PREPARED / PLANNED

2.2 Overview of Energy research activities

Selecting priority fields of science is a very challenging task since the process implies designating some key priorities on which financial resources are focused, while there is a natural pressure from actors outside those assigned priorities to redesign measures and include more areas into the priority budget. International experience indicates that the best approach when assigning priorities is to proceed with a combination of a bottom up and a top down priority setting. Orientation of research is normally done through a number of national research programmes that target fields selected as a priority due to their socio-economic relevance. Albania's NSDI underlines the importance of modernizing economic sectors such the agro-food industry and tourism, as well as the strategic importance of energy, environmental and water resource management.

Strategic governance of the research system and informed and objective selection of national priorities will require the development of capacities to carry out forward-looking studies (foresight, technology

road-mapping, and technology assessment) by or at the request of the consultative bodies advising the government and parliamentary committees. Equally, it is important not to stick to only top down pre-selected topics, nor overly broaden them, unless additional funding can be assured. A structuring of research potential through competitive calls for proposals that incite researchers to work together in inter-institutional and inter-disciplinary modes can allow for 'own-initiative' proposals to emerge from the research community. A principal criterion for selecting research themes will be the demonstrated ability and potential to create a critical mass of excellence in the form of groups of researchers working together on an agreed medium-term (five–seven year) research 'road-map'. Based on international experience, the size and budgetary constraints of the Albanian research system allow for the creation of four or five centres of excellence, initially over a five-year period but realistically the process could take up to a decade for the centres to reach maturity. The development of such centres of excellence will be critical for improving the credibility and visibility of Albanian research within the ERA, and thereby maximise the inflow of funds from EU research programmes (FP7, COST, EUREKA, etc.). The procedure for the development of such centres of excellence is set out below.

Albania has made considerable efforts to improve its STI system particularly from 2009 onwards. Some key regulatory measures have been created to foster collaboration between public and private research institutions, companies and universities. Albania is working for the Innovation Law, which has aimed at favoring partnerships between public and private institutions/industries.

These guidelines foresee:

- Consolidation of the National System of S&T&I in Energy sector
- Creation of a favorable environment for innovation in firms;
- Strengthening of the country's innovation capability in strategic areas;
- Promotion of the popularization and diffusion of technologies to improve life conditions of the population.

2.2.1 Energy research projects

The key research priorities identified in the Energy Strategic Plan are:

- Promoting research and innovation in the framework of the Industrial, Technological, Foreign Trade Policy guidelines along the four priority sectors: ***capital goods; software and Energy goods***
- Creating feasibility for strategic research programs on ***renewable energy research, bio-products, and energy (hydrogen, biomass and biofuels);***
- Increasing social inclusion and development opportunities based on S&T in particular for the poorest.

2.2.2 Key competencies in Energy research fields

International cooperation in research is largely conducted at the national, institutional or programme level which results in fragmented overall European contribution.

The new strategy sets out a number of principles:

- a further opening of the European Research in Energy Area to the rest of the world,
- a better coherence between research and other policy instruments for international cooperation,
- fostering strategic research partnerships and,
- increasing the attractiveness of Europe as a research partner and location.

The adoption of common principles should help move towards identification of common research objectives and pave the way for a more collaborative approach to international cooperation in science and technology.

New long term partnerships between the different actors in Europe will be encouraged in a more effective way to open and develop research programmes, both at the level of Community programmes and National programmes which support international cooperation, and to address research challenges, particularly those with a strong global dimension in Energy sector.

2.2.3 Energy research infrastructure

Final Energy Supply in Albania accounts 2105 Ktoe in 2010. Within the scope of the ESD, the total final energy consumption for 2008 has been 1879 Ktoe. The energy consumption by fuel is as follows: coal 1,2%, oil by products 64.4%, electricity 22.7%, fuel wood 11.7%. Energy consumption by sectors is as follow: Industry 13%, Transport 44%, and Residential 23%, Service Sector 10% of the TFC, Agricultural and others 10%.
Most important issues for future economic development of Albania and its energy sector are the increase of energy consumption per capita and maintaining, at the same time, a low relative level of energy intensity which would induce an efficient and competitive economy in an increasingly more open international market. As a consequence, Albania's energy sector will continue facing two important challenges: (i) maintaining this intensity at average levels, and (ii) increasing the energy consumption per capita. One average possible scenario of the Gross Domestic Production (GDP) growth rate (average one with 4.5%) for the period 2009-2018 is supposed to be more realistic for planning the country economic development and forecasting the energy demand.

Albania has historically experienced an abnormally high growth rate of electrical consumption. A large part of that growth has been artificially stimulated by extraordinarily high rates of electricity theft, nonpayment of electric bills and tariff rates well below cost. Consumers have failed to save electricity, or to make adequate use of alternative fuels for the past decade. The artificially high electricity consumption, particularly for electric space heating, has diverted a valuable resource away from commercial and industrial uses that would otherwise create jobs and contribute to economic growth.

2.3.3.1 Crude oil and oil products supply

The supply in oil, gas and petroleum products to the economy becomes from importing and local production. Although the local production of oil, gas and petroleum products fulfill 15% of economy's needs, it is getting to play an important part in the local market year after year, due to increase of the domestic production and will help to establish fair equilibrium in the sectors supply.

The production level of crude oil in total (Albpetrol, Bankers Petroleum Albania Ltd and Steam Oil & Gas) for 2010 was 894.5 Ktoe and in 2002 was 308.0 Ktoe.

It should be noted that, for a better use of our crude oil reserves in existing oil fields, in order to increase the coefficient of the oil-extraction through the use of different new technologies and for exploration and discovering new oil and gas fields , there have been signed and adopted petroleum agreements with some foreign companies such as Bankers Petroleum Albania Ltd. and Oil & Gas Steam in existing oil and gas fields and Island International Exploration BV, MedOil and DWM Petroleum AG in the new blocks of exploration.

The refinery sector is privatized in 85% of its shares since 2008. As a result of an ambitious program of investments by the company Albania Refinery Marketing Oil ARMO sh.a will improve the processing and production technology of petroleum products as in terms of investment for existing equipment improvement, which were extremely depreciated, heading to the renewal with new modern technology.

2.3.3.2 Natural gas and liquefied petroleum gas LPG supply

Currently, our country has a minimum production of natural gas, about 13 million Nm^3, almost a negligible amount, and that only serves to supply the refineries and technological processes of oil industry. Despite numerous studies of our country is not linked with international network of gas. It is understandable that linking Albania with gas network will have a positive impact on improving the energy situation in the country, significantly influenced the reports of the use of energy, where until now the main consumption belongs oil products and electricity.

Liquefied petroleum gas (LPG) in our country has significantly increased its presence and is playing an increasingly large role in the domestic market, as an alternative energy source most likely to replace electricity in the housing sector and services being consumed mainly for heating and cooking, reaching a total consumption for 2010 of 110 Ktoe. The LPG is getting a wider user in the sectors like food industry and construction.

2.3.3.3 Coal

Actually, the capacities of coal mines are at their minimum, producing around 7000-9000 tons from 2 million tons produced in ‘90s. In Tirana-Durres basin is found 70% of total reserves, Korce-Pogradec 10% and Memaliaj 4 %. According to the above analysis, it results that existing reserves in this coal basin are around 114.96 Mtoe.

Coal characteristics in our country are of poor quality, sulfur contents is round 3-5%, ashes content is 40-60% and humidity goes up to 60%. Our coals have a calorific power from 2000 kcal/kg up to 3000 kcal/kg and they are extracted from up to 300 m depth, with layer width of 0.7-1 m.

Coal usage in our country shall not be provided in the near future due to the high extraction costs and its unfavorable physical-chemical qualities. However, given the limited reserves of hydrocarbons in the world, the option of using imported coal for energy shall remain open. Obviously, its use shall be made by strict environmental regulation observation at plants that use this energy option.

2.3.3.4 Renewables Energy

Albania is working for a reliable and sustainable energy sector, development of which shall be based on using all energy options in order to meet own energy demand and to create added value for Albania citizens, in alignment with principles of environmental, economic and social responsibility.

Albania has significant renewable energy resource potential from hydro, wind, and solar energy. The country currently relies on hydropower for almost all of its electricity, which creates difficulties when water flows are low. The Government of Albania recently adopted new electricity market laws and is undergoing a process of opening that market to competition. An attractive feed-in tariff is already in place for small hydropower, but the Government is still in the process of determining the incentive mechanism for encouraging more near-term investment in renewable energy technologies. Several very large and high-profile wind-farm deals are under development and should provide political pressure to speed the government decision process.

The potential areas for follow-on activities to support the expanded use of RES in Albania include support mechanisms and administrative issues. The support mechanism that probably will be chosen by Albanian authorities (green certificates) needs to be developed such that certificates generated in the Albania national market can be sold and traded with the other European countries, especially given the new Italian wind-farm deal.

Currently only hydropower makes a significant contribution to the current energy consumption in Albania. However, the country has significant potential for renewable resources in the form of wind, solar and biomass.

Albania is located in south-western part of Balkans peninsula, Southeast Europe. The country is linked with the rest of the world via land, sea and air routes.

Albania lies in the Mediterranean climatic zone, characterized by a hot dry summer, strong sunshine and generally mild winter with abundant rainfalls. Annual average rainfall is 430 mm. Situated along the Adriatic and Ionian sea coast, Albania constitute one of the key points of intersection for the roads crossing the Western Mediterranean into the Balkans and Little Asia. Albania ensures via sea route the connection with other world countries and that of the central

Potencial Renewable Energy

The Law “On Renewables” has been drafted recently, aiming to transposes all requirements of EU Directive 2001/77 and 2003/30 and the key principles of the New EU Directive 2009/28. According to expressed scope, the law aims to deal with renewable energy sources, included bio fuels. A positive impact on promoting investments has been created by some amendments on the Power Sector Law, No. 9072/2003, that give to the Council of Ministers the right to issue the authorization permits for the construction of the new generation capacities, RES included, that are not subject of the Concession Law.

This law establishes: the legislative framework for the promotion of electricity generated from renewable energy sources; it sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy; the priority connection and access to the Grid systems of electricity generated by installations using renewable energy sources within the territory of the Republic of Albania; the priority purchase and payment for such electricity by the Wholesale public supplier; the rules relating to guarantees of origin, streamlining licensing and permission requirements, and the legislative framework relating to the use of renewable energy sources in transport.

Hydro

Exploitation of hydro energy through small hydropower plant (SHPP) schemes is of interest, too. Until 1988, in Albania were built 83 SHPPs, which capacity varies from 5 to 1200 kW, with a total capacity of 24 MW. The purpose of construction of these SHPPs, at the beginning, was to supply electricity to isolated mountainous areas. These SHPPs are mostly run-of-river type and exploit the water springs and streams close to these areas. A development program for these SHPPs has been part of recent GoA energy policies, and the law on privatization of SHPPs has created possibilities to bring them back into effective operation.

Albania is referred to in Europe as a country with considerable water reserves proportional to the population, with a hydrographical outspread to almost the entire territory. Although 100 % of this electricity is produced by hydro power stations, so far only 35 % of the hydro power potential of the country has been used. The existing installed hydro energy capacity is round 1450 MW. The total reserves of the hydro power make possible the installation of a capacity of about 4500 MW and the annual potential of production may amount to 16-18 TWh.

Biomass

Biomass is the most widely used energy resource in Albania, predominantly in the form of firewood combined with many shrubs and agricultural residual plants. The consumption of firewood has been decreased almost three to four times during the period 1990-2002. After this year fuel wood consumption has increased slightly in recent years as a result of the increased prices of other fuels and electricity. Processed wood fuels, wood chips, pellets and briquettes, are not popular due to their higher prices and the underdeveloped supply system.

Residues from fellings and low-quality wood are mainly used. Biomass waste from agriculture is not used to a great extent and is usually destroyed on the spot. The use of biogas is underdeveloped despite the available resources. It should be noted that most of the heating appliances used stoves and fireplaces are obsolete and inefficient, with heat losses amounting to 40 - 50%. Heating by high efficiency boilers for local systems is underdeveloped. The estimates of the National Agency of Natural Resources under the document of the updated Strategy of Energy show a potential significant increase in the extraction and utilisation of biomass in Albania from forestry, agriculture and livestock (for biogas production).

Fuel wood and biomass have a large potential provided that forests are adequately managed and agriculture waste used locally. Forests cover a large part of Albania's territory (2.5 percent) with proven reserves of fuel wood estimated at 125 to 250 million m^3 or 6 Mtoe.

The lack of forestry management and extensive cuts (estimated at 1.8-2.5 million m^3 or 250-350 ktoe for domestic and neighbouring markets), especially illegal ones, have endangered the resources in some parts of the country and generated a process of deforestation.

Useful biomass for energy purposes can be classified in four major categories:

- Woods or wood residues from various wood processing industries;
- Vegetation residues (stems, seeds etc.) after completion of their production cycle, which are not used in other production sectors;

- Energetic plants (woods) cultivated to be burned as biomass, and;
- Animal residues (bones, skins, dung), which are not used in other economic sectors.

Wind Potential

The main directions of wind in our country are northwest-southeast and southwest-northeast, with dominant direction towards land. Our country's coastline is 345 km north-south direction, where a part is the coastal lowlands and the other coast very close to the south seaside mountain. Inside the territory, the direction and intensity of wind from area to area varies in time.

There are major plans for developing wind energy in Albania in the next few years with significant investment in a proposed 2000MW new generation capacity from wind. It is an ambitious goal, because at present there are no wind projects in the country. Albania is also proposing to become a wind power exporter agreeing to export surplus wind energy to Italy via a planned undersea power cable.

According the study wind speed is around 6 meters per second (m/s). The good areas in Albania for wind farm locations are especially in the coastal lowlands, in the hills of Northern Albania and mountains of Southern and Eastern Albania. The basic aim our calculation is to guide the transmission operator OST in the assessment of new potential capacity at appropriate grid connection points.

There are major plans for developing wind energy in Albania in the next few years with significant investment in a proposed 1300MW new generation capacity from wind. Albania is also proposing to become a wind power exporter agreeing to export surplus wind energy to Italy via a planned undersea power cable.

The first step to carry out an energy assessment is to carry out wind measurements at the site. An anemometer is mounted at various heights up a mast. Generally, the mast should be as close to the hub height of the proposed wind turbine. For example at Bilisht Wind Farm the chosen heights were 60, 55, 50 and 45 meters, so they can measure the change in wind speed with height. At Bilisht and Lezhe areas, there is a year's data recorded for the sites. This may not be representative of the long-term speed at the site.

Solar Energy

Albania considers a country with a good regime of solar energy and a high potential of solar radiation. Solar energy is a very promising energy source for the future and its use is potential, because energy is an infinite natural resource, is the biggest natural reserve of great power that is distributed all over the world in greater amounts than our needs for energy, is clean and its use requires no other costs, and it poses no environmental pollution risk. Thanks to this geographical position, solar potential energy: most areas of Albania are exposed to more than 1500 kWh/m^2 per year varying from 1185 to 1690 kWh/m^2 per year which means a good opportunities for investments in solar energy

National Agency of Natural Resources (NANR) and donors has carried out a number of studies for installing solar panels in both residential and service sector. Based on these studies, has achieved providing small grants from various donors, and has installed the solar panel systems. Albanian citizens have started installing solar panels for hot water promoted repeatedly by the NANR through various awareness campaigns. If the solar panel systems in Albania would be developed similarly with that in Greece, the potential production of hot water shall be equal with the energy amount of 360 GWh_{th} (or 75

MW_{th} of installed capacity). These figures correspond to a total surface of solar panels of 300 000 m^2 (or 0.3 m^2/family), while the solar panel penetration in countries such as Israel and Greece is actually greater than 0.45 m^2/family.

Geothermal Energy Reserves

Nowadays, increasing attention has been given in most countries of EU to the development of geothermal resources for utilisation in district heating and in direct end users in Services and Agriculture sectors. For this type of development to materialise in a way that would be profitable for the country requires early institutional support of joint research and development efforts in collaboration with international laboratories and research groups which are well advanced in this field.

There are a variety of geothermal sources, which may be classified in: hydrothermal sources, hot drought and melted rocks. From these three groups, up to date, only hydrothermal sources have found practical utilization in Albania. Hydrothermal sources are divided in: sources where drought steam is produced from, sources where saturated steam is produced from temperatures of these two sources are higher than 150 C^o and sources where hot water is produced, from which in some countries is used for space heating.

A new technique of using the geothermal energy, which is spreading out, is that of injection of cold water in deep wells of oil and natural gas where it gets warmed. Water is injected with a temperature of (7-8)^{o}C and comes out on the surface with a temperature of (22-25)^{o}C. In our country there are still not discovered geothermal sources, producing steam, as the geological studies show there is a little hope for these sources, but there are some hydrothermal sources with lower temperature.

Most important geothermal resources in Albania are:

- Geothermal area of Kruja is the zone with the largest geothermal resources in Albania, with a size of 18 km length and 4.5 km width, containing reserves of a range of $5.9x10^8$-$5.1x10^9$ GJ.
- Geothermal area of Ardenice where the water springs from deepness with a temperature of 32-38 ^{o}C and a water flow of 15-18 l/s.
- Geothermal area of Peshkopi where there are some geothermal sources located next to each other. Water flow is about 14-17 l/s and the temperature is 43.5 ^{o}C.

ln order to better prepare the implementation of Directive 2009/28/EC, Contracting Parties should make an assessment of the available potential for the development of domestic renewable energy sources by June 2011. The table 10 along with tables 1 and 3 of the template of the National Renewable Action Plans as adopted under Directive 2009/28/EC are used as a structure to summarize the main findings.

2.3.3.5 ENERGY PROJECT

<u>Generation</u>

The generation capacity under construction or already committed by the Albanian Government is provided below.

<u>A) Hydro Power Plants</u>

(i) Ashta HPP (48 MW) in Drin River – 2009-2012 (160 MEuro - private fund), which is contracted with Verbund Austria as concessionaire;

(ii) Kalivaci HPP (93 MW) in Vjosa River - 2008-2012 (120 MEuro - private fund), which is contracted with consortium BEG Italy – DBank Germany as concessionaire;

(iii) Devolli River Cascade with three hydro power plants (3x15+2x20 +2x80 MW) in Devoll River - 2009 – 2015 (930 MEuro), which is contracted with consortium EVN Austria and Statkraft Norway as concessionaire;

(ii) Skavica HPP (350 MW) in Black Drin River, (Public fund)

Skavica HPP will be constructed in the upper side of the Drin river cascade. The reservoir will be entirely located in Albanian territory. The installed capacity is about 350 MW and the electricity production is foreseen 1,05-1.1 TWh/year. The Skavica reservoir allows planning the electricity production through the optimization of the water recourse use. More electricity, 200-300 GWh, can be produced from the downstream power plants of Fierza, Komani and Vau Dejes;

(ii) Vjosa River Cascade (Private fund)

Vjosa River is the second largest river system in Albania. Its upper catchments include areas in Greece's Northern Mountains, with high precipitation; Vjosa River is 272 km long and annual average inflow is about 195 m3/sec. Until now, the hydroelectric potential has not yet been exploited, except Kalivaci HPP;

SOGREAH, a French company presented the final feasibility study for the assessment of production potential of Vjosa River, at the end of February 2013.

B) Thermal Power Plants

(i) Vlora THPP (distillate oil) (97 MW – 92 MEuro - public fund), financed by European Bank for Reconstruction and Development (EBRD), European Bank for Investment (EIB), World Bank (WB) and by KESH itself. The THPP is planned to be put in commercial operation in June 2010.
(ii) Lezha Biomass (palm oil) TPP (140 MW; 150 MEuro – Private fund)), which is authorized to be constructed by Marseglia Group Italy

C) Wind Farms

(i) Lezha Wind Farms (108 + 114 MW), which is authorized to be constructed by Marseglia Group Italy

(ii) Wind-farm project in Karaburun Vlora, with 500 MW installed capacity, which is authorized to be constructed by MONCADA Group Italy;

D) Small Hydro Power Plants (less than 15 MW)

As of December 31, 2011, the Albanian Government, based on the Concession Law (approved on December 2006), has issued up to about 120 concession contracts (110 already have been approved and 10 are in the final stage of discussion) for building different categories of HPPs. Presents the projected total installed power generating capacity for each of the above mentioned HPP groups. Analysis shows that the total installed capacity is 1740 MW, and the part for SHPPs is about 48% with 839 MW. Those are very high figures if we compare them with actual total installed HPP capacity of Albania (1426 MW).

Also, SHPPs total capacity of 839 MW is much higher compared with capacity of existing SHPPs (25 MW) installed until 2006.

Electricity interconnections

A number of projects to improve the electricity supply and electricity exchanges and network interconnections with neighbouring countries and/or regions are in various stages of implementation:

- ***400 kV interconnection Project Elbasan – Podgorica***

  This project is separated in three lots:

  - 400 kV line Tirana – Podgorica, total length 154 km (125.5 km in Albanian side where 80 km will be double circuit and 28.5 km are in Montenegrin side). The contract for the construction is signed with Dalekovod Company. About 280 out of 323 towers have been already constructed and erected. The Project is foreseen to be finish around mid 2010.

  - 400 kV Line Tirana 2 – Elbasan 2, total length 48 km. The contract has already been signed on February 2008 with the Contractor SAE/TERNA. The Project is foreseen to be finish around mid 2010. About 102 towers out of 111 have already been constructed and erected. If the Tirana 2 substation will not be ready and the temporarily connection is foreseen between Elbasan 2 and Podgorica 2 substations.

  - 400/220/110 kV Tirana 2 Substation, transformation capacity 2x300 MVA 400/220 kV and 2x120 MVA 220/110 kV. The Project is foreseen to be finish around mid 2011.

- **The construction of the New National Dispatching Center.** The contract has already been signed with ABB/Falcione on June 2008 and is effective from September 2008. First phase of the implementation which includes the LFC loop as well control of the main 400 and 220 kV substation and some 110 kV substation has an overall time schedule of 33 months from the effective date of the contract. It is expected that the contract could finish around mid 2011.

- Also we are in the initial phase of the construction of the **new 400 kV interconnection line with Kosovo (Tirana2 – Kosovo B)**, total length about 235 km. German bank KfW expressed interest on financing it. The consultancy contract for preparation of the documents of the tender has already been signed with DECON Germany, financed by KfW as grant, and we believe to launch bids for the mid of next year. The time frame for the construction is around 24 months from the contract signing.

International gas network

The policy for the developing of the oil and gas sector will diversified the supply options and interconnection with the neighbouring oil and gas networks, since significant discoveries and a consequential increase in the internal oil&gas production level are very unlikely.

The development of a future diversified gas supply strategy for Albania should be based on supplies from the Caspian Sea and Middle Eat Regions, Russia and Central Europe through Croatia.

Policies and plans of the Albanian Government for the interconnection of the oil and gas pipelines are materialized with the support of some interconnection projects with neighboring countries and those of South Eastern Europe, through the involvement in regional project in the framework of the Energy

Community Treaty as well as agreements or bilateral and multilateral conventions for specific projects or for the energy sector in general.

In the concept of development policies of the fossil fuel transportation pipeline systems as well as regional connection of these systems, is evaluated that Albania's connection to the regional and European network of oil and especially gas shall have a positive impact in improving the energy situation in the country by substantially effecting the ability to ensure supply of energy resources as well as the proportions of the types of energy used where up to present day oil products and electrical energy account for most of the consumption.

The projects that might potentially be developed in order to connect Albania with the international gas pipeline network and expand the domestic gas market are:

The Ionian Adriatic Gas Pipeline -IAP Project

The project is related to the plans for the development of the gas pipeline network of the Western Balkans, from Croatia towards Bosnia & Herzegovina, Montenegro and Albania. This project is planned to function as a ring system, where the supply shall be carried out in two directions, through north via the Croatian system and through south via the TAP gas pipeline project.

The IAP project shall be at the same time part of the Energy Community Gas Ring, which is a regional project, approved by the Energy Community and the EU. The project is currently in the preliminary study phase. The total length of the gas pipeline shall be around 400 km (around 170 km in Albanian territory) and an estimated investment cost of EUR 230 million.

The Ministerial Declaration between Albania, Croatia and Montenegro has been signed for the IAP project on September 25 2007 in Zagreb and on December 11 2008 Bosnia & Herzegovina has co-signed it in Tirana. The pre-feasibility study for the IAP project has been completed by the companies EGL and Plinacro in August of 2008, while in April 2009 the Plinacro Company has completed the hydraulic study and cost comparison.

Approximate cost: The Albanian part EUR 90 million, the Montenegrin part EUR 60 million and the Croatian part EUR 80 million.

"Trans Adriatic Pipeline" (TAP Project)

Project TAP (Trans Adriatic Pipeline) shall be part of a new corridor "The Fourth Corridor" East-West, which shall bring to Europe the gas from Middle Eastern and Caspian countries. The gas pipeline shall cross Thessaloniki (Greece), into Albanian territory and from the Seman coastline (Adriatic Sea) through an underwater pipeline shall reach the Southern Italian coastline. Our country is using its membership in the Energy Community Treaty, which supports gas projects that realize the re-gasification of as many South Eastern European countries as possible in addition to supplying EU countries.

The (TAP) is a project that has been promoted by the Swiss company Elektrizitats-Gesellschaft Laufenburg (EGL). In February of 2008, EGL signed an agreement with the Norwegian company Statoil Hydro, and created a joint venture 50/50, to build and operate TAP.

(TAP) shall be 520 km in length in total (around 200km inside Albanian territory inland), including around 115 km on the seabed (Albania – Italy).

TAP initially will have a capacity of 10 bcm/year, providing a lot of energy for slightly more than 3 million families. The transportation capacity of the pipeline can be expanded to 20 bcm/year.

In reference to these project-proposals, the main connection point in Albanian territory shall be the interconnection point between the TAP project, the IAP project and the LNG terminal, which shall be an important transit point near the town of Fier.

The TAP gas pipeline shall connect to the Greek gas system and shall open a new corridor and network for the natural gas (The Fourth Gas Corridor for the EU), from the Caspian Sea and Middle Eastern Regions to Europe, through the Turkey – Greece – Albania corridor, securing a cheaper tariff for the transportation of gas to the EU and ease of connection to the existing gas network.

LNG Terminal of the Trans European Energy BV sh.c on the Fieri District seaside.

The projects consist of the construction of the deposits and re-gasification plants for LNG in the coastal zone of the Fieri District and of the construction of the underwater gas pipeline to Southern Italy. Presently, several companies have expressed interest in building LNG gas terminals in our country. The Albanian Government has approved areas in the Seman zone where LNG terminals shall be constructed, realizing in this framework the "Permit Contract" with the "Trans European Energy B.V" company.

Several project proposals for the construction of LNG re-gasification terminals in the Adriatic coast have been reviewed based on the study "On the possibilities of construction of LNG terminals in Albania and pertinent infrastructure in the coastal zone of the Fieri District", approved by CMD nr. 731 dated 11. 11. 2006, and based on the pertinent TRCRA Decision, Nr. 1, dated 01. 03.2007 on the approval of the respective master plan. One of these projects is that of the "Trans European Energy BV" sh.c., for which a "Permit Contract" was signed on December 2 2008 in Tirana for the construction of the LNG terminal in the coastal area of the Fieri District as well as the underwater gas pipeline to Southern Italy after a long period of review, evaluation and bilateral talks.

The LNG terminal shall have a capacity of around 8 billion Nm3 per year, the equivalent of around 6 million tons of natural gas per year. The LNG terminal shall be able to unload ships of capacity up to 140.000 m3.

Oil Pipeline project

The main project on the connection of Albania with the regional oil pipeline network is the project on the Trans Balkan Oil Pipeline, Albania - Macedonia - Bulgaria –(AMBO project). This project has been considered a strategic project due to the fact that the Trans Balkan Oil Pipeline system AMBO has been designed to be part of the infrastructure of the Pan-European East-West Eighth Corridor.

MOST IMPORTANT RELEVANT INSTITUTIONS (POLITICAL, ADMINISTRATIVE, HIGHER EDUCATION, PUBLIC/PRIVATE RESEARCH INSTITUTIONS)

The science system in Albania includes the higher education, scientific research, development and knowledge and technology (innovation) institutions. As such it includes not only the public and non-public institutions of higher education and basic research, but also entrepreneurships acting in the field of research, development and innovation. The reforms undertaken in the field of higher education and basic research, first and foremost, are targeted at integrating these two systems, which so far have been entirely separate from one another, and which should be innovative and efficient for the conditions of a small country with limited financial resources.

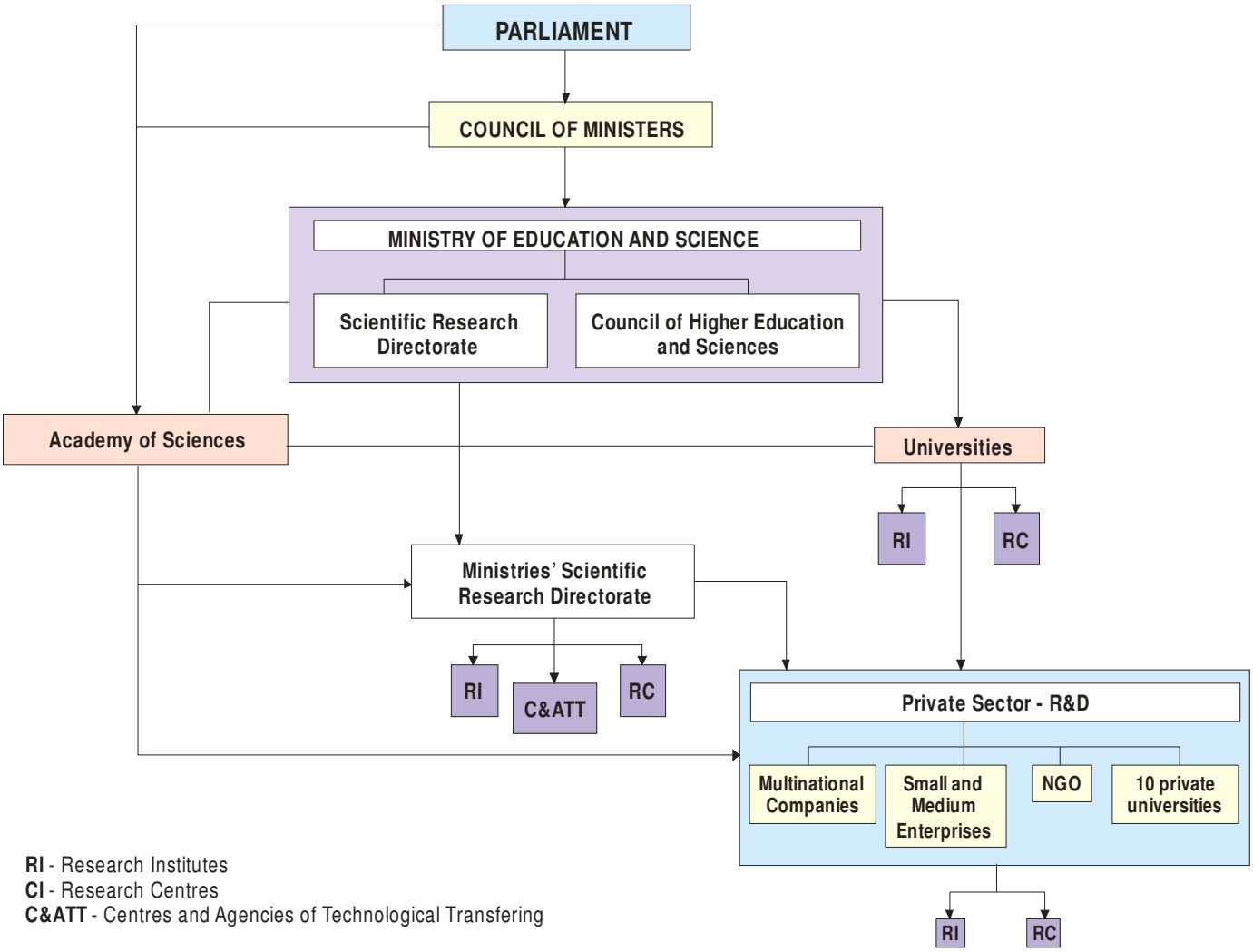
a) The higher schools are academic research institutions, which, according to the higher education strategy (2008) ensure tertiary education, scientific research, development and transfer of knowledge and technology. The duration and level of scientific research in the various universities varies. Currently, Albania has eleven higher public schools and 38 private higher schools. The latter are at a young age –the first opening in Albania only six years ago. However, some of these have shown potential even in the field of research.

b) The national research centres are research-oriented academic institutions whose mission is to carry out scientific research, to educate and deepen university education in the second and tertiary circle of studies, to develop and transfer knowledge and technology. The Albanologic Study Centre has been established based on the re-organization of the Albanologic Institutes of the Academy of Sciences. The higher schools and research institutions that mainly deal with scientific research and have sufficient human capacities should build research–academic groups as basic units for realising research operating within the respective department or faculty. The new Law on Higher Education in the Republic of Albania provides the establishment of such a structure. In the public schools that have more limited capacities for research, it is more important to support the establishment of Regional Development Centres, where researchers of various faculties and departments cooperate through projects for carrying out important studies for the region. According to the higher education strategy, the establishment of these centres should be supported by an initial promotional fund.

c) Public Centres / Agencies of development and technology transfer have the mission of carrying out studies and development projects and of transferring knowledge and technologies in the practice of product and service delivery. The following centres/agencies operate in the relevant line ministries:- six centres/agencies in the Ministry of Agriculture, Food and Customer Protection- one agency in the Ministry of Environment, Forests and Water Administration- one centre in the Ministry of Tourism, Culture, Youth and Sports- two centres/agencies in the Ministry of Economy, Trade and Energy- two centres in the Ministry of Public Works, Transports and Telecommunication.

d) Centres/Agencies/institutes and other private entrepreneurships dealing with research, development, technology and knowledge transfer fields. This chain of the system is still in its first steps of development in Albania, but the development trend is very positive. Some similar, private units also exist in the form of institutes or NGOs with a clear profile of competencies in this field, in particular in the field of analysis of social and economic problems, serving as a basis for policy making. This segment of the research and development system has provided good support for the policy-making, executive and legislative bodies. Meanwhile, private entrepreneurships in the field of knowledge and technology transfer in the IT sphere have also increased. However, initiatives in other important fields for economic and social development of the country are scarce. For instance, there is little private initiative for studies in the field of energy, agriculture, molecular biology, biotechnology, natural resources and other related fields. In addition, it should be highlighted that development of private entrepreneurship in research, development, technology and knowledge transfer has, in all cases, been speedier than that of public institutions, because of the absence of stimulating financial mechanisms for researchers and genuine public institutional reform of the science system (Scheme 1).

SCIENTIFIC SYSTEM IN ALBANIA



The main institution in energy sector which works in R&D programe are as follows:

Energy Regulatory Entity (ERE) is an independent institution, based on Law No. 9072, dated 22.5.2003, "On power sector", amended, Official Journal No. 53, Page 2120; Publication Date 03.07.2003), and Law No. 9946, dated 30.06.2008, "Natural gas sector", (Official Journal No. 114, Page 5015; Publication Date 22.07.2008), with closely associated responsibilities with energy markets. Its mandate includes licensing electricity and gas companies, setting wholesale and retail tariffs, protecting

consumers' interests, settling disputes between licensees and consumers, promoting competition and approving market rules and grid codes.

Ministry of Economy, Trade and Energy (METE) is the highest state authority in drafting policies and strategies in the energy sector. Missions of METE in the energy sector are development policies to ensure a normal supply with energy of the consumers, to guarantee a sustainable growth of country's economy and a social and cultural development of the population. It determines the policies at national level for developing different kinds of energies, policies in the field of energy efficiency and measures for implementing these energies. METE has the authority of supervising the activity of companies with state owned capital and it has the power to appoint all the members of the Supervisory Councils of these companies.

National Agency of Natural Resources – NANR (Agjencia Kombetare e Burimeve Natyrore - AKBN) has been established in accordance with Council of Ministers Decision No. 547, dated 09.08.2006, "Establishment of National Agency of Natural Resources", (Official Journal No. 93, Page 3903; Publication Date 25.08.2006), as the outcome from the former National Agency of Petroleum and the Institute for Extraction and Processing of Minerals merge. Based on CMD No. 202, dated 11.04.2007, "Few supplements and changes in CMD No. 547, dated 9.8.2006, "Establishment of National Agency of Natural Resources" (Official Journal No. 50, Page 1324; Publication Date 02.05.2007), the former National Agency of Energy was abolished as an institution and it merged with NANR. NANR is an institution depending directly from responsible Minister on energy. It serves as a specialized body for drafting the strategy in this field, monitors its implementation, plans the needs for energy in the future, issues recommendations, as well as implements policies of the Government in the field of minerals, petroleum and hydro-energy.

Central Technical Inspectorate (CTI) has been established based on Law No. 9595, dated 27.7.2006, "Establishment of Central Technical Inspectorate", (Official Journal: Year 2006, No. 84, Page 2871; Publication Date: 09-08-2006), as a merge of State Inspectorate of the Oil and Gas Control, Inspectorate of Containers under Pressure and Inspectorate of Electrical Equipment and Installations. This inspectorate is responsible to exercise control with all public or private entities that have to meet requirements, norms and standards determined for the petroleum products, under pressure equipments and electrical equipments.

The Agency for Research, Technology and Innovation (ARTI) is a public, legal institution under the competences of the Council of Ministers. ARTI is established with the Decision of Council of Ministers and has started its activity in March 2010.

The mission of the Agency for Research, Technology and Innovation is to evaluate, finance, monitor and manage programs and projects in the fields of science, technology and innovation in Albania. ARTI aims to fund projects in the field of Small and Medium Business as well as transfer, modernization and renewal of their technologies.
ARTI aims to build a modern system of science, strengthen of research and technology, as well as their integration inside the higher education system.
ARTI facilitates the exchanging of knowledge, mutual activities and partnership within and outside the country.
ARTI as a coordinating and guiding structure which cooperates with institutions in the field of science

and technology for sustainable development of the country, in line with national priorities, development of scientific and technological policies and management of Research and Development (R&D) institutes.

Albanian Energy Efficiency Centre – EU (EEC) has been established in June 1996. Its role is implementation of renewable and energy efficiency projects.

Organization of Public Electricity Sector

The public power sector is organized as follow:

Albanian Power Corporation (KESH sh.a.) is responsible for production of electricity and maintaining and developing the generation assets (Drin River Cascade 1350 MW, Mat River Cascade 50 MW, Bistrica Cascade 27.5 MW, Selita HPP 5 MW, Fieri TPP 159 MW (out of functioning) and new Vlora TPP 97 MW. KESH has also the license as Wholesale Public Supplier of electricity for the tariff customer and could play the role of the supplier of last resort for the Eligible Customers;

Transmission System and Market Operator (OST sh.a.) is responsible to operate, maintain and develop the transmission system 400-220–110 kV including high voltage substations, to operate the power system in Albania and to organize the electricity market in Albania;

Distribution System Operator (OSSH sh.a.) is responsible to operate, maintain and develop the distribution system 110-35-MV-LV kV including the substations and transformation points at each level of voltage and has also the license for Retail Public Supplier for essentially the billing and revenue collection associated with the Tariff Customers;

Also, from one side, there are independent electricity producers, especially for the small hydro power plants, which operate an installed capacity up to 15 MW. There are some eligible customers on the other side; two private industries qualified, which are ACR Chrome Elbasan and Cement Factory Fushe Kruja. In addition, many private companies are licensed for their activity in Supply as Qualified Supplier and Trading Electricity as traders on wholesale market.

Organization of hydrocarbon sector

The organization of hydrocarbon sector at METE is at horizontal line, where there have been included General Departments, such as the General Department of Policies (DPP), General Regulatory Department (DPR), General Department of the Trade Services (DPSHT), which in accordance with the scope of their activity aim at ensuring a normal supply to the consumers with hydrocarbon energy resources.

Related to the companies operating currently in the hydrocarbon sector, the state continues to play a role in the supervision of their activity specifically on the production of the oil and natural gas and processing and trading of inland oil production.

In the public sector of oil and gas, there are operating company Albpetrol sh.a., being responsible for the activity of exploration, production, services etc, ARMO sh.a. already privatized, being responsible for the refineries (Ballsh, Fier), as well as activities of wholesale and retail trading of fuels (based on the local resources). In the field of marketing and trading, the private companies of trading are prevailing, covering round 23% of the needs of the market. In the exploration and production activity, the foreign companies are prevailing, operating based on the petroleum agreements concluded with the Albanian state.

In 2011 the activity of exploration and production are in operation 6 petroleum agreements with Albanian state for 9 blocks exploration, while in the development of existing oilfields are in operation 7 petroleum agreements for 6 oilfields and 1 condensate oilfields. Crude oil production in 2009 was 576 576 ton from that 396 853 ton are from agreements hydrocarbons.

2.3 Key drivers of Energy research

Policy driver / Scenario	Reference	Renewables	Energy Efficiency
Energy security and diversification	Increasing gas imports Hydro-dominated generation system	Increased use of more costly domestic RE resources, reducing gas imports	Reduces gas and oil imports due to lower direct energy and electricity consumption
CO_2 mitigation	Emissions double by 2030 due more carbon-intensive energy system	Strong cumulative reduction in emissions of 7.1%	11.3% cumulative emission reduction (17.8% in combination with RE target)
Enhanced competitiveness[1]	Electricity system expansion and greater access to gas key for continued (high) economic growth	Stimulate investment in renewable market Significant increase in long term electricity price	Lower fuel costs and less capacity additions Reducing household bills, increasing purchasing power

2.3.1 Main Energy sector trends in Albania

The full engagement of the Albania energy trend began in earnest some two years ago. As has been described in the previous sections substantial progress has been made with respect to assembling and using the software-Albania model. Going forward areas for additional sensitivity analyses under consideration for the next phase of the project include:

- Potential of gas, coal and nuclear power as a viable future generation options;
- Impacts of regional energy sector integration, particularly imports-exports of electricity;
- Assessment of the policy mechanisms to incentivize energy efficiency uptake, such as appliance subsidies, in particular for solar thermal for hot water in the residential and service sector;
- Opportunities for pursuing sustainable low emission development strategies (e.g., reducing carbon emissions cost-effectively), and
- Further exploration of energy system options in the absence of future gas supply, to assess energy system resilience to import ‘shocks.’

2.3.2 Main socio-economic challenges in Albania

1. Albania has the lowest per capita income in the Western Balkan region. Poverty is widespread in Albania, affecting about 18.5% of the population in 2009. This reflects a dramatic decline since 2002 when 25.4% of Albanians were affected. This improvement is largely the result of the recent rapid economic growth and the high level of remittances by Albanians living abroad. However, another 10% of the population lives very close to the poverty line. The incidence of poverty is almost twice as high in rural areas compared to urban areas. The largest expenditure of Albanian households is on food, accounting for about half their disposable income.

2. Over the past decade, Albania saw a massive population migration from rural to urban areas (and particularly to Tirana) as well as emigration to Greece and Italy. There is also a similar flow of temporary migrants from Albania to these countries. Remittances from working migrants are now the largest source of foreign exchange estimated at over 14% of GDP. These working migrants reduce the level of poverty significantly. Almost 50% of Albanian households have access to migration networks and this acts as an important social safety net.

3. The World Bank's Poverty Assessment for Albania (2009) indicates considerable non-income poverty[2] measured by an index of Unmet Basic Needs (UBN), including inadequate electricity supply shown in Table below.

Unmet Basic Infant and maternal mortality have decreased as well as Albania's nominal unemployment rate (UBN) (in %)

	Tirana	Urban	Rural	Total
1. Inadequate water and sanitation (*)	0.5	2.6	28.6	17.5
2. Inadequate housing (**)	8.5	6.3	16.5	12.5
3. Inadequate energy supply (***)	1.7	9.0	18.1	13.5
4. Crowding (more than 3 persons/room)	10.3	15.6	18.6	16.7
5. Education (hh head w/ primary or less)	34.7	47.0	74.8	61.2
Poor (two or more UBN)	11.5	16.6	47.2	33.8
Extreme Poor (three or more UBN)	2.3	3.2	18.3	11.9
Non poor (one or no UBN)	88.5	83.4	52.9	66.2

**Inadequate water and sanitation: running water and piped WC are both unavailable for water and sanitation*
*** Subjective assessment (house inadequate for living or under construction)*
****Inadequate energy supply: power shut off for 6 hours of more per day*

Source: World Bank, Report No. 26213-AL "Albania Poverty Assessment" November 2009

4. Based on the UBN index, the World Bank classifies a household as poor if two or more basic needs are unmet. In this way, the World Bank considers that over one-third of Albania's population is classified as poor. A weakness of this type of assessment, however, is that it does not consider inadequate housing or crowding in detail. There is an important distinction between summer and winter situations including the potential reduction of heated / living space during winter periods. In Albania, the lack of energy both in volume, quality and security of supply is an important obstacle for economic and human development, especially in rural areas.

5. Albania has a comprehensive poverty reduction framework that was elaborated by the "National Strategy for Growth and Poverty Reduction" in 2009. The "National Strategy for Socio–Economic Development" (2009) and its Action Plan (2005-2009) are the key documents that combine the main policies of the government for reducing poverty. Also, in 2009, a Department of Strategy and Donor Coordination (DSDC) was established in the Office of the Council of Ministers to coordinate a national Integrated Planning System (IPS) through various ministries and the inter-ministerial Strategic Planning Committee to the Council of Ministers.

6. Inadequate energy supply is a key factor affecting poverty in Albania and is incorporated repeatedly in various poverty reduction and development strategies, assessments and reports. The World Bank's "Albania Poverty Assessment" (2009) outlined that: "While the coverage of the (electricity) network is virtually universal, delivery of the service is highly unreliable, and the situation is worse in rural communities. Only 14% of households report receiving electricity continuously (28% in Tirana, 7% in rural areas) and 73% report daily interruptions (83% in rural areas, 56% in Tirana). Among those reporting interruptions, electricity was not available for 8.6 hours on average on a typical day (9.4 hours in rural areas, 7.7 in urban areas, 5.6 in Tirana)".

7. Albania's 2009 Energy Strategy and its update in 2009 both aim to improve conventional energy supply through the implementation of a broad reform agenda including the restructuring and privatization of parts of the energy sector, the introduction of block electricity tariffs and direct subsidy schemes for vulnerable households. The latter is a strategic priority of the social protection sector strategy. LPG has been expanding its market share in Albania as an alternative to electricity and fuel wood for space heating and cooking. It has the advantage of being more reliable in terms of supply, as well as more flexible and clean. Nonetheless, it is still relatively expensive and not widely available in the country.

8. In 2009, Albania's electricity tariff system set a lower residential tariff for the first 300 kWh consumed per month. This was lowered to 300 kWh/month in 2009. Above this limit, the tariff doubled. This two-tiered tariff system targeted essential electricity use (lighting, cooking and, electric appliances) by the population and sought to limit electricity consumption particularly for space heating. Since 2004, the Ministry of Social Affairs has provided about 190,000 households a cash subsidy to cover the first-tier tariff of electricity bills. Also, since 2004, the government exonerated the agricultural sector of the excise tax on oil products, accounting for 45% of the total price. This has stimulated a 15% increase in mechanization and a 15-20% increase in land cultivation.

9. Fuelwood fuel is extensively consumed, in particular in rural and mountainous areas, and accounts for over 10% of total primary supply. It is the most important source of energy for vulnerable households but it is consumed inefficiently in low-efficiency stoves in poorly insulated houses. Furthermore, fuelwood is relatively expensive during the heating season and generates indoor and outdoor pollution.

4. Integration of Albania in the European Research Area in the field of Energy

Albania policymakers must encourage adoption of an analysis framework and the development of a rigorous process for vetting and updating it. Since the evaluation of energy solutions is a complex problem with many variables, the initial framework must be carefully formulated, or, as in the example above, confusion will persist.

It is not reasonable to expect the framework to include every criterion. Policymakers must commission an up-front analysis to identify the key criteria relevant to the major impacts. The most important criteria must be selected based on their predicted impact and their sensitivity on overall outcomes. Criteria must also be concisely defined, so they can be easily referenced, and transparent enough to show the effects of assumptions and values.

In general, the framework should embrace "big-picture" issues, such as costs (direct and indirect), potential efficiencies, feasibility, overall energy supply and balance, projected national and international demand, and environmental impact and sustainability. Many analyses to date have provided simple projections of existing trends. These may not be correct as technologies, demand, and other factors change significantly over time. The framework should be robust enough to accommodate these changes. It should explicitly consider trade-offs among technology choices and resulting unintended consequences at the national and international level. It should utilize commonly accepted standards of computation so different users can arrive at similar results. It should be verifiable, consistent along a material flow chain and allow evaluation throughout the lifecycle. It must protect proprietary data to encourage industrial participation and be consistent with domestic regulations and international agreements. Furthermore, it must be easily understood, so that policymakers and key stakeholders grasp the framework and can follow it through to the conclusions.

The evaluation criteria will necessarily be both quantitative (e.g., cost, greenhouse gas emissions, energy efficiency) and qualitative (e.g., lifestyle, transfer of wealth, national security impacts). The scientific and engineering community has developed such criteria for other purposes. As an example, the non-profit organizations in Albania, standardized criteria for evaluating engineering problems. Their criteria spanned economics, environmental impact, health and safety factors, manufacturability, sustainability, and social, political, and ethical concerns. The latter three categories can encompass impacts on local populations, national goals, or international agreements.

Selected criteria must include both direct and indirect effects. For example, greenhouse gas emissions must be included; also the human health and ecosystem impacts of these emissions must be incorporated. The indirect impact of using food crops (e.g., corn) as ethanol feedstock on the price of food must be included, as well as changes in cost profiles of other commodities with significant changes in demand. It will be imperative to consider costs from a life cycle perspective; e.g., battery life cycle costs must be evaluated from creation through disposal, including opportunities for reuse or recycle. Indirect impacts on other countries must also be considered, as choices made in the US may be augmented or offset by other nations and vice versa.

The first step in developing the framework will be to sharply focus the scope and define the energy system boundaries. As shown in the earlier example, lack of a common framework among studies may result in strongly differing conclusions. The second step will be to agree upon the evaluation criteria. The

different companies are developing criteria for consideration. Supply-chain steps can then be defined: for bio-ethanol, these might be growth, harvest, and transport, conversion to a fuel, and distribution and use of the fuel. Then, a few key criteria, carefully normalized, can be selected for analysis, such as cost per standardized mile, energy density by mass and volume, water consumption per standardized mile, greenhouse gas emissions per standardized mile, etc. Process boundaries and impacts should be clearly stated to facilitate comparison of systems, and stakeholders should be engaged throughout the process.

4. SWOT analysis of the Energy research capacity in Albania

Albania's competitors have industrial policies which target specific sectors and technologies. They aim to improve and strengthen domestic industries and this strategy is typified by their energy research programmes.

Whenever they use public funds to support R&D programmes precise research and performance goals are set and it is significant that their competitiveness in terms of cost are evaluated. This approach helps to keep efforts focused on technologies which are most likely to become commercially viable.

For example, one method to keep a project on track is the "stage gate process". It's a management tool which keeps the needs of government and industry in line with each other and is particularly useful at the later stages of a project, as it nears commercialisation. Decisions about whether to proceed are taken only after critical elements have been evaluated. These elements include technical feasibility and risks, the legal and regulatory environment, strategic fit and competitive advantage. This tool has been used by Albania energy program, where costs have been shared with industry and the investment risk is high yet the projects have been considered to be essential for the Government's strategy.

Another approach is to set periodic cost targets which must be met at regular, medium-term intervals.
This can keep the project focused and is being used effectively by the Albania energy Strategy where cost targets have been defined for each three year phase.

A different method may be needed when trying to get promising technologies developed for a conservative industry sector which doesn't like taking risks. In these cases it can be appropriate to use public funds for fundamental research into a suite of technologies all of which have the potential for achieving a defined goal.

Albania is doing this with its future energy project to demonstrate the best options for using gas and coal to produce electricity and hydrogen with zero emissions. However, one difficulty when targeting priorities and setting precise goals is making sure the project program is sufficiently diverse and can be adapted if the world changes. Too narrow a focus could result in projects that are successful in themselves but which don't contribute to global objectives.

Albania will have implemented innovative energy research programs. The main reasons to support innovative energy research are of three (non-exclusive) types:

- The support to national energy and/or to technology endowment on the one hand and the support to national industrial sectors on the other hand

• The search for energy independence for security issues as well as the result of the increase of oil prices
• The contribution of energy research and technological development to sustainable development policies.

4.1 Strengths

The bottom-up approach or the top-down approach (or a mixture of both) were almost always well-adapted to the energy programs

• Criteria for selection of projects are satisfactory and adapted to the objectives
• Many programme managers already have some experience in international cooperation
• Networking different actors is a success

4.2 Weaknesses

Relations between different types of actors in spite of being effective are sometimes insufficient

• Involvement of national researchers in interdisciplinary projects is too weak
• Programmes have some difficulty to conceptualise instruments able to invariably detect innovative projects
• Programmes are not sufficiently flexible

4.3 Opportunities

Albania will increase exchange of information on national programmes between participants
• Albania is an opportunity to collectively design innovative instruments

• International cooperation will provide the participants with access to foreign researchers
• Trans-national cooperation is a way to gather national strengths
• Trans-national cooperation will reduce research duplication
• Trans-national cooperation will increase the visibility of innovative energy research

4.4 Threats

Large differences in expectations of the participants towards trans-national cooperation may be an issue

• Differences of research priorities amongst countries is also problematic
• National money has to go to national researchers
• Cooperation will raise difficulties as regards daily management
• Lack of energy researchers
• IPR has to be addressed at the beginning

• Trans-national cooperation needs confidence in one another and reciprocity of efforts

5. Energy research priorities for Albania

For Albania to better exploit the opportunities and face the challenges stemming from this new reality, traditional policy is not sufficient. Research cooperation, joint efforts for developing technological standards, reinforced regulatory dialogues must accompany the requirements to reduce trade and non-tariff barriers to investment and lead to new partnerships with priority regions in priority areas, including a joint effort to tackle global challenges.

5.1 Energy Research priorities on the basis of the country's readiness*

- Widening the ERA and making it more open to the world, especially to our neighbours and key international partners.
- Ensuring coherence of policies and complementarities of programmes by contributing to the EU's main policy objectives such as fighting climate change or securing energy supplies.
- Fostering strategic S&T cooperation with key third countries to guaranty a critical mass of resources.
- Developing the attractiveness of Europe as a research partner.
- Launching results-oriented partnerships on information society regulation.
- The European Community and Member States working together, both within the EU and worldwide.

5.1.1 Priority 1 (incl. explanation and if possible give further specification for sub-Theme, area, activity)

Strengthening the international dimension of Albania to the European Research Area (ERA) by:

- Integrating Albania into the ERA
- Fostering strategic cooperation with key third countries through geographic and thematic targeting

5.1.2 Priority 2

Improving the framework conditions for international S&T cooperation by:

- Tackling scientific challenges through global research infrastructures
- Developing the mobility of researchers and global networking
- Opening research programmes
- Promoting Intellectual Property (IP) issues, by ensuring reciprocity, equitable treatment, and mutual benefits
- Particular attention in ICT research cooperation on pre-standardization

5.1.3 Priority 3

In future, cooperating together with countries in a geographical region (for example SEE coutries) will be more appropriate at Community level. Such region-to-region cooperation will better achieve critical mass in science and technology (S&T) and allow common challenges to be addressed at regional level.

5.2 Energy Research priorities on the basis of future potential**

Energy Research priorities in Albania is a unique initiative to bring together European universities' research and education capacities to address a high priority "grand societal challenge" field at the EU level. Its purpose is to discuss the potential role and development of Albania to the European Platform - "from concept to implementation" - and to consider a range of activities addressing the following missions to:

- establish a strong voice for university energy research and education at the European level;
- ensure that characteristic university attributes such as fundamental research and training, and collaborative activities with industry partners, are properly included in forthcoming EU energy activities in the next Research Framework Programme, entitled Horizon 2020;
- facilitate competitive European university groupings to participate in the realisation of the Strategic Energy Technology Plan (SET-Plan) in cooperation with the European Energy Research Alliance;
- bind more strongly the various disciplines ranging from natural sciences, engineering to social sciences and arts/humanities to best fulfill the needs of society in energy research;

- speak for long-term thinking in European research agendas and initiatives, with due consideration

given to a balance between top-down and bottom-up research strategies.

5.2.1 Priority 1

- to develop **environmental technologies and eco-design** to design products, services competitive with low environmental impact, if any, throughout their life cycle;

- to invent models **of buildings and sustainable cities** by rethinking the architecture and planning and developing the technologies of energy storage.

5.2.2 Priority 2

- **the future carbon-free energy** with a balance between energy research and research on renewable energy in order to preserve the **environment:**

5.2.3 Priorities 3

- enhance the whole plant, not just the edible portion in the new methods of producing **biofuels** in order to avoid harmful competition in the use of agricultural land;

- develop services and technologies **cities and sustainable energy,**

- improve engine combustion **vehicles** and preparing the transition to the vehicles with low emitters of CO2