EUROPEAN ENERGY INTERCONNECTION EFFECTS ON THE ROMANIAN ECONOMY

Ionescu Mihaela

Doctoral School of Social Sciences, Faculty of Economics, University of Oradea, Romania
ss_mihaela@yahoo.com

Abstract: In this paper the author wants to exemplify the extent to which economic growth in Romania is influenced by the current power system infrastructure investments in Europe. Electricity transmission infrastructure in Romania is at a turning point. The high level of security of supply, delivery efficiency in a competitive internal market are dependent on significant investment, both within the country and across borders. Since the economic crisis makes investment financing is increasingly difficult, it is necessary that they be targeted as well. The European Union has initiated the “Connecting Europe” through which investments are allocated to European energy network interconnection of energy. The action plan for this strategy will put a greater emphasis on investments that require hundreds of billions of euro in new technologies, infrastructure, improve energy intensity, low carbon energy technologies. Romania's energy challenge will depend on the new interconnection modern and smart, both within the country and other European countries, energy saving practices and technologies. This challenge is particularly important as Romania has recovered severe gaps in the level of economic performance compared to developed countries. Such investment will have a significant impact on transmission costs, especially electricity, while network tariffs will rise slightly. Some costs will be higher due to support programs in renewable energy nationwide. Measures are more economically sustainable to maintain or even reinforce the electricity market, which system can be flexible in order to address any issues of adequacy. These measures include investments in border infrastructure (the higher the network, so it is easier to evenly distribute energy from renewable sources), to measure demand response and energy storage solutions. An integrated European infrastructure will ensure economic growth in countries interconnected and thus Romania. Huge energy potential of Romania is an opportunity economic recovery after the financial and economic crisis and the recent recession. Interconnected network of high quality will be a lasting investment with long-term positive consequences.

Keywords: energy, infrastructure, investments, energy market, energy intensity, economic growth

JEL classification: F 21

1. Introduction

Europe’s energy infrastructure is aging. The current European electricity networks relies mainly on technology developed now more than 30 years, and the need for innovation so far has been limited. The network has been designed for uni-directional flow of energy from large centralized power and total control up to consumers at the other end of the network. A set of recent proposals is about to change this image and put under pressure from changing networks. The promoters of this movement are both outside the network (those who are preparing a future low carbon) and internal, such as the need to replace the aging structure. This challenge combines emergency needs reinvestment cycle after new requirements mainly due to the rapid growth of electricity production from renewable
sources arising from energy and climate policy objectives of the "Europe 2020 strategy".

2. European energy infrastructure development

2.1. The EU framework

Establishment and development of trans-European networks in the energy sector are set out in Article 154 of the Treaty establishing the European Community. Articles 155 and 156 of the European Community Treaty provides guidelines to define the objectives, priorities and broad lines of measures for them. EU Council established a legislative framework to ensure the proper functioning of a competitive internal market for electricity while maintaining security of electricity supply and ensuring sufficient interconnections between Member States, general, transparent and non-discriminatory.

In November 2010 the European Commission adopted an initiative entitled "Energy 2020 - A strategy for energy competitive, sustainable and secure energy". This strategy defines the energy priorities for a period of ten years and establishing actions to be taken to address a number of challenges, including achieving a market with competitive prices and reliable supply, facilitating positioning as a leader in technology and negotiating effectively with international partners. In the same month, the European Commission adopted an initiative entitled "Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network". It defines EU priority corridors for the transport of electricity, gas and oil. It also proposed a set of tools to facilitate timely implementation of these priority infrastructure. In March 2011 he started the Agency for the Cooperation of Energy Regulators. As a supervisory body with an advisory role, the Agency shall advise the Commission on market regulation and development priorities of the transport infrastructure. As additional measures were adopted two regulations that were established cooperation structures transmission system operators in the European network (Entso): one for electricity (Entso-E) and one for gas (Entso-G). Entso, along with Acer, create technical codes and detailed rules on network access and ensure coordination of network operation through the exchange of operational information and the development of common standards and procedures for safety and emergencies. Entso are also responsible for writing a ten-year investment plan every two years interval, and these are then reviewed by Acer. In 2013, among other codes were developed network code on capacity allocation for cross-border gas and electricity capacity allocation for.

2.2. The need for cross-border investments in energy infrastructure

Recently adopted guidelines for trans-European energy infrastructure provide a new way to identify infrastructure projects of common interest and to accelerate their performance through enhanced regional cooperation, simplified authorization procedures through appropriate regulatory process and with assistance European financial mechanism provided by the proposed "Connecting Europe ". Despite variations between Member States, EU progress far enough to allow it to fulfill its commitment to have a 20% share of renewables in final energy consumption according to the objective set by the EU Directive on renewables. A significant share of renewable energy in the electricity mix (Figure 1) raises the question of the adequacy of generation capacity of electricity networks. This becomes a problem louder while the intermittent solar and wind power generation requires the consideration of other sources of energy as alternative sources.
Some Member States are considering the option of paying for the available production capacity at national level, and this ability is often based on fossil fuels. Such an approach is likely to be economically inefficient and is likely to maintain the internal electricity market fragmentation and maintain dominance of power generation capacity based on fossil fuels.

The European Commission has estimated that by 2020 would require investments of around 200 billion for energy infrastructure in Europe. Given this requirement, the Commission adopted the Communication "A budget for Europe 2020" under the next multiannual financial framework (2014-2020), proposing the Connecting Europe Facility (CEF) for supporting priority projects in energy, transport and digital infrastructure critical. MCE proposal, launched on 19 October 2011, allocated 9.1 billion euros (out of a total fund of 50 billion allocated MCE) for the development of trans-European energy infrastructure projects. To facilitate absorption MCE for projects of common interest, the Commission launched a proposal for a regulation on guidelines for trans-European energy infrastructure and repealing Decision No.1364/2006/EC, which was recently adopted by the Council and Parliament. Identifies 12 priority areas and corridors which include electricity and gas networks, as well as for the transport of oil and carbon dioxide and establishes measures for streamlining and expediting procedures for the authorization and regulation of projects of common interest. Commission proposed in 2013 a list of European projects of common interest, in accordance with the procedures and criteria set out in the Regulation.

2.3. Preparation grid in the European Union 2020

In order to integrate a high penetration of RES in the coming decades, Europe power system will have to face several infrastructure changes. Significant investments will have to be made over time in order to accommodate variability of the high penetration RES variable. A single technological solution will not be enough to meet expected needs for arbitration. Complementarity and substitution potential response energy storage and demand on the electricity transmission must be understood in order to design efficient investment. However, optimal mix between these three technologies depend on their relative costs and on the future development of the European energy system. This development will be in fundamental forces of supply and demand, which are highly dependent not only on RES and carbon policies, but also on the socio-economic Europe.
If electricity operators (Entso-E) table below illustrates the estimated total cost of investment in the country for projects of pan-European by 2020. Total investment cost amounts to 104 billion euros, of which 23 billion euros for submarine cables.

Table 1: Ten-Year Network Development Plan 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Billion EUR</th>
<th>Country</th>
<th>Billion EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1.1</td>
<td>Ireland</td>
<td>3.9</td>
</tr>
<tr>
<td>Belgium</td>
<td>1.9</td>
<td>Latvia</td>
<td>0.4</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>-</td>
<td>Lithuania</td>
<td>0.7</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>0.2</td>
<td>Luxembourg</td>
<td>0.3</td>
</tr>
<tr>
<td>Croatia</td>
<td>0.2</td>
<td>Montenegro</td>
<td>0.4</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1.7</td>
<td>Netherlands</td>
<td>3.3</td>
</tr>
<tr>
<td>Cyprus</td>
<td>0.0</td>
<td>Norway</td>
<td>6.5</td>
</tr>
<tr>
<td>Denmark</td>
<td>1.4</td>
<td>Poland</td>
<td>2.9</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.3</td>
<td>Portugal</td>
<td>1.5</td>
</tr>
<tr>
<td>Finland</td>
<td>0.8</td>
<td>Romania</td>
<td>0.7</td>
</tr>
<tr>
<td>France</td>
<td>8.8</td>
<td>Serbia</td>
<td>0.2</td>
</tr>
<tr>
<td>FYROM</td>
<td>0.1</td>
<td>Slovakia</td>
<td>0.3</td>
</tr>
<tr>
<td>Germany</td>
<td>30.1</td>
<td>Slovenia</td>
<td>0.3</td>
</tr>
<tr>
<td>Greece</td>
<td>0.3</td>
<td>Spain</td>
<td>4.8</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.1</td>
<td>Sweden</td>
<td>2.0</td>
</tr>
<tr>
<td>Iceland</td>
<td>0.0</td>
<td>Switzerland</td>
<td>1.7</td>
</tr>
<tr>
<td>Italy</td>
<td>7.1</td>
<td>United Kingdom</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Source: Entso-E

These figures do not include investment needs for smart grids, worth about 40 billion euros.

Priority Interconnection Plan (PIP) displays in detail the progress of forty-two projects declared of European interest within the guidelines for trans-European energy networks (TEN-E) adopted in 2006.

Sixty percent of the electricity network projects suffer delays, mainly due to the complexity and lack of harmonization of planning and authorization procedures. Financing difficulties and objections to the environment or health are equally obstacles.

Compared to the previous Action Plans, future Action Plan for this strategy will put a greater emphasis on investments that require hundreds of billion investment in new technology, infrastructure, improve energy intensity, low carbon energy technologies and training of people for economic decarbonisation. Since the economic crisis makes investment financing is increasingly difficult, it is necessary that they be targeted as well. Energy security will depend on the new interconnections, both within the EU and abroad, energy-saving practices and technologies, and transport networks for smart metering technologies.

In the current globalization, the economic and social objectives in 2020 is considered to be significant. These can result in the EU 60 billion reduction in spending on oil and gas imports by 2020, this means not only cost savings but also an essential step in ensuring energy security. The further integration of the European market by applying the provisions of the Third Package can lead to an increase of 0.6 % - 0.8 % of GDP in the Union.

There are two specific issues to be addressed, namely authorization and financing. Licensing and cross-border cooperation must become more efficient and transparent, in order to increase the responsiveness of the public and to speed up the achievement. Have found financial solutions that meet investment needs, estimated at one billion euros over the next ten years, half of this amount is needed only for energy networks. Regulated
tariffs and congestion charges will be the bulk of these network investments. However, the current regulatory framework does not accommodate the necessary investments and will facilitate their achievement with desired promptness, especially because of positive externalities or non-value added at regional and European projects with limited direct benefits to the national or local level. The slowdown in infrastructure investment was unfortunately exacerbated by the recession.

3. Infrastructure power generation in Romania

3.1. The current situation

Some failures demonstrate that the lack of coordination between national energy networks and a real separation between the functions of generation, transmission and supply. Network operators belonging to vertically integrated companies are not really keen to develop their interconnections with other networks and to expose new players so competition level of production or supply. Infrastructures are increasingly exploited to limit their physical capacity, which prevents the integration of additional energy resources that are otherwise necessary for growth markets. Thus, mass production of electricity from renewable energy may be compromised in some regions. Network congestion threatens also cause temporary supply disruptions, and an increase in energy prices. In addition, many regions continue to be "energy islands" all or poorly connected to the rest of the internal market. Romania has set a strategic goal for 2020 to reduce primary energy consumption by 20% by 2020 in a scenario of increasing efficiency and use of RES.

Table 2: Production and consumption of electricity in Romania (MWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Consumption</th>
<th>Export</th>
<th>Import</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>60.5</td>
<td>53.37</td>
<td>3.38</td>
<td>1.30</td>
</tr>
<tr>
<td>2008</td>
<td>64.01</td>
<td>54.61</td>
<td>5.37</td>
<td>0.92</td>
</tr>
<tr>
<td>2009</td>
<td>56.69</td>
<td>49.92</td>
<td>3.15</td>
<td>0.68</td>
</tr>
<tr>
<td>2010</td>
<td>59.14</td>
<td>52.03</td>
<td>3.85</td>
<td>0.94</td>
</tr>
<tr>
<td>2011</td>
<td>60.39</td>
<td>53.74</td>
<td>2.94</td>
<td>1.04</td>
</tr>
<tr>
<td>2012</td>
<td>56.71</td>
<td>52.36</td>
<td>1.15</td>
<td>1.40</td>
</tr>
<tr>
<td>2013</td>
<td>58.57</td>
<td>49.78</td>
<td>2.46</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Romanian National Institute of Statistics

According to the National Statistics Institute (NSI), the final energy consumption in 2013 was 6% lower than that reported last year (table 2). A decrease of almost 10% was recorded in electricity consumption in the economy because energy-intensive industries have been replaced with more efficient, especially as EU directives gradually push toward revamping. A negative impact on total consumption and decreasing consumption had a population of 1.3%, while public lighting was reduced by 12.6%. At the same time, reduced the consumption of electricity for heating and buildings. Other explanations consist of more expensive electricity to industrial consumers as well as business interruption large consumers over the last year. The good part of this result is that Romania regained energy exporter as production increased by 3.2%. As a solution to decrease domestic consumption is increasing electricity exports by European infrastructure.

3.2. Energy outlooks from Romania

Romania has advantages interconnection European network. In case of electricity, the interconnected power systems of neighboring countries, Romania, for that matter any other country in the European Union takes advantage of power reserves in the event of
major incidents. For pan-European interconnection policy to be truly effective you have to increase interconnection capacity with Member States on high voltage power lines and the availability of natural gas high pressure pipeline. To increase interconnection capacity power lines required new production capacities and decommissioning old ones that produce only a quarter full. While reducing energy consumption Romania was confronted in 2013 (table 2). With surplus production, which, however, could not use to his advantage because of the lack of interconnection capacity.

4. Expected evolution of the Romanian energy system up to 2020

4.1. Investment needed in Romanian energy system

Under a steady annual decline of 3-5%, 4-6% oil and natural gas, as well as assessing the degree of reserve replacement run oil and 15-20%, respectively, 15-30 % for natural gas may conclude that the primary energy production in Romania based on both the harnessing of fossil primary energy, coal and hydrocarbons as well as those of uranium ore in the most optimistic case, will not grow in the next two to three decades, but the contrary. It follows that increasing coverage of primary energy demand in Romania will be achieved through increased use of renewable energy resources and imports of primary energy - gas, oil, coal, nuclear fuel. At the horizon examined, Romania will remain dependent on imports of primary energy. Dependence will depend on the discovery of new exploitable internal resources for the integration of renewable energy and the success of measures to increase energy efficiency. Theoretical energy potential of renewable energy sources available to Romania is significant. Potential that can be used for these sources is much lower due to natural limitations, technologies, economic efficiency and environmental restrictions.

Necessary investments in new capacity by 2020 energy are presented in table 3.

Table 3: The investment in Romania’s energy system by 2020

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total power</td>
<td>MW</td>
<td>910</td>
<td>4500</td>
<td>5410</td>
</tr>
<tr>
<td>Total investment</td>
<td>Mil. euro</td>
<td>1753</td>
<td>7084</td>
<td>8837</td>
</tr>
</tbody>
</table>

Source: Romanian National Research and Development Institute for Electrical Engineering

Total installed capacity is now steadily declining due to the decommissioning of old and uneconomic capacity to fulfill their normal operating life. The energy of these capabilities is not competitive electricity market, the old groups, low performance and overcome technical and economic.

Approximately 80 % of the energy groups in existence today were installed during 1970-1980, being today the normal operating limit, with yields of about 30%. These yields are 65-70% of yields modern groups currently in operation in most developed countries.
4.2. Aligning energy intensity in Romania to European values

Romania has established its National Reform Plan (NRP), a national target for 2020 to reduce primary energy consumption by 19% (estimated at around 10 Mtoe).

4.3. Economic consequences for Romania

Energy intensity is a measure of the energy efficiency of a nation’s economy and shows how much energy is needed to produce a unit of GDP. There are various reasons for the observation of improvement in energy intensity: general transfer from industry to a service-based economy in Europe, a shift in the industry the less energy-intensive activities and production methods, the closing of inefficient, or more appliances energy efficient.

In table 4 shows the change in energy intensity and probable relative increase in GDP due to structural change and new energy investment until 2020.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy intensity</td>
<td>Mil Toe</td>
<td>3600</td>
<td>3657</td>
<td>3721</td>
<td>3788</td>
<td>3849</td>
<td>3911</td>
<td>3975</td>
<td>4039</td>
</tr>
<tr>
<td>Energy intensity</td>
<td>Toe/100</td>
<td>0.25</td>
<td>0.24</td>
<td>0.24</td>
<td>0.23</td>
<td>0.23</td>
<td>0.22</td>
<td>0.22</td>
<td>0.21</td>
</tr>
<tr>
<td>Energy intensity</td>
<td>0 Eur</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Relative growth of GDP</td>
<td>%</td>
<td>3.7</td>
<td>3.2</td>
<td>4.3</td>
<td>3.9</td>
<td>4.8</td>
<td>3.4</td>
<td>3.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: Data obtained by the author

As in other European countries, reducing energy intensity in Romania increases relative domestic product of Romania, estimated in 2020 at around 4.1%. As a nation with a high level of homeowners and low-income or a reduction in utility costs could help alleviate financial stress for many families.
5. In conclusions
Measures are economically sustainable to maintain or even reinforce the electricity market, which system can be flexible in order to address any issues of adequacy. These measures include investments in border infrastructure (the higher the network, so it is easier to evenly distribute energy from renewable sources), to measure demand response and energy storage solutions.

Developing energy potential of Europe is impossible without increasing the number of interconnections within the European Union and neighboring countries. Risk and cost of disruption and wastage will be much higher if urgent EU invests in smart energy networks, efficient and competitive. The new policy of the EU energy infrastructure was needed to coordinate and optimize network development on a continental scale. This policy will allow the EU to reap all the fruits of an integrated European network that exceeds its individual components. Given expectations regarding future generation portfolio, increasing electricity demand, and expanding cross-border transmission capacity electric network by Entso-E will reduce shipping costs by 1%. This reduction is greater for lower rates of growth in demand.

A strategy for fully integrated energy infrastructure based on intelligent technologies and low carbon, low carbon energy will reduce costs through economies of scale achieved by each Member State. A fully interconnected European market will improve security of supply and help stabilize prices for consumers, by providing optimal targeting electricity and gas. European networks include, as appropriate, neighboring countries will facilitate the competitive climate in the EU single energy market and will strengthen solidarity between Member States.

If doubling the share of renewable energy by 2020 and forecasts amounts to over 20% of the European energy mix, investments expected transboundary energy will reduce shipping costs by almost 3.7%.

For Romania, the increase interconnection network capacity by investing in new energy equipment requires investment of approximately Euro 7.084 million in 2020. Adequate interconnection network with low energy losses as a result would increase GDP by around 4.1%.

Integrated European infrastructure will ensure access to citizens and businesses in Romania affordable energy sources in terms of prices. This in turn will contribute to the achievement of the Europe 2020 strategy, maintaining a strong industrial base, diversified and competitive in Europe.

An integrated European infrastructure will ensure economic growth in countries interconnected and thus Romania. Huge energy potential of Romania is an opportunity economic recovery after the financial and economic crisis and the recent recession.

Acknowledgment
This paper has been financially supported within the project entitled „SOCERT. Knowledge society, dynamism through research”, contract number POSDRU/159/1.5/S/132406. This project is co-financed by European Social Fund through Sectoral Operational Programme for Human Resources Development 2007-2013. Investing in people!
References
EC (2010b) EU Energy Trends to 2030.
EC (2011a) A roadmap for moving to a competitive low carbon economy in 2050 Available online at http://eurlex.europa.eu/LexUriServ/LexUriServ.do.