Revista Românească pentru Educație Multidimensională
ISSN: 2066-7329 | e-ISSN: 2067-9270
Covered in: Web of Science (WOS); EBSCO; ERIH+; Google Scholar; Index Copernicus; Ideas RePeC; Econpapers; Socionet; CEEOL; Ulrich ProQuest; Cabell, Journalseek; Scipio; Philpapers; SHERPA/RoMEO repositories; KVK; WorldCat; CrossRef; CrossCheck

2022, Volume 14, Issue 4 Sup.1, pages: 155-170 | https://doi.org/10.18662/rrem/14.4Sup1/664
Submitted: July 10th, 2022 | *Accepted for publication:* September 21st, 2022

New Requirements for All Levels of Education in Energy Management in the Current Context of Global Crisis

Victorita RADULESCU[1]

[1] University Politehnica of Bucharest, Romania, vradul4@gmail.com

Abstract: In the current economic context of the energy crisis caused by global warming, the conflict between Russia and Ukraine, and the increased prices for fuel and gas, new requirements are imposed on the educational system. International energetic trade, the use of renewable sources, energy saving, and energy efficiency have become common terms in education since childhood. Energy education should be based on new concepts, new rules, and trends, linked to EU regulations, and rapidly implemented at the national level. The requirements for each level of education, together with related projects developed in the EU states and Romania are presented separately. The new approaches to teaching energy management in secondary schools and universities are detailed separately. The main steps, directions, and recommendations of the implementation plan are mentioned both for primary and secondary schools and high schools and universities. The paper ends with some conclusions as necessary and future action steps and with some recommendations.

Keywords: *Engineering education; Knowledge transfer; Learning management systems; Open educational resources; Power engineering education.*

How to cite: Radulescu, V. (2022). New Requirements for All Levels of Education in Energy Management in the Current Context of Global Crisis. *Revista Românească pentru Educație Multidimensională, 14*(4Sup1), 155-170. https://doi.org/10.18662/rrem/14.4Sup1/664

©2022 Published by LUMEN Publishing. This is an open access article under the CC BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

1. Introduction

Energy security has emerged as a critical issue in the current economic, financial, and military context across Europe and beyond. The accelerated rise in fuel and food prices coincides with the energy crisis and the acute challenge of climate change. All these aspects must be addressed to fulfill the main objective of creating an "Energy Stable Europe", structured on the Energy Treaty of 2015 and revised in 2016 (Rusnák, 2016) and the Green Agenda (European Commission 2020). Objectives such as a functional internal energy market, its interconnection with international networks, systematic and secure energy supply, energy efficiency, energy-saving, and a national economy based on low-carbon production must meet the requirements of the Climate Agreement, (United Nation, 2015) and requirements for the promotion of renewable energy sources (Blazejczak et al., 2014; Primova, 2015).

As part of the EU, based on international cooperation, Romania is involved in cross-border economic and energy exchanges. To achieve this goal, it is necessary to train experts in domestic and international legislation to ensure a "win-win" solution for all concerned (Kandpal & Bromen, 2014).

Specialists are often trained in universities around the world, allowing them to rapidly adapt to current international rules, agreements, regulations, and legislation. Over the past decade, many political, social, and economic incidents have occurred between EU and non-EU countries. Many non-EU countries either supply electricity, gas, and petroleum products or allow their transportation on their territories. Customs duties, qualitative and quantitative restrictions on the import and export of energy, and all measures with equivalent effects are based on these new rules imposed both on the EU member states and other contracting parties.

The main goals were to achieve economic and social stability, as well as to secure energy supply (Eikeland, 2011). There are international rules that must be adopted and implemented at the national level. It is unanimously recognized that a Pan-European Energy Market (PEEM) is necessary (Pagnier & Jacquod, 2017; Pinto et al., 2015), especially now post-Brexit and in the present context of the conflict between Ukraine and Russia (Schulze et al., 2016). The European Market Coupling Company (EMCC) promotes an electricity system between different regions, by supporting the integration into a single European market. International electricity flows are calculated according to the power lines' capacities and trade (Alam et al., 2017).

As a member of the EU, Romania has amended its legislation on excise duties and cross-border gas and electricity trades. The creation of a single regulation for setting the prices for conventional or unconventional resources and energy exchanges is necessary to adapt the legislation and expand the energy markets. Another aspect imposed on Romania concerns gas emissions from industrial and urban activities, as an integral part of the prevention and fight against of environmental pollution and climate change.

All these new directions related to emerging energy problems must be taught to all children and students at each level of education. In schools, the involvement of children and students in educational projects on energy management, energy economy, energetic efficiency, renewable resources, and environmental problems through different thematic competitions and their training in these new domains stimulates their interest. For each educational level, these approaches, with their implications and necessary steps to achieve them, are further detailed. Finally, some essential solutions and projects are also mentioned, necessary to be included in the energy education system, and adapted to the current international context.

2. Theoretical background

In recent months, the EU has faced a new energy reality, so the main objectives of the European Energy Council-EEC have become the restructuring of national markets as part of international structures and the management of the nationals' resources (Smith & Parmenter, 2015).

The EEC requires each country to have secure national electricity transmission lines, built on the rules of the regulatory energy market, with friendly and transparent investments. The aim is to create a connection between regional markets and the Pan-European structures. All states must report systematically based on the "status quo", the energy production structured based on primary resources, and the amount of cross-border trade. Romania has complied with these requirements, so Transelectrica SA, the national authority, reports daily the energy production from primary resources as well as the import and export situation. Figure 1-a shows, as an example, the energy production from April 21, 2022, from different resources, where: blue-water, green-wind, yellow-hydrocarbons, brown-photovoltaic, red-nuclear, beige-biomass, and in Figure 1-b the cross-border exchanges.

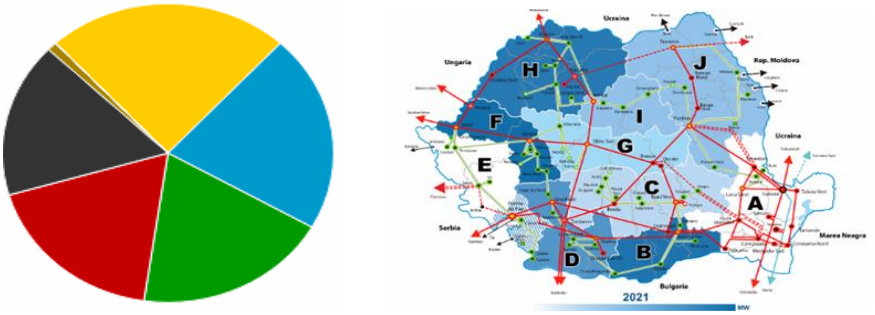


Figure 1. a – Structure of energy production in Romania **b** - Scheme of cross-border electricity exchanges
Source: Transelectrica (n.d.)

More intensive use of renewable sources is necessary to reduce CO_2 emissions and dependence on Russian gas and oil. This is a necessary condition for the stabilization of economic structures and international energy exchanges. The EEC also proposes some improvements in many areas, such as legislation, investments, regional development, administrative structures, and **Education in energetic management for all levels, in schools and universities.** This involves the entire process of this sector, from production to consumers. Advanced design methods, numerical modeling, equipment, and its efficiency, measurement, and control techniques are now used to monitor energy production, ensuring efficient utilization and cross-border exchanges (El Shimy et al., 2018). Energy management has become very useful given the current economic conditions when the EU countries want to be independent of Russian gas and oil. Some EEC proposals allow its sustained development in several directions:

1. More flexibility in adjusting excise duties for each country, based on social conditions, economic level, the existence of connections with the EU electricity transmission lines, the existence, or lack thereof, of pipelines for the transport of gas or petroleum products;

2. New energy connections and support between European countries are needed to promote new technologies based on renewable sources with low CO_2 emissions;

3. Grant financial support for priority infrastructure projects established by the EEC for each regional area;

4. New rules and restrictions regarding environmental protection, with reduced emissions of pollutants and toxic gases;

5. At least partial energy independence requires concrete support for the private sector and small entrepreneurs for the construction of power plants based on renewable resources.

The new concept of education in energy management also involves regulations for the application of all "freedoms," including free transport of electricity, services, and capital, as well as some regulations implemented in each country within competitions and research projects funded through the model EU state aid. Next, Figure 2 shows the main steps of a complex energy management educational plan, as it is taught to students from Romanian universities.

In the latest 2021 report of the EEC, the objectives regarding the efficiency of energy management are structured in four major directions:

1. No geographical limitations at the EU border. The EEC, at its last meeting (May 2022) mentioned a strategic interest in partnerships with non-EU countries that can support Europe's desire to be energetically independent. These states can only partially implement the set of "Community excise duties" to participate in the energy market.

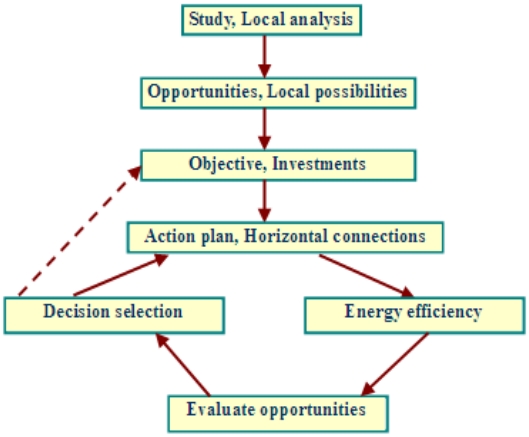


Figure 2 – Main aspects of the energetic management plan

Source: Authors' own conception

2. The Pan-European Energy Market's primary goal is adaptability, to each nation's, social, and economic situations. At the European level, Romania's energy sector is not entirely competitive;

3. Increasing financial support for EEC-related projects;

4. By gradually replacing the EEC Regulatory Council, reform the institutional structure, by establishing a legislative forum with a Court of

Justice with executive capabilities, in the areas of international competition and state aid.

Learning about energy resources, the economy of energy, energy efficiency, and environmental preservation must begin from childhood and continue through college, master's, and even doctoral degrees.

There are two main, distinctly different tendencies in how energy management is approached in primary, secondary, and high school education. Some are directed towards the goals of the school by attracting sponsors or the interest of local authorities, and others are oriented only towards the individual objectives of the children or students, such as interschool contests, Olympiads, and thematic competitions organized by large companies, for their later professional recognition. In the medium and long term, only the combination of both directions ensures efficient managerial development in energy education.

Recently, every EU country has implemented educational projects directly connected to energy management, at a national or regional level, for primary and secondary schools. Next are detailed projects, by country.

UK projects, such as:

- *We grow together, we save together!* Children are taught to conserve water and electricity, as well as to be aware of waste management issues;

- *Remarkable in four years!* During four years they learn about primary and renewable energy resources, energy production, and energy economy, as well as environmental protection and climate change, along with the greenhouse effect;

- *Education involves instilling values and creating dreams!* Educational and scientific models in the field are presented to the children, with special results and projects, developing their "desire to dream, to do";

- *Be open to your potential and enjoy success!* It is an educational project with great impact on children because, in addition to gaining knowledge about energy, it encourages competition and the joy of success.

Spain and Portugal, countries with high tourist potential have developed projects such as:

- *Education for environmental protection is a cardinal point in life!* Children learn about the importance of environmental protection, the effects of global warming, and the efficient management of waste;

- *School for life!* The main elements of the energy chain: resources, production, and small consumers are taught;

- *Energy education is a landmark in the community!* This project has many components, depending on the geographical areas, implemented and adapted to the local energy resources and their utilization;

- *The future starts here!* Renewable energy sources are mainly presented as the future in the energetic domain, associated with the main applications and projects from the area to reduce global warming.

In **Romania** during 2010-2019, thanks to large companies involved in the energy system such as Enel SA and Hidroelectrica SA, several educational projects were implemented:

- *Renewable sources, a future for all!* Children from different schools were involved in different projects with the realization of functional models, using renewable sources.

- *The future of energy starts here, with us!* The main sources of energy, energy-saving options, and some large projects developed in Romania over the last few decades were presented to children and students. Unfortunately, due to the Covid pandemic, these projects have stopped and have not yet been resumed.

General observations:

- Children in rural areas were more open to ideas about energy production sources, particularly the use of renewable sources in various projects that resulted in the realization of different functional models. Many interesting functional models, such as street lighting, playgrounds, illumination, watering gardens, heating solariums, and so on, were presented during the National Competitions.

- Children from the urban areas prefer to create computer projects with special effects, images, and dynamics, with a wide range of possible applications determined by modeling;

- Children have a unique imagination, and they are open to and drawn to new experiences;

- The idea that materials deemed useless, such as dried plants from agricultural lands or animal waste can be used to generate energy inspired many teams to create very interesting projects;

- Children from the urban area were more interested in water and electricity economics, while those from the rural areas were more attracted to environmental protection.

3. Argument of the paper

Energy management education at the university level must include all aspects to compete in today's international context. A well-trained specialist must be familiar with energy resources, the production system for oil and gas, biofuel, or coal, transportation and distribution, the operational and

trading market, individual producers, and finally, the consumers. Regardless of the domain of training, whether technical or economic, the personnel involved, the legislative system, societal demands, the local community, and, last but not least, government policy must all be considered.

The UPB students developed a logo based on this aspect, depicting a chain of people with varying appearances and colors to suggest different specializations, but all holding hands. Climate change and global warming, environmental pollution, uncontrolled deforestation, water needs, wastewater management, energy supplies and urban population growth, must all be considered.

Students created also an image with a man concerned about what's new (literature-he reads a book, Internet-he has a computer), energy saving (a useless light bulb is open even though the clock shows broad daylight), but also new energy policies (he has a paper with different standards), and if it were possible the man should have several hands to work with simultaneously. However, it must be understood that each specialist represents the interests of his group, and regional or political objectives, but in essence, each one analyzed as an individual is a consumer, with his interests.

A specialist must analyze the next aspects to become a leader:

- What are the consumer's needs?
- Can the area's population density affect the price of supplied energy?
- What is the primary concern of the consumer? Price? Security? Availability?
- What methods should be used as many things as possible, quickly, to stay current with new trends?
- In his opinion, how committed is a producer/consumer?
- The top specialist must be the first to bring up the issues that have emerged and are of interest even to other specialists.

Students must learn the value of teamwork, working with specialized agencies in the field, participating in research projects in the energy domain, and having contacts with various beneficiaries, but they must also be able to analyze the market competition. To give credibility to their projects, they should be well documented and presented using modern methods, to avoid audience boredom. Phrases should be short and to the point, emphasizing the most important points. Only in this manner will they be able to attract prospective investors and develop energy-efficient projects.

Licensed students must learn to choose new topics and approach them from various perspectives, such as energy efficiency, energy resource management, or environmental protection.

4. Arguments to support this thesis

To be competitive, modern higher education **must include** the following components:

- Seeking scholarships to study in other countries for at least one semester, to understand their current energy policies and approaches;
- Obtaining research funding from national or international research funds, as well as industry partners;
- Looking for educational and training opportunities such as Erasmus Programs, NATO Scholarships, and so on;
- Identifying collaborators from other universities in the country or abroad through connections with related themes and interdisciplinary research topics;
- Understand how to complete specific tests and quizzes;
- Find documentation that has been published abroad, to discover new research trends and guidelines in the field;
- Monitor educational fairs in the field as well as recently implemented projects by international institutions such as EACEA-European Education and Culture Executive Agency and EEA- European Education Area;
- Through various collaborations, they will learn how to present and argue their projects;
- Research into new areas such as the complex use of renewable resources, building efficiency, smart cities, AI in electricity production and distribution, and IoT in data storage.

At the university level, aspects of national and international legislation, excise duties, necessary parameters of electricity transmission lines, and the system of cross-border cooperation are transmitted to students from various domains as accurately as possible, taking into account global realities (Kandpal & Broman, 2014).

Students from the University Politehnica of Bucharest-**UPB, Faculty of Energy**, study courses in economic financing, European legislation, international cooperation, and economic balances, in addition to specialized study programs on the efficient use of traditional energy sources, particularly renewable, cross-border trades, and environmental protection.

All of their bachelor's or dissertation projects must include economic calculations, related to the topic (Jennings & Lund, 2001).

Undergraduate students from the **Academy of Economic Studies-ASE**, the Faculties of Administrative Development, and Finance-Banking learn notions about excise tax calculation and, more importantly, how to correctly implement it. Students of **International Relations, Law, and Legislation** learn the rules, laws, and norms required for these domains, for being part of the future of international structures. The problems that emerged in the last decade, particularly in the energy domain, prompted the establishment development of the **Faculty of Entrepreneurship and Business Management** at UPB, with special sections dedicated to electrical and energy engineering. A solid understanding of energy management is required for a good education on it.

5. Arguments for the new plans of energy projects implementation

5.1. In Primary and Secondary schools

Two interconnected methods have been implemented in all national projects, over the last two decades, with two stages:

Stage 1. All of the participating children were involved in the consultation and collaboration process, to determine future competition themes. Each one was debated and discussed. Some aspects related to their field were presented, including the use of renewable resources, the use of waste as a raw material in various industrial processes, environmental protection, and energy-saving. The selected themes were voted on, and those with the majority of votes were chosen. In this way, children and students learned about democracy and were able to participate in decision-making processes.

Stage 2. During this stage, parents were also involved in the decision-making process, to create a positive family environment and encourage the projects chosen by their children. For example, participating in the planting of flowers and trees associated with environmental projects, promoting energy and water conservation by turning off lights in unoccupied spaces or partially closing the taps when a high flow of water is not required, and separate collection of household waste with energy efficiency, and so on.

A manager was chosen to lead each selected project, aided by a working team in which each member has a specific problem to solve, such as finding specific materials, searching for meaningful images and documentation, promoting the project, or attracting new members. The rest

of the children from the class or school who were not on this team were involved in the project's execution, coming up with new ideas and exploring different options to improve the original project. In this way, they were also interested in and engaged in the project's completion.

5.2. In High Schools and Universities

Students and licensed students must learn the basic principles, to implement an educational plan on energy management:

1. When investors make a decision, they expect to find useful answers to all their questions, such as new funding opportunities, energy efficiency, and the ability to recover investments.

2. Small investors or entrepreneurs are becoming more educated and informed as a result of prior research on energy investment conducted online through similar projects that gather information from a variety of sources. It is critical that they comprehend the proposed energy management plan, the value of the investment, and its effectiveness. Investors can currently make a real profit only by applying the Values at Risk principle to new clean technologies.

3. Because local governments do not have time to devote to details or non-essential issues in the analysis of a potential project, a well-executed website or presentation page facilitates the attraction of the authorities' investments.

4. Students and licensed students should compete in competitions on this topic in high school or faculties. By presenting in front of colleagues, they learn how to argue about the efficiency and quality of their project in front of possible "competitors." This will make it easier for them to attract future investments in this field.

5. Energy management must gain a better understanding of local needs and provide content to support the investment concept. Customer characteristics provide preliminary information about their interests.

6. Each specialist must demonstrate leadership to ensure proper energetic management and expertise. According to a Romanian energy report, approximately 68% of large energetic consumers believe it is important to consult with a trusted salesperson or advisor beforehand. It is even more obvious in the energy domain, because prices and technical solutions evolve rapidly, with new trends and objectives.

7. A more educated specialist spends less time implementing new programs and projects.

Customer education falls primarily on sales teams using legacy management approaches. Recent research mentions that investors make up 60% of their purchasing decisions by searching online.

In the current context of the global energy crisis, it can be assumed that by educating children and students on these energetic fundamental ideas, Romania will be able to find technical and efficient solutions to ensure energetic independence, giving its hydro, wind, and solar potential, as well as Black Sea gas deposits. Nuclear and thermal power plants are added to this list. A good leader must be educated, understand, and explain the benefits of an energy project.

6. Final recommendations

The paper examines an important issue, energy education at all levels, beginning with international trends, and progressing to the national context. The main objectives, trends, and educational objectives are examined separately, for each level of education. Several models from EU countries, as well as some successful ones from Romania, were presented for the primary education system. In this field, the importance of the family and its involvement in shaping children's education was emphasized. The university level was approached separately for different domains, including technical, economic, financial, legal, and legislative requirements. Some ideas, however, are universally valid:

- These projects, regardless of educational level, can only be realized through a class or work team;
- Renewable sources are currently channeling competitive research and cutting-edge technologies;
- The new transition includes job opportunities, advancement, challenges, and international funding with future developments;
- Infrastructure must be modernized and digitized, utilizing cutting-edge AI and IoT principles;
- Because of the global availability of energy resources, geo-strategic changes are occurring gradually, so being a global energy leader today does not guarantee that it will be in the future.
- As a stable and strong educational program for energetic management, energy efficiency, environmental protection, and energy conservation must be part of everyone's education from childhood.
- To ensure Romania's energy independence, future specialists or entrepreneurs in this field thoroughly understand all of these aspects.

7. Conclusions

A modern educational system is necessary to meet the current requirements directly connected to the energy situation worldwide.

Some conclusions can be mentioned:

1. Energy management education is a collaborative effort, so **teamwork** is the first skill to learn, even from childhood. One person cannot do it all. It is preferable to develop topics in which the team members are involved in specific issues and ensures the communication of results, in addition to training. Future specialists must first be educated, as this is a complex activity involving a team, possibly with several sub-teams. However, proper management requires **team leadership**, which must be supported by executives, investors, and authorities. The team must include people who are enthusiastic about energy, as well as good specialists. Some specialists in such teams have technical training, others have financial experience, and others work for large corporations or local governments. An energetic manager must be able to work with all levels of staff, including directors, specialists, technicians, financiers, and, most importantly, authorities. The makeup of energy management teams is critical.

2. Given the current global situation, **3D issues** such as Digitization, Decarbonization, and Decentralization must be integrated into modern educational systems. Environmental protection, renewable sources, sustainability, and the reduction of CO_2 emissions impact, energy efficiency, and economy are all terms that must be included in the current lexicon of any university, regardless of its domain.

3. Any modern educational energy management project must now be built on Artificial Intelligence (**AI)** and the Internet of Things (**IoT)**. Because of the situation imposed by COVID, in which students learn online for nearly two years, they begin using computers and tablets in elementary school. Everything that the educational chain currently entails, particularly that dedicated to the much-discussed fields of energy production, transportation, industrial processes, the environment, and even agriculture, is realized through numerical modeling, in which AI and IoT play critical roles. At any level of study, the effectiveness of each aspect must be taught.

4. To have a competitive university educational system, licensed students must understand that a team must first consider the **main concerns of the beneficiaries**:

- For businesses: production, raw materials supply, operation, maintenance, financial services, computer-aided design, health, the team in

charge of utilities and energy services, work safety, and, last but not least, environmental protection;

- For small investors: investments costs, recovery time, and energy efficiency;

- For local authorities: the needs of the local population, the availability of the transportation lines, local resources, environmental issues, local investors, and buildings of local significance such as hospitals, schools, and social organizations;

- For universities and schools: access to research projects and funding, institutional development, and increased visibility. It is recommended that students learn how to attract partners, suppliers, and customers for implementing a plan into action;

- Service providers who reduce their energy costs through these projects can use these savings to lower the prices of their services.

There are some **essential steps** in energy educational management for various fields, regardless of their structure. We cannot speak of a universal energetic management plan that is valid for all energetic aspects.

a. For example, most energetic improvement for buildings and installations energy efficiency must be adapted primarily to reduce energy consumption in buildings and losses of any kind;

b. Examination of opportunities or the requirement for new, energy-efficient technologies;

c. Identifying and allocating financial resources, as well as delegating responsibilities. The key to the success of an energy management program is cost reduction. Some organizations dedicate a percentage of their budgets to this goal. The challenge, however, is to include energy-saving projects in the budgets of local authorities or major investors;

d. Realization and establishment of an energy-saving program through detailed and efficient planning. The advantages must be carefully emphasized and communicated via posters, websites, surveys, or contests. Newsletters and appealing websites keep the energy program alive and well. The likelihood of winning and implementing new projects increases when a pilot project has a short payback period.

e. The implementation of a modern educational system, based on new data, real-world consumption, AI, and IoT, updated data on the performance of the existing equipment, and finally, the identification of new priority areas;

f. The most difficult challenge is probably maintaining and continuously improving the energy management educational program because it means keeping the team members motivated to improve their

performance. Training and raising team awareness are important first steps. Studies or surveys can be conducted for all students in a school, community, or university, or for a selected group of peers. To generate interest in the energy program, motivational contests can be organized. Knowledgeable people are more motivated to contribute new ideas, participate effectively, and implement energy-saving solutions.

Energy efficiency, environmental protection, and energy conservation must become a part of everyone's education beginning in childhood, as a stable and strong educational program are essential, especially in the context of the global energy crisis.

References

Alam, F., Alam, Q., Reza, S., Khurshid-ul-Alam S. M., Saleque, K., & Chowdhury, H. (2016). Regional power trading and energy exchange platform. *Energy Procedia, 110*, 592-596. https://doi.org/10.1016/j.egypro.2017.03.190

Blazejczak, J., Braun, F., Edler, D., & Schill, W. P. (2014). Economic Effects of Renewable Energy Expansion: A Model-Based Analysis for Germany. *Renewable and Sustainable Energy Reviews, 40,* 1070-1080. https://doi.org/10.1016/j.rser.2014.07.134

Eikeland, P.O. (2011). EU Internal Energy Market Policy: Achievements and Hurdles. In V. L. Birchfield, & J. S. Duffield (Eds.), *Toward a Common European Union Energy Policy* (pp. 13–40). Palgrave Macmillan. https://doi.org/10.1057/9780230119819_2

El Shimy, M., Mostafa, N., Afandi, A. N., Sharaf, A. M. & Attiaa, M. A. (2018). Impact of load models on the static and dynamic performances of grid-connected wind power plants. *Mathematics and Computers in Simulation, 149*, 91-108. https://doi.org/10.1016/j.matcom.2018.02.003

European Commission. (2020). Guidelines for the Implementation of the Green Agenda for the Western Balkans. European Commission. https://neighbourhood-enlargement.ec.europa.eu/system/files/2020-10/green_agenda_for_the_western_balkans_en.pdf

Jennings, P., & Lund, C. (2001). Renewable energy education for sustainable development. *Renewable Energy, 22*(1-3), 113-118. https://doi.org/10.1016/S0960-1481(00)00028-8

Kandpal, T. C, & Broman, L. (2014). Renewable energy education. A global status review. Rene*wable and Sustainable Energy Review, 34*, 300-324. https://doi.org/10.1016/j.rser.2014.02.039

Pagnier, L., & Jacquod, P. (2017). A predictive pan-European economic and production dispatch model for the energy transition in the electricity

sector. IEEE Manchester PowerTech *(pp. 1-6)*. IEEE. https://doi.org/10.1109/PTC.2017.7980982

Pinto, T., Silva, H., Vale, Z., Santos, G., & Praça, I., (2015). Pan-European Electricity Market Simulation Considering the European Power Network Capacities. *26th International Workshop on Database and Expert Systems Applications (DEXA)*, (pp. 91-95). IEEE. https://doi.org/10.1109/DEXA.2015.36

Primova, R. (2015). *The EU Internal Energy Market and De-carbonization, Energy*. In C. Dupont & S. Oberthür (Eds.), *Decarbonization in the European Union. Energy, Climate and the Environment* (pp. 25–45). Palgrave Macmillan. https://doi.org/10.1057/9781137406835_2

Rusnák, U. (2016). *The international energy charter with related documents last updated 2016*. Energy Charter Secretariat. https://www.energycharter.org/fileadmin/DocumentsMedia/Legal/ECTC-en.pdf

Schulze, M., Nehler, H., Ottosson, M., & Thollander, P. (2016). Energy management in industry: a systematic review of previous findings and an integrative conceptual framework. *Journal of Cleaner Production, 112*(5), 3692-3708. https://doi.org/10.1016/j.jclepro.2015.06.060

Smith, C., & Parmenter, K. (2015). *Energy Management Principles: Applications, benefits, savings*. Elsevier.

Transelectrica. (n.d.). Transelectrica Society Administered in Dualist System, Home page. Transelectrica. https://www.transelectrica.ro/ro/web/tel/home

United Nation. (2015). *Climate action. The Paris Agreement*. United Nation. https://www.un.org/en/climatechange/paris-agreement