



Curricula

for Training of Educational and Career Counsellors



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Introduction

Dear teachers, educational and career counsellors,

You have received a material which was produced in the framework of the international project REFUGE (www.refuge.ekofond.sk). The title of the project is abbreviation of words Renewable Energy for Future Generations. The lead partner of the project was EkoFond, non-investment fund established by SPP, partners of the project were: training and consultancy company firma IDEC S.A. from Greece, Integrated Secondary School from the Czech Republic, Secondary Vocational Electrotechnical School Trnava, Joint School Kremnička Banská Bystrica, Secondary Vocational Technical School Prešov and State Institute for Vocational Education.

The objective of the project was to inform in a simple and acceptable way about individual types of energy, mainly from the renewable energy sources and about the wide range of occupations in the sector of renewable energy sources (RES).

This document is devoted mainly for training of educational and career advisors, many of which do not have technical background. In order to maximise the efficiency of this document, it should be used during the training together with the Handbook on occupations in RES „**Renewable energy resources related occupations**“, which is another output of the above mentioned project REFUGE.

The objective of this document for training of educational and career advisors is:

- to improve awareness about the varied range of job opportunities in the sector of the renewable energy sources,
- to provide easily accessible information and materials on how to obtain employment in various sectors of energy production from renewable sources, a detailed description of available jobs and training and information about potential employers and job offers
- to increase, via educational and career advisors, the interest of pupils in occupations in the area of renewable energy sources (RES),
- pôsobiť on the change of thinking about the character of work in the area of RES and energy fields of study.

We hope that this document will fulfil its objective and will become valuable help and guidance in your work.

I. Situation in the Energy Sector

I.1. Importance of the Renewable Energy Sources

Energy accompanies the mankind since the beginning. The existence of people is not possible without energy in its various forms. Was the origin of energy thanks to the man who vykresal the fire with stones? Or did he use the fire left behind by the storm lightening? Or did the pračlovek discover the energy in the hot springs which protected him against the cold? One thing is sure: energy in various forms extends throughout the history as the Ariadne's thread.

The importance of energy increased thanks to the technical revolution. Machines, inventions and technique required more and more energy. After the century of coal and steam, the new form of energy emerged - electrical energy, nuclear energy and its consumption continued to grow.

And besides the passion, there occurred also the negative aspects of energy and the first warning voices of scientists. The London fog or rather smog from coal combustion, destroyed landscape after uncontrolled logging of wood and coal - those were the first indications that energy should be treated economically and with sense. This was followed by environmental disasters, significant changes of the country, climate changes, the greenhouse effect and warning signs that the conventional energy sources are decreasing and are irreplaceable.

What the nature created for millions of years and stored it in the form of coal, oil and gas, the man managed to ransack vydrancovat' in several decades and in addition caused serious damage to the environment.

Which way to go?

The answer is not simple. The conventional energy sources – coal, oil, gas as well as the nuclear energy are not renewable but at the same time technologies are tied to them. The solution could be such technical development which will enable use of the conventional energy as úsporne as possible.

Another solution is to start using in an appropriate degree renewable and alternative energy sources. You can find information about RES in the above mentioned Handbook **„Renewable energy resources related occupations“**.

Renewable energy sources are often considered as sources of the future, however, their use is gaining more importance already today. They bring a real alternative to fossil fuels, resources of which are limited, they are not resupplied and are spent very quickly at present. Processing of fossil fuels from mining to combustion, produces emissions of substances harmful not only for the environment but also for the human health. Moreover, they are largely responsible for global warming, which now causes problems throughout the world. Their wise use is able to ensure sustainable development. They have many advantages, but in spite of it is their development in our country still slow.

Although the share of RES is small at present, and interest in their increased use is not a priority, there are many factors other than environmental reasons that predict for them a much greater use. The finite nature of fossil fuels and their gradual depletion is well known. Another important factor is the high dependence of SR on imports of primary energy resources from abroad (90%). Therefore, it is necessary to increase both the efficiency of electricity production as well as its final consumption while increasing energy supplies from domestic sources, thus increasing the share of new and renewable energy sources.

The use of RES as energy sources increases security and diversification of energy supplies while reducing the negative impact of unstable oil and natural gas prices. Use of RES is based on advanced, environmentally friendly technologies; it contributes to reducing greenhouse gases and other pollutants. Wise use of RES has an impact on improving the health of the population and the environment. The importance and promoting the use of renewable energy sources are reflected in the strategy papers on renewable energy sources as well as laws concerning the use of renewable energy prepared by the relevant sectors at national level. The basic prerequisite for promoting the use and development of renewable energy sources in Slovakia is a strategic document - The Concept of the use of the renewable energy sources.

The legislation in the field of renewable energy sources has to ensure greater use of renewable energy sources. The European Union has issued a number of important documents which are not legally binding. For instance, the "Roadmap" for renewable energy sources in which the Commission presented a long-term strategy for the use of RES in the EU. In this document, the Commission has proposed as a target of a 20% share of renewables in the energy mix by 2020 and also 10% for biofuels in the transport sector.

The share of RES

The share of RES in the primary consumption was only approximately 9.5 % in 2010, the Slovak Republic as a member of the European Union committed to reach 14 % of consumption from RES in 2020.

In 2010, the energy intensity of Slovakia was the fourth highest of all EU Member States. This fact points to a high potential for energy savings.

The share of nuclear energy in electricity production is 55% and it ranks Slovakia on the third place in the world (after France and Lithuania). However, currently the other two reactors at Mochovce are being finalised, and other reactors are under consideration Jaslovské Bohunice.

Although, the fossil and nuclear sources are still dominating in the European Union, the tendency of installing new capacities points out to the rapid development of the renewable energy sources.

I.2. Trends in the Energy Sector and Legislation

The European Union and its Member States are aware of the situation in the energy sector and their responsibility for the state of the environment. The European Union, with its global

policies and legislation in the field of energetics and sustainable development, becomes the driving force for other countries.

The energy policy of the European Union can be generally divided into seven main areas, namely:

- ✓ energy efficiency
- ✓ European energy policy
- ✓ secure supply, external dimension and enlargement
- ✓ Internal Energy Market
- ✓ nuclear energy
- ✓ renewable energy sources
- ✓ climate policy

The legal documents which exist in the European energy policy are directives and regulations. Besides them, there is also a Green Paper issued by the Commission in order to invigorate the discussions and start the process of commenting the documents on the European level. In the area of the sustainable development the European Union issued the Green Paper:

http://ec.europa.eu/green-papers/index_sk.htm and the White Paper:
http://ec.europa.eu/white-papers/index_sk.htm.

The Green Paper of EU is document which is issued by the European Commission in order to invigorate discussions and to trigger a process of commenting various documents on the European level. The European Commission publishes Green Papers in order to indicate proposals for the future EU legislation.

After finalisation of the commenting process, the European Commission issues the White Paper. The White Paper clarifies into more details the EU initiatives. After its approval by the European Council it could be a basis for the action plan of the European Union for the relevant area. It was for example basis for the Programme of the Single European Market - target 2000, in which the Commission published its proposals for healthy competition, prosperity and employment in Europe.

More information about the sustainable development, energy efficiency and other relevant topics could be found on the EU pages and pages of the environmental institutions:

<http://www.urso.gov.sk/?q=content/legislat%C3%ADva-eur%C3%B3pska-legislat%C3%ADva>
http://www.enviromagazin.sk/enviro2009/enviro4/07_podpora.pdf
<http://www.siea.sk>
www.ekofond.sk
<http://www.economy.gov.sk/>
www.urso.gov.sk
<http://www.siea.sk>

www.energia.sk
<http://www.atlasoze.sk/>
www.euractiv.sk

Currently, RES pays careful attention to energy consumption. That means, that the trend is energy savings and reducing energy consumption.

Energy consumption per unit of production, or in a broader sense, the share of energy consumption per added value created by a company, sector or economy. *The energetic needs of the economy* (energy consumption / GDP) is usually calculated for the consumption of primary energy sources, but sometimes also for final energy consumption. It is the most common aggregate indicator which allows evaluation of measures leading to better management of energy over a longer period of time. The *energy efficiency of buildings* represents in the balance of power needs and energy complex the second largest savings potential in the economy of every developed country. Their comprehensive energy consumption is a sum of the total investment inputs to ensure thermal protection and annual operational demands of energy systems of building during their lifetime.

Across the whole EU, it is assumed that higher quality of construction of buildings their better use affects about 42 % of the final energy consumption, about 35% of greenhouse gas emissions and more than 50% of all exploited raw materials. Activities focused on energy efficiency and use of renewable energy sources in buildings play a key role in meeting the energy objectives across the EU. By 2011, all new buildings in the EU must be buildings with nearly zero energy consumption (public buildings since 2019), respectively the priority is put on energy-active buildings.

The new legislation on energy efficiency introduces an obligation for Member States to renew their public buildings, which should play an exemplary role in the energy performance of buildings.

The housing stock in SR is created by more than 1.6 million flats built in residential and family houses. There are almost 840,000 flats in the apartment houses and more than 95% of them are heated from a heat source which is located outside the apartment.

Reducing the energy consumption of buildings could be secured by:

- improving the thermal performance of building systems
- purification and regulation of heating systems with installed regulation and measurement
- improving the level of management of the building operator
- improving the contracts for the supply of heat and its control
- improving energy efficiency
- energy conservation and construction of low-energy, passive energy, energy-active buildings
- more economical use of water - hot and consumption water

In order to achieve objectives in energy efficiency in buildings, the energy audit is used.

Energy audit

Energy audit is a tool to achieve energy savings and cost. It is a systematic procedure to obtain adequate information about the current state of the technical equipment and buildings designed for use of energy. It serves for identification and design of the cost-effective energy savings opportunities. The output from the energy audit is a written report. The energy audit is an activity which aims to obtain information about the particular energy system. Such information includes, for example information about the method and the efficiency of energy use by the system. During the energy audit it is important to determine the size of energy losses, what shows the potential for energy savings and as a positive result, reduction of adverse environmental impacts. The energy audit is an objective analysis of the production and use of energy and setting the possibility of the maximum effect in the target (future) state.

It is not enough to balance the purchase, transformation and distribution of all media, but also to review the whole system and suggest measures for cost optimization of the whole cycle.

Types of energy audits

- **Complex energy audit**

It includes total balance of purchase, transformation, distribution and consumption of all energy carriers, the assessment of the whole system, the draft measures for cost optimization of the cycle to ensure reliability of supply.

- **Purpose energy audit**

It focuses only on the selected area (e.g. heat production, heat consumption for heating, heat consumption for technology, compensation in the consumption of the electrical energy, review of the price list rates when buying energy carriers, etc.).

- **Special energy audit**

Its objective is to prepare the documents for the implementation of rationalization projects in the field of energy, including a proposal for financing.

Forms of the energy audit

Short-term (framework)

Its aim is in very short time (about 3 days) to examine the energy system equipment (production, distribution, energy use) and in the first approximation to set up the opportunities for energy savings.

Long-term (complex)

It represents a detailed assessment of possible savings based on detailed knowledge of the state of energy use. In the resulting solutions and proposals for the implementation are also included long-term measures that would not otherwise be resolved. That is, using the results

shown in the audit can create a project for the comprehensive energy rationalization of the system.

Energy self-sufficiency of households

In the recent past - in Europe for several years after the Second World War - each farm was energetically self-sufficient. Its inhabitants could provide not only energy, i.e. wood from its own forests, and feed for animals, but also managed to grow and sell various food, livestock and other products. It is now possible that the farm produces and markets biofuels (wood, wood chips, pellets or briquettes from wood, straw or other crops or grain, corn for heating). It can also generate electricity and sell its surplus. It means that someone from the residents shall deal with energy professionally. It is basically a specific business where the energy self-sufficiency is only a kind of by-product.

Similarly could run a house with its own water (or wind) power plant. However, there exist only a small number; places suitable at the same time for a plant and a house are rare. More often we meet with the requirement that the energy of the house should work "spontaneously", without any significant demands for its operation, like e.g. "aquaculture" when the building has its own well and root sewage. In that case the house has to survive with solar energy. Such requirement can be met e.g. by passive houses with photovoltaic plant on the roof. It remains just to clarify whether a house should be really independent – i.e. one that is not at all connected to the electricity or distribution of gas or heat. This solution is, of course, necessary if we want to have a house far away from civilization, where building of connections would be too expensive. Or we can have a house that will have zero consumption only on accounts. Such a house is normally connected to the electricity, but it also has its own source of electricity. Where appropriate, it takes electricity from the network or returns it back into it. More or less theoretically it can work well also in summer when the house submits the surpluses of heat to the public network. In such house we cannot get rid of payments for energy, but when properly conducted we will send, on the contrary, the energy bills to our customers.

The most used types of renewable energy:

- solar,
- wind,
- water,
- biomass,

Other types of renewable energy:

- geothermal energy,
- tidal and wave power.

All basic information about individual types of energy are publicly available and summarised in the Handbook on employment in RES „**Employment in the area of the renewable energy sources**“, and other supportive materials including methodological materials, animations, videos and theory which could be used during the education and when trying to persuade the

pupils about their further career, could be found at the platform created by EkoFond: www.platforma.ekofond.sk. Therefore only briefly about it.

The solar energy is inexhaustible. The sun's rays fall on the Earth and their power is immense. The disadvantage is in alternation of the day and the night and in the intensity of the sunlight at different latitudes. Nevertheless, in the history the use of the solar energy was for heating of the water. This use is also currently the most widely used form of solar cells to heat water. However, technology can also be used the sun to generate electricity in the form of photovoltaic cells.

The wind energy is used to power ships, pumps and mills. And the technique has developed also in this case: the wind turbine converts the mechanical energy of wind into electricity, which appears also at home when we press the switch.

The hydropower was used to transport of goods by rafting, to drive the mills, until Mr. Kaplan, Pelton and Francis invented turbines. Each has a different principle and the water flow began to produce electricity.

Energy from biomass uses mainly combustion and differs from water, wind and sun so that is exhaustible, but it can be quite quickly refreshed.

This brief excursion through renewable and alternative sources has shown us the way, how to produce the required energy from other sources than from conventional fuels. Like everything else, this too has its cons. Although resources are free, technical solutions are relatively demanding and energy has big daily and seasonal variations.

I.3. Importance of Technical Studies for the Future

But enough theory and regulations. From the above mentioned it is apparent to us that the technical and professional licenses and jobs in the field of energy are necessary. But how to achieve that technology does not become just a space for a few enthusiasts and fanatics, but a space with a variety of options?

Graduates of vocational high schools can work in all sectors. Slovakia is a country where science and technology is progressing and gives more room for technical professions. We are a country that hankers after professionals, and this is why our graduates of secondary vocational education come into awareness and demand for their knowledge continues to grow. Almost all professions lack qualified specialists. Shortage is especially in skilled technical positions.

Here is the room for us teachers, educational and career advisors to focus teaching on technical issues, through technical excursions to museums and factories to bring children to technical problems. At time when TV stations are competing with the number of broadcasted series, culinary competitions and reality shows, without a systematic work with children from an early age we will not be able to arise interest in the technique. Maybe just a trip to the creek and built a small watermill will affect a future technician.

Surely, you have met with the terms a low-energy house, or even active energy house. Let us turn it all into details in my school. Take children to the place where the renewable energy

resources are used, and on a simple example explain them, how much energy we can save just by turning off appliances. But you, dear colleagues, will find out hundreds of other examples. Inspiration for enrichment of the learning process can be found on the web site of EkoFond: <http://www.platforma.ekofond.sk/>. Contributions of teachers are prepared so you can use them too, they are arranged into modules 'School in action, Experiments and Videos, Modern Teaching'.

Why technology?

Technology is an integral part of human culture, which is closely linked with the creative activity of man. No one else, just as a man was, is and always will be the primary initiator of all the innovations and changes, whether technical or technological nature, which still more and more intensively permeate and enter in professional or private life not only of children, youth but also adults and thus significantly contribute to shaping their attitudes, beliefs, values, affecting their physical and mental health, as well as their way of life. Everyday life brings us an incredible amount of information, problems and challenges that we have to accept and deal with. Better understanding and explanation of problems and tasks is easier if we have technical education in the lifelong learning system already at the pre-school age, through the lower and upper secondary education, higher education and university education to lifelong learning. Technical education expands our options, applies our ideas into the real life. It is necessary to look on the technique through the social line, because the social consequences of the benefits of science and ever-increasing pace of technological changes on the environment influence the life of everyone.

Technical education in its very beginnings was primarily through independent discovery of new technological advances, particularly in an disorganized manner and individually. Today, in the third millennium, it is a complex system of technical education, which is always determined not only by impacts from the external environment, but also by technical means .

The prime role of the technical education is to create an active and critical relationship to technology, information - communication technologies and to the technical progress in order to ensure that each person is technically literate, because we all have not only the right but also the duty to regulate the impact of technology on the natural and social environment. The basic philosophy of technology and technical education is based on the idea that technology is one of the conditions of the current and likely future human existence. Its enormous influence must be taken into account by all of us without distinction, both in the positive as well as the negative sense. Young people should be best prepared for this society-wide phenomenon in order that they are not afraid of the technical achievements, they do not resign because of its complexity and to be able to face the negative impacts.

The basic attributes of the technical education defines the most common core competencies. That means, the core competencies which the students have to learn in upper secondary technical education can be defined through the basic technical literacy of the upper secondary level, in which we talk about the acquisition of elementary skills, such as:

- ✓ awareness of the key processes in technical education (what it is and how it works)
- ✓ to be able to apply technical knowledge in real situations,

- ✓ to be able to use technical machinery and equipment,
- ✓ to be able to make effective use of technical information,
- ✓ ability to self-evaluation,
- ✓ ability to self-knowledge,
- ✓ ability to implement the knowledge, skills, habits and competences from other subjects and to apply them in vocational technical training,
- ✓ to be able to use the means of information and communication technologies,
- ✓ to be able to apply numerical and mathematical literacy in technical subjects,
- ✓ to develop technical logical thinking.

Trade is a handful of gold – this proverb is still valid. Almost all professions lack qualified specialists, especially in skilled technical positions.

Salary - graduates in technical fields (experts) from the secondary schools have often higher salaries than graduates of universities.

Ability to get job - graduates of high quality vocational secondary schools have far greater ability to get a job than graduates from secondary grammar schools. Plants and factories would like to employ them for their qualifications, which they learn at school.

- A graduate from secondary vocational schools have no problem to continue their studies at universities.
- The electrician will always be an electrician or even an economist. Vice versa it is not possible!
- A graduate from a professional school may work as a well paid entrepreneur.
- It is always better when a child with worse achievements at the primary school completes "apprentice" education and can work as a craftsman.

History is full of names of technical inventors and inventions that changed the course of history more than many other historical events. Do not let technology fit dust, in it is our future .

II. Orientation in the World of Occupations

II.1. Handbook on Occupations in RES

The importance of energy generation from renewable energy resources to the sustainable development is broadly recognised, and it is growing due to the increasing concerns over the global climate changes and energy supply safety.

Lack of qualified and skilled labour force is one of the key obstacles for successful development of renewable energy resources and fulfilment of targets defined within the Europe and also worldwide, which would trigger the needed expansion of this sector and its support.

The development of renewable energy resources is accompanied with the development of new set of occupations alongside the Europe. Students and individuals interested in this sector lack information about potential jobs within the sector, and face problems when searching for the career counselling. Weak general awareness of the scope of employment opportunities in the renewable energy sector may also be a problem.

The Handbook called „**Renewable energy resources related occupations**“ tries to solve this problems. It is an important toll for educational and career advisors, through which they may advise pupils and others who are interested in occupations in the area of the renewable energy sources or those who are thinking about change of their qualification.

It helps the educational advisors in primary and secondary schools who can through the Handbook provide the students not only the basic information on renewable energy sources, but mainly an overview of occupations in which they may find jobs.

The Handbook consists of two parts. Part One provides the basic information about energy generation, an overview of the most frequently used natural energy resources and various technologies within individual renewable energy resources sectors. Part Two of the Handbook comprise the Schedules, and provides an overview of occupations directly or indirectly related to the renewable energy resources preparation, energy generation and technologies, present at the energy generation labour market in Slovakia. Many occupations are relevant for a broad scale of sectors related to energy generation from renewable resources, and though these vary across countries and companies, job descriptions should cover the broadest spectrum possible. The Schedule also describes occupations related to the renewable energy resources within the EU, and also the list of study branches in Austria focusing on renewable energy resources, including various courses to renewable energy resources related topics.

II.2. School Education Programmes, RES and Education at Schools

All of us are familiar with the documents. Those are essentially extensive school curricula. They have a lot of pages. In order not to be lost, you need to read the characteristics of the school graduate, his competences and skills. From the profile we will find out, if the field of study is technical or not. The difference between a cook and a gas specialist is obvious, more difficult it is with the electrician specialised in utility and heavy current technology. This is, where the school education programme is an aid for the educational and career advisor. It is a compass in a sea of disciplines.

Get students into technical fields is a worldwide problem. This problem must be addressed comprehensively and almost on the level of kindergarten. Renewable energy resources and their importance must be part of teaching in schools. What can help us?

- lectures by experts from companies, NGOs, institutions and so on.,
- new information materials from companies,
- film screenings, presentations,
- installation of exhibitions with the theme of renewable energy sources,
- excursions and tours to places where the use of renewable energy sources is successfully implemented in practice or in companies that deal with renewable energy technologies (production, sales ...)
- coursework, games, quizzes, for inspiration visit www.platforma.ekofond.sk/
- participation in camps and labor camps,
- study visits abroad
- monitoring of announced grants on the theme of renewable energy sources,
- elaboration of projects for renewable energy sources from various grants, for example at www.saaic.sk, etc.

II.3. Familiarisation with the Concepts The National System of Occupations and The National System of Qualifications

One of the reasons why the job applicants have a problem to get a job at the labour market is discrepancy between their knowledge and skills acquired at school and the requirements of employers. This in a certain degree has relation with the absence of actual, objective and complex description of requirements of the labour market that could be used for creation of suitable educational programmes.

An important role in should eliminate the discrepancies shall be implementation of the national project the **National system of occupations** www.sustavapovolani.sk, which is defined by the Act No. 5/2004 Coll. on employment services as amended as a national, single information system of descriptions of the standard labour market demands on individual jobs. The National system of occupations shall define requirements on professional skills and practical experience for execution of working activities at the labour market.

The system provides characteristics of occupations and at the same time also the relevant field of study for that occupation, characteristics of the graduate and other information.

Since 2013, the national project the **National system of qualifications** which builds on the national project the National system of occupations started.

The objective of the national project the **National system of qualifications** is to create and develop an effective system of lifelong learning aimed at development of key competences, deepening and increase of qualifications in line with the current and future needs of the knowledge society available for all citizens of Slovakia during their whole life.

Another source of information about occupations is www.istp.sk

On the pages you can find detailed files and registers of jobs. There is a job description, required knowledge and skills, required education, type of school or course suitable for the job and at the ISTP page you can find also the average salary for the given job. Pages actually help to choose an appropriate course of study for the occupation.

As an example we will provide description of the field of study: technician of energy equipment in buildings.

Technician of energy equipment in buildings

Charakteristics

The technician of energy equipment in buildings coordinates and carries out activities related to the installation, maintenance and repair of technical equipment (pressure, gas, electric, lifting) and ensures the efficient operation of energy facilities in the building and their technical condition from the point of view of the operator or the supplier of those services and facilities. He/she is responsible for the supply and efficient energy consumption, carries out activities in the field of installation, maintenance and repair of building equipment, small and medium sized enterprises, including electrical installation, gas installation, plumbing, heating and so on. He/she puts them into service, conducts their testing and servicing. He/she provides advice on the design of energy equipment in buildings.

III. Current Information for the Educational and Career Advisors

Nothing is immutable, do not enter twice into the same river, and therefore this material should be considered as a small aid in a difficult job of the educational counsellors. Key facts and philosophy remain, but the numbers are variables, therefore specific data needs to be supplied in order to complete the changing data.

The flow of information around us is constant, for inspiration we offer some useful resources that contribute to the popularization of occupations in the area of the renewable energy sources and technical professions in general.

Websites:

Occupations for graduates

http://www.upsvar.sk/statistiky/nezamestnanost-mesacne-statistiky.html?page_id=1254

www.profesia.sk

<http://old.minedu.sk/index.php?lang=sk&rootId=8952>

<http://www.uips.sk/regionalne-skolstvo/nezamestnanost-absolventov-strednych-skol>

http://www.uips.sk/sub/uips.sk/images/JH/uplatnenie_a12_.pdf

Other interesting information about RES:

http://www.stuba.sk/sk/diani-na-stu/o-vyskum-oze-na-slovensku-maju-zaujem-i-firmy-energia.sk.html?page_id=4570

<http://centrum-oze.webnode.sk>

We hope that this Handbook will become for you an inspiration for the development of interest in technical professions, especially in occupations in the area of RES.