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REPORT ON THE PROJECT OF COOPERATION IN EEA GRANTS

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Project: Comparison of energy potential of Iceland and the Czech Republic

Date: 1/ 8/ 2021 – 31/ 8/ 2022

Schools: Technical College Reykjavík a Technical College Jihlava

Place: Iceland and the Czech Republic

1. Introduction

The project was implemented from 1.8.2021-31.8.2022. The project was 100% funded by the European Economic Area Funds under the Mobility Projects. The main goal was to strengthen cooperation between the Icelandic Technical College in Reykjavík and the PTA Jihlava Secondary School. It was attended by 17 Icelandic and 17 Czech students and teachers. In the Czech Republic, they explored the energy potential for 15 days and then the same time in Iceland.

Their task was during the implementation of the cooperation project:

Compare the current energy mix of both countries

Assess the readiness of both countries for new changes in energy - ie requirements for clean energy, carbon neutrality and the involvement of more low-emission sources

Investigate network resilience and the impact of low emission sources on network stability

Determine readiness for the introduction of electric cars

2. Visit of the Icelandic participants in the Czech republic

2.1. Monday 08.11.2021

The cooperation program began on this day. In the morning, Ing. Hamrová (project coordinator) and Ing. Miroslav Vítů (school principal) and welcomed all present and then introduced the program.

This was followed by a presentation on "Comparison of the energy potential of the Czech Republic and Iceland", which was presented by Ing. Buršík at the Dukovany nuclear power plant. After the presentation, the so-called "speed dating" took place so that all participants have the opportunity to get to know each other and ask each other and answer a few questions. Subsequently, there was a networking and mutual discussions on the topic of the project and the project program.

2.2. Tuesday 09.11.2021

The next day was followed by a visit to the Ledvice coal power plant. It is a thermal power plant located near the town of Ledvice. In addition to generating electricity, the power plant supplies heat to Bílina and Teplice. At the top of the boiler room of the new block, a lookout tower with a height of 144 meters is open, from which you can see a wide area, including coal basins and mining machines. Units 4 and 6, which generate 770 MW of electricity, are currently in operation. With the fact that unit 4 has an output of 110 MW and was built in 1968. Unit 6 is the newest with an output of 660 MW and was completed in 2017. The latest unit is interesting in that it is a so-called supercritical mode, because the steam has a temperature of 600 ° C. Thanks to this, its efficiency reaches up to 42.5%. The boiler is powder, which means that the coal is first ground in coal mills to a fine powder, which is blown into the combustion chamber. The coal for this power plant comes from the Bílina Middle Mine, and the power plant consumes approximately 3.5 million tons of coal a year.

2.3. Wednesday 10.11.2021

On the third day, the students had to work on a project of readiness of the Czech energy network for electromobility. The activity was divided into three parts. The first part presented the possibilities of deploying EV in the conditions of the Czech Republic. This is specifically information about the number of cars in the Czech Republic, information on how many kilometers these cars drive on average per year, what is the maximum and minimum daily load of the distribution network and what is the average energy consumption in the Czech Republic in one year. The second part was followed by the processing of questions in groups. The students were divided into 4 groups and all was supplemented by one group of teachers. The processing was very active and complemented each other perfectly thanks to the diversity of both countries and their energy mix. In the third part, the participants presented their results. I will now summarize these in common conclusions:

- 1) The best charge would be in the current situation at night. The situation may change significantly with the arrival of solar power plants and an increase in their share in the energy mix. Then it would be advisable to charge the cars during the day. As a result, stable and renewable sources can be combined appropriately.
- 2) The average result was 15%. This is a real but average number. The individual charging times and the schedule of human operation would have a great influence on this load. According to the participants, so-called smart grids are offered here. They will be able to regulate the necessary energy flows themselves and use cars as energy sources and stabilizing elements of the energy network.
- 3) Many concerns about electric cars from the point of view of Czech participants appeared in the discussion, thanks to the knowledge of Icelandic students of local conditions in Iceland (relatively high penetration of electric cars) some were refuted, others will need to be resolved in the future. This is especially the peak load on the network when people come home after work and connect their cars to the network. The topic of taxation and electricity prices also resonated.
- 4) The conclusion was that the electricity network in the Czech Republic is capable of deploying electric cars. All this under certain conditions for network stabilization. If a large number of EVs were deployed immediately, the network would collapse. If it is a gradual process using modern technology, it is possible.

In the final discussion, the participants agreed that the use of electromobility must be based primarily on technical and scientific knowledge. Electromobility is often associated with emotions and the polarization of society. But even this topic is not just black or white.

2.4. Thursday 11.11.2021

The program included a visit to the Dolní Vítkovice area, which is located near Ostrava.

On site, participants had the opportunity to see a blast furnace for smelting iron and exhibits in a small and large world of technology, which is basically a technical museum focused on coal mining and iron production. Near the blast furnace is a technical interest, it is a gas tank. It was able to hold up to 50,000 m³ of cleaned blast furnace gas and regulated the pressure in the gas network using a sophisticated roof. The gas was used to heat wind heaters. Coke chambers and served as fuel for gas engines of reciprocating blowers.

2.5. Friday 12.11.2021

A presentation from ČEZ, the largest electricity supplier in the Czech Republic, took place on Friday. The presentation covered the future strategy on renewables and nuclear power plants. In the afternoon, a second project took place on the topic of energy network readiness with regard to the transition to low-emission sources. Individual details are given in the final report of this project.

2.6. Monday 15.11.2021

On this day we went to the Dukovany nuclear power plant and the Dalešice hydroelectric power plant. Dukovany NPP is one of the main sources of electricity for the Czech Republic. Its construction was completed in 1987 and produces 2,040 MW of electricity. Two reactors are planned for the future, each with an output of 1,200 MW, which would double the output of this nuclear power plant. The annual production of this power plant is 15 TWh of energy. Dukovany NPP covers about 20 percent of electricity consumption. Energy in the Czech Republic. VE Dalešice is a pumped storage power plant installed near the Dukovany NPP. It is located on the river Jihlava and its dam forms the Mohelno reservoir. The hydroelectric power plant has an output of 4 x 120 MW. Francis's reversible turbines and transformer system convert hydropower into electricity. There is also an old turbine on the power plant site, which is particularly attractive for its relatively respectable dimensions. The power plant will start from idle phase at full power in 55 seconds. Thanks to this, it is the fastest growing source in the Czech Republic to cover energy peaks.

2.7. Tuesday 16.11.2021

The main program of the day was a lecture by Ing. Drábová on the topic of low-emission energy. Ing. Drábová is a respected expert in nuclear safety and at the same time chairwoman of the State Office for Nuclear Safety.

The elaboration of the third project by students followed. It was about the readiness of both countries to move to low-energy energy. The content and results are again part of the project report.

3. Visit of Czech participants in Iceland

3.1. Monday 25.4.2022

The program began with information about the Taeknisgolinn in one of the buildings. I was especially interested in the use of creative workshops, which contained several parts. In one of the positions were 3D printers for printing jigs, then it was, for example, a music and film studio or the latest simulator of an excavator, crane and many other vehicles. The school offers 50 study programs and 800 subjects each semester. The school is attended by almost 3,000 students

3.2. Tuesday 26.04.2022

On this day we visited the geothermal power plant HELLISHEIÐARVIRKJUN. The power plant produces 303 MW of electricity and 133 MWth of hot water, which is used to heat the capital Reykjavik. The power plant is operated by ON, which is the equivalent of Czech ČEZ in Iceland. The power plant uses 50 wells for hot water extraction and the deepest well is 2200m.

3.3. Wednesday 27.04.2022

The day began with a lecture and introduction by ON. The use of Carbfix technology was very interesting, in which he sees a relatively large potential. It is a technology that binds CO₂ below the earth's surface. The used water from the geothermal power plant is enriched with CO₂ bubbles and subsequently pumped underground, where CO₂ is bound to the rocks. The technology was introduced by Haukur Georgsson.

In the afternoon, the Minister for the Environment of Iceland, Mr Guðlaugur Þór Þórðarsson, gave a lecture. The ensuing discussion was very interesting, which revealed possible pitfalls as well as possibilities.

3.4. Thursday 28.04.2022

The introductory topic concerned sustainable energy in Iceland, presented by Dr Þröstur Þorsteinsson. It was a reflection on the possibility of generating electricity from the wind in Iceland. Gradually, I realized that generating electricity from water and geothermal energy is much better for Iceland. The main reason is the strong pressure of people to preserve nature and the character of the landscape. The subsequent discussion also dealt with the possibilities of using tidal power plants and special types of power plants, using differences in air pressure above and below sea level using water bags and pipes with generators.

3.5. Friday 29.04.2022

The students took part in a special event - it is a celebration of graduating years in the city with the use of masks. The teachers visited the settlement center and learned about the history of Iceland, including fables and short stories about the origin and settlement of Iceland. Subsequently, they visited the geothermal baths on the mountainside, which very well illustrates the character and structure of Iceland,

where places with boiling water from the ground are a relatively common and widely used phenomenon for both bathing and generating heat and electricity.

3.6. Monday 02.05.2022

This day we visited the Krýsuvík geothermal area. We saw the so-called bridge between the continents. This is where the lithospheric plates touch. They are gradually moving away from each other and thanks to that it is possible in Iceland to use geothermal energy. In the afternoon we visited the Blue Lagoon. It is a lake that used to be a waste for a geothermal power plant. The water from the depths contains a large amount of fine silica powder. This gradually caused the waste lake to become a bathing lake and subsequently a tourist attraction. The stones surrounding the lake and the bottom are covered with a deposit of this powder.

3.7. Tuesday 03.05.2022

Lecturer Erla Guðný Helgadóttir spoke about nature in Iceland, I was interested in the fact that most of the territory in Iceland is protected as a nature reserve. We have learned that a large part of the population wants to preserve and protect the character of the Icelandic landscape. In the second part, Icelandic students presented us with their short video, which discussed the impact of the use of social networks on CO₂. It was quite an interesting idea for me and I was pleasantly surprised that they provided verified and confirmed numbers and information on how much energy one post on Twitter, Facebook and Tik Tok cost, for example.

3.8. Wednesday 04.05.2022

Golden Circle is a loosely translated hiking trail, which when you set out you will see beautiful waterfalls, beautiful lakes and geothermal activity. I was very interested in the lake, whose temperature was around 5 ° C. There was a warning at the lake that swimming was allowed on its own. The springs in the lake are hot, up to 100 ° C, so there is a danger that certain areas of the lake will be warm. This was also shown on the shore, where water was simply boiling in some areas. So if you dug a hole and put eggs in it, it was no problem to enjoy a hearty breakfast in a while.

3.9. Thursday 05.05.2022

We visited the largest church in Iceland Hallgrímskirkja church. It is a church built entirely of concrete. It is really famous and shows architectural and engineering sophistication. It was interesting that the ceremonial glass pedestal was made in the Czech Republic, because no one else could do it. I would also like to mention that our student Dominik Máca could play the local organ, which has about 5,000 flutes. It was an exceptional event because the owner is one of the best European organists.

In the afternoon we visited the company deCODE genetics. It is exceptional because it deals with genome decoding. On its ground floor, we had the opportunity to see automatic machines for sorting and processing samples at a temperature of -25 ° C and -85 ° C. Subsequently, we also learned that the company operates a huge data center of 200 PTB data and had the opportunity to view it, which is very unusual and I was personally pleased with this opportunity.

3.10. Friday 06.05.2022

There was a debate among the students on the last day. It was also the last project of our visit. The students were divided into two groups, one group had to defend the deployment of data centers in Iceland and the other had to oppose. It should be noted that within two weeks, I understood that the people of Iceland are not enthusiastic about data centers. The argument was that they consume cheap electricity, but they bring essentially nothing to Iceland. This proved to be a valid argument during the discussion as well.

Conclusion:

I am glad that I was able to participate in this project. It significantly broadened my horizons and our students. We learned a lot about Iceland, we had the opportunity to compare the energy mixes of our two countries, readiness to deploy electromobility and low-emission energy. We also met new people and were able to compare our views on energy and the future of energy. The project filled me with optimism and I am proud of the results we have achieved.

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