

## REPORT ON THE PROJECT OF COOPERATION IN EEA GRANTS

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<b>Schools:</b>	Technical College Reykjavík a Technical College Jihlava
<b>Place:</b>	Iceland and the Czech Republic

### Czech Republic

We launched the EEA Fund Project "Comparison of the Energy Potential of Iceland and the Czech Republic" on November the 7. when the Icelandic students came for an exchange.

On the first day of the program, there was an official welcome of Icelandic students and teachers to our school. This was followed by a presentation comparing energy potential the Czech Republic and Iceland, in which we found that Iceland produces electricity mainly from renewable sources such as hydropower and geothermal power plants, while the Czech Republic produces electricity mainly from coal and nuclear power plants. What surprised me was that Iceland produces much more electricity per capita, then Czech Republic but, But Iceland does not sell its energy to anyone.

### Coal power station Ledvice

The next day we visited the Ledvice coal power plant near the town of Bílina, which burns coal from a nearby lignite mine named after this town to produce electricity.

Coal from this mine is first imported by train to the Ledvice Coal Treatment Plant, and then travels by a conveyor belt directly to the storage tanks of individual boilers, or to a handling dump with a capacity of 60,000 t. The power plant was originally made up of 5 units builded

between 1966 and 1969, currently only two units are in operation, unit number 4 with a power of 110 MW and unit number 6, the so-called "New Source" with a power of 660 MW. Thanks to the use of the most modern available technologies in its construction, the "New Source" is one of the most modern conventional power plants in Central Europe, thus reducing all monitored emissions in the Ledvice locality by an average of 50 %.

### **Nuclear power plant Dukovany**

On 15.11. we visited the Dukovany Nuclear Power Plant is the first nuclear power plant built in the Czech Republic. Dukovany dominant are 8 cooling towers with a height of 125 m with a lower diameter of 90 m and an upper diameter of 60 m tower. There are 4 production units of the VVER 440 type in the power plant. The first reactor unit was put into operation in May 1985 and since July 1987 all four production units have been in operation. As part of increasing efficiency and utilization of power reserves, the installed capacity was increased from the original 4 x 440 MW to the current 4 x 510 MW, the total installed capacity is therefore 2040 MW

This nuclear power plant has long covered over 20 % of the total electricity consumption in the Czech Republic.

In the power plant's more than 30year history, only one failure has occurred, which has been classified according to the international INES2 scale. It occurred in the early 1990 s due to the disconnection of the power plant from the external network at the Slavětická substation.

### **Dalešice pumped-storage hydroelectricity**

On same day as Dukovany, we went for a tour the Dalešice the hydroelectric power plant. It is interesting that this power plant is power plant with highest sprinkled water dam in Europe it is high 102 m. This pumped storage hydroelectric power plant located on the river Jihlava was built between 1970 and 1978. Its output reaches 4 x 120 MW and total output is 480 MW. The main use of this power plant is a source of technological water for the Dukovany nuclear power plant, which is pumped from the Mohelno reservoir, and is also used for the short-term replacement of one unit of the nuclear power plant.

It reaches full power in 55 seconds from the idle phase, making it the fastest-running pumped storage hydropower plant in the Czech Republic.

### **Other program in Czech republic**

During the program, we visited not only power plants, but also cultural and technical monuments such as Dolní Vítkovice, Prague, Lipnice Castle, the Church of St. Jakub in Jihlava and the Jihlava underground. We also had a lot of lectures on electric cars and low-emission energy during the program.

### **Iceland**

We started the second part of the project on April 24. Again at Jihlava bus station. There we met classmates and teachers and took a bus to Munich, where we boarded a plane and flew to Keflavík, from there we took a bus to the destination of our trip to Reykjavík. There we warmly welcomed Icelandic students who took us to their homes.

The first day, as in the Czech Republic, was dedicated to welcoming us Czech students to the Icelandic school.

### **HELLISHEIÐARVIRKJUN geothermal power plant**

26.4. we visited the HELLISHEIÐARVIRKJUN geothermal power plant, which supplies electricity and hot water to Reykjavík and its estimated output is around 303 MW. Interestingly, the hot water cools down to only about 2 ° C during this journey. There was an exhibition on geothermal energy and Carbfix, which is a technology for storing carbon dioxide in basalt. It works by mixing the captured carbon dioxide with water, which then becomes acid, which is injected underground, where it reacts with basalt, which has pores on the surface, which after two years fill with carbonates, which are formed by the combination of elements such as calcium, magnesium and iron with carbon dioxide.

### **ON – Power – Orka náttúrunnar**

We also saw interesting presentations in Iceland. One of them was a presentation about the company ON-POWER it is a company that produces 100 % renewable energy. In addition to electricity, it also produces hot water.

The company wants to produce so-called smart street lights in the future, which is a big topic in Iceland for long nights in winter. In addition to the light, these street lamps should include a Wifi connection, an air quality sensor, a road traffic sensor and other conveniences.

### **Sentence power plants**

On April 28, we had a presentation on the topic of wind power plants. There aren't many of them in Iceland yet, but there are plans to build them in mountainous areas. In the presentation it was said that many things they say about wind farms are not true, for example that wind farms kill a lot of birds or that they are too noisy. In this presentation, however, I was most interested in the idea of a wind power plant without a tower Airborne Wind Energy Systems, it works in that the "plane" attached to the ground with a cable moves in the air and thus creates mechanical energy which it supplies to a generator that is on the ground and produces from the supplied mechanical energy electrical energy. The second version of this idea works on a similar principle of an "airplane" attached to the ground by a cable, only in this case the generator is located in the "aircraft" and produces electrical energy from the energy of the wind. Offshore wind farms were also mentioned in the presentation. In order to achieve a greater profit of electrical energy, we must increase their number or enlarge them.

### **Ocean energy**

On the same day, we also had a presentation on ocean energy, in which we learned that sea waves caused by the transfer of kinetic energy of the wind to the upper surface of the ocean can also be used to produce energy. Secondly, the energy of tides can be used, which is 2/3 due to the gravitational force of the moon and the earth and 1/3 due to the gravitational force of the sun. Thirdly, tidal currents caused by the filling and emptying of coastal areas as a result of tides can also be used. Fourth Ocean currents caused by the thermohaline circulation of the oceans. Fifth, the conversion of heat energy of the oceans, which is the temperature difference between the heat of the upper ocean layer and cooler sea water below 1000 m, and sixth, salinity gradients, the difference between the salinity of fresh

water and salty ocean water in estuaries. Unfortunately, despite the high potential of producing electricity from ocean energy, this method of energy production is not used much.

### **Carbfix**

Another interesting presentation was a presentation about the company Carbfix, where we learned more information about this technology, for example, to store 1 ton of CO<sub>2</sub> requires 25 tons of water, 1 cubic meter of basalt can hold 50 kg - 100 kg of CO<sub>2</sub>, Carbfix technology not captures only carbon dioxide, but also sulfur dioxide etc.

### **Other program in Island**

As part of the program, we visited the Blue Lagoon, the National Museum of Iceland, the Westman Islands, Gullfoss Waterfall and Other natural monuments in Iceland.

### **Summary**

The project was beneficial for me in that I learned a lot of new information about energy, renewable resource, electromobility and other topics. It was also an opportunity to improve English and learn about the island's culture. We found that in Iceland energy is produced mainly from renewable sources such as geothermal and hydropower, while in the Czech Republic mainly from coal and nuclear power plants. Iceland has much better conditions for the production of green energy, one of them is that there are many hot springs that can be used for the production of geothermal energy, in the future it will also be possible to use wind energy in mountainous and coastal areas and the energy of the ocean.

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