



Czech-Austrian Winter and Summer School

(Promoting renewable Energy - Targets and strategies by technology from 2005 - 2018)

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1 Abstract

In Austria as in Czech Republic in 2005 the first guidelines for promoting renewable energy were released. Both countries differ a lot in their energy mixture as a result of their geographical and political differences. Austria on one side always had a high percentage of renewables in the energy mix because it's mountainous geography provides many rivers and therefore a big potential for Hydropower. Also Austria never run a nuclear power plant. The Czech Republic on the other hand had a historical favor for coal power plants. Those big and strong plants always were attractive for the big industries, which need a lot of electrical energy. As the Czech's operate nuclear power plants too, a need for a replacement is searched for. As European goals were published, both countries released guidelines according to the EU goals. Austria had to rise the percentage of renewable energy sources from 9% in 2005 up to 34% in 2020. The Czech Republic had to rise their percentage of renewables from about 4% in 2005 up to 13% in 2020. In 2012 Austria released a law which reserved roughly 0.16% of it's GDP for renewables. In 2013 the Czech Republic did the same, reserving about 1% of it's GDP. Both countries show a positive evolution of renewables. In Austria as in Czech Republic only small power plants were strongly promoted. With the mechanics of the CO_2 certificate trade market, big energy suppliers have their own instrument of rising the attractiveness of renewable energy sources. The promotions of both countries rose the amount of small power plants significantly.

2 Introduction

In 2007 the European Union started to define a guideline and target package for climate protection. This guideline is valid for all EU Members and became EU law by 2009. The wanted impacts until 2020 became famous as the 20-20-20 Goals of the EU.[4] These included the following:

- 20% less greenhouse gas emissions than in 1990
- 20% of the energy production from renewable sources
- 20% more energy efficiency

2.1 20% less greenhouse gas emissions than in 1990

In order to reduce greenhouse gas emissions, all Member States contribute to differentiated national targets identified through a burden-sharing process. With this process a emission trading system was founded.[11]

Major emitters, such as Power Plants, Industrial Plants and air traffic receive 21% less Emission rights in 2020 than in 2005. This trading system has expanded and intensified in 2013 by discontinuing to dispense the emission rights and starting an auction system for them. The emission trading system is the most important instrument of the EU and covers 45% of the greenhouse gas emissions.[11]

For the emitters which aren't covered by the emission trading system, for example house building, agriculture, waste management and traffic (without air traffic), national emission reduction targets are defined differently. The targets vary with the wealth of the country from a reduction of 20% for the richest EU Countries up to a maximum increase of 20% for the least wealthy EU Countries (but these are generally required to make efforts to reduce their emissions). In an annual meeting every country has to prove their actions to reduce the greenhouse gas emission.[11]

2.2 20% of the energy production from renewable sources

The next big part is the increase of renewable energy sources in every country. Every EU member has to define their own guidelines to increase the renewables in whole Europe by 20% until 2020. This is more than two times the amount of 2010 (9.8%). These guidelines vary countrywise from 10% in Malta up to 49% in Sweden. Another goal is to increase renewables in traffic by 10%.[11]

2.3 20% more energy efficiency

For the improvement of energy efficiency the EU has adopted a number of measures which include:[10]

- annual reduction of 1.5% in national energy sales
- EU countries making energy efficient renovations to at least 3% of buildings owned and occupied by central governments per year
- mandatory energy efficiency certificates accompanying the sale and rental of buildings
- minimum energy efficiency standards and labelling for a variety of products such as boilers, household appliances, lighting and televisions (ecodesign)
- the preparation of National Energy Efficiency Action Plans every three years by EU countries
- the planned rollout of close to 200 million smart meters for electricity and 45 million for gas by 2020
- large companies conducting energy audits at least every four years
- protecting the rights of consumers to receive easy and free access to data on real-time and historical energy consumption
- the Commission has published guidelines on good practice in energy efficiency

2.4 Goal of this Paper

This Paper will give an overview of how renewable sources of energy are promoted in Austria as in Czech Republic. Most of this is promotion by subsidising those technologies. We will focus on the Time between 2005 and 2018 for finding a conclusion of how we would rate the input - output ratio of subsidies. These are the technologies this paper will focus on. We will take a look at the laws and their effects for promoting renewable energy sources in Austria and Czech Republic over the given time period. With the technologies available and the valid laws we will be able to connect the subsidies to the growth of renewable energy sources and give a brief comparison on how efficient the financial subsidies were used in the two countries. In the end we should be possible to evaluate if the subsidies reached the planned goals or not.

3 Development of promotions of the renewables in Austria and Czech Republic

3.1 Austrian promotions

Austria was obliged to increase its share of renewables from 23.3% in 2005 up to 34% in 2020. This goal is valid not only for generating electricity, but the entire Austrian power supply. To fulfill this goal a decrease in energy consumption of 13%, paired with an 18% increase of renewable energy sources from 2008 on, is necessary.[17]

3.1.1 Richtlinie 2009/28/EG des europäischen Parlaments und des Rates

The Guideline from 2009 was the first regulation from the EU regarding the 20-20-20 goals. In Austria it qualified small water power plants to gain extra $6.47c/kWh$ and other renewable technologies $10.33c/kWh$. The investment promotion was depending on the netlevel, where the power plant was connected. It ranged from $15000Euro/year$ in netlevel 1 (380kV) to $15Euro/year$ in netlevel 7 (230V/400V).[2]

3.1.2 Ökostromgesetz 2012

The plans of the Ökostromgesetz 2012 are to increase the electric energy produced by renewables up to 15% of the whole production. As long as the produced electric energy is not more than 20% higher as the self consumed amount, the plant is suitable for tariff promotions.[3][Abschnitt 3] The maximum for this tariff subsidies is $6c/kWh$ additive to the normal tariff.[3][Abschnitt 4] In total there are 50 million Euro preserved for Investment promotion. This investment subsidies decreases by 1 million Euro per year over the following 10 years. [3][Abschnitt 5]

3.1.3 Kleine Ökostromnovelle 2005

In Austria there was a first valid law for promotion of renewables founded in 2005. It held 50 million Euro for subsidies in total. The investment subsidy was depending on the connected net level and ranged from a bonus of 56% of the total price of the plant in net level 1 up to 123% in net level 7. For the tariff subsidies the feeder bonus ranged from $0.02c/kWh$ up to $0.16c/kWh$. [18] This law was then superseded by EU-law from 2009.

3.2 Czech promotions

The country-specific support program's differ despite a framework set by the EU. On the one hand, this is due to the energy production profile which is unique for each country. The Czech situation is characterised above all by a transformation that has taken place in the last 25 years. With the collapse of the USSR, the Czech energy market was liberalised. In the years that followed, the topics of the environment and climate protection became more and more important in relation to this change.[13] In the Czech Republic, support for renewable energies began in 2005, the year in which a state program was launched to promote renewable resources for electricity and heat generation. The year marked a decisive turning point in the Czech energy industry, and since then there has been significant growth in renewable energies. Even between 2009 and 2010 there was a real boom in the construction of PV plants. However, this is seen very critically, as the massive plant expansion was based on fixed purchase prices guaranteed by the state.[13] But in the year 2014, a revision of the subsidy system attempted to leave this tax scandal behind and to meet the European requirements by changing the incentives. For example, the new system relied on tax relief and obligations for the plant operators to comply with. This has had a positive effect on the cost efficiency of these plants.[13] The total expenditure for the expansion of renewable energies in 2013 in the Czech Republic amounted to 1.65 billion euros. This amount can be broken down as follows:

- major consumers (industry) 930 million Euro
- staat budget 430 million Euro
- households 310 million Euro

Thus, government expenditure amounts to 1% of the total budget of the Czech Republic in 2013, which is an unusually high amount. This means that in 2013 the Czech state spent 71 Euro per household on renewable energy. Part of the support for renewable energies in the Czech Republic is aimed at opening up new labour markets and creating long-term security. Bio energy ,with bio gas biomass and biofuel, is particularly promising in the field of renewable energies in the Czech Republic. All in all, there is no clearly formulated law or a clearly defined climate strategy, as is the case in the EU with Article 5(1) of Directive 2001/42/EC. For instance, the Czech state has only a clearly formulated target to increase renewable energies by 13% gross electricity generation by 2020, which corresponds to the EU targets.[12]

4 Development of promoted renewable energy sources in Austria and Czech Republic

4.1 Renewable energy sources in Austria

Besides the high percentage of commercial Hydropower in Austria the promoted power plants (such as PV, Windpower, small Hydropower and Biomass) saw a constant rise over the past 13 years. The total promoteable generation rose from 5773GWh in 2005 up to 9784GWh in 2018.[5][6] (fig. 1)

	2018				2005			
	fed energy in GWh	payments in million €	promoted renewable percentage	average tariffs in c/kWh	fed energy in GWh	payments in million €	promoted renewable percentage	average tariffs in c/kWh
Small Hydropower	1 506	82,9	2,54%	5,51	3 561	162,6	5,5%	4,57
other renewables	8 279	963,7	13,96%	11,64	2 212	208,9	3,4%	9,44
Windpower	5 061	463,5	8,5%	9,16	1 328	102,9	2,1%	7,75
solid Biomass	2 014	260,4	3,4%	12,93	553	59,1	0,9%	10,69
gas Biomass	568	98,8	1,0%	17,39	220	29,3	0,3%	13,31
liquid Biomass	0,05	0,006	0,0001%	11,69	33,0	4,60	0,0512%	14,16
PV	620	140,1	1,05%	22,59	13	8,4	0,02%	65,14
Biogas	15,8	0,8	0,03%	5,37	63	4,4	0,10%	6,91
Geothermal	0,23	0,0102	0,0004%	4,33	2,00	0,200	0,0031%	8,15
Overall	9 784	1 046,5	16,5%	10,70	5 773	371,5	9,0%	6,43

Figure 1: Comparison of the amount of subsidised renewable energy sources in Austria [5][6]

A change in popular technologies can be seen in fig. 2.

While small Hydropower slowly decreased, Windpower and PV saw a exponential rise over the past years. Reason for this are subsidies on one side and more affordable and better technology on the other. While the average tariffs are lowest for Hydropower and the highest for PV, small Hydropower is very expensive compared to PV. (fig. 3)

A look on the correlation between payments for renewable energy sources and the growth of renewables reveal quite a similarity due to a linear pricing function. The correlation between subsidies through tariffs and the growth of renewables show a clear delay. That happens because of the time gap between starting to promote technology and people starting to invest in it.

A look in fig. 4 shows the relation between growth of payments, growth of tariffs and the growth of subsidised renewables. The Delay between pricing (promotion through subsidies) and the reaction (increasing or decreasing growth) can be seen nearly every year. (fig. 5)

Overall a rise of subsidised renewable energy sources is clearly visible. The last 13 years show a average rise of 8.62% of renewables in Austria while the tariff increases by 4.39% and the overall payments increased by 4.63%.[5][6]

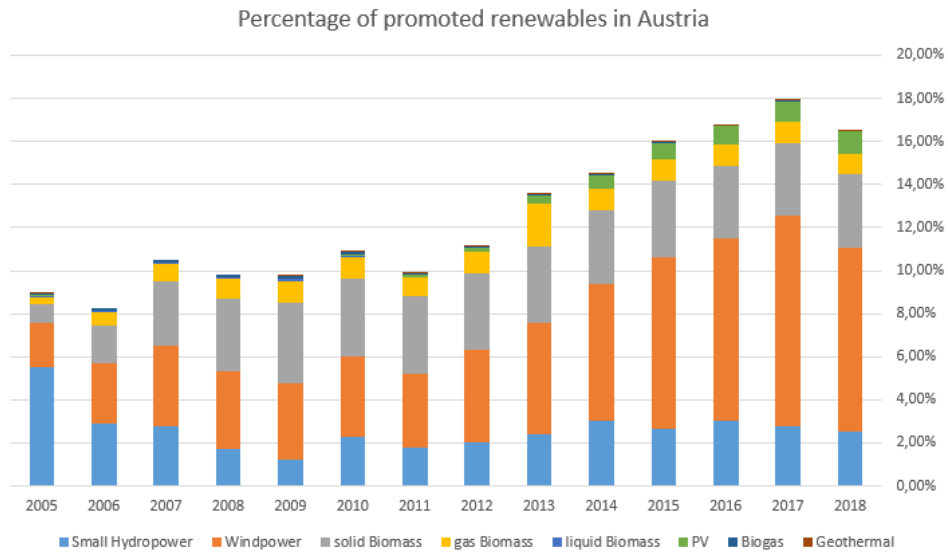


Figure 2: Installed power of subsidised renewables [5][6]

Average of Tariffs for promoted renewable sources in Austria (2005 - 2018)

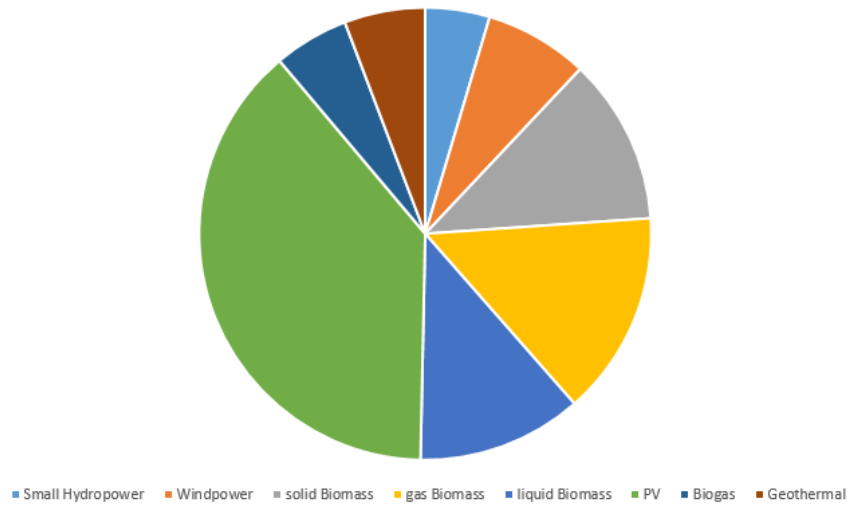


Figure 3: Average tariffs by technology [5][6]



Figure 4: Correlations between pricing and growth of renewables [5][6]

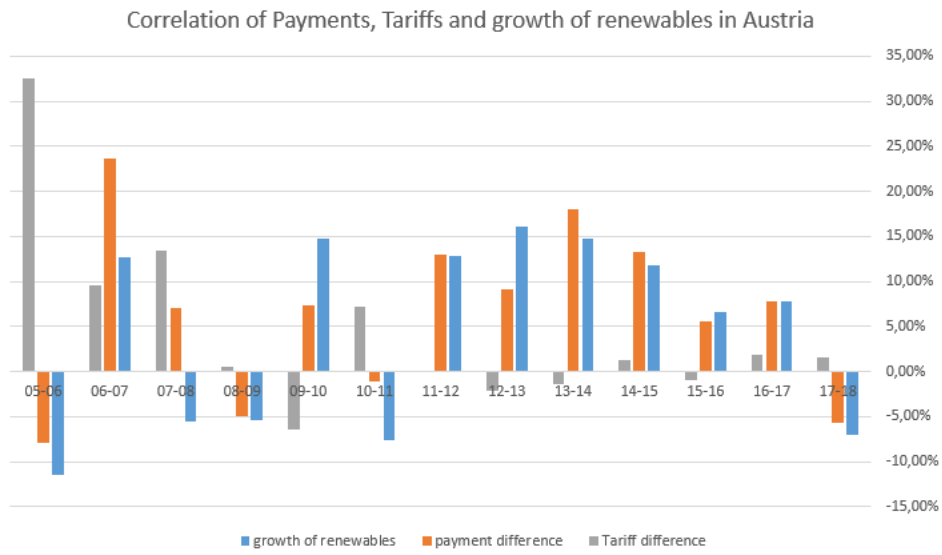


Figure 5: Correlation between growth rates of tariff, payment and renewables [5][6]

4.2 Renewable energy sources in Czech Republic

This part will give some information about what renewable technologies were using Czech Republic from 2005 to 2018. In first part i will focus on types of renewable sources in Czech Republic and how much electricity they produced between years. The consequences of climate change, growing dependence on fossil fuels and rising energy prices are the reason why renewable energies are at the forefront of today.

4.2.1 Electricity producing from renewable in Czech Republic

The contribution of renewable energy sources lies primarily in their ability to reduce greenhouse gas emissions and pollution levels, to increase security of supply, to promote knowledge-based industrial development, to create jobs and to boost economic growth, as well as competitiveness and regional development. [20] According to OECD IEA Update (7\2019) on „Recent Progress in Reform of Inefficient Fossil Fuel Subsidies that Encourage Wasteful Consumption“ also shows that even in the group of 44 OECD and G20 countries, where fossil fuel support is still declining, the reduction has slowed down. Support in these countries was down 9% in 2017, a slower decline than the 12% recorded in 2016 and 19% in 2015. [19] For the Czech Republic, the European Commission has set at least a 13% share of renewable energy in gross final consumption energy and securing at least 10% of renewable sources in transport. [20] Renewable energy sources are mostly of domestic origin, do not rely on the availability of conventional energy sources in the future, and contribute to alleviating energy dependency on foreign energy supplies through their predominantly decentralized nature. Renewable energy is one of the important elements of future sustainable energy, so it is for Czech Republic. The main objective of the energy sector is to ensure the energy needs of the Czech Republic in the long term. See Figure 1, graph of gross electricity production from renewable sources (2005 - 2017). The Czech Republic is gradually increasing the development and use of renewable resources. There is also a lot of investment in this section.

Energy Concept The Czech Republic, whose key strategic objectives are security, competitiveness and sustainability, assumes that it is safe and reliable energy supplies at an affordable price will be ensured through the use of all available domestic energy sources for using the best available technologies and in an environmentally friendly manner. [14] Renewable energy sources are one of the parts of domestic energy sources and their continuous and ongoing development is expected and must fully respect the geographic, geological

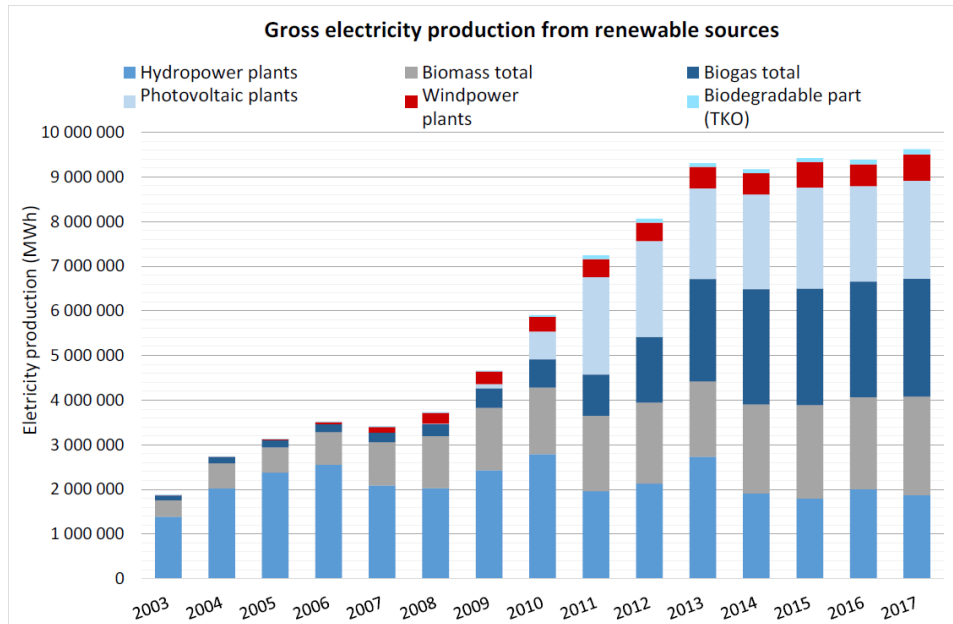


Figure 6: Gross electricity production from renewable sources [15]

and climatic conditions, the parameters of the energy networks and, at the same time, the financial and social possibilities of the Czech Republic, with the gradual reduction of support in line with the technological development and fulfillment of the planned target values of the National Renewable Energy Action Plan.

National Action Plan of the Czech Republic for Renewable Energy is a strategic plan of the Czech Republic issued in 2015 which sets strategic goals in the field of energy. It issues measures to achieve the stated goals and is based on Directive 2009/28 / EC of the European Parliament and of the Council of 23.

5 State of the Art

5.1 The situation and forecast in Austria

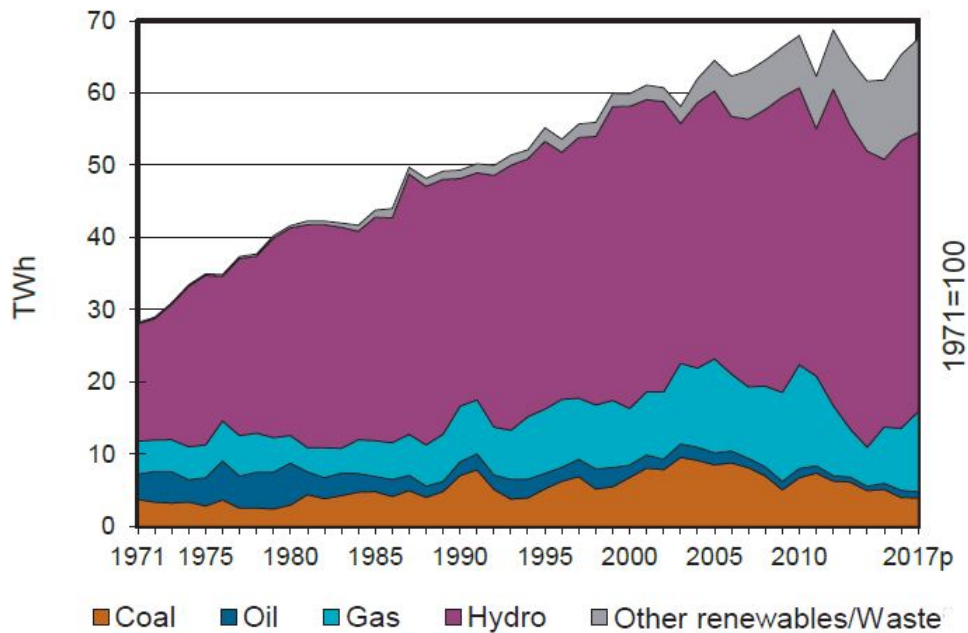


Figure 7: Energy Sources in Austria [9]

As can be seen from fig. 7, Austria is a special case because, unlike its neighbours, its topology favours the generation of a very large proportion of its electricity by hydro-power. Therefore it was easy for Austria to meet the European targets for 2020, which can also be seen from fig. 7. In 2009, the Austrian government oriented itself to a strategy following a reorientation of European energy policy. The entire project provides for a reorientation towards renewable energies and a carbon dioxide poor industry. Thus Austria had also made concrete statements on possible targets within the framework of this policy change. [1] Thus, the Austrian government had five goals that the new orientation had to fulfill:

1. Security of supply
2. environmental compatibility
3. competitiveness

4. cost efficiency

5. Social compatibility

[1] On the basis of these goals, a path should be taken for Austria which should make it possible to achieve the ambitious goals and at the same time, in addition to a change in the energy sector, also initiate an overall economic change towards a more environmentally friendly industry [1]. Among the EU countries, Austria is one of the countries that had already covered more than a fifth of its total consumption with renewable energies in 2005, which was far above the European average of 8.5 percent. The target figure for the expansion, planned at EU level in 2008 and adopted in Austria in 2009, was 34 percent for Austria. This is far above the planned European average of 20 percent [1]. Austria is therefore highly likely to achieve the target set, as a share of 33.5 percent was achieved in 2018. As a result of this successful expansion, a further strategy was adopted in 2018 with the aim of generating energy free of fossil fuels. Austria currently covers 90 percent of its fossil fuel needs through imports and is therefore highly dependent on them. [7] It is thanks to this that the new strategy is an attempt to take account of change with the greatest possible care and prudence. Under the synonym "mission2030", the Austrian government describes a comprehensive reorientation, the goal of which is not only independence from fossil fuels, but at the same time recognizes an opportunity to develop new technologies, to play a pioneering role with regard to decarbonized energy production and mobility. Mobility should also be mentioned in this context, since digitalization and the forthcoming change in the sense of e-mobility will have a major impact on power generation and the associated infrastructure. [7] The Austrian model therefore provides for measures that go far beyond the goal of generating electricity from renewable energies. This will strongly focus on synergy effects between mobility, energy and heat generation, industry and the necessary interconnecting infrastructure. [7] Another focus is on the storage of energy, which is inevitably linked to the topic of renewable energies, since energy production is dependent on cycles of nature, especially wind power and solar energy. [7] When talking about energy production, we must also talk about its affordability and competitiveness. Here Austria relies mainly on small projects that are characterized by a decentralized organization, so a photo-voltaic expansion for the own electricity needs of citizens is relied on. To this end, bureaucratic hurdles are to be reduced, the infrastructure is to be strengthened throughout, investment incentives are to be set and, with regard to the European energy market, flexibility is to be created to ensure rapid adaptability to new situations. The focus is particularly on decentralized organization and the self-sufficient energy supply of citizens,

with tax relief and strategies to promote capital investments from the private sector in the foreground. [7] In summary, it can be said of the state strategy that it meets the change with a far-reaching catalogue of measures. However, it is also necessary to take a neutral view in order to be fully informed about this topic and the situation in Austria. A study by Haas (2017) which evaluates this new strategy comes to the following conclusions. Based on your forecasts, the situation is changing very strongly in some cases. It is assumed that in the coming years Austria will change from a net importer to a net exporter on the electricity market. This favours the situation already considered in the context of this work, a not inconsiderable part of the electricity generation is already provided by renewable energies, Austria. On the other hand, the combination of mobility, generation and industry is viewed critically, and a higher peak load is assumed. Furthermore, existing barriers to investment must be dismantled in order to decentralise electricity generation and storage[16].

5.2 The situation and forecast in Czech Republic

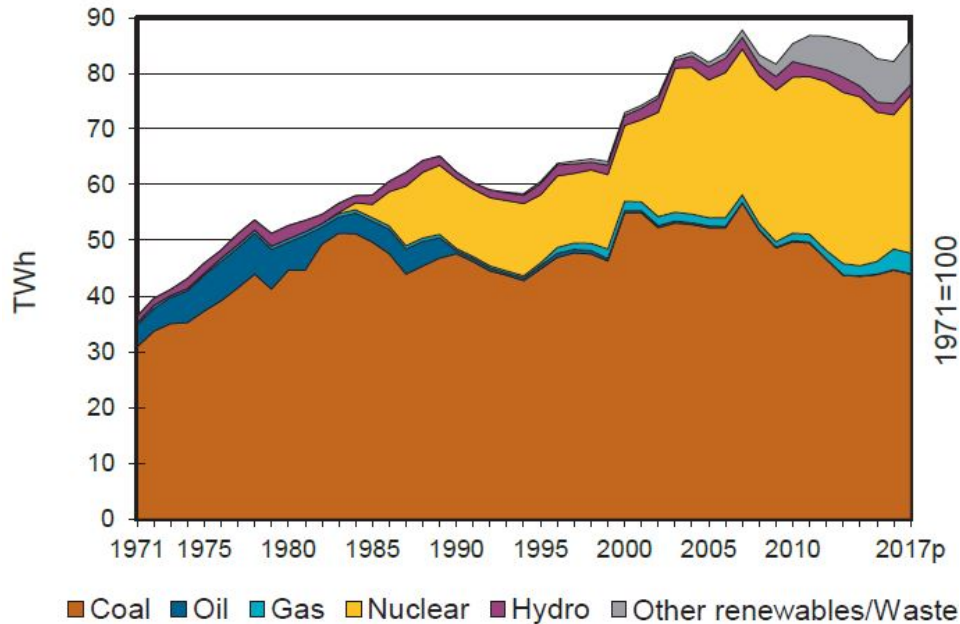


Figure 8: Energy Sources in Czech Republic [9]

As you can see from figure 8, the situation in the Czech Republic is completely different in comparison to Austria. For example, Czech power generation is highly dependent on fossil fuels, especially coal. In addition, a not inconsiderable proportion of the electricity still comes from nuclear power plants. Although these are climate-neutral, but they entail incalculable risks. In addition, nuclear energy has higher costs than renewable energies. Thus, renewable energies have a cost advantage over nuclear energy, since the financial burden for a society decreases faster in the case of renewable energies than would be possible in the case of nuclear energy [8]. In the Czech Republic, the nuclear power plant in Temelin was connected to the grid in 2002, which significantly increased the country's electricity exports. In addition, 50% of electricity in the Czech Republic is still covered by coal. However, Czech industry is still the most important branch of the economy in the Czech Republic, accounting for about half of GDP. However, since this industry has a high energy demand, the Czech Republic largely covers its domestic electricity demand by it own. It should be noted that the Czech industry is one of the most energy intensive in the EU.[13]

6 Conclusion

The following can be said, the comparison of Austrian energy production and Czech energy production represents a good basis for studies and pilot projects. Since the Austrian situation plays a special role due to its topological nature, since the energy has long been derived from renewable sources here. Here, topics such as efficiency, infrastructure and a CO₂ neutral industry are predominant and Austria as a economic location needs to be strengthened. While the Czech situation represents the change from a traditional energy production driven by fossil fuels to an energy production by renewable energies. At the same time, the Czech case focuses on independence from foreign resources and competitiveness as well as positive impulses for the economy. This can also be seen from the expansion targets for 2020, while Austria is aiming for an expansion target of approx. 34%, the figure for the Czech Republic is approx. 13%. It is particularly striking that in the Czech case there is little to be found on government programs and that in 2010 there was even a scandal in the course of the expansion of photo voltaic systems.[13] The comparison of the two energy sectors also shows how heterogeneous the situations within the EU are and how the strategy and its implementation depend strongly on the respective member state. The common goal, on the other hand, remains clear, so that it can be stated that a stronger integration of the individual national strategies at the European level is to be aimed at in order to use synergies between the countries.

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