Discussion of the German Energy Sector Transformation with Focus on Economical and Social Problems

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Bachelorarbeit

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1. INTRODUCTION

1.1. RELEVANCE AND MOTIVATION

At least since the accident in Fukushima Daiichi in 2011 the topic of a Transformation of the Energy System (TES) from fossil fuels and nuclear power to renewable energy is heavily discussed in the German society. Since this accident onward the last CO2 free alternative to carbon based fossil fuels were no longer accepted. At this point even the CDU/CSU chancellor Angela Merkel proclaimed the "Energiewende", moving from the position that nuclear power is a bridging technology to the point, that nuclear power free TES is necessary (so called Atomausstieg).[1]

That leads to the point, that by now all parties of the "Bundestag" are supporting a TES.[2] So today's political question is not if but how TES should be performed. The most often quoted reason for undertaking the TES is climate change.

Climate change is that important in context with CO2 emissions because according to the IPCC reports the human influence on global warming is practically secure. As main man made driver of climate change greenhouse gases are identified. Furthermore climate change has been classified by a wide range of studies as economical hazardous. If climate change cannot be slowed down or even stopped it is likely to cause lower crop yields especially in Africa, more hurricanes in the United States and even the collapse of ecosystems as the Amazonian rainforests. Also the list of cities threatened to be flooded includes metropolis as London, Shanghai, New York, Tokyo and Hong Kong.[3]

Also the production of fossil fuels has negative impact on its environment as it became focus of the public interest when in March 2011 the deepwater horizon polluted the Gulf of Mexico As compensation BP paid 20 billion dollar. [4]

In July 2008 the for Europe most important oil sort Brent (North-Sea-Oil) reached its all-time high at 147,50$ per barrel.[5] So several reasons for substituting fossil fuels by renewable exist.

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[1] (Zeit Online, 2009)

[2] (Die Linke, 2012); (FDP, 2012); (CDU, 2012); (SPD-Parteivorstand, 2011); (Bündnis 90 / Die Grünen, 2010)

[3] (IPCC, 2007); (Stern, 2006)

[4] (Yost, 2011)

[5] (Wallstreet Online, 2012)

1.2. LITERATURE REVIEW AND AIM

In context with the topic TES different concepts are suggested. For this papers focus, a complete transformation from the mainly fossil fuel based energy production to a 100% renewable and sustainable alternative is focused. For Germany a cross Institution Study "Energiekonzept 2050" [6] from June 2010 exist. Furthermore the Sachverständigenrat für Umweltfragen (SRU) [7], the Renewable Energy Research Association (FVEE) [8], the Bundesumweltministerium (BMU)[9] and a Mc Kinsey study for Roadmap 2050.[10] are offering different pathways. They all are designed based on a subsidy or obligatory contribution like the Erneuerbare Energien Gesetz (EEG)[11]. They present different concepts reaching from large offshore wind energy production combined with storage in Norwegian pump storage power plants to solar energy from the North African deserts (DESERT TEC[12]) or promote storage in methane gas. All papers are of the opinion that their completely different and partly incompatible solutions are the best and therefore struggle for political support. They are also agreeing on the point that renewable energy would be a lot closer to a competitive level or even would be competitive if the CO2 emission as externalities would be included in energy prices of fossil fuels and the electricity produced from it.

Following this CO2 argumentation this paper suggests an inclusion of externalities by a Carbon Tax. Due to the political agreement that some amount of carbon emissions are acceptable, at least for the transition phase, this paper uses the idea of a Emission Trading System (ETS). It allows policy to set a fixed amount of carbon emissions and let market forces decide about the price. Due to that system a market based and therefore most efficient solution for the question which technology should be used can be found. It allows setting politically a reduction path as amount of emissions on the carbon market. Then price mechanism will automatically solve the question if reduction (abandonment or efficiency increase) or promoting renewable energy production is more efficient. As positive side effect no subsidies are needed and reve-

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[6] (Fachausschuss " Nachhaltiges Energiesystem 2050" des Forschungs Verbunds erneuerbare Energien, 2010),

[7] (Sachverständigenrat für Umweltfragen (SRU), 2010)

[8] (FVEE, 2011)

[9] (BMU, 2009)

[10] (McKinsey, 2010)

[11] (Bundestag, 2012)

[12] (DESERTEC Foundation, 2009)

nue during auctioning of the certificates is gained. Finally the limitation and options for a policy maker faced with only options in Germany instead of a European solution are shown. As introduction and for evaluating the current progress of the TES the current status of the German Energy system is explained based on BMWI data.

2. CURRENT PROGRESS OF THE TRANSFORMATION OF THE GERMAN ENERGY SECTORS

The Translation of the German term "Energiewende" is in the further paper the Transformation of the Energysector (TES). It describes the idea of substituting fossil energy like coal, gas, nuclear power by renewable sources like wind, solar, waterpower, biomass, geothermal and marine energy.[13] Aim is to reach a 100% renewable energy supply, so no usage of any fossil energy source in the whole German economy. Literature points out that the TE has two factors. On the one hand the energy used should come from renewable sources; on the other hand energy consumption should decrease. This has to be undertaken as well in the private as in the industrial sector and not only for electricity but for all forms of energy usage. Observing the energy contained in primary energy sources used in Germany it is not easy to find an impact of any of the proclaimed efforts to reduce energy consumption.

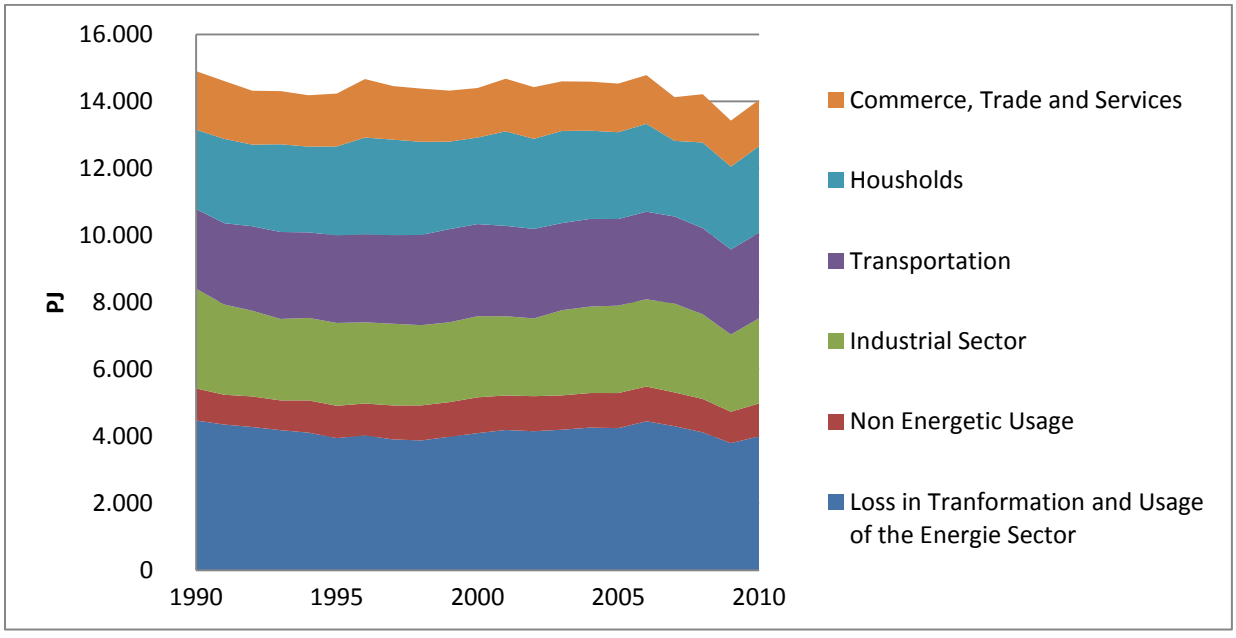

Figure 1: Germanys primary Energy Consumption own Figure based on (Bundesministerium Wirtschaft und Industrie (BMWI), 2012) Data.

[13] (Wikipedia, 2012)

7. CONCLUSION

This paper presents a market based solution by taxing externalities in a CTS. Instead of planning the change it allows market forces to find the most efficient solution for a given amount of carbon certificates. By accessing a marginal cost of 80€ per ton CO2-Emission Reduction it also gives a pricing idea for solutions, which are non market based. If German policy aims to halve Carbon emissions this is the 2020 price benchmark per Ton. All carbon based taxes for agents should be focused on that aim. This price is only possible if all polluter are included, every exception increases the marginal costs for doing so. Following a linear 2,63% emission cap reduction path a zero emission is possible in 2050. The price would be the result of market forces without political interaction needed. As directly feasible measurements a equal taxation of Diesel and Gasoline and at least a increase of the heating oil and gas taxation on that 80€ per Ton CO2 level are feasible steps without interaction on EU level necessary and a risk of Carbon leakage. Also the subsidy of renewable concept for renewable energy should be rethought, due to the fact, that solar energy is unlikely to be a more efficient way of carbon reduction than energy saving technologies.

Further research is needed for predicting the possible outcomes of a market based solution and where this solution itself will suffer imperfections and negative externalities. Also the correct estimation of the market price of a Emission Allowances highly depends on the projections how energy production technology, saving and consumer behavior reacts on taxation.