What is a rational energy policy and who is the judge?

Comments on Smyrgała's „Fukushima and Energiewende"

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1. Introduction

The German energy transition – the *Energiewende* – is a hot topic for all students of energy systems and energy policy and it is not surprising that it also features prominently as an object of analysis on the pages of "Energy Sources" (González-Gómez 2017; Koch and Büchner 2016). Every analyst has a normative vantage point and a political perspective of his or her own, but the scholarly ideal of objectivity necessitates that these be bracketed off as much as possible. In this article, we respond to a number of points raised by Dominik Smyrgała (2017) in his recent piece "Fukushima and Energiewende: Impact on structure of power generation". We believe that his piece, although timely and taking on an important topic, suffers from three important issues. With the quite clear goal of criticizing the German policymakers for the path they have taken in energy policy, Smyrgała makes *selective use of statistical data and opinions*, and *bends some facts* and the spirit of certain documents to fit his thesis. Lastly, the question he asks about the impact of a single event on an entire energy system trajectory is very difficult to tackle from an epistemological perspective, and the research design he proposes fails to acknowledge this - thus failing to answer the research question. The goal of

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this response is also to provide some additional information on the changes taking place in the German energy sector and deepen the understanding of this massive social, economic and political experiment.

2. The basics: What Energiewende is, and what it is not

The German energy transition started long before 2010 and was, at best, only accelerated by the Fukushima nuclear disaster. Smyrgała compares the period before and after the Fukushima nuclear disaster, taking 2010 and early 2011 as "crucial moments of change due to the announcement regarding the new goals for Energy Transition and the Fukushima disaster in March 2011" (p. 333). He deserves praise for not equating the *Energiewende* with the nuclear phase out (*Atomausstieg*) – a mistake committed quite often by analysts and pundits alike. In reality, however, the expansion of renewable energy sources and the gradual phase-out of nuclear energy has already began with the adoption of the Renewable Energy Act in April 2000 and agreement with the power utilities to switch off all nuclear power plants by 2022, signed 2 months later (Morris and Jungjohann 2016). The introduction of the feed-in tariffs in the Renewable Energy Act led to rapid a development of renewables – also before 2011 – as well as the increased costs referred to by Smyrgała. Admittedly, the term Energy Transition (*Energiewende*) has not been used in any of those documents. But in the later legislation it has been used retroactively, e.g. in a proposal submitted by the Social Democrats in 2011 the authors referred to *Energiewende* as initiated by the Social Democrats and the Greens in 2000.

The "new goals for Energy Transition" adopted in 2010 and referred to by Smyrgała have actually been adopted in the framework of postponing the nuclear phase out agreed in 2000. That document, the, so called, "Energy Concept" extended the operational lifetime of nuclear power plants by on average 12 years. At the same time, as a compromise, the share of renewable sources of energy was to be increased much faster, at the cost of fossil fuels (BMWi 2010). The catastrophe in Fukushima six months later led to a significant change in German energy strategy and the government *returned* to the initial idea of phasing out nuclear energy by 2022.

3. Establishing causality in complex systems

Smyrgała seeks to assess the "impact of the 2011 Fukushima nuclear disaster on the German program of Energy Transition". This is a difficult task. What this translates to is the isolation of a single causal factor and evaluating its "weight" in bringing about a certain outcome. Smyrgała does not even try to get to grips with epistemological and methodological difficulties; he simply *assumes* that things that occurred after 2011 are due to Fukushima. If we add that the time series for his analysis is incredibly short – 2011 (supposed cause) to 2014, observing any outcome, much less a trend, is virtually impossible.

Taking the developments in 2010 and 2011, which in terms of approach to nuclear energy cancel each other out, as the starting point of the energy transformation, undermines the scientific value of the assumption resulting from comparing the periods 2006-2010 and 2010-2014. The main driver of the changes in German power sector (to which the *Energiewende* has largely been reduced) was the introduction of the Feed-in-tariff (FiT) with the Renewable Energy Act from 2000. An additional factor was for sure the steadily decreasing costs of renewables, especially solar PV, which led to a significant increase in the new installed capacity in 2010-2012. None of these factors has been influenced by the decisions taken immediately before or after the catastrophe in Fukushima. Of course, the Kyoto Protocol, European Union's renewable energy legislation and the nuclear-phase out do have some impact and certainly provide additional justification for installing new renewables, but the *political economy of renewable energy* in Germany, which is the object of Smyrgała's interest, was shaped by the FiT.

4. Bending notions: Is nuclear a "transition fuel"?

We have already discussed the major problem with Smyrgała's research design. Abstracting from the difficulty of providing a meaningful answer to the research question he proposes with the data he gathers, we have to now move to the actual analysis. In the following two sections we will try to show that to prove his point, Smyrgała bends certain facts and interprets documents in unconventional ways, and later – that the statistical data and use of sources display characteristics of cherry-picking.

One of the important claims Smyrgała makes is that nuclear and gas are seen as "transition fuels" in Germany and that their visible decline in the energy mix is a failure for Energiewende's planning. The aforementioned "Energy Concept" of September 2010, has indeed referred to nuclear energy as "bridge technology" on the path to largely renewables-based energy sector. However, we have already noted that the approach to this source of energy changed the following year when the Cristian Democratic Union government deciding to completely phase out nuclear within 11 years. A source that should be phased-out cannot logically be considered "transition fuel", certainly not in the longer term.

In relation to natural gas, the "Energy Concept" only refers to increasing the role of natural gas-powered vehicles (BMWi. This was perceived as one of few opportunities to reduce emissions from the transport sector. No other references to natural gas as a bridge fuel can be found. Smyrgała argues, however, that the role of natural gas should have increased to deal with the „serious imbalance in the stability of the power grid in Germany" resulting from nuclear phase-out. This assumed goal of the architects of the Energiewende has, according to Smyrgala, not been met as the share of natural gas (and naturally also nuclear) in the power generation decreased after 2011.

There are two main issues with this narrative: (i) There was no significant decrease in the stability of the Germany power grid after the nuclear phase-out, and (ii) even if that were the case, nuclear energy, contrary to natural gas, would not have been much of a support in stabilizing the grid, (iii) the increase in the role of natural gas in 2014 was not an exception but beginning of a trend.

There are numerous ways to measure the stability of the power grid. Significant price volatility and the average power outages can be considered the most useful ones, even if each of those measures

fails to show the full picture. The European Energy Exchange, which provides information about electricity prices since 2005, shows much higher price volatility in the period 2005-2009, than after the decision to phase-out nuclear energy (EEX 2017). Also, numbers concerning the average power outages show a significant improvement since 2006: from 21.5 minutes in 2006 to 12.3 minutes in 2014 (Bundesnetzagentur 2017). Both contradict Smyrgała's unsubstantiated assumption about the "serious instability of the power grid in Germany".

Switching off the oldest nuclear power plants with a combined capacity of 8.4 GW could have actually contributed to the grid's stability. Nuclear energy is a very inflexible source of energy, which does not respond well to the changes in power demand. In addition, unplanned shutdown of nuclear power plants leads to electricity shortfall and that indeed threatens the stability of the grid (Andrews 2016). It seems, however, that Smyrgała's idea about the inherent instability of intermittent renewables and monolithic stability of nuclear baseload predates the analysis, and is part of a particular conservative mindset among many energy experts in Germany and Poland (Szulecki and Kusznir 2017).

Smyrgała is correct in pointing out that gas-based power plants could counterbalance the intermittent nature of renewables and wrong in indicating nuclear can play that role. An analysis of weeks and days with the highest renewable energy generation clearly indicates, that inflexible nuclear suffers most and contributes to overproduction, negative prices and the need to export power. That was the takes in the second week of May 2016, when the share of renewables in the power mix regularly exceeded 60% and on 8 May approached 90%. Despite a significant oversupply, production of electricity from nuclear power plants decreased only slightly, which led to the fall of electricity price at the stock exchange to -130€/MWh (Agora Energiewende 2015)

While correctly pointing out that high share of renewables in the power mix require storage, he overstates its role and fails to recognize any other ways to balance the grid. These include: increasing interconnections with other countries and regions to take advantage of different weather conditions (Puka and Szulecki 2014), encouraging demand management (Rocky Mountain Institute 2015), or taking advantage of the flexibility of dispatchable renewables such as biogas power plants or CSP plants (Lund et al. 2015). Contrary to Smyrgała's theses, many of those options are already

implemented and utilized in Germany, contributing to increasing grid stability. Overall, while gas has certainly been seen for a long time as the perfect "transition fuel" for low-carbon energy transitions, due to lower emissions and flexibility, the *Energiewende* has to be seen as a policy and system governance laboratory, which helps falsify certain assumptions. The role of gas, as we see it from the perspective of 2017, is not as great as anticipated in 2011. That said, the increase in the use of gas in 2014 was not an aberration, as Smyrgała choses to interpret it, but the beginning of a longer rise. In a longer perspective, we can note that between 2003 and 2016 the production of electricity from natural gas has risen by 15.6 TWh, and there has been an increase by 18 TWh only between 2014 and 2016 (AGEB 2017).

5. On cherry-picking: Is Germany more reliant on fossil fuels?

Smyrgała is correct in pointing out that the share of fossil fuels in German power mix was growing after switching off nuclear power plants in reaction to the catastrophe in Fukushima. Replacement of 8.4 GW of capacity with comparably high utilization rate led to an increase in the role of other sources of energy. This obvious trend could and has been expected (Schwägerl 2011). The exception mentioned by Smyrgała at the end of the analyzed period turned out to be the beginning of a new trend, during which the role of fossil fuels, despite the continuous nuclear phase-out, started to decrease. According to the same source used by the author, in 2013 lignite and hard coal generated 45.2% of electricity. Their share decreased to 40.3% in 2016. Contrary to the assumption made by Smyrgała, the share of natural gas increased from 10.6% to 12.5% in the same period. The share of all fossil fuels combined decreased by 3%.

It is surprising that an article published in 2017 does not at least use the data for 2015 and perhaps 2016. But even if this information was not available, considering the last year of the analyzed period as an *exception*, without admitting the possibility of it constituting the beginning of a trend – which could be expected keeping in mind the significant increase in RES capacity – creates the impression of data cherry picking.

A different example of cherry picking is in Smyrgała's use of "qualitative" data. The entire research design seems to rest on one opinion by an energy analyst (Huebner 2013), who suggested that Fukushima would accelerate the *Energiewende*, and is taken as an illustration of an apparently broader trend and the "German point of view", which supposedly includes a majority of experts as well as the government.

6. "Irrationality" is in the eye of the beholder

Without providing enough justification or for his assumptions, Smyrgała also points out that "renewable power generation still remains uncompetitive to coal-based production. Even in Germany, additional means have to be taken in order to meet the objectives of the energy climate policy and Energy Transition". Indeed, renewable energies benefit from the support granted in the framework of the Renewable Energy Act, and as we have already argued, the FiT was instrumental in bringing about a massive deployment of new RES. At the same time Smyrgała fails to mention that also the coal sector in Germany benefits from significant subsidies (Umweltbundesamt 2017). Furthermore, comparing the costs of electricity from new sources of energy such as wind and solar energy, which do not contribute to depletion of resources or climate change, with the costs of electricity from largely paid off coal-fired power plants, with significant external and largely unaccounted costs, lacks scientific soundness.

Throughout the article Smyrgała dismisses the *Energiewende* as a result of a "largely irrational" decision. This accusation is neither new nor uncommon in the world of energy studies – and applies to almost any energy policy decision, which is politically contested. The usual way of creating the opposition between an irrational and rational policy is by calling on an economic calculation to back the 'rational' option, and showing that the alternative is too costly, hence – 'irrational'. The problem is that in the energy sector economic calculations change depending on assumptions and forecasts, time horizons adopted and externalities taken into account. It is thus mostly a convenient rhetorical device. Energy policy has to planned based on a longer strategy and in response to politically identified goals. All energy infrastructure is costly and all change is more costly

than sticking with status quo – this does not make change and investment in new infrastructure inherently "irrational"

For sure, the German Energy Transition is a massive experiment, and its full consequences and repercussions cannot be easily predicted. While also based on ethical assumption, it far from being an "irrational" and emotion-based decision that Smyrgała portrays it to be. After the catastrophe in Fukushima the Federal Chancellor, Angela Merkel, created the Ethics Commission "Safe Energy Supply" to reassess the role of nuclear energy in the future energy mix in Germany. In its final report the Commission suggested phasing out nuclear energy by the end of 2022, thus de facto returning to the initial nuclear phase out adopted in 2000. It also pointed out that to achieve the emissions reduction goal by the end of that decade – especially in the light of the nuclear phase out – emissions should decrease much faster than in the preceding years (Bundesregierung 2011).

At the time of the discussion in the framework of the Ethic Commission, it was obviously not known that the costs of renewables will decrease rapidly, which will lead to an explosion of investment in renewable energy in the subsequent years. This lead to a significant decrease in the support for renewable in the amendment of the Renewable Energy Law in 2014, which slowed down this development, especially for solar energy.

It cannot be excluded that the 16 members of the Commission, including the representatives of the different religious communities, industry, science, as well as former ministers of science and transport, and environment, where influenced by the worsening developments in Fukushima in the background. However, we should also consider that risks of such accident are underestimated in the periods between their recurrence. In a thorough analysis comparing the way scientific evidence and facts are established in such long-term analysis of the impact of energy choices, Lis (2017) shows how the German and Polish debates about shale gas differed beyond the possibility of dialogue. While the Polish energy policymakers used an environmental impact assessment, gathering evidence on actual visible impact of fracking, the German experts used models for calculating risks of possible conjunctures of worst-cases, and put them against a risk levels deemed politically acceptable. This last strategy was modelled on the way German policymakers approach nuclear energy – cautiously, but certainly not irrationally. Put in the context of the German debate on nuclear which goes back to the

1970s (Morris and Jungjohann 2016), the Fukushima disaster is by no means a "remote and (theoretically) unrelated event" (Smyrgała 2017: 332).

The discussion in the framework of the Ethic Commission, combined with the difficulty to predict technological development, shows that while difficult to plan, German Energy Transition was far from "irrational". Judging on the number of studies published by a number of research institutes on every aspect of the transformation, the opposite point can be made: that German *Energiewende* is the one of the most frequently researched topics. Not all of these lessons and repercussions from this research end up at the policy level, where – as in any country – different lobby groups still play an important role. Smyrgała's article ignores most of these aspects, focusing instead on a small selection of data and information to make assumptions, which do not reflect the much more complicated reality on the ground.

7. Conclusions

While no single piece of research can grasp the whole of a complex techno-scientific, socio-economic and political process, we believe that Smyrgała's paper does not display the effort to engage truly with the complexity of the German energy transition. We point out the problematic nature of his challenging research question and the inadequacy of the research design. We then highlight the selective use of data, both in bending some facts to fit the thesis and in cherry-picking data only when it proves the point. Finally, we challenge the notion that the *Energiewende* is "irrational" and suggest that this idea was the driving force of Smyrgała's analysis, a point to be made rather than a conclusion to come out of an analysis of the data. "Irrationality" is a handy whip with which different energy policies can be lashed, and our paper shows that it depends on the vantage point and assumptions made – and should rather be avoided in scholarly analyses.

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