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Is Germany a Role Model for Energy Transition?

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The energy transition in Germany aims to increase the share of renewable energy from almost 20 percent in 2011 to 80 percent in 2050. Presently, in Germany, electricity is primarily generated by coal (approximately almost 45 percent) and gas power stations (almost 14 percent). The nuclear phase-out envisages that all nuclear power stations currently still in operation will be gradually decommissioned by 2022. The plan is to increase the share of renewable energy from the current 20 percent to 35 percent by 2020, while, at the same time, significantly improving energy efficiency, particularly in buildings.

Germany's implementation of these targets is in line with EU Directives. The EU Roadmap suggests that, by 2050, the EU should increase its share of renewable energy to 80 percent. Further, the EU target is also to cut greenhouse gas emissions by between 80 and 95 percent in the same period. This is to be achieved primarily through the decarbonization of electricity generation, i.e., a significant increase in the use of renewable energy combined with improved energy efficiency.

Germany has resolved to reduce greenhouse gas emissions by 40 percent by 2020, compared to 1990 levels. The 25-percent drop in emissions achieved by 2010 is already evidence of success. The expansion of renewables and improvements in energy efficiency, particularly in the transport and mobility sectors, are key to meeting the climate targets.

In 2010, the CDU-FDP (Christian Democrat-Free Democrat) coalition government under Chancellor Angela Merkel initially extended the lifespan of Germany's nuclear power plants by approximately eight years. However, in spring 2011, the nuclear disaster in Japan, which struck in the aftermath of an earthquake, caused Germany to rethink its nuclear policy. As part of a moratorium, also in spring 2011, eight nuclear power stations were immediately and irreversibly taken off the grid. This saw Germany return to the decision it originally made in the year 2000, which, also as part of a nuclear consensus, committed to phasing out nuclear power by revising the Atomic Energy Act. As early as 2002, an amendment to the Act stipulated that nuclear power plants would only be permitted to produce limited volumes of electricity, which, assuming a normal service life would equally have brought about the gradual closure of nuclear power stations by 2022.

However, the actual energy transition is not only about withdrawal from the nuclear energy program but rather the comprehensive restructuring of German energy supply. If an average service life of 40 years is taken as a basis for power plants, then approximately half of all German coal-fired plants could be shut down in the next ten years due to age.

Across Germany, numerous new coal-fired power plants will either be in the planning stages or already under construction by 2017, with a total output of over 10 gigawatts. Thus, in purely mathematical terms, it would be possible to replace all the nuclear reactors presently in operation. However, fundamentally, coal-fired power plants are not compatible with the concept of a sustainable energy transition: they produce significantly more polluting greenhouse gases than other energy sources—twice the volume produced by gas, for example.

Gas-fired power plants would be far more suitable for the transitional period. They not only produce fewer emissions but are also easier to combine with fluctuating renewable energy sources, since the output of gas-fired plants can be quickly and easily ramped up and down. For electricity generation, particularly in combination with cogeneration, gas is the most efficient and also a climate-friendly form of energy supply. Further, for mobility, gas is a very interesting alternative to oil. Natural gas vehicles are subject to lower taxes which makes them very economically attractive.

Renewables are very volatile. During periods when there is an abundant supply of renewable energy, the electricity networks often lack the capacity to feed the excess power to other parts of the country or abroad. With the expansion of renewables comes an increased need to upgrade, expand, and optimize the networks. First, power grids will be needed to connect northern and southern Germany, particularly to transport the electricity generated by the off-shore wind farms to regions where nuclear and coal-fired power stations will be increasingly decommissioned, i.e., western and southern Germany. Second, an expansion of the European electricity grid is also necessary, particularly to exploit geological advantages in electricity production using renewable energy sources, to improve trade, and to optimize networks. Further, intelligent distribution networks that can optimize the volatile power supply and corresponding demand will also be needed. Along with enhanced energy storage, demand management plays an equally important role here. For example, even energy-intensive industries can manage their demand patterns so as to combine them more easily with the increasingly volatile power supply generated by the growing share of renewable energy sources.

The funding of renewables is set out in the German Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG), which enables guaranteed feed-in tariffs and priority access to the grid, both of which reduce the risk for investors. In recent years, the EEG surcharge has increased to 3.5 cents/kWh, primarily due to strong growth in photovoltaics. In 2014, this surcharge dramatically increased to 6.28 cents/kWh. This is not primarily because of the increased share of renewable energy, but rather because of the calculation method: the EEG surcharge is calculated as a difference to the wholesale price, which has declined drastically. The lower the wholesale price, the higher the EEG share. If the price declining effect would be passed through the electricity consumer as well, the total electricity price could remain constant.

Energiewende in Germany: a role model for other nations

The German energy transition is now in progress. In 40 years, electricity generation, which for the most part, is currently based on fossil fuels such as coal and gas, will be almost entirely converted to renewable energy sources. Presently, the share of electricity produced from renewables is about 23 percent, which is slightly more than nuclear power (18 percent). Further, as part of the energy transition, a commitment has been made to phase out nuclear power early: the remaining nuclear reactors will be decommissioned by 2022. The energy transition is also focused on improving energy efficiency, both in the building energy sector and to achieve more sustainable mobility. The energy transition is designed to facilitate the development of a sustainable energy supply. There will be no blackouts, provided that sufficient funds are invested in improving energy efficiency, optimizing the electricity grid management system, expanding the grid and storage capacity, and also in gas-fired reserve power plants during the transitional period. Only a slight increase in the price of electricity is anticipated since there are key factors exerting both a downward and an upward effect on prices. Although significant investment is required, this will, in turn, create added value and employment, however. Since Germany has sufficient plant, infrastructure, and power plant engineering and construction expertise, the German economy is in a better position than any other to profit from the energy transition, the boom in renewable energy, new power plants, improvements in energy efficiency, and sustainable urban development and mobility. The energy transition is expected to create hundreds of thousands of new jobs and thus undoubtedly brings more economic opportunities than risks.

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