Contribution ID: **38** Type: **not specified**

Optimizing Germany's Energy Transformation: Connecting Labor Markets, Training Strategies, and Migration Policies with energy system modelling

Friday, April 4, 2025 12:05 PM (25 minutes)

The transformation of Germany's energy system to renewable sources demands a diverse and expanding workforce specialized in wind and PV installations, infrastructure expansion (electricity, heating, hydrogen grids), and building renovations. This need arises as workers retire, leading to declining employment [1]. While literature highlights job gains from renewable energy, Germany faces the challenge of securing workforce amid labor shortages. Increasing workers in the energy sector is essential. Strategies include retraining, education, and recruiting foreign labor [2]. Prioritizing the energy transition involves incentivizing retraining programs, enhancing education in energy fields, and attracting international workers—representing the best-case scenario. However, geopolitical tensions and a right-leaning political landscape may divert resources, limiting personnel and funds for the energy transition. The growing right-wing climate may deter immigrants, making the best-case scenario challenging. In November 2023, members of the right-wing party AfD and radicals like the Identitarian Movement planned deporting individuals with a migration background [3]. Hence, Germany might not achieve the best-case scenario but instead face low immigration or even emigration and expulsion. To explore this, we conduct economic optimizations for Germany's energy transition under three scenarios: best-case, low-migration (limited immigration and fewer retraining opportunities), and worst-case (emigration and no retraining). We aim to answer: What impact does labor market development, influenced by training measures and migration policy, have on the energy system transformation and climate targets in these scenarios?

Our methods involve a literature review analyzing the required workforce for specific technologies and current and future employment trends in Germany. We develop scenarios projecting employment, considering the maximum workers suitable for the energy sector if prioritized in labor market policy, including evaluating right-wing expulsion plans for the worst-case scenario. We perform energy system modeling using GENeSYS-MOD, a linear techno-economic optimization model capable of comprehensive case studies with up to hourly resolution [4], [5], [6]. The model integrates a job module introduced by Hanto et al. [7], further developed to analyze different transformation paths based on training and migration policies.

Expected results indicate that in the best-case scenario, workforce growth through retraining, education, and immigration allows cost-effective energy system optimization without labor constraints. The value of immigration is highlighted by quantifying the number of foreign workers needed to fill domestic job gaps. In the low-migration and worst-case scenarios, a lack of skilled workforce is expected to hinder the energy transformation, illustrating the significant impact of migration and labor policies on climate goals. Comparing these scenarios underscores the importance of attracting international workers to facilitate the transition.

Conclusions suggest that additional efforts in labor market policies are necessary, potentially requiring the energy sector to be prioritized to enable timely transformation. Nationalist migration policies could jeopardize the energy transition's success, exacerbating the climate crisis. Therefore, more effort is needed to stabilize the political spectrum and enable worker migration to Germany. Efforts should extend beyond legal migration pathways to creating an environment that attracts people to work in the energy sector and other critical areas.

Author: HERPICH, Philipp (TU Berlin WIP)

Co-author: Dr LÖFFLER, Konstantin (TU Berlin)

Presenter: HERPICH, Philipp (TU Berlin WIP)

Session Classification: Energy market outlooks and transformation strategies