Anticipation of low-carbon energy future 2050 in north-west European countries

Abstract

This study proposes an approach to comparing and assessing the policy settings in the European low-carbon energy scenarios. First, it will present the methodology for such analysis, including ten characteristics for scenario assessment: modelling framework (diversity), ambitiousness of the targets 2050, relations with other (European) countries, stakeholder involvement, technology options, non-technological aspects, economic component, usage of scenarios in policy design, intermediate indicators of targets' achievement and revision of scenarios. Second, based on the combination of qualitative and quantitative methods, it will evaluate energy scenarios developed in six north-west European countries (the Netherlands, Germany, France, Denmark, the UK, Belgium) as the examples. Third, these scenarios will be evaluated by contrasting them with societal trends, which may support the transition towards a low carbon economy (e.g. "shared society") or may counteract it (e.g. a trend towards single households). Finally, the conclusions and recommendations will be made concerning the possible ways of the scenario design improvement.

Theoretical background

Different practical studies in relation to low-carbon energy scenarios have been conducted at the national and regional level, and some attempts were made in academic research to compare these approaches (f.e. Van Sluisveld et al., 2017; Sartor et al., 2017; Spencer et al., 2017; Knopf et al., 2013; Notenboom et al., 2012). Nevertheless, in the scientific literature there have been no works devoted to the systemic analysis of the differences in policy settings of the low-carbon energy scenarios in the European countries. Existing studies mainly deal with fragmented aspects and are not comparable. Therefore, the main goal of this paper is to propose such a structured approach, taking six north-west European countries (the Netherlands, Germany, France, Denmark, the UK, Belgium) as the examples.

Therefore, the ***main goal*** of this research project is to propose a structured framework with the system of characteristics (indicators) for comparison and assessment of low-carbon energy scenarios 2050 of six north-west European countries (The Netherlands, Germany, France, Denmark, the UK and Belgium), taking into account societal trends, in order to develop recommendations on moving towards more harmonised approach to achieve the EU 2050 targets.

The ***research question*** of this study is:

How can we compare and evaluate the policy settings of the low-carbon energy scenarios 2050 in European countries, which they have put in place to achieve the EU 2050 targets, taking into account societal trends?

The methodology of this study includes the stages of preparing, analysis and integration of data (radar diagrams). For this, *qualitative* (literature review, expert interviews) and *quantitative methods* (statistical analysis, trend monitoring) are used. The following

information sources form the basis for research: scientific publications, international and national (governmental) reports and strategic programs, international statistics (e.g. of European Commission etc.), materials of energy conferences and workshops, consultations with the experts from energy area.

Based on the literature review and interviews with national experts, the ***methodological framework*** of this research proposes ten characteristics for the assessment of policy settings in energy scenarios:

1. *Modelling framework (diversity)*
   The diversity of policy scenarios
2. *Ambitiousness of the targets 2050*
   Maximum modelled GHG emissions reduction compared to 1990
3. *Relations with other (European) countries*
   Inclusion of trans-border regional developments (TRD)
4. *Stakeholder involvement*
   The degree of stakeholder involvement (particularly, public engagement)
5. *Technology options*
   Transparency of technology selection
6. *Non-technological aspects*
   Inclusion of non-technological aspects (social acceptance, etc.)
7. *Economic component*
   Description of economic component (cost-benefit analysis, etc.)
8. *The usage of scenarios in policy design*
   The degree of scenarios' usage in policy development
9. *Intermediate indicators of targets' (2050) achievement*
   Current consistency of scenarios with the EU 2050 targets
10. *Revision of scenarios*
    Frequency of scenario revising

Results

The analysis has shown that all selected countries have the potential for modifying their energy scenarios in order to achieve the joint European targets 2050. Therefore, since these countries are socially and economically interrelated, a more harmonised approach to scenario development is needed to be designed and introduced on the European level, which should take into account societal trends and include the common requirements for scenario development. Ten characteristics proposed in this study may serve as an initial input for such harmonisation. The approach developed in this paper may be of a specific interest for policy makers discussing the priorities in the specific energy sectors and monitoring the success in sustainable development on international, regional and national level. In addition, the results may be used by business representatives intending to understand the risks, uncertainties and possible disruptions in the energy markets to develop effective corporate strategies. The proposed framework may also invite academic researchers involved in energy-related activities to contribute to a general methodology of scenario design assessment.

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