DTU Management Engineering
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Policy analysis of energy demand flexibility

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Policies to provide cost-efficient flexibility in a sustainable energy system

Large-scale development of intermittent renewable energy sources, like wind and solar power, increase the demand for flexibility in our power system. At the same time the availability of conventional power plants – the traditional suppliers of flexibility – may become more costly. While the energy demand side constitutes a certain potential for flexibility, it is still largely unutilised – even though a range of enabling technical solutions have been developed.

In order to maintain reliability in our future sustainable electricity system in the most cost-efficient way a policy strategy aiming at flexibility needs to be developed. An important element of this strategy will be to take into account specific motives of energy consumers and barriers that exist to utilising their flexibility potential.

Research question

As part of the *INCAP* research project *("Inducing consumer adoption of automated reaction technology for dynamic power pricing tariffs"*) this PhD study will contribute to the question of whether electricity consumers can be induced to adopt varying tariffs and automatic response technology for common household appliances at costs that make this socially attractive.

In particular the PhD project will address the following research question:

> *To enable the utilisation of energy demand flexibility what are beneficial policy interventions in terms of system reliability and costs that take specific demand-side characteristics into account?*

Conceptual model/theory

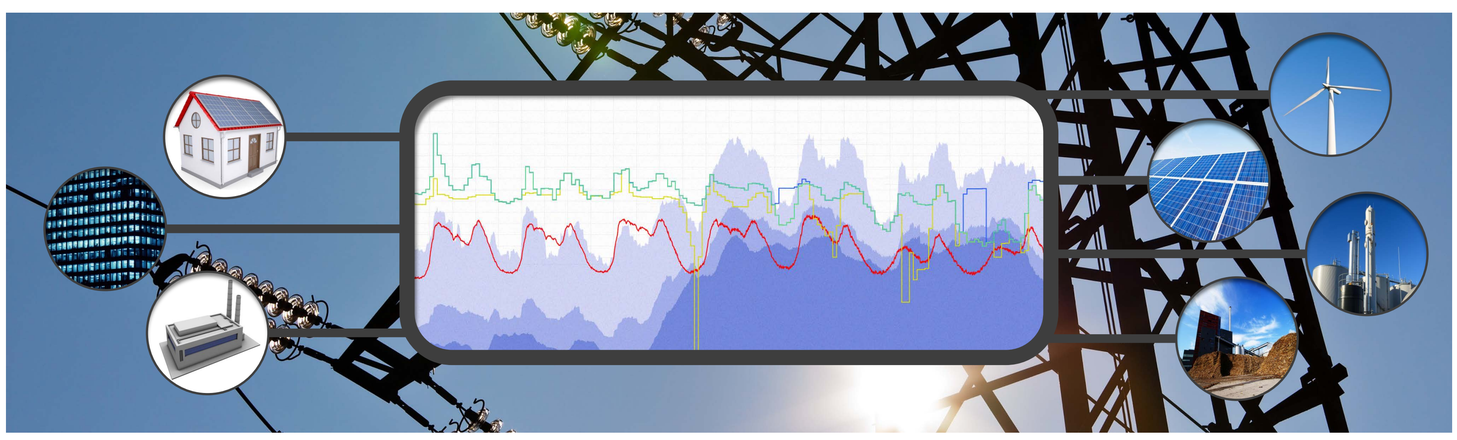
Economic models and concepts of policy analysis are used to determine effective and cost efficient policy instruments that respect technical constraints of electrical power systems and behavioural constraints of the energy demand side.

Method

Policy instruments creating incentives to provide flexibility will be analysed using partial equilibrium models and energy system models. To support such modelling actual behaviour of energy consumers will be observed in a field experiment. While the design of this experiment is part of the overarching *INCAP* research project and outside the scope of the PhD project, it should provide valuable input to the policy analysis.

Expected results

The analysis will contribute to defining policy strategies for the deployment of smart technologies and the utilisation of energy demand flexibility potentials. An identification of barriers founded in behaviour and market architecture is an important element. The policy strategies must take such barriers into account and could potentially address them directly.



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Quantitative Sustainability Assessment

Systems Analysis

Engineering Systems

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