

31761 - Renewables in Electricity Markets

Assignment 0: How would you design an electricity market?

General considerations

Assignment 0 concentrates on the big picture, i.e., on how one believes future electricity markets should be, based on substantial renewable energy penetration, and possibly a more proactive role of final consumers. This is to be seen as a very free and personal assignment, as any well-argumented vision will be accepted. This vision is to rely on all lectures, exercises, etc. of the course.

Assignment 0 is inspired by an initiative launched by Eurelectric and the Florence School of Regulation (European University Institute) on future electricity markets. Through that initiative, anyone is invited to submit his proposal vision for future electricity markets. The call for proposal is available at the following link: [Eurelectric challenge](#).

The aim of Assignment 0 is to evaluate

- your understanding of electricity market mechanisms, e.g., sequence of markets, clearing principles, etc.
- your ability to have an overview of the purpose of electricity markets,
- your understanding of the impact of renewables on electricity markets, e.g., market prices, investment in new capacities, etc.
- your creativity and open-mindedness regarding what electricity market could look like?
- your critical analysis on the viability of alternative proposals.

The expected outcome of Assignment 0 consists in a report of maximum 4 pages (excluding appendices). Assignment 0 is an **individual assignment**. It may be handed in at any time between 30.1.2017 and 8.5.2017. The assignment will remain open over the whole course period, meaning that it may be possible to submit an updated version of your report.

The **evaluation of Assignment 0 will count for 10% of the final grade**.

Description of the Assignment

Let us consider a real-world setup, for instance Denmark aiming to go for 100% renewable energy system in the medium-term. There is a strong will such that, ultimately, this system is operated through an electricity market, at both wholesale and retail levels, in order to maximize social welfare through healthy competition. Though, as of today, very few have proposed a vision for how this would work. The aim of this assignment is to take a shot at it, by proposing a vision for future electricity market, while developing a critical argument about how and why such a vision is to be seen as reasonable.

A vision for future electricity markets may cover some of the following aspects:

- A proposal for the mix of generation capacities and supporting assets, e.g., storage, interconnection, etc.
- Are generation capacities centralized (for instance, large CHP plants) and/or largely distributed (for instance rooftop solar)?
- What is the future role of consumers? Are these all prosumers, i.e., potentially producing and consuming electric energy?
- A proposal for the organization of the overall system, e.g. is there still a transmission system operator and distribution system operators? are there retailers?

- In case large power plants are to disappear, how are those system services necessary for a reliable power system operation provided?
- In a future (nearly) fully renewable energy system, if the marginal cost of energy is close to zero, how will investment in new generation capacity be insured and/or supported?
- Since renewable energy generation is difficult to predict a reasonable time in advance, (nearly) all power generation may be uncertain - how can electricity markets accommodate that?
- Would your vision require substantial regulatory changes (e.g., allowing anyone to sell his power generation to his neighbor)?
- Are there specific technology enablers that would allow your vision to realize? (for instance, Facebook, AirBnB and the likes would not exist without internet...)
- etc.

The Eurelectric call for proposals may also inspire you: [Eurelectric challenge](#).

An example proposal vision that can be found in the literature, focused on renewables impact, is: [Schleicher-Tappeser \(2012\)](#)

Another example proposal vision that can be found in the literature, focused on prosumers, is: [Parag and Sovacool \(2016\)](#)

Structure and contents of the report to be delivered

The report for the assignment may include, though not obviously in separate sections:

- A vision for future electricity markets
- Illustrations of future market organization and role of its actors
- Arguments supporting your vision
- Possibly a list of references that inspired you and/or support your vision too. References can be any type of material (articles, piece of news, video online, etc.)

Delivery of the Assignment

Assignment 0 is to be uploaded through campusnet before the **final deadline of 8.5.2017** (all day included). It should take the form of a pdf document with naming convention "31761-Assignment0-StudentID.pdf". StudentID is your DTU student identification, e.g. s07123. The assignment report may be updated as many times as you wish before the final deadline for delivery.