MARKET MODEL 3.0

THE ELECTRICITY MARKET AS THE KEY TO A CLIMATE NEU-TRAL SOCIETY

Danish Energy Agency
2021

Chapter 1

Executive Summary

The starting point for developing Market Model 3.0 is the effective implementation of Danish and European energy and climate objectives. The purpose of the project has been to investigate how the current market model can be adapted to fulfil those objectives.

In 2020, a parliamentary majority adopted a climate law with a target to reduce greenhouse gas emissions by 70 percent in 2030 compared to 1990, and become climate-neutral no later than 2050. The climate law also aims for Denmark to adopt a leading role in the international green transition.

The green transition in numbers[1]

- Wind and solar capacity in Denmark is expected to increase by a factor of 2.5 from 2020 to 2030.
- The capacity of thermal power plants will fall by about 40 percent, from around 7 GW in 2020 to about 4 GW in 2030.
- Renewable energy will comprise about 97 percent of electricity consumption in 2030.
- Electricity consumption will rise by 57 percent from 31.9 TWh in 2019 to 50 TWh in 2030.

[1] Source: Denmark's 2021 Energy and Climate Outlook to 2030 under the assumption of a frozen-policy scenario ("with existing measures").

Denmark is well on the way towards becoming a green society, but the next few years will be particularly challenging as the energy system is subjected to profound changes. A successful green transition requires not only the production of electricity from renewable sources, but also that production and demand for electricity is balanced in the most efficient way. This ensures a cost-effective green transition while maintaining a high security of supply.

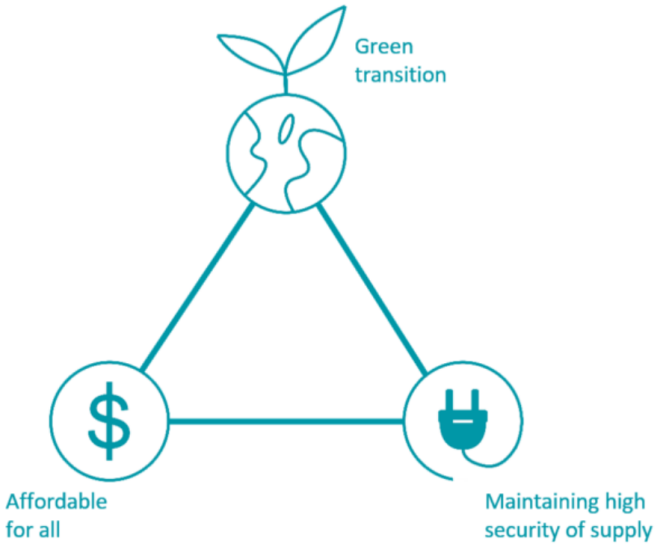
A prerequisite for the above is the development of a much more flexible energy system where a well-functioning and future-proof electricity market is key for unlocking new projects like energy islands, Power-to-X plants and the electrification of other sectors such as heating, transport and industry. These considerations constitute the background for Market Model 3.0.

Overall objectives of the regulation

The objective of the project is to further develop the current market model to achieve a flexible electricity market that supports the transition towards a climate neutral society. The aim of Market Model 3.0 is therefore the development of a flexible electricity market.

The market model must consider the energy trilemma. The trilemma consists of ensuring a decarbonised energy system while maintaining a high security of supply at least cost for consumers and society, see *Figure 1.1*.

Figure 1.1: The Energy Trilemma



Central principles for fulfilling the overall objectives

The recommendations contained within Market Model 3.0 and their contribution to ensuring affordability, security of supply and the green transition have been guided by four central principles:

- Market-based solutions
- Energy-only markets
- Common European and Nordic markets
- Clear separation of monopoly and competitive activities

Scopes of Action and Recommendations

The recommendations of Market Model 3.0 have been split into five scopes of action that focus on different parts of the power sector to support the overall objective.

Five scopes of action

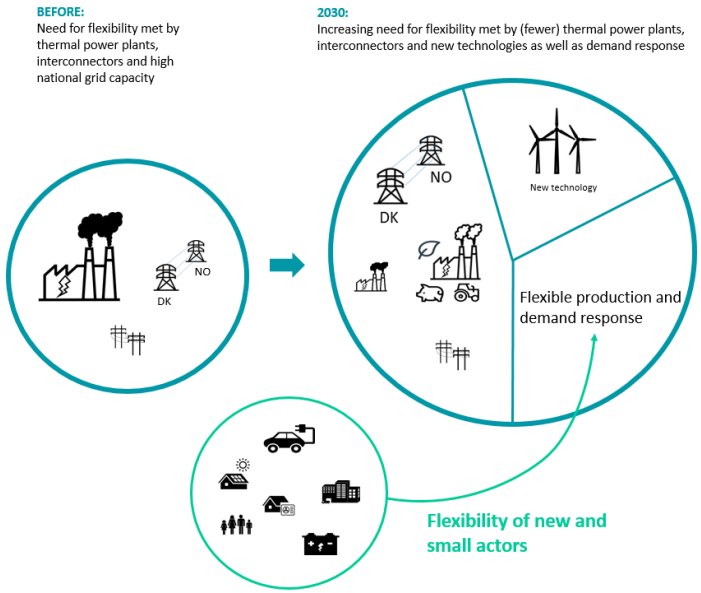
1. All actors must be able to contribute to a flexible electricity market
2. A flexible electricity market must ensure a robust and balanced energy system
3. A flexible electricity market must ensure a cost-effective expansion of the grid
4. The regulation of monopolies must promote a flexible electricity market
5. The electricity market model must be forward-looking

The report contains 13 main recommendations within the five scopes of action, with 23 associated concrete action points that follow up on the recommendations. Some of the identified action points are based on the requirements of the EU Clean Energy Package including the Electricity Directive (EU) 2019/944. These proposals are already implemented in Danish law and are marked in italics below.

Scope of Action 1: All actors must be able to contribute to a flexible electricity market

A first and fundamental step towards realising the objective of a flexible electricity market is ensuring a regulatory framework that allows for the widest possible group of actors to supply flexibility services on market terms. A higher total supply of flexibility is indeed one of the preconditions for the triple objective of green transition, security of supply and affordability. It is therefore essential to engage the vast number of small actors that dispose of small consumption and production flexibility resources as illustrated in *Figure 1.2*. For this to be efficient it must be possible for these flexibility resources to be pooled. This task will be carried out by a new type of market actor; notably by an aggregator.

Figure 1.2: New actors



Recommendations and Action Points

Market access must be ensured for as many market actors as possible

- *The regulatory framework for aggregators must support the development of business models that are transparent and simple from a consumer perspective.*
- The regulation of aggregators must be further developed and prevent market distortions.
- The regulation of electricity meters and settlement must support the utilisation of flexibility and support an intelligent and flexible rollout of heat pumps and charging infrastructure.

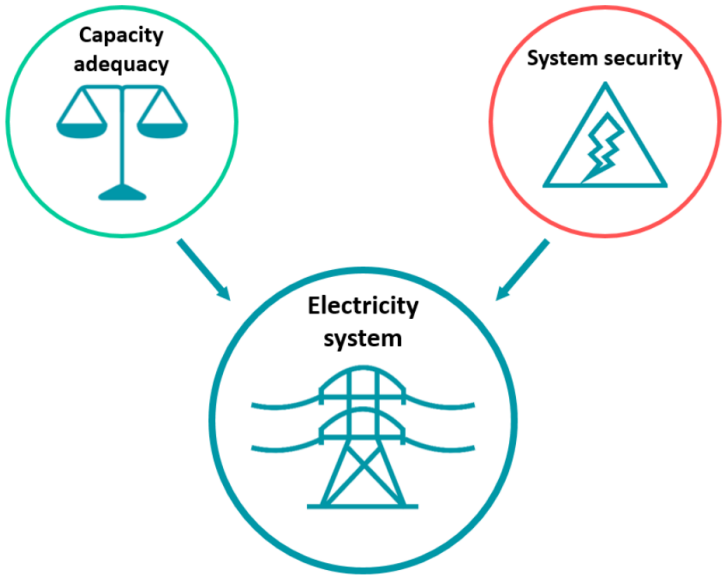
The regulatory framework must increase transparency and strengthen the engagement of market actors

- *The development of the regulatory framework for energy communities must ensure a balance between the costs and savings that energy communities contribute with.*
- The Danish Energy Agency will, in cooperation with stakeholders, investigate and work towards ways of increasing price transparency for aggregator products, possibly in the form of a comparison portal.
- The transmission system operator Energinet accelerates and strengthens its pilot projects and open-door approach for new actors.

Scope of Action 2: A flexible electricity market must ensure a robust and balanced energy system

A second crucial step towards realising the ambition of a climate neutral society with a high security of supply is a power system that is flexible on all levels – both in solving mismatches between supply and demand across seasons and weeks and in compensating for imbalances and errors within the day and in real time. Scope of Action 2 focuses on capacity adequacy and system security as necessary preconditions for a robust, balanced energy system, as illustrated in *Figure 1.3.* Capacity adequacy is about ensuring sufficient flexible production capacity and interconnectors to meet demand. System security, or robustness, refers to the system's ability to withstand outages, faults and short-circuits.

Figure 1.3: Capacity adequacy and system security



Recommendations and Action Points

The need for flexibility to balance the energy system must be more transparent

- The transmission system operator Energinet's annual evaluation of system needs must be complemented by a trend analysis of market developments for the most important ancillary services, with a forecast horizon of 3-5 years.

Flexibility must be driven by accurate price signals

- The transmission system operator Energinet must conduct an analysis to evaluate whether scarcity pricing can be used as a tool to strengthen the price signal on the balancing market and to increase market actors' incentives to ensure balance.
- The Danish Energy Agency will investigate how best to create incentives to exploit the flexibility potential of renewable energy and electrified technologies.

The market framework must be developed nationally and internationally such that renewable energy and new technologies can be brought into play

- At the international level, Denmark should share Danish experiences in balancing variable renewable energy while preventing the introduction of regulatory barriers to the participation of renewable energy in balancing markets.

Renewable energy must be integrated in a way that maintains the robustness of the energy system

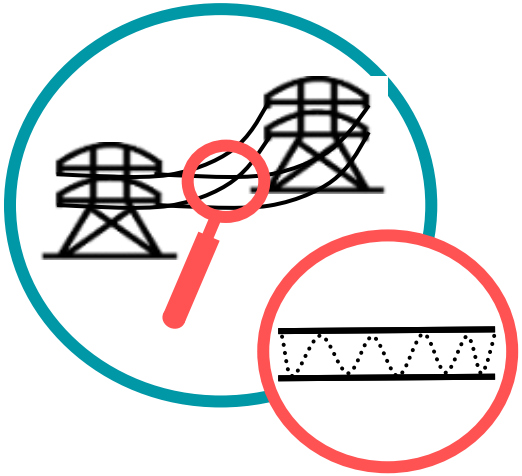
- The transmission system operator Energinet must initiate an analysis with a focus on the implications for system robustness of transitioning towards renewable energy and new technologies.
- Increased focus on the requirements for grid connection must ensure the contribution of new capacity to system robustness.

Scope of Action 3: A flexible electricity market must ensure a cost-effective expansion of the grid

The third essential step towards realising the central objective concerns the need for local flexibility to ensure a cost-effective green transition. The transition towards a climate neutral society entails the transportation of much higher volumes of electricity. This imposes new demands on network infrastructure, where the consumption and production of electricity constantly needs to be accommodated within the available network capacity.

The electricity grid plays a key role in the green transition. Promoting local flexibility to the largest possible extent is essential for future-proofing the grid and for ensuring its cost-effective development. Scope of Action 3 therefore focuses on the security of supply issues that relate to network adequacy. Network adequacy refers to the grid's ability to transport electricity from the point of production to the point of consumption. Scope of Action 3 notably focuses on local needs for flexibility.

Figure 1.4: Network adequacy



Recommendations and Action Points

The need for flexibility must be more transparent

- *Distribution system operators must develop and publish network development plans.*
- Distribution system operators must release anonymised consumer and producer data.
- The transmission system operator Energinet must continue to highlight its geographical needs for local flexibility.

Flexibility must be utilised as a cost-effective tool in the operation of the grid

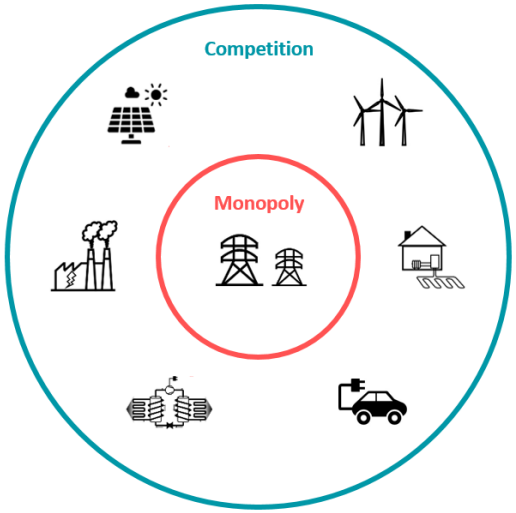
- *It must be ensured that distribution system operators have the possibility to purchase flexibility services on market terms.*
- The continued coordination between the transmission and distribution system operators must ensure an effective use of local flexibility.
- The addition of information about the geographical location of bids in the balancing market must contribute to the effective expansion of the grid.
- The development of other potential tools to address local network congestion must continue.

Scope of Action 4: The regulation of monopolies must promote a flexible electricity market

The fourth essential step is ensuring that regulation of the transmission and distribution system operators continues to support a cost-effective green transition that goes hand-in-hand with maintaining a high security of supply and affordable consumer prices. A well-functioning grid, electricity market and associated power systems represent crucial aspects of the green transition, where society increasingly needs to consume electricity from green sources, which must be transported safely and efficiently through the grid.

The regulation must prevent the costs of transporting electricity from becoming a barrier to the green transition while supporting the development of an integrated energy system. Scope of Action 4 is about establishing the best possible framework for the electricity market, including through a clear separation of monopoly and competitive activities, as illustrated in *Figure 1.5.*

Figure 1.5: Separation of monopoly and competitive activities



Recommendations and Action Points

The transmission and distribution system operators must continue to support the green transition by operating, developing and expanding the grid

- A continued clear separation between monopoly and competitive activities must ensure a cost-effective development of the grid.

Framework management must be the premise for regulating the transmission and distribution system operators

- Incentive-based framework management must ensure a cost-effective and safe operation of the grid.

Distribution system operators must continue to be regulated through licenses

- The requirement for distribution system operators to have a license must support a well-functioning electricity supply infrastructure.

Scope of Action 5: The market model must be forward-looking

The fifth and last step is ensuring that the electricity market model continues to be adjusted and developed based on data and in line with the experiences gained in the coming years. The energy system is entering a transition phase in which experiences with implementing the initiatives of Market Model 3.0 simultaneously need to be taken into account and assessed.

With flexibility representing one of the keys to a cost-effective green transition with a continued high security of supply, it is important not to cease development of the market model. On the contrary, there is a need to proactively gather and share practical experiences so as to continuously make the necessary and data-based adjustments to the market model, so that it continues to support cost-effective flexibility in the energy system. Notably, flexibility in the power system must be promoted through a new forum for flexibility.

Figure 1.6: Forum for flexibility

Recommendations and Action Points

Proactive stakeholder involvement and gathering of practical experiences must be used to continuously adjust the market model to promote flexibility

- The Danish Energy Agency will take the initiative to develop a new forum with a focus on promoting flexibility in the energy system.

There is a need for more data about the flexibility potential

- The Danish Energy Agency will carry out an analysis that quantifies the potential of new and existing actors for supplying flexibility.

Looking ahead

The work around Market Model 3.0 has identified a number of recommendations and action points with the objective of promoting a more flexible electricity market and an integrated energy system. The Ministry for Climate, Energy and Supply, in cooperation with the transmission system operator Energinet, the distribution system operators and market actors, will continue working with the action points to ensure that these are followed up. Significant steps will therefore be taken towards promoting flexibility not only from both existing and new, renewable energy sources, but also on the demand side.

The market model is but one of several tools that contributes to an integrated energy system. There will be a need to apply other tools, and to take further steps, such that high security of supply is maintained, cost-effective development of the grid is ensured, and transition of the energy sector continues.