



European
Workshops on
Demand Response
2022



DR4EU
DEMAND RESPONSE FOR EUROPE

Demand Response in Denmark

State of play, evolutions and perspectives

*55 min to be
Fit for 55!*

Agenda

- Sabine CROME, DGENER, EC
 - Iolanda SAVIUC, JRC



- Jonas KATZ, Danish Energy Agency



- Karsten FEDDERSEN



- Helle JUHLER-VERDONER



- Martin SALAMON



- Q&A + questions on-going => in the chat box please



Demand response and the implementation of the Clean Energy Package

Sabine Crome
European Commission – DG Energy
Internal Energy Market

Relevance of demand side flexibility

- *Developing demand response has lost none of its relevance, even in the current crisis*
- *With high energy prices, the participation of demand response in wholesale markets can be a crucial element to tackle the volatility of prices*
- *Demand side flexibility provides system flexibility. System flexibility is key because:*
 - *accelerated deployment of electricity from renewable sources*
 - *increased electrification of end uses*

Key provisions of the Electricity Directive 2019/944

- *Non-discriminatory access of demand response to all electricity markets, either directly or through aggregation (Art. 17)*
- *Full recognition of (independent) aggregators as market participants (Art. 17)*
- *Customer entitlement to contract with independent aggregator of their choice, without need for consent or prior agreement of their supplier (Art. 13)*
- *Strict limits to compensation payments (Art 17(4))*

Transposition of Electricity Directive 2019/944

- *Key that Member States transpose these provisions into the national laws swiftly*
- *Deadline for transposition: 1 January 2020*
- *Transposition very uneven among Member States*
- *While progress has been made, significant number of important provisions have not been transposed in several Member States*

Network Code on demand side flexibility

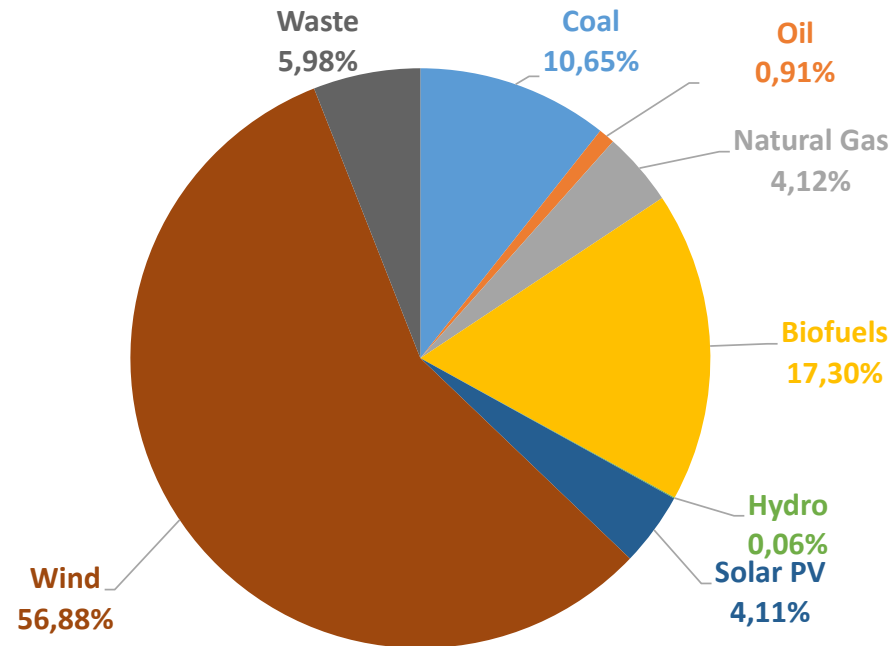
- *Legal basis: Article 59(1)(e) Electricity Regulation – Commission empowerment to establish a Network Code on demand side flexibility*
- *Commission together with ACER started work on provisions to address remaining regulatory barriers for the development of demand side flexibility, including demand response*
- *Provisions will either be included in a new network code/guidelines or will consist of amendments to existing network codes/guidelines*
- *Provisions are complementary to the provisions of the Electricity Directive and Electricity Regulation*

JRC findings on DR in Denmark

Iolanda SAVIUC and Chema LOPEZ

for the Joint Research Center of the European Commission

Denmark's Electricity Generation mix in 2020 (%). Source: IEA



DR and Independent Aggregators in Denmark

The Danish grid is well interconnected and the national goal is to upgrade it through projects coordinated with neighbouring countries. Denmark is currently focusing on the integration of power markets, with an emphasis on creating cross-border markets for balancing products.

Players and Context

- The Danish transmission system is owned and operated by Energinet. The distribution network is divided between 16 major DSOs and ca. 26 smaller DSOs.
- The Danish Energy Regulatory Authority (DERA) oversees the electricity, natural gas, and district heating markets.
- Denmark is part of Nord Pool, a deregulated electricity market. Nordic countries (Norway, Finland, Sweden, and Denmark) have separate TSOs, though they share a single electricity market.
- The Danish Utility Regulator (DUR) is the independent regulator in Denmark and together with Iceland, Sweden, Finland and Norway forms the NordREG group.

Transposition of EU Directive 2019/944 in Denmark

- Aggregators, including independent aggregators, can participate in the flexibility markets (bid limit: 1 MW)
- Market Model 3.0, based on the Danish Climate Act from 2020, recognizes that a high number of flexibility providers in the grid are necessary, and in order for this to be efficient, they need to be aggregated.
- The details of participation in DSO-markets are yet to be developed.
- As part of NordREG, in 2020 Denmark has contributed to developing the Nordic Regulatory Framework for Independent Aggregation, which proposes legislative changes in order to enable the legal basis for a common Nordic market for aggregation services

Prosumers and Flexibility Services

- Most customers now have different dynamic price contracts available to them, and many DSOs have implemented time-of-use tariffs.
- Adoption of dynamic pricing is still low: around 10% of Danish end-consumers using it, mainly due to the low impact of the energy component in the final electricity bill.
- The Energy Agreement from 2018 investigated how a new tariff system could be structured, among other things to facilitate demand response and a more flexible energy system with efficient use of the existing infrastructure

Flexibility Services

- The framework for participating in flexibility markets has improved, the requirements for online measurement and BRP to provide FCR have been lowered, and bids have been lowered from 10 MW in the past to 5 MW and 1 MW.
- Most of the tender conditions for suppliers of ancillary services are the same in the two bidding zones (western Denmark DK1, eastern Denmark DK2).

Explicit Flexibility services:

- The Nordic TSOs are currently developing a new Nordic Balancing Model towards a common Nordic capacity market for aFRRs and mFRRs, and the implementation of 15-minute imbalance settlement period.
- The FCR is open to DR and (independent) aggregation, across Denmark. The aFRR is open to DSF and aggregation too, however the minimum bid size of 5MW and the product design make it difficult for new market players to enter the market. The mFRR is open to DSF and (independent) aggregation

Enablers and Barriers for DR and Independent Aggregators

- From the regulatory point of view there are no specific barriers that prevent an independent service provider from signing a contract with a customer or aggregator to provide demand flexibility.
- An upgrade of the market model is ongoing, to facilitate demand management such as aggregation, and to support the use of flexibility at the distribution level.
- The market design currently favours generation, and the residential consumers are subjected to very high taxes. In addition to this, there are no reserve requirements in the Danish system.



Danish Energy Agency

Presentation DR4EU the 3rd of May 2022

Legal implementation

- EMD rules on aggregation have been implemented by 31-dec 2020 in Executive order on aggregation no. 2250 of 29/12/2020

BEK nr 2250 af 29/12/2020

<https://www.retsinformation.dk/eli/ta/2020/2250>



Guiding principles

- Ensure required independence
- Avoid market distortion
- Limit complexity

Independent aggregator

- Energinet and DSOs shall allow aggregators to participate in all electricity markets
- Participation shall not require other market participants consent
- Operation independent of supply contract possible, subject to Energinet's regulations regarding aggregators

Avoid market distortion

- Independent aggregators can become financially responsible for their imbalances
 - Energinet to set rules on balance settlement and correction
- Parties affected by activation of flexibility shall be financially compensated
 - Energinet to set detailed rules on financial compensation
 - Financial compensation shall not result in market access barriers for aggregators
- The minister may set a deadline for Energinet's issuing of rules and regulations regarding balance correction and compensation

Limit complexity

- Aggregators shall inform about
 - Preconditions to be fulfilled by customers to enter into contract
 - Bundling with supply contract
- Bundled contracts shall clearly distinguish aggregation and supply services
- Household customers should not become directly involved in financial compensation measures



ENERGINET - THE DANISH TSO

DR4EU workshop - 3rd May 2022

Karsten Feddersen - KAF@energinet.dk

Jeannette Møller Jørgensen - JMJ@energinet.dk

INDEPENDENT AGGREGATOR

- A company that is not associated with the consumers electricity supplier

Energinet have held two workshops with market participation

- June 2021 – Data & methods
- September 2021 – Compensation og Korrektion

Energinet regulation for independent aggregators is mandated in Aggregeringsbekendtgørelsen.

Regulation of independent aggregators only apply to independent aggregators who deliver ancillary services containing energy.

Compensation and correction settlement ensures that the independent aggregator is settled correct without impacting the balance responsible settlement of imbalances.

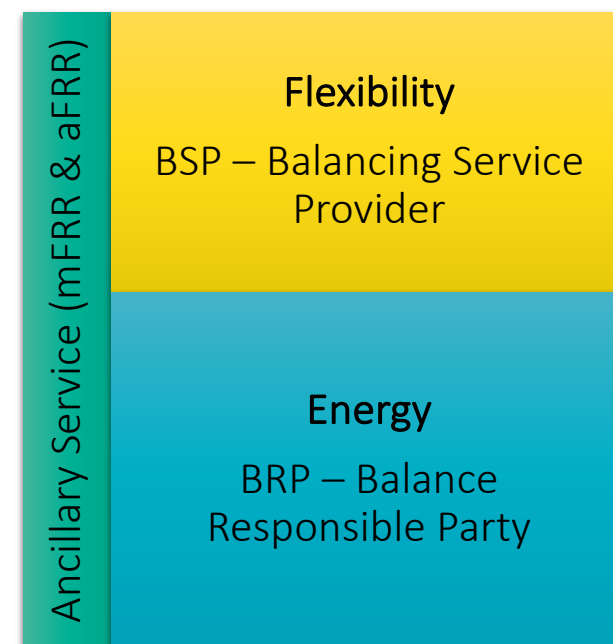
ANCILLARY SERVICE WILL CONSIST OF TWO PARTS

Need to regulate independent aggregators when they deliver energy containing ancillary services mFRR & aFRR to Energinet

Base requirement for the electricity system: All energy must be balanced

New market development -> Normally energy containing ancillary services is delivered as a combined flexibility and energy product. But for independent aggregators it will be possible to deliver energy containing ancillary services with being balance responsible for the energy part. I.e. Independent aggregators will only supply the flexibility part.

The possibility of avoiding balance responsibility for energy containing ancillary services requires obligations for the independent aggregators in order to retain the principles of *polluter pays* (financially responsible for imbalances)



COLLECTION OF DATA FOR THE INDEPENDANT AGGREGATOR

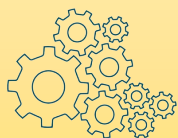
Data must be supplied by the independant aggregator to the Danish DataHub
Markedsprocesses in the DataHub must be added/adjustet



Market
metering point

Metering point in DataHub of type consumption (E17) or generation (E18) that always has a balance responsible and a retailer attached

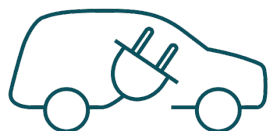
Same method
can be used for
rebound



Flexible asset –
activated
energy

Mandatory – Metering point for each asset of the aggregator with the activated energy that assembles the ancillary services.

Tim e 17	Tim e 18	Tim e 19	Tim e 20	Tim e 21	Tim e 22
0	0	11	11	0	0

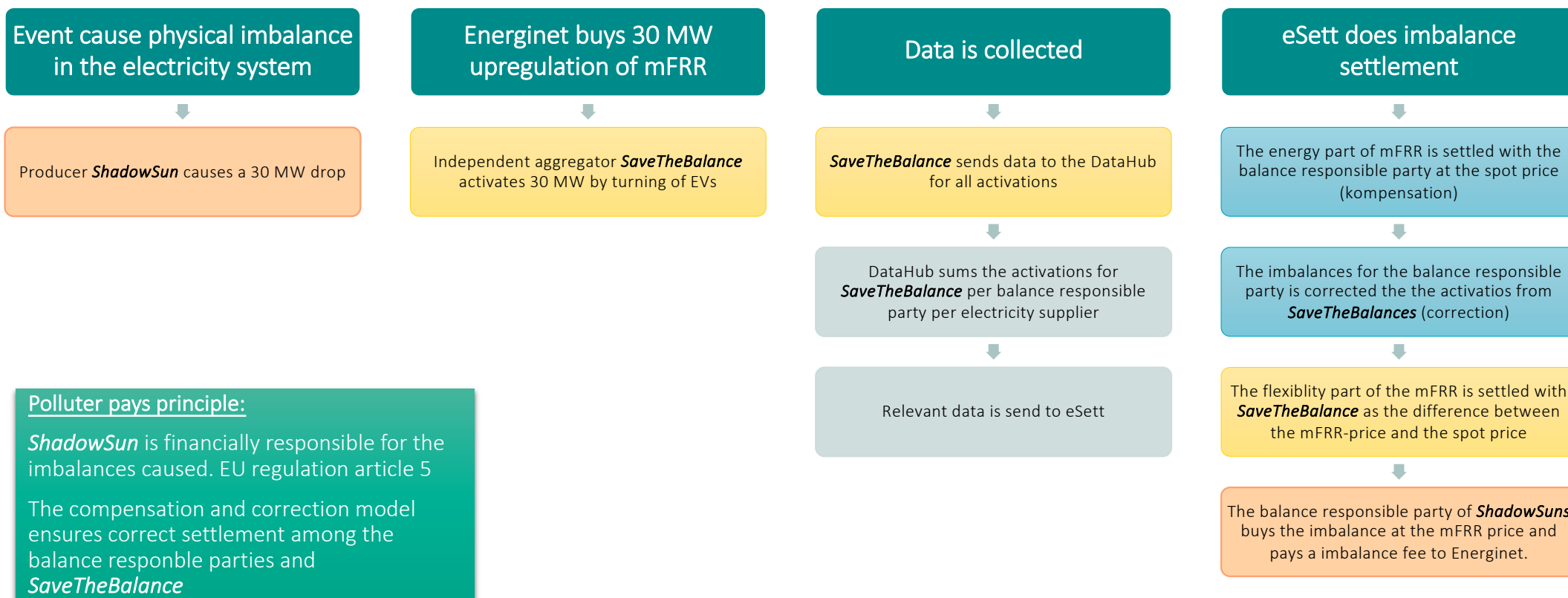


Flexible asset -
actual
consumption or
generation

Optional – Metering point for each asset with the actual consumption or generation of the asset.

Tim e 17	Tim e 18	Tim e 19	Tim e 20	Tim e 21	Tim e 22
5	11	0	0	11	11

EXAMPLE OF EVENTS AND SETTLEMENT PROCES OF COMPENSATION AND CORRECTION SETTLEMENT



EX OF NUMBERS OF COMPENSATION AND CORRECTION

[illegible]



European workshops on demand response - Denmark

Helle Juhler-Verdoner, Managing director of Danish Intelligent Energy Alliance

26 April 2022



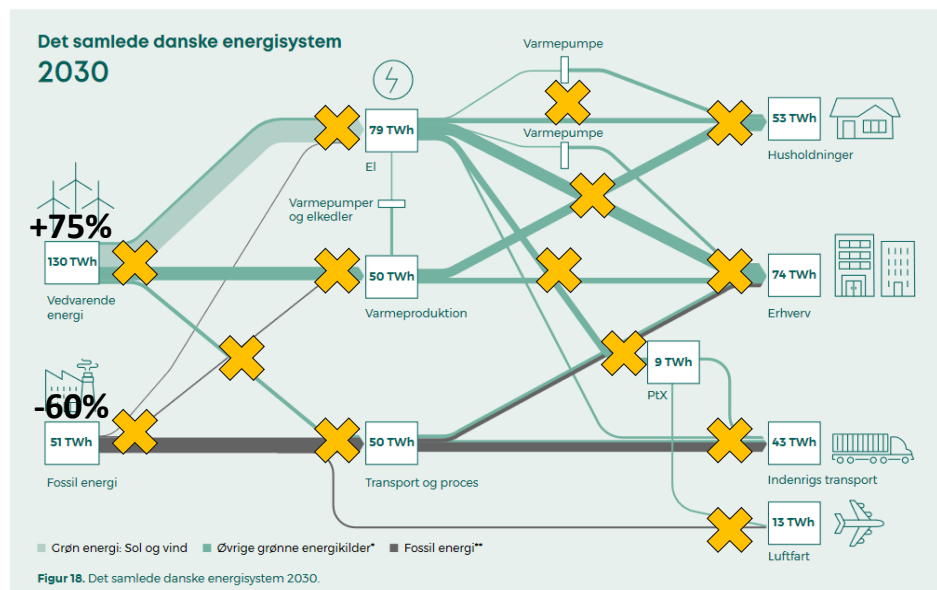
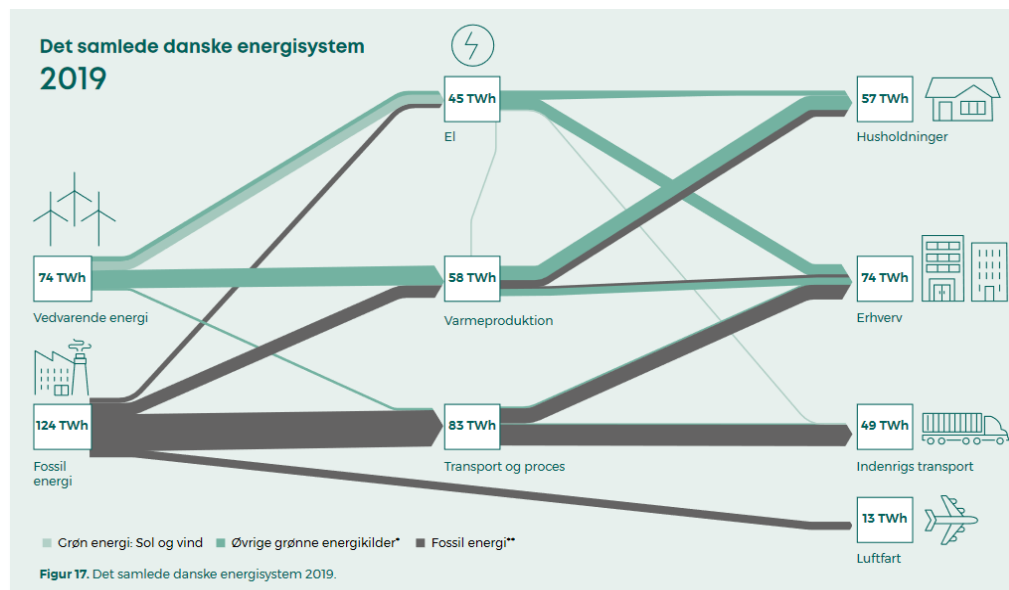
Agenda

- The Danish Intelligent Energy Alliance – Who are we?
- **DR and security of supply?**
- Fair competition and data
- Network tariffs and DR incentive
- Needs and benefits of DR



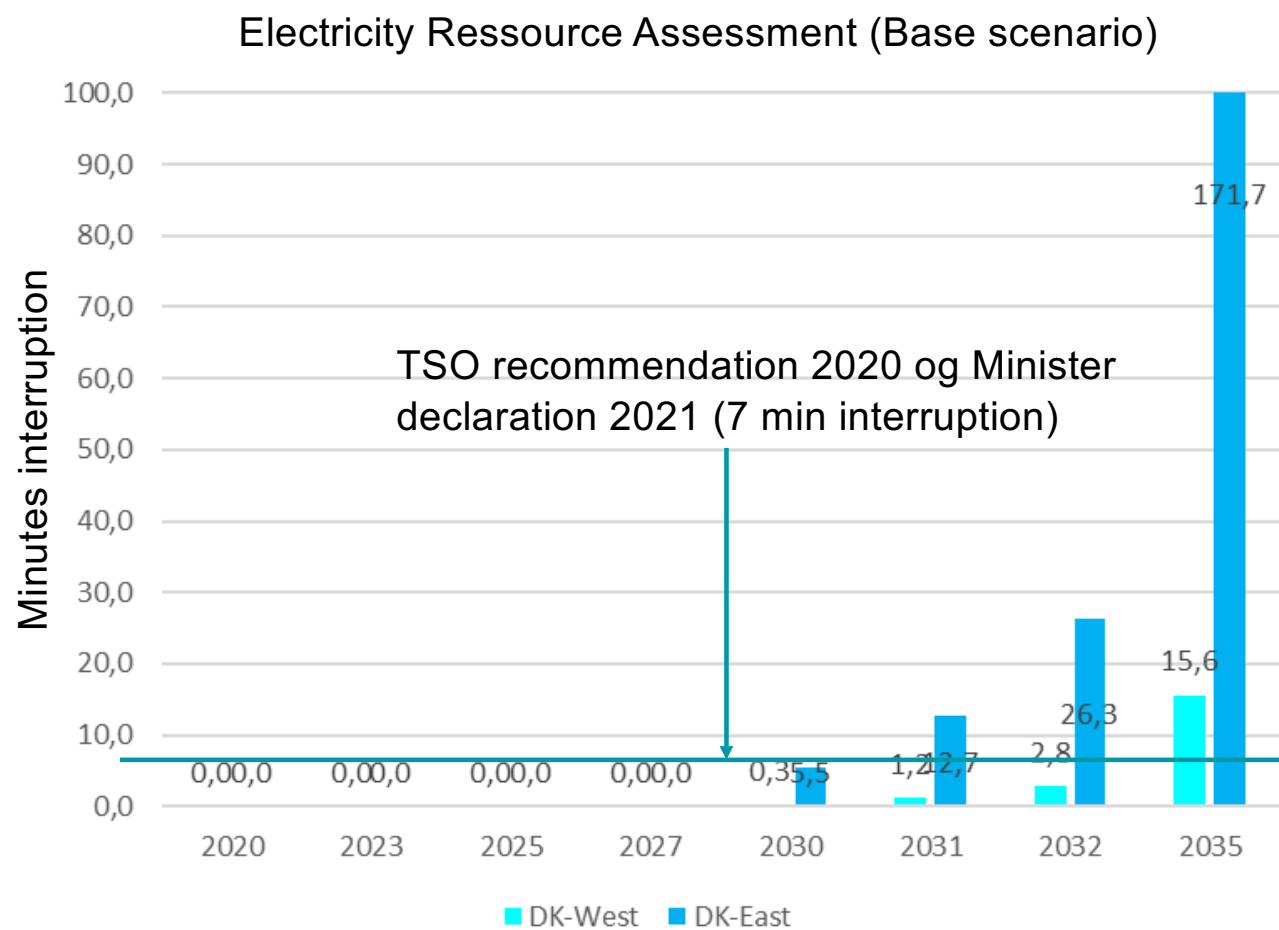
“With higher variability in supplies, power systems will need to make flexibility the cornerstone of future electricity markets in order to keep the lights on.” Fatih Birol, IEA WEO 2018

The energy system transition – Denmark

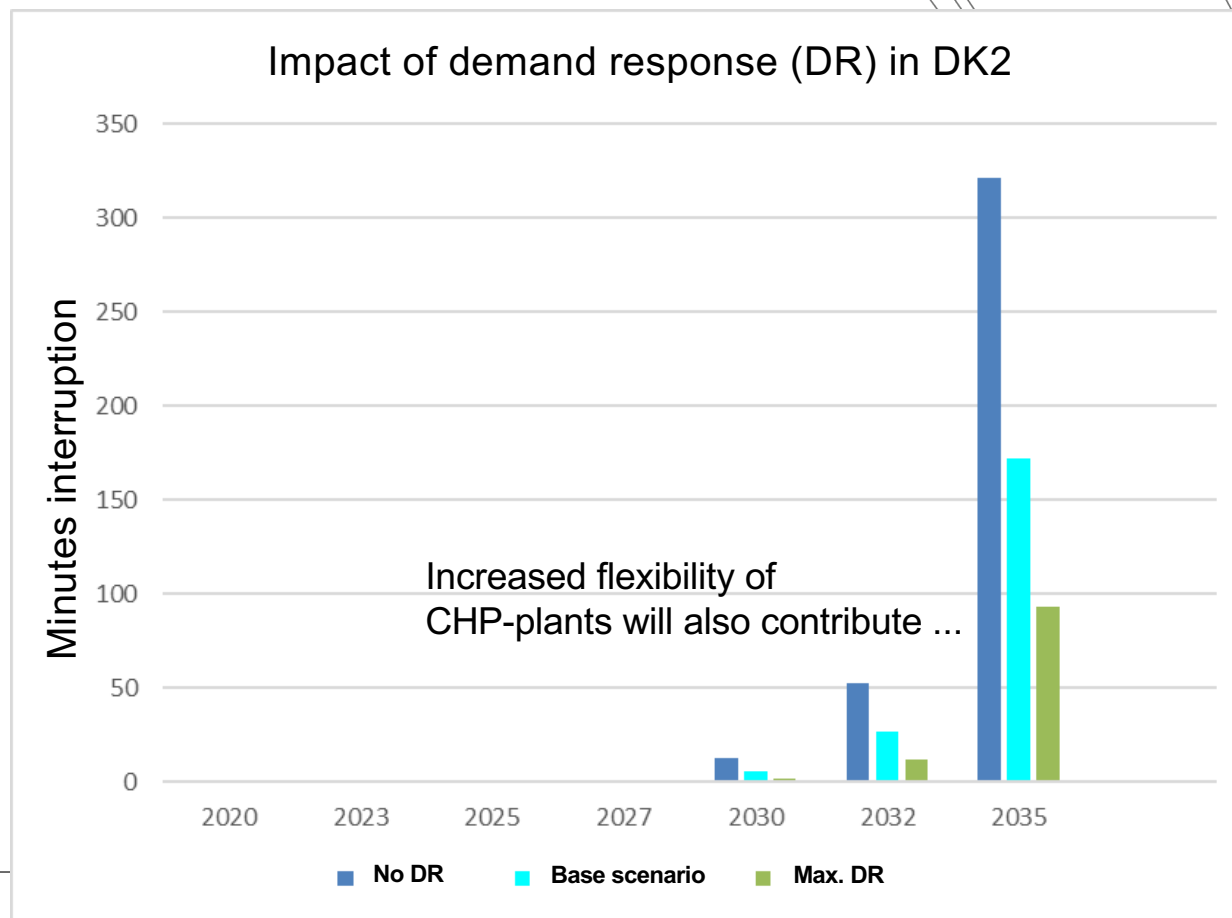


- **70%-reduction of CO₂-emissions by 2030 and 100% climate neutrality by 2050 aligned with a robust energy system in balance. Significant transition of the Danish energy system.**
- **Efficient sector coupling, digital asset management, demand response and focus on intelligent, digital customer solutions is key to reach the target by 2030 and beyond**
- **Deep digitalization to optimize market places and drive development of new digital markets and inter-actions btw utilities and customers in all intersections of the energy and utility system**

Electricity Adequacy Assessment



Demand Response – important part of the solution



Agenda

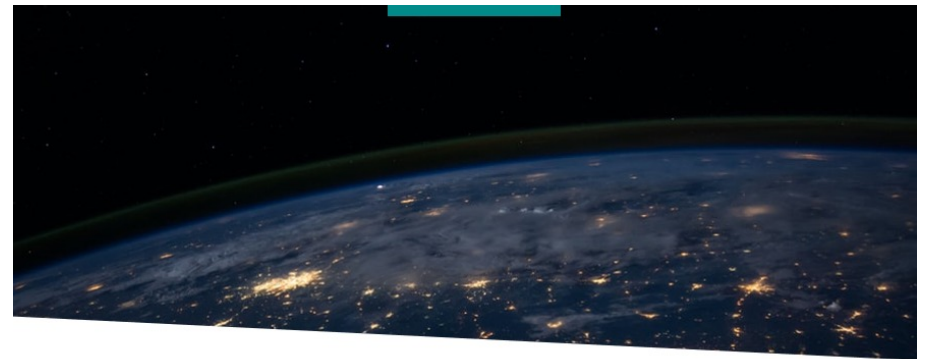
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“With higher variability in supplies, power systems will need to make flexibility the cornerstone of future electricity markets in order to keep the lights on.” Fatih Birol, IEA WEO 2018

Fair competition and data

- You can only be a green leader if you are a digital leader
- The position is to ensure free access for all market players to anonymous utility data (power, heat, gas and water) – await government strategy on digitalization
- Electricity regulation ensures 3rd. Party access through consumer approval
- New electricity law will give access to DSO-data of various kind for all players



Dialogoplæg:
Etablering af et Data Space for
energi og forsyning

ENERGINET

DANSK
ENERGI

INTELLIGENT
ENERGI

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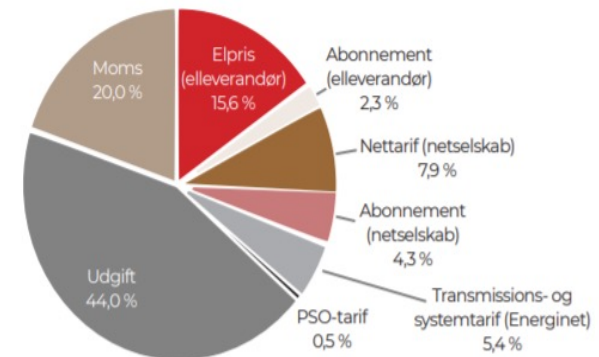


“With higher variability in supplies, power systems will need to make flexibility the cornerstone of future electricity markets in order to keep the lights on.” Fatih Birol, IEA WEO 2018

Incentivising DR through grid tariffs

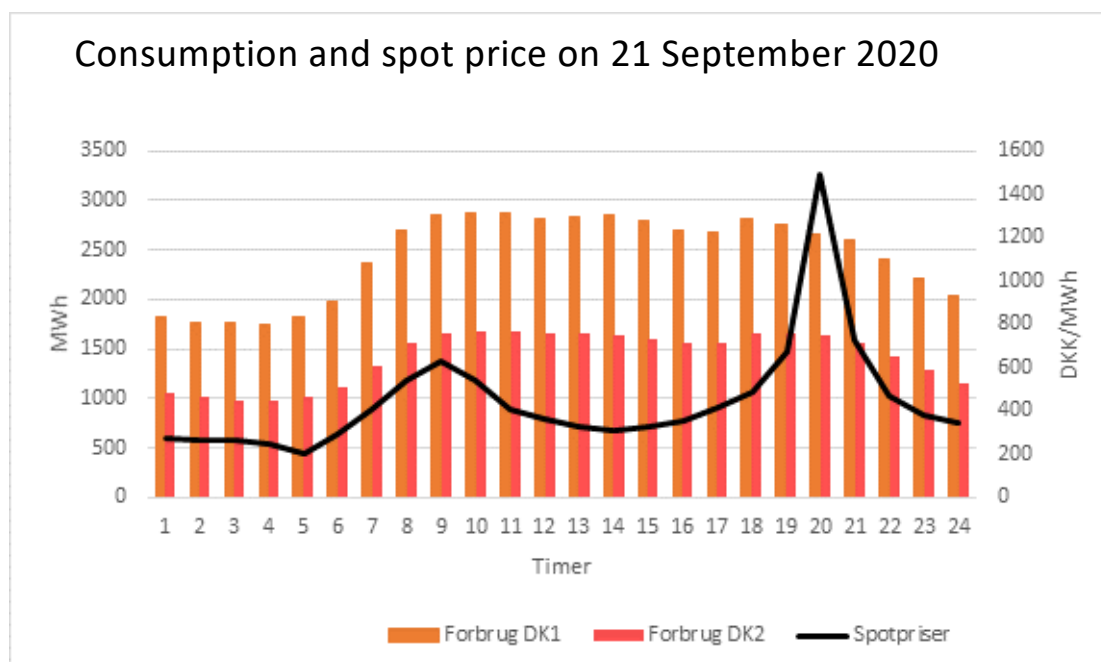
- Enhanced time-of-use tariffs (DSO-tarif model 3.0)
- P2X-agreement outlines geographical differentiation of grid tariffs
- Energinet review of all tariff elements (grid and system)
- New TSO-DSO-tarif model to be developed

Fordeling af de samlede udgifter for en gennemsnitlig C flex-kunde med et forbrug på 4.000 kWh:



Kilde: Forsyningstilsynets elprisstatistik, 1. kvartal 2021.

Intelligent monitoring increase value of energy and grid optimization – energy savings + spotprice + grid tariff optimisation



Test on tariff diff. shows that 13% of an individual heat pump's consumption today is during winter peak

I 2-ledet setup som med den aktuelle tidstarif

	kWh	Andel af total	Andel af sæson
Total forbrug	6.710		
Heraf sommer	1.850	28%	
Heraf vinter	4.860	72%	
Sommer højlast	1.850	28%	100%
Vinter højlast	4.239	1	87%
Vinter spidslast	621	9%	13%

I 3-ledet setup som fremtidsscenarie 1

	kWh	Andel af total	Andel af sæson
Total forbrug	6.710		
Heraf sommer	1.850	28%	
Heraf vinter	4.860	72%	
Sommer lav-last	815	12%	44%
Sommer høj-last	1.035	15%	56%
Vinter lav-last	933	14%	19%
Vinter høj-last	3.306	49%	68%
Vinter spids-last	621	9%	13%

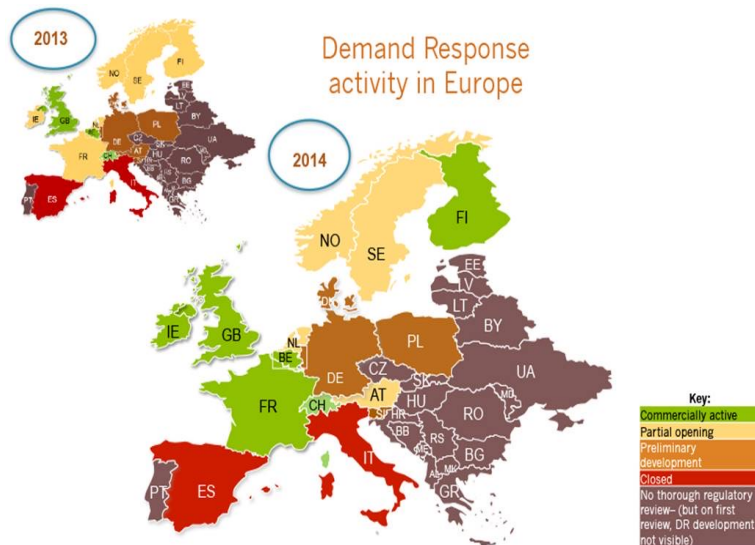
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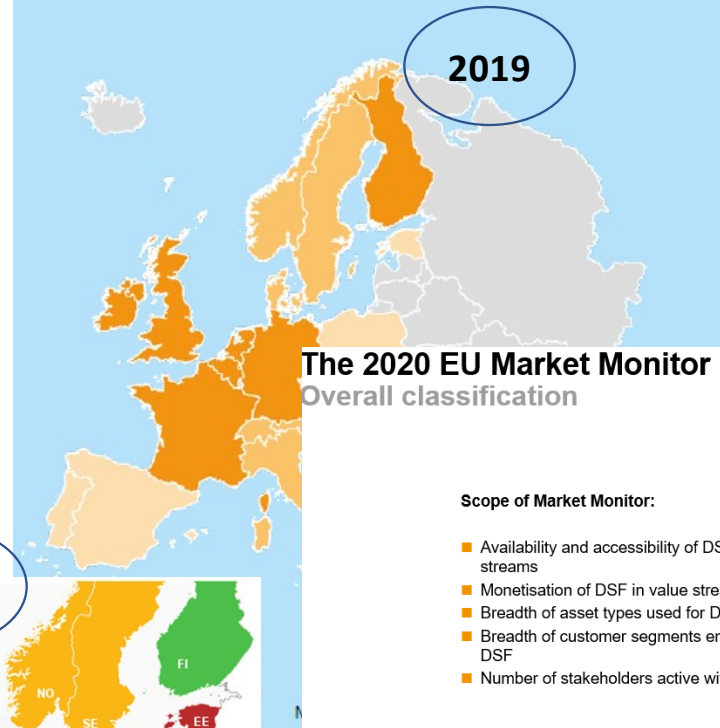


“With higher variability in supplies, power systems will need to make flexibility the cornerstone of future electricity markets in order to keep the lights on.” Fatih Birol, IEA WEO 2018

Market development



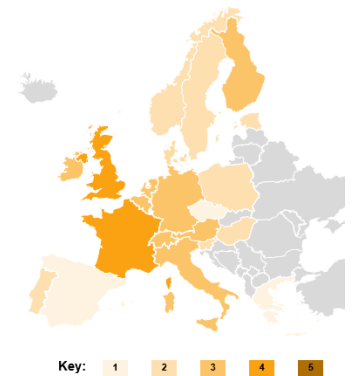
France, Great Britain, and Ireland are the highest ranking countries for market activity, followed by Germany, Finland, Belgium and the Netherlands.



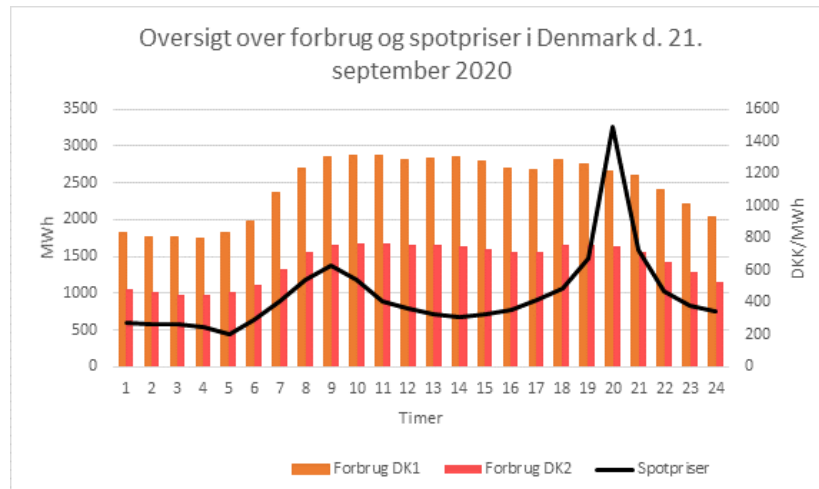
The 2020 EU Market Monitor Map for Demand Side Flexibility
Overall classification

Scope of Market Monitor:

- Availability and accessibility of DSF to value streams
- Monetisation of DSF in value streams
- Breadth of asset types used for DSF
- Breadth of customer segments engaged with DSF
- Number of stakeholders active with DSF



Price signal from the ancillary service market and the grid operators are important instruments in the cost effective green transition



Case kølekompressorer DK2

DK2 regulering		Kapacitetsbetaling mFRR DK2			
1 Mwh	Frys	Opregulering	Pris højere eller lig med	2.500 kr.	
Ar	mdr	Sum OP DK2 kr.	Sum OP DK2 timer		SUM mFRR_UpP riceDKK
2021	Feb	- kr.	0		40.320,00 kr.
2021	Mar	- kr.	0		87.189,66 kr.
2021	Apr	- kr.	0		249.155,37 kr.
2021	Maj	- kr.	0		285.303,48 kr.
2021	Jun	5.305,84 kr.	3		117.073,05 kr.
2021	Jul	3.988,28 kr.	2		44.640,00 kr.
2021	Aug		0		46.160,00 kr.
2021	Sep	1.150,35 kr.	1		43.200,00 kr.
2021	Okt	25.704,89 kr.	19		100.510,68 kr.
2021	Nov	40.361,04 kr.	34		43.240,00 kr.
2021	Dec	32.668,48 kr.	62		43.816,00 kr.
2022	Jan	18.222,03 kr.	14		35.940,00 kr.

Tarifmodel 3.0. Forbrugs fordeling	Andel - elbiler	Andel - varmepumper
Lavlast	25%	23%
Højlast – sommer	28%	17%
Højlast – vinter	29%	44%
Spidslast – sommer	8%	4%
Spidslast - vinter	10%	12%

Case eksempel – Tarifmodel 3.0.	Forbrug – kWh	Betaling ved flad tarif	Betaling ved tarifmodel 3.0	Besparelse
Nuvve – elbiler	102.701	22.573	20.678	
OK – lille varmepumpe	6.710	1.849	1.846	
Scenarier for elbilernes fleksibilitet				
50% af forbruget flyttes fra spidslast til højlast		22.573	17.597	-15%
100% af forbruget flyttes fra spidslast til højlast		22.573	14.516	-30%
100% af forbruget flyttes fra spidslast til lavlast		22.573	12.843	-38%

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Danish Intelligent Energy Alliance

Established on 13 March 2012 by Danish Energy

WHY?

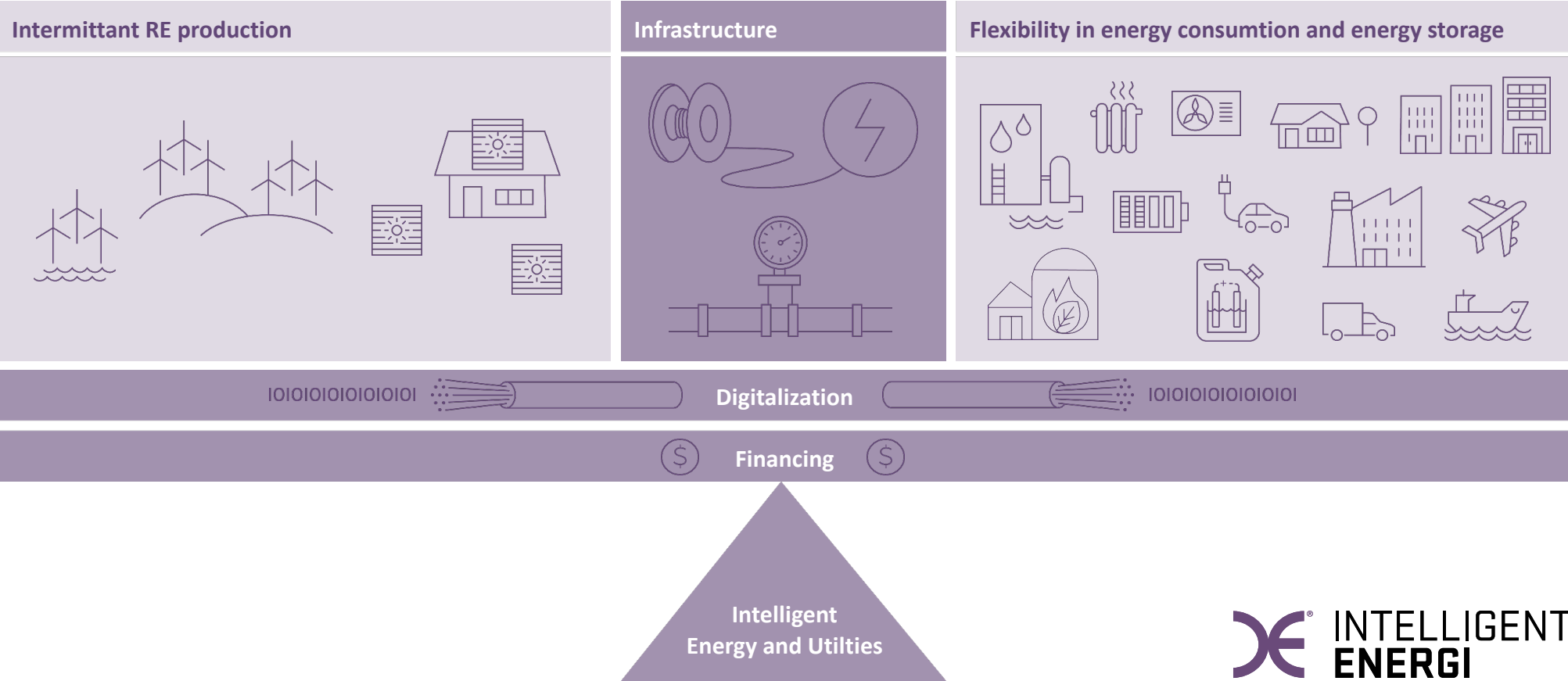
The energy system is undergoing a significant transformation due to political and technological drivers such as...

Decarbonization
Firstly through Electrification
Digitalization
The key enabler
Decentralisation
of RE production

This calls for closer cooperation between infrastructure owners and related stakeholders to develop an **INTEGRATED** and **FLEXIBLE** energy system with sector coupling to buildings, transport and industry.

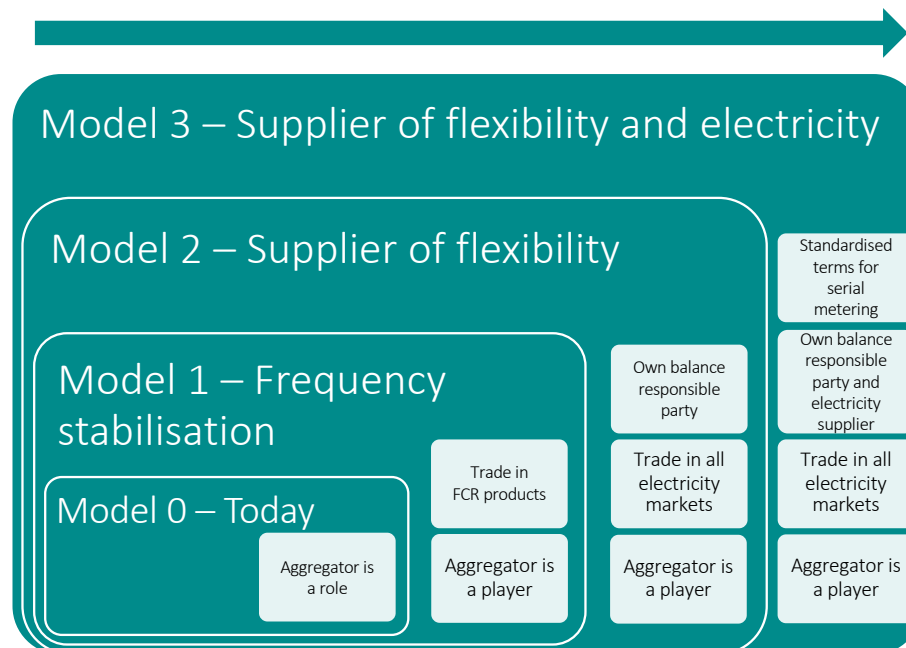


iEnergi strategy is to pave the way for an intelligent, active collaboration between all utilities, sectors and active customers. This will bring us all the way to climate neutrality by 2050 in a cost effective way through digitalized, flexible balancing between RE from wind and sun, energy consumption af energy storage



SUMMARY

- GRADUAL EXPANSION OF CO-EXISTING AGGREGATOR MARKET MODELS
- CLEAN ENERGY PACKAGE PUSHED DEVELOPMENT FURTHER ALONG



Model 1

No balance responsibility due to low or no energy amount.

Model 0 + 2 and 3

The aggregator is or balance responsibility

Consumers' point of view

And one question:

We do not see such companies delivering aggregation of DR services in the market, with benefits to all consumers. Would it be because the net benefit principle defined in the European legislation is hidden somewhere or simply absent in the Danish implementation?

Martin SALAMON

