

# THE COMMERCIALISATION OF FLEXIBILITY FROM THE DEMAND SIDE

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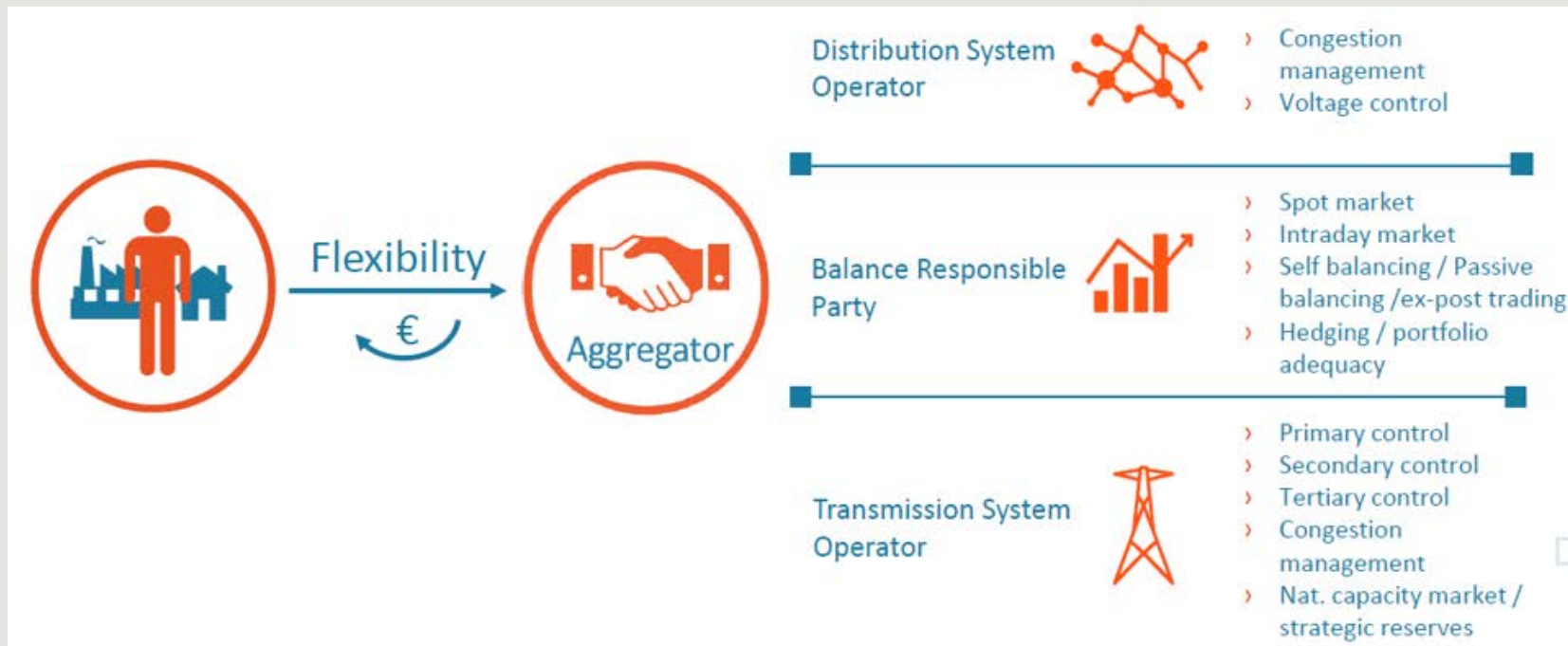
# Flexibility potential – What is out there?

## 2020+ scenarios

- An analysis by Association for Decentralised Energy found that the total amount of potential DSR in the UK in 2020 can be conservatively estimated at **9.8 GW**. This estimate includes:
  - 2.8 GW from industrial demand flexibility
  - 1.7 GW from commercial and public sector demand flexibility
- Agora Energiewende's Smart Markets study estimates the demand-side potential in DE in 2025 to around **30 GW**
- The European Commission estimates the theoretical potential at **100 GW** in 2020 and 160 GW in 2030
  - 2020 potential mainly from residential consumers
  - 2030 estimate driven by new flexible loads such as electric vehicles and heat pumps.
  - App. 30-40% can be considered technical and economic potential if market arrangements are in place

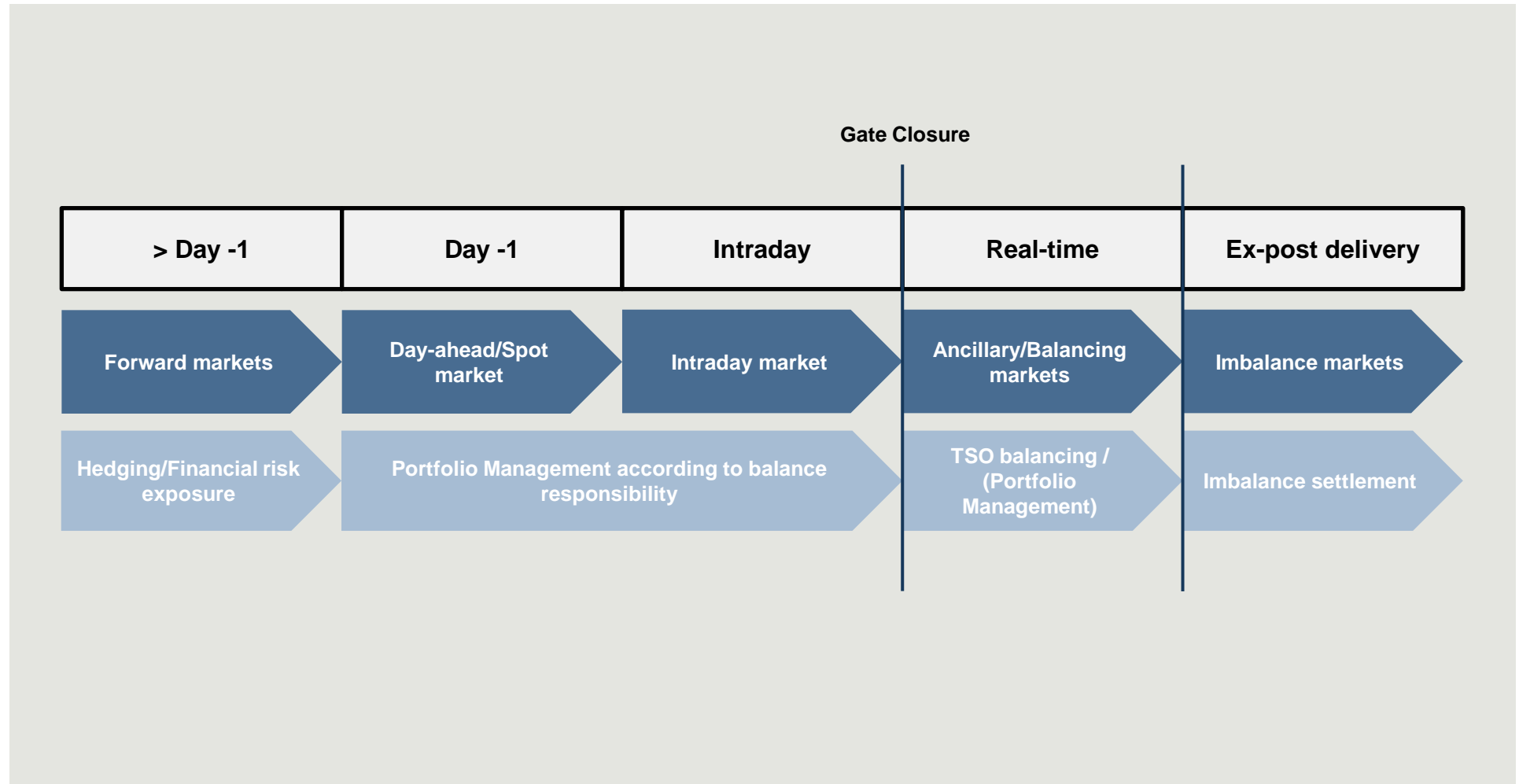
# The flexibility value chain

*Involving all relevant stakeholders*



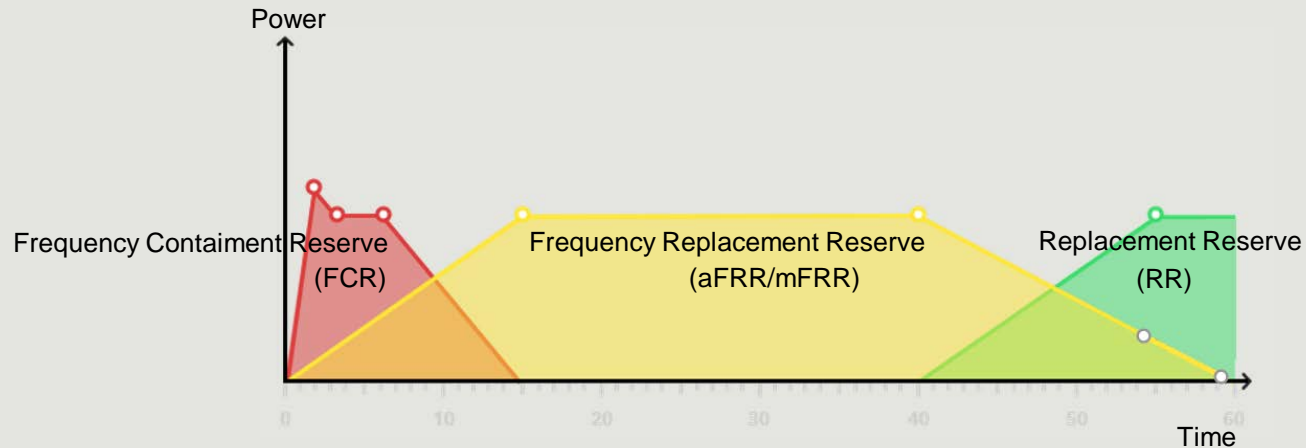
# General market design philosophy

## *Energy and balancing markets*



# Ancillary Services Markets

How TSO's balance the system with reserves – Case Denmark and Great Britain

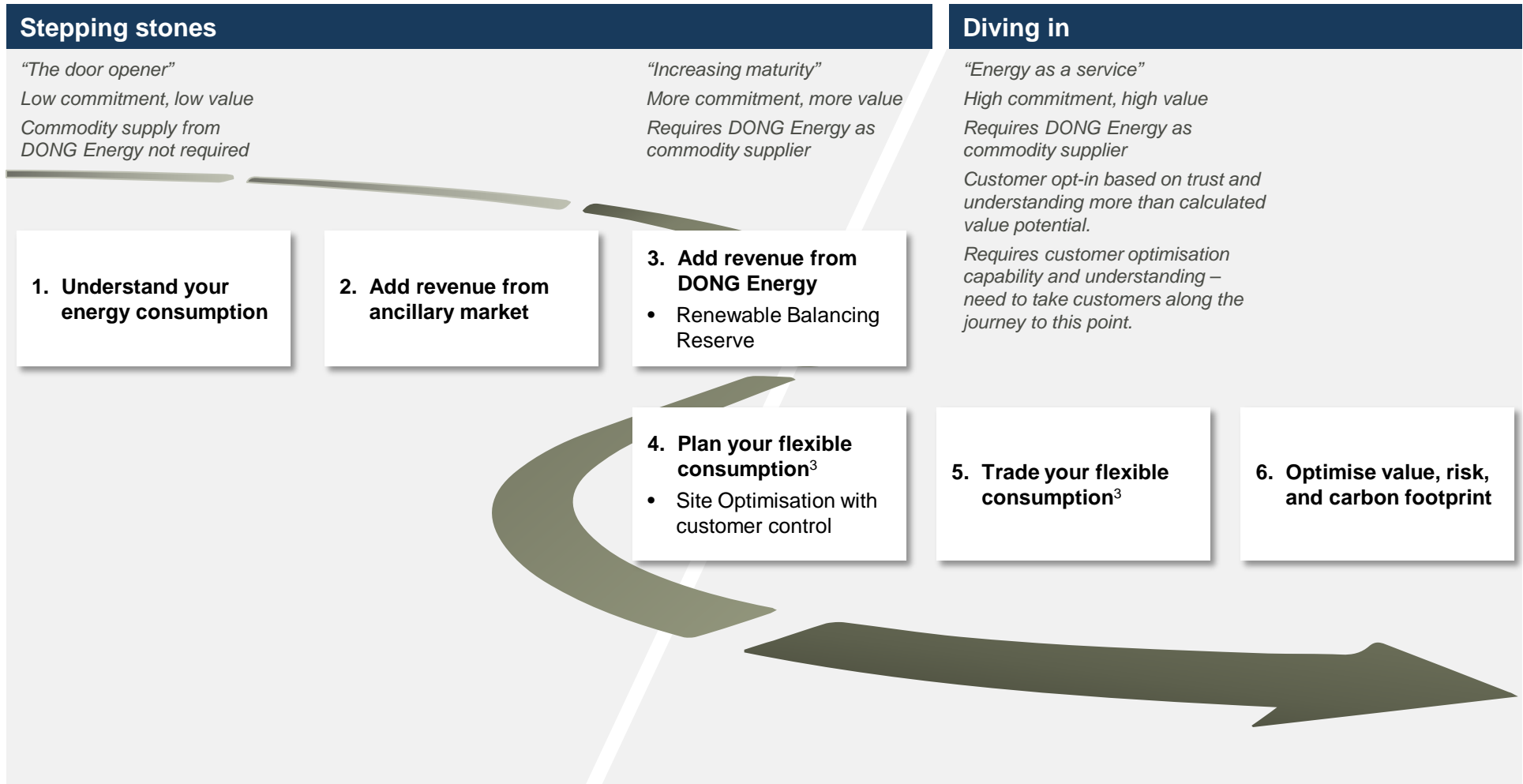


European terminology	National terminology (DK1)	Contracted volume	Others
FCR	Primary Reserve	~22 MW	Min. Bid Size: 0,3 MW
aFRR	Secondary Reserve	~100 MW	Min. Bid Size: 1 MW
mFRR	Tertiary Reserve / Regulerkraft CMO	~870 MW	Min. Bid Size: 10 MW

European terminology	National terminology (GB)	Contracted volume	Others
FCR	Firm Frequency Response	~180 MW	Different response sub-requirements
FCR	Enhanced Frequency Response	~ 200 MW	Sub-second response – designed for batteries
FCR	Frequency Control by Demand Management	N/A	Bilateral agreements only
FRR	Fast Reserve	~2400 MW	
RR	Short-Term Operating Reserve	~3000 MW	Oversubscribed and very competitive
RR	Demand Side Balancing Reserve	~300 MW	Phased out from winter 16/17

# The customer journey begins with low commitment solutions

## *The future of flexibility product development*



[1] Typical asset size is 3 MW

[2] Typical power consumption and/or generation is 25 GWh per year

[3] Consumption and embedded generation

# Demand contributes to system stability and security of supply

## Case study from the Faroe Islands

- Large industrial customers in Faroe Islands providing sub second FFDR (Fast Frequency Demand Response) for the system operator SEV
- Incentive is security of supply, mitigating risk of losing embryonic fish stock, etc.
- Part of the Micro Grid energy management system

### Kollafjord Pelagic

Receives freshly caught fish and freeze it. The facility in Kollafjørð is one of the world's largest and most advanced processing facilities for human-consumption pelagic fish.

(4200 kW cooling compressors)



- Cloud-based system planning and scheduling performed by Power Hub central optimisation engine
- Response activation done locally on site by Remote Terminal Units with embedded Power Hub intelligence
- Faroese system operator, SEV, documented at least 4 prevented black outs in 2014 by activating FFDR

# Introducing Renewable Balancing Reserve in the UK

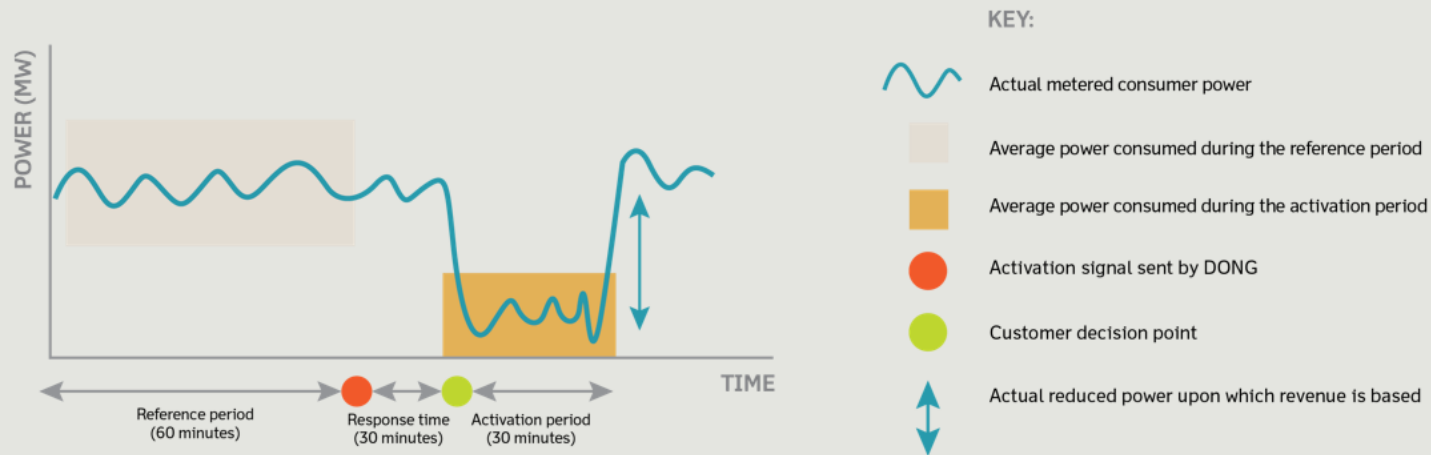
Offering flexibility products to the customers



Renewable Balancing Reserve is a new demand management scheme that enables DONG Energy customers to build a new revenue stream, by taking a share of our reduced system balancing costs



By reducing consumption or switching to onsite generation when requested by DONG, you can help us to balance intermittent renewable generation whilst earning revenue for every MWh you haven't taken in supply





# Renewable Balancing Reserve

*How does it work?*

**Renewable Balancing Reserve operates via an online portal, which is very simple to set-up and use:**

Set the times in which you can participate, and the minimum price you are willing to accept

We alert you the times to reduce your consumption, and the revenue available to you

You confirm whether you are able to participate during these times

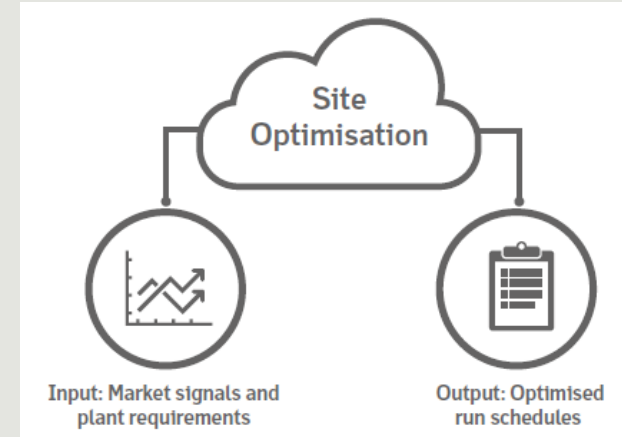
You receive payment according to the actual consumption and imbalance price



# Site Optimization

*Asset operation guideline to lower the overall energy cost*

- Cloud based solution to calculate the optimal run schedule for an operating plant
- Analysis of market signals, such as wholesale energy prices, in relation to operating constraints and asset availability
- Day-ahead (5 days ahead) run schedules that are optimised towards the half-hourly forecasted spark spread

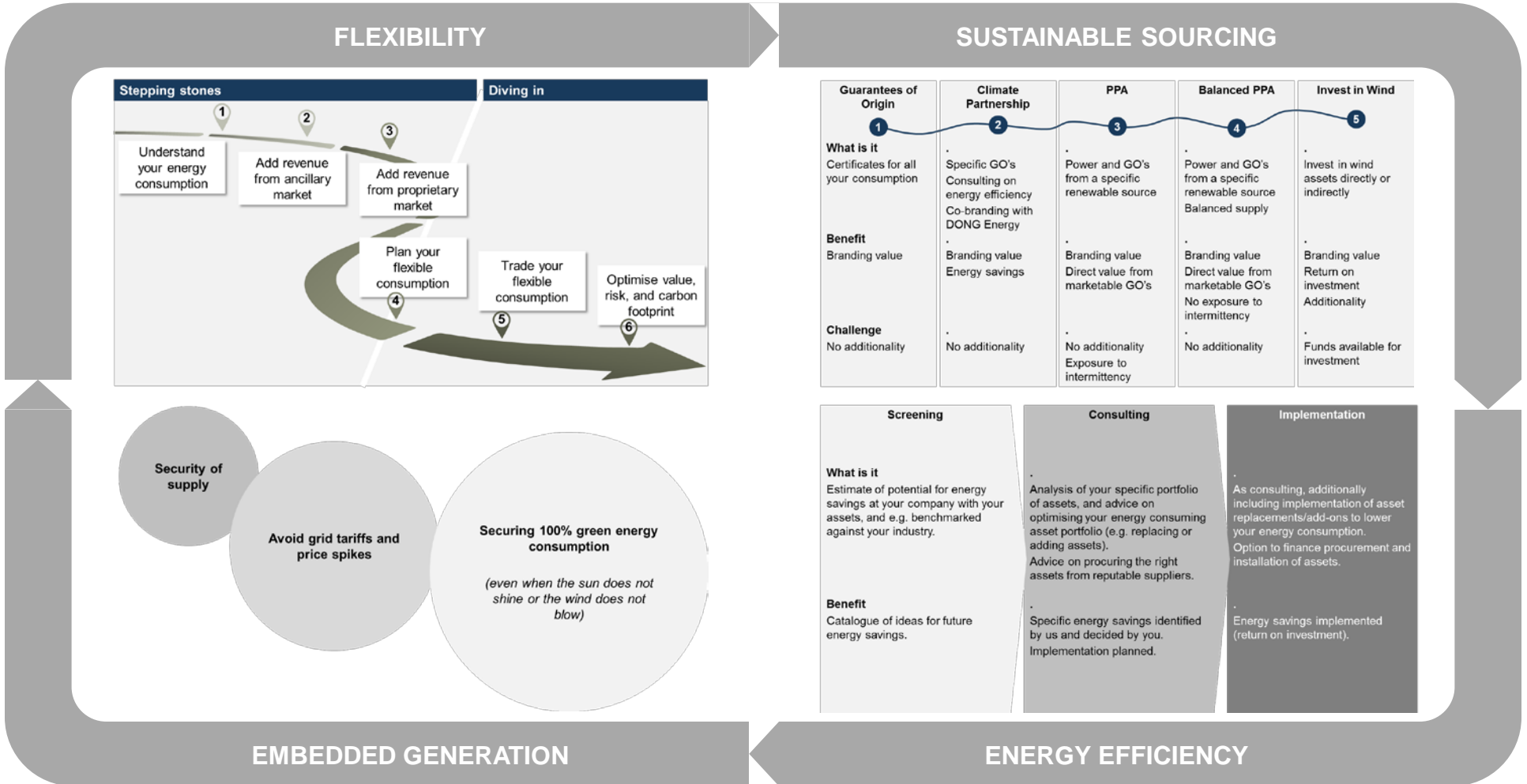


**Kodak alaris**

- Kodak Alaris manufactures photographic and imaging equipment
- Need for a strategy that used generation and consumption assets in the most efficient way to reduce energy costs
- 11% saving in energy costs as well as increase in operational performance

# Energy as a Service – A new business area

Several customer offerings compiled into one journey



**Thank you!**

# Backup

# Dong Energy's aggregator platform Power Hub

## How to manage flexibility by aggregation

- Combining physical, financial and contractual optimisation
- Planning and scheduling up to 5 days ahead
- Energy trading and reserves activation within day of operation is also done

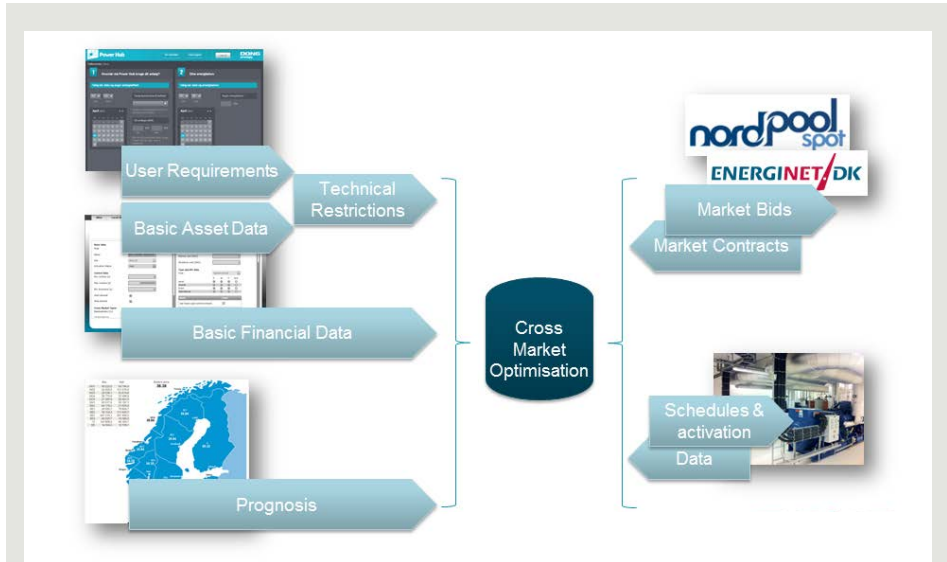
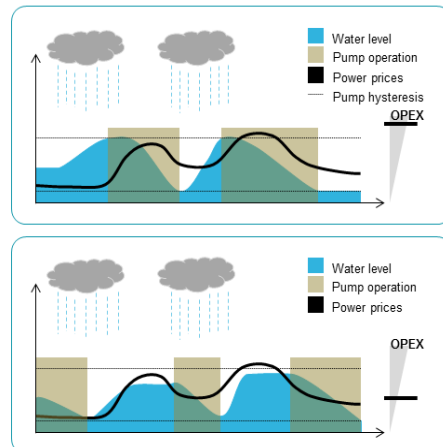
**TRADITIONAL PUMPING FACILITY CONTROL SCHEME:** hysteresis based

- Convenient (easy to understand)
- Reactive measures
- OPEX sensitive to fluctuating power prices



**VPP INTEGRATED PUMPING FACILITY**

- Price optimal and predictive
- Proactive measures
- OPEX reduction due to fluctuating power prices



- IT system run on site or as a cloud-based service
- Control system integration and require a robust communication infrastructure may be needed
- Power Hub links the customer to the energy and reserve markets

# Clarity is needed to enable the full potential of flexibility

*The challenges to enable the full potential of demand side flexibility are not technical*

- The business case is not good in most cases
- Many regulatory barriers are identified and addressed by policy makers in their market reform initiatives

## Implementation of measures proposed in the market reforms

- Market Reforms in UK, DE, DK etc
- EU Winter Package and Balancing GL
- Facilitate independent aggregation

## Standardized role model

- Standardized business processes and contracts e.g. USEF
- Facilitation of harmonized markets

## The role of the DSO

- Encourage use of flexibility on market terms to solve congestions
- Review network tariff structure



## Improved business case

- New products and services to the customer
- Less risks for the strategic business case due to more regulatory stability
- Liquid markets for flexibility (e.g. intraday)

# Barriers for integrating Demand Response

## *Challenges in existing market design*

### **Relationship between market players**

- Streamlined contractual and process setup between customer, supplier, aggregator, BRP, TSO and DSO
- Ensure transparency and privacy
- Fair transfer of energy and financial risks

### **A one size fits all solution for all countries seems not feasible**

- Industry and customer segments with different profiles
- Joint approach is needed to ensure a certain compatibility of national models
- Different national interests and regulation

### **Adequate measurement and verification methodologies**

- Appropriate metering and sub-metering setup
- Baseline methodologies

### **Market access**

- Technology agnostic product requirements
- Review markets in terms of bid size, duration and gate closure
- TSO approval of an aggregator's portfolio as a single unit



# Renewable Balancing Reserve

*How does RBR compare with other demand side schemes?*

	Commitment free	Notice period	Ease of participation	Volume restrictions	Penalty free	Scheme availability
National Grid Demand Side Balancing Reserve	✗	2 hrs	Formal bid process	Restricted	✗	Peak demand only
Capacity Market Demand Side Response	✗	2 hrs	Formal bid process	Restricted	✗	Peak demand only
DECC Electricity Demand Reduction	✗	N/A	Formal bid process	Restricted	✗	Peak demand only
Short Term Operating Reserve (STOR)	✓	Up to 4 hrs	Formal bid process	Restricted	✗	Peak demand only
<b>DONG Energy Renewable Reserve</b>	✓	5 mins – 50 mins	<b>Fully flexible: participate when you wish</b>	<b>No restrictions</b>	✓	<b>Throughout the year</b>

**Renewable Balancing Reserve uniquely provides a commitment and penalty-free opportunity, that is available all year round**