

Demand response – An industry perspective



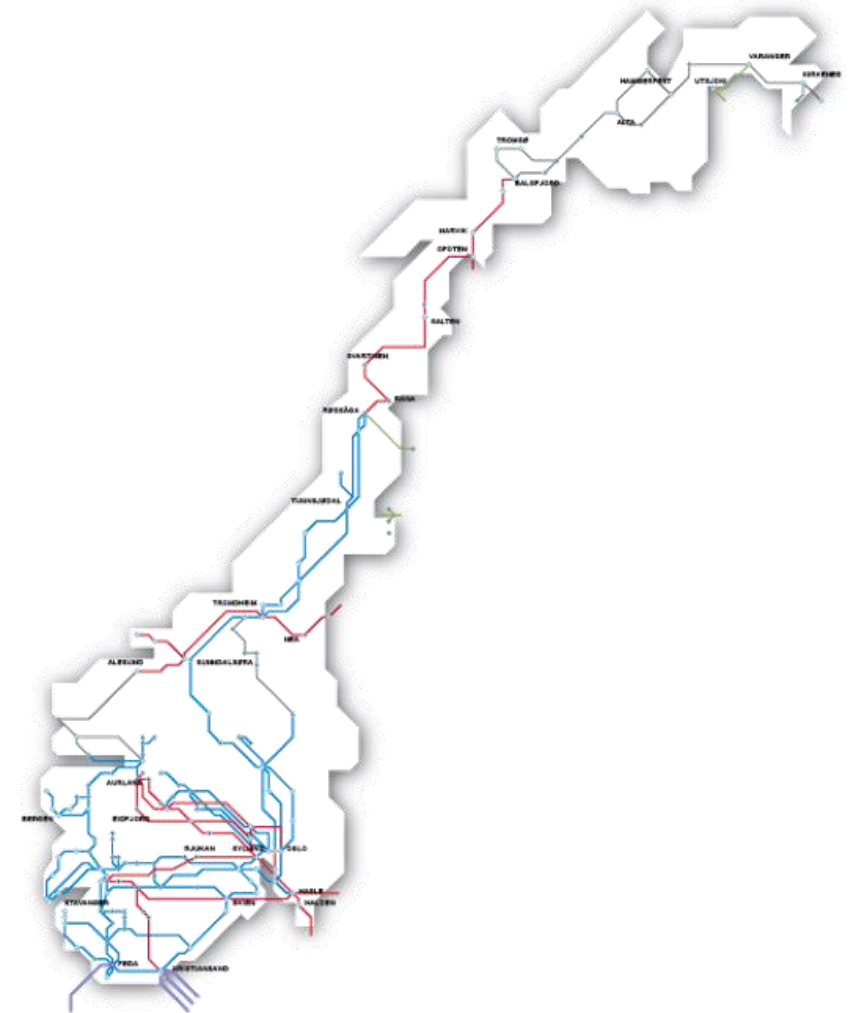
Kari Dalen

Senior Advisor

Reserves and Flexibility Statnett

About Statnett

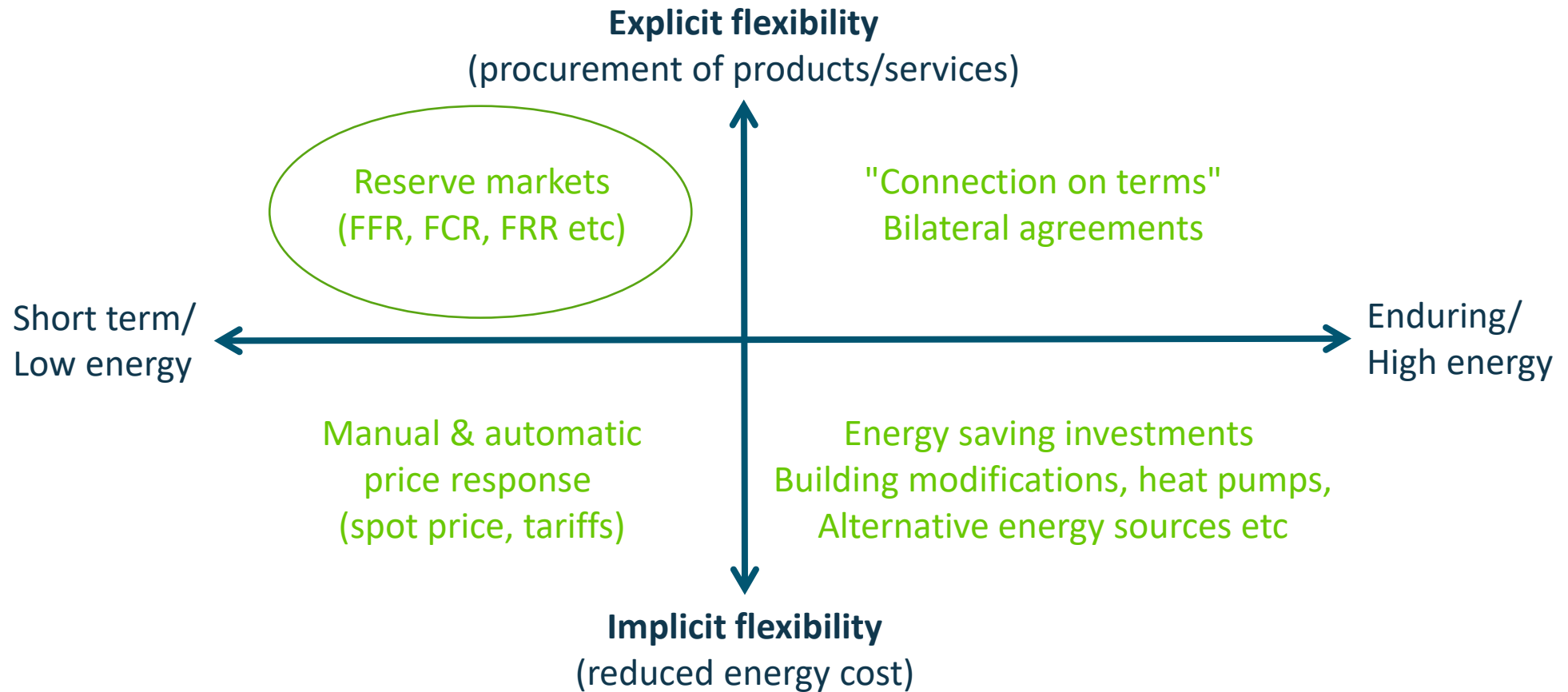
- Statnett is the system operator of the Norwegian power system
- Statnett operates around **11,000** km of high-voltage power lines and **180** substations and **2,900** km of subsea and land cables
- The National and Regional Control Centres continuously monitor the grid to ensure stable power supply
- Statnett is also responsible for interconnectors to Sweden, Finland, Russia, Denmark, the Netherlands, Germany and UK



The need for flexibility is increasing

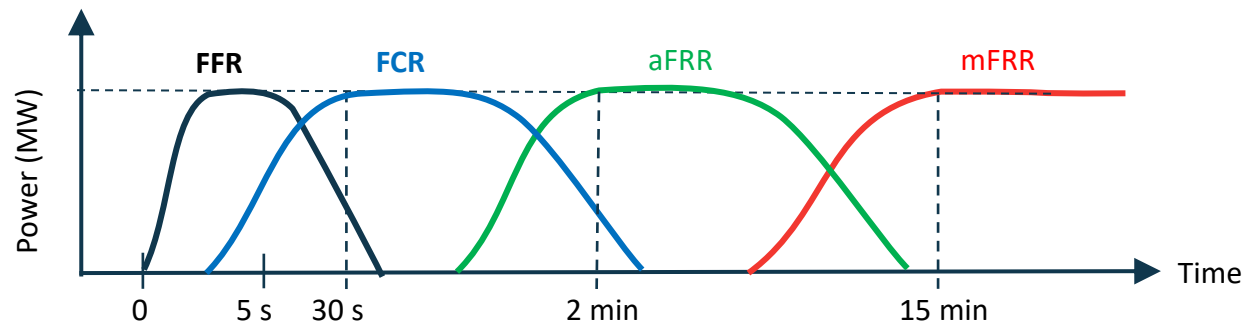
- The European power system is experiencing the greatest transition ever
 - More renewable power results in large and fast changes in flow and balance
 - Implementation of common European regulation for markets and system operation
 - More automated system operation
- *Sufficient flexibility in the power system is crucial in order to balance the system, handle bottlenecks and incidents in the power system, as well as provide grid connections faster and reduce/postpone investments in the grid.*
- Today, hydropower is Norway's primary tool to ensure stability in the grid. Currently, it is almost exclusively the regulation of hydropower which ensures the balancing of the Norwegian power system.
- *Flexibility on the demand side – demand response – will become more important and valuable in the future due to the extensive changes in the power system.*

Flexibility categories



Statnett uses markets as of tool for attracting and using flexibility to balance the power system

Different markets and products, with different requirements to participation, response time and duration of the service



- **Fast Frequency Reserves (FFR):** 0,7-1,3 sec response time; 5-30 sec duration
- **Frequency Containment Reserves (FCR-N og FCR-D):** 30 sec response time; minimum 15 min duration
- **Automatic Frequency Restoration Reserves (aFRR):** Full response within 2 min; duration for the period(s) the bid concerns
- **Manual Frequency Restoration Reserves (mFRR):** Full response within 15 minutes; duration for the period(s) the bid concerns
- <https://www.statnett.no/for-aktorer-i-kraftbransjen/systemansvaret/kraftmarkedet/reservemarkeder/>

Having a dialogue about Statnett's reserve markets

Flexibility



mFRR

Requirements



Flex



mFR-
what?



Customers
with
consumption



New common Nordic model for balancing of the Nordic power system is under implementation

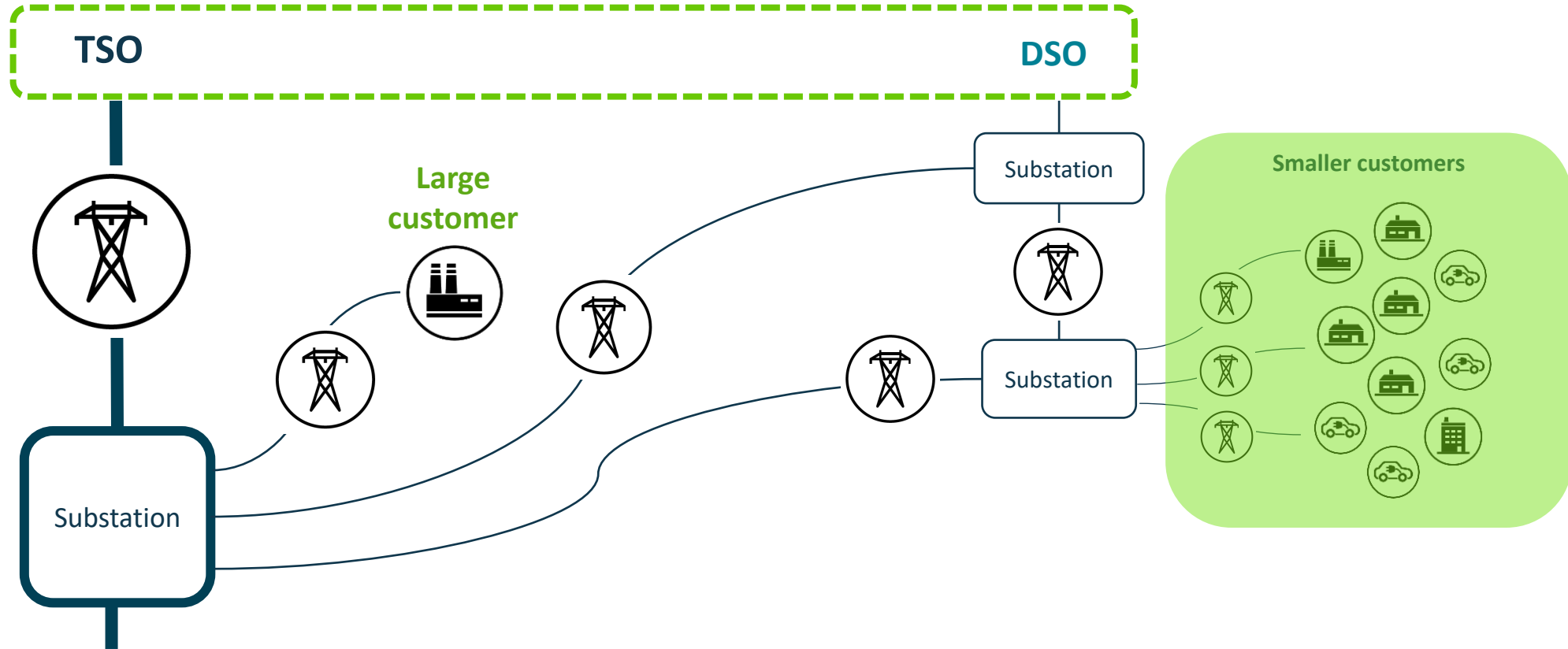
- The development of the power system demands an alteration of today's tools for power system balancing
 - From operator to machine driven > Estimation of balancing needs, automated activation
 - Need for larger volumes with a larger geographical distribution
- This is a large restructuring, which affects not only Statnett/TSOs, but the whole power business
- Statnett and market parties currently implement new international market solutions with a high degree of standardisation
 - Automated Nordic activation market for tertiary reserves (mFRR)
 - New capacity markets for tertiary reserves (mFRR)
 - Common Nordic capacity market for secondary reserves (aFRR)
 - Integration with European balancing platforms (MARI and PICASSO)

Summary: The power business including Statnett needs ICT students!

Most customers are situated in the distribution grid

Transmission System Operator

Distribution System Operator



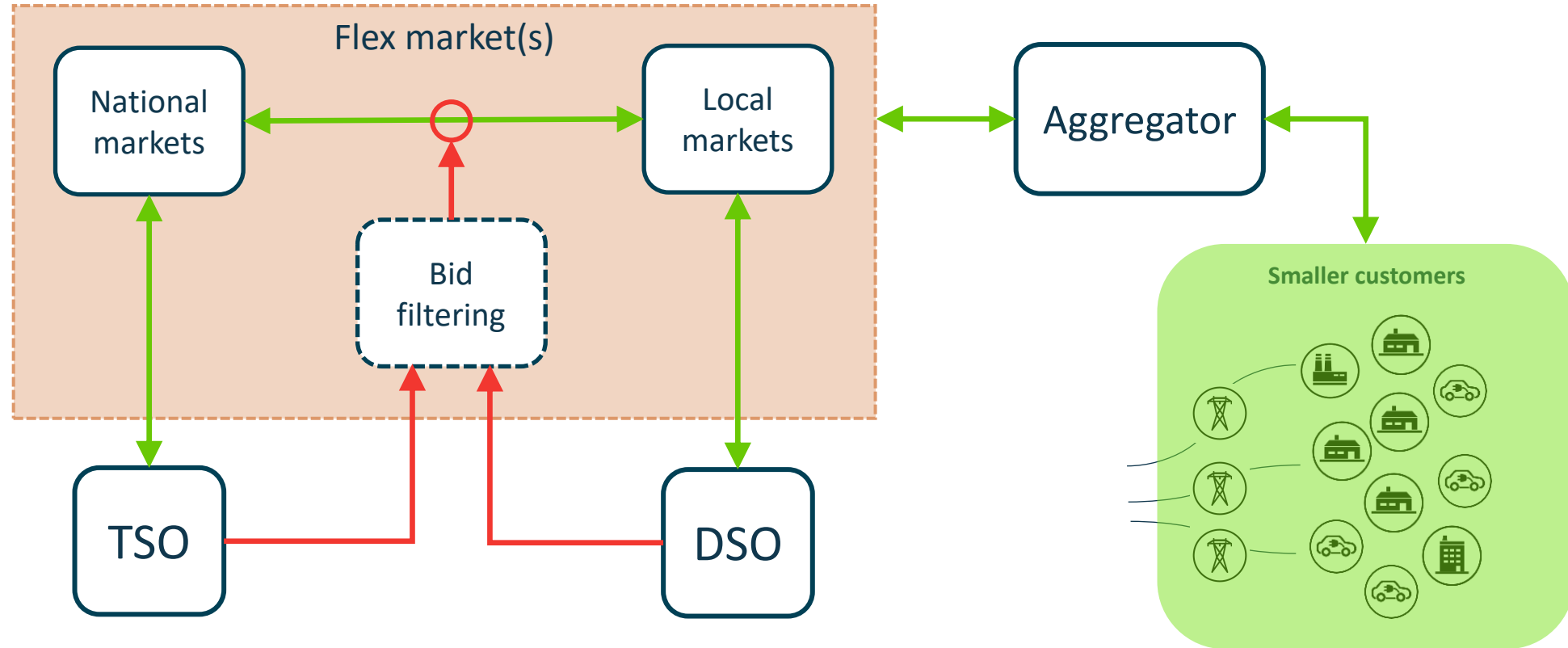
It's necessary that DSOs and TSOs coordinate their activation of flexibility

DSO

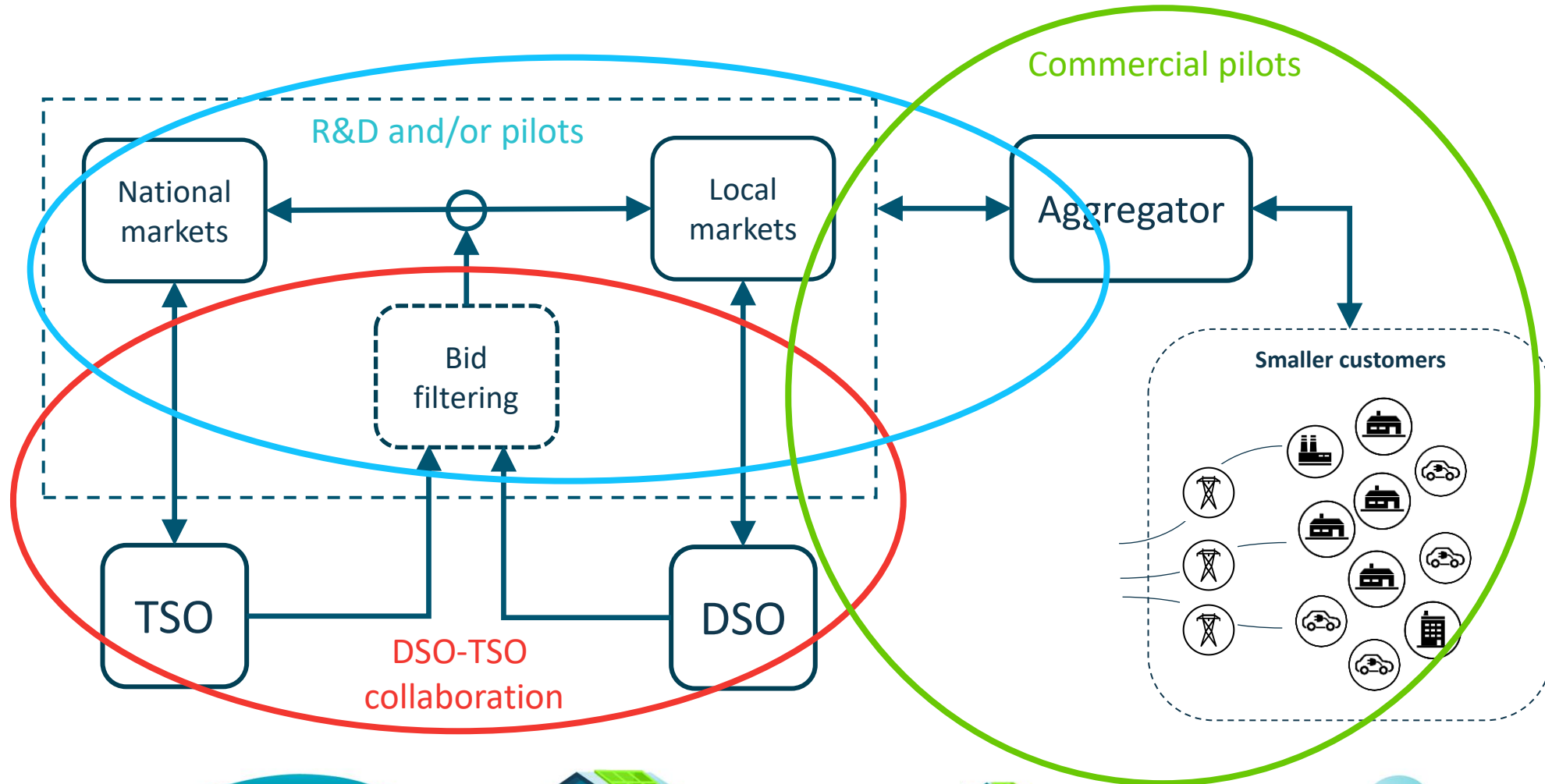
	Needs activation	No impact	Negative impact
Needs activation	OK	OK	NO
No impact	OK	-	-
Negative impact	NO	-	-

TSO

High level concept for flex value chain



Coordinated engagement on three arenas



Summary

- The European power system is going through it's largest restructuring ever
- The changes in the power system drive changes in how we operate the power system – manual tools are not sufficient anymore
 - Need for automation of the balancing: New ancillary service products, markets, processes
- Statnett works in order maximize available capacity as explicit flexibility which can be ordered and activated according to the need in the power system
 - R&D, pilots, external dialogue and workshops
- Most of the small scale flexible resources are connected to the distribution grid
 - Well-functioning cooperation and coordination between TSOs and DSOs is crucial
- **The transition currently happening in the power system makes ICT-students very (super) relevant!**



Ledige stillinger | Statnett

Thank you!

