

Business Potential

How Will V2G Play a Role on Distribution System Level

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Outline

- What distribution system services (DSSs) can be expected?
- Can money be earned of it?
- How will the collaboration between services work?

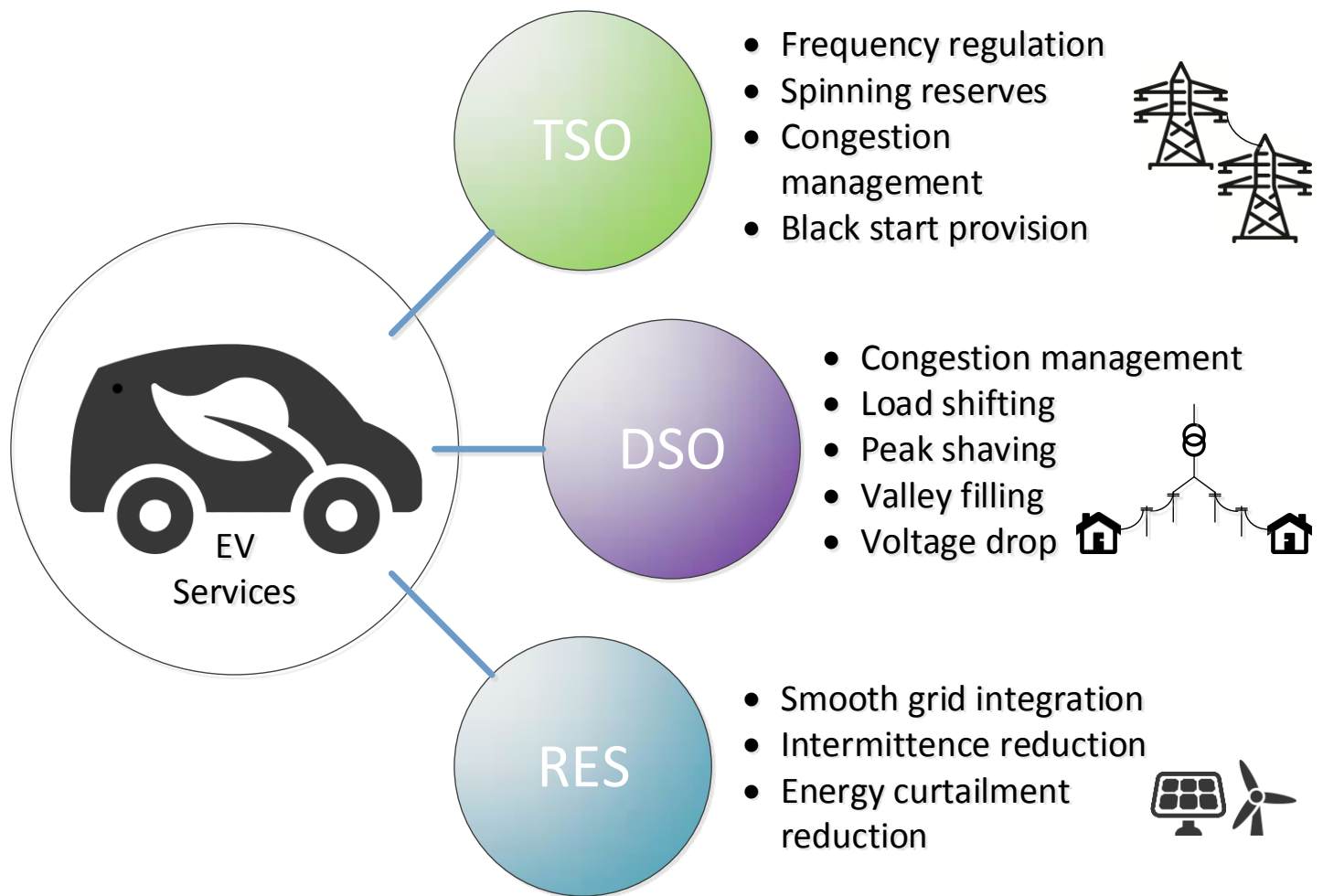


- **Which services can be expected from EVs?**

Almost all services that are provided now by other ancillary service providers.



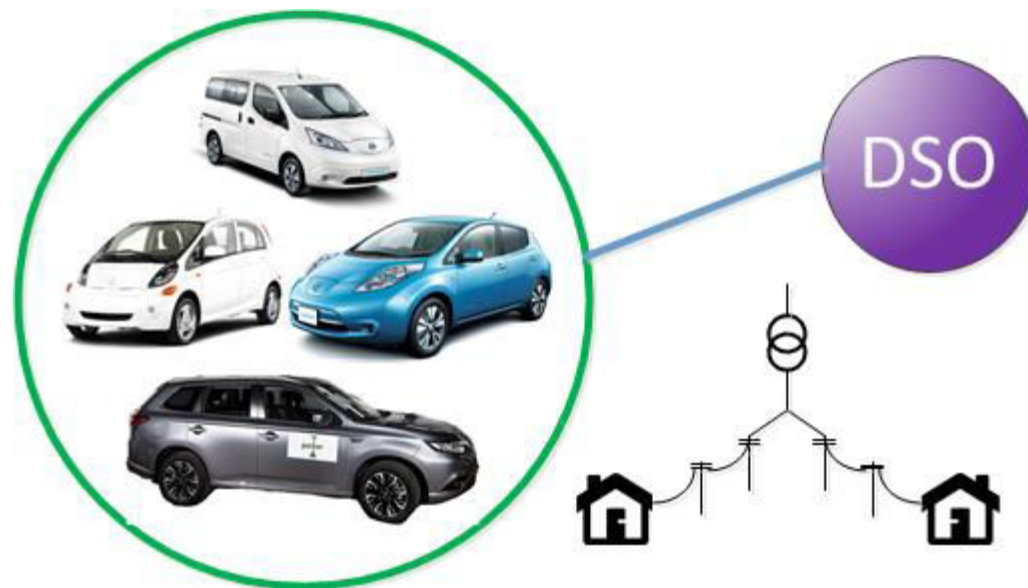
Services provided by EVs to power systems



➤ Active power support

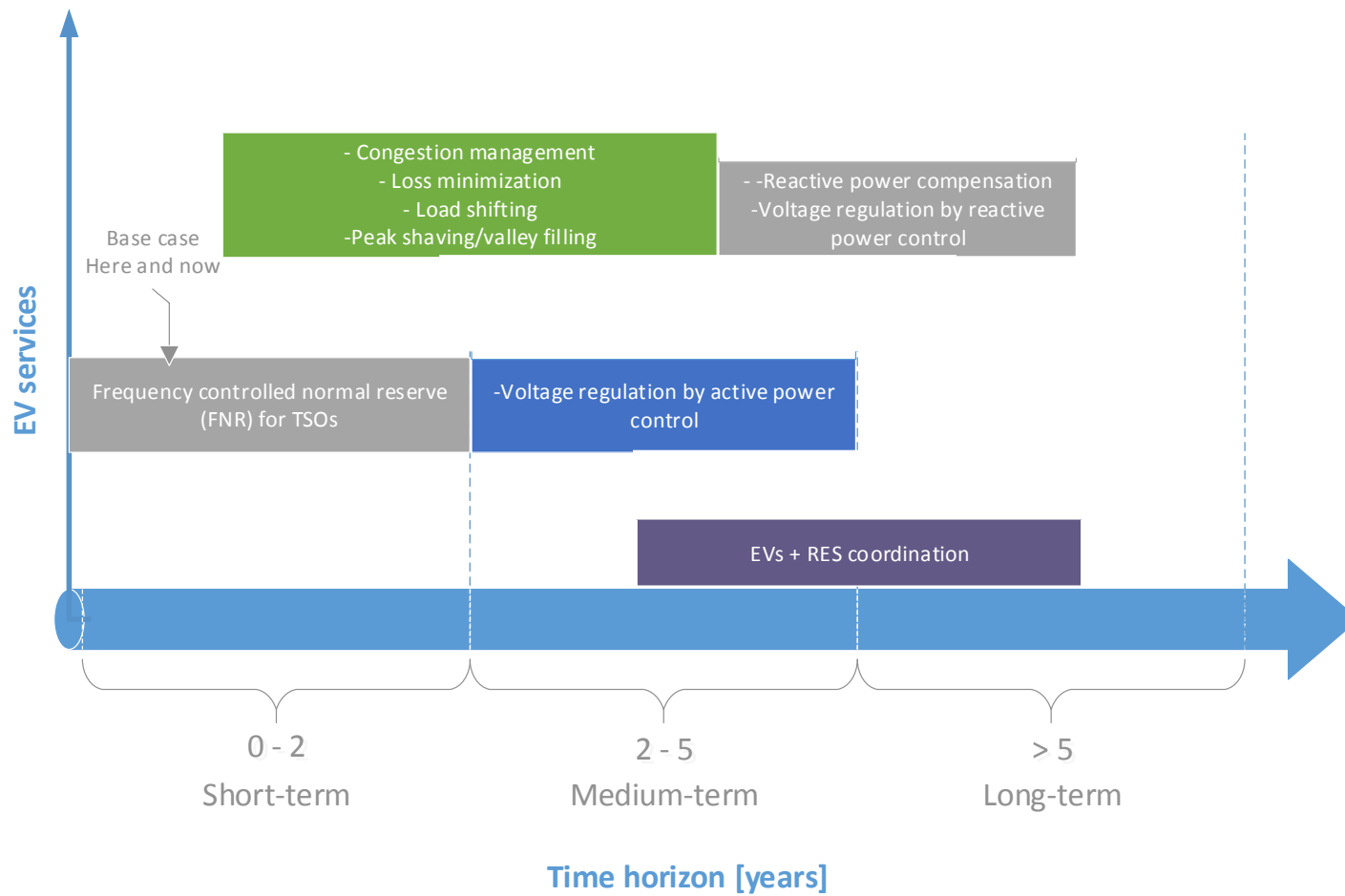
- Congestion management
- Load shifting
- Peak shaving
- Voltage control

➤ Reactive power support





The Maturity in the EV-DSS Implementation



- **Can money be earned of it?**

Yes,

How much? it is very case sensitive.





Potential Business Solutions

- Postpone/eliminate DSO investments for the grid upgrade
- Minimize power losses in the network
- Extra earning through new market for reactive power provision in renewable-based power systems



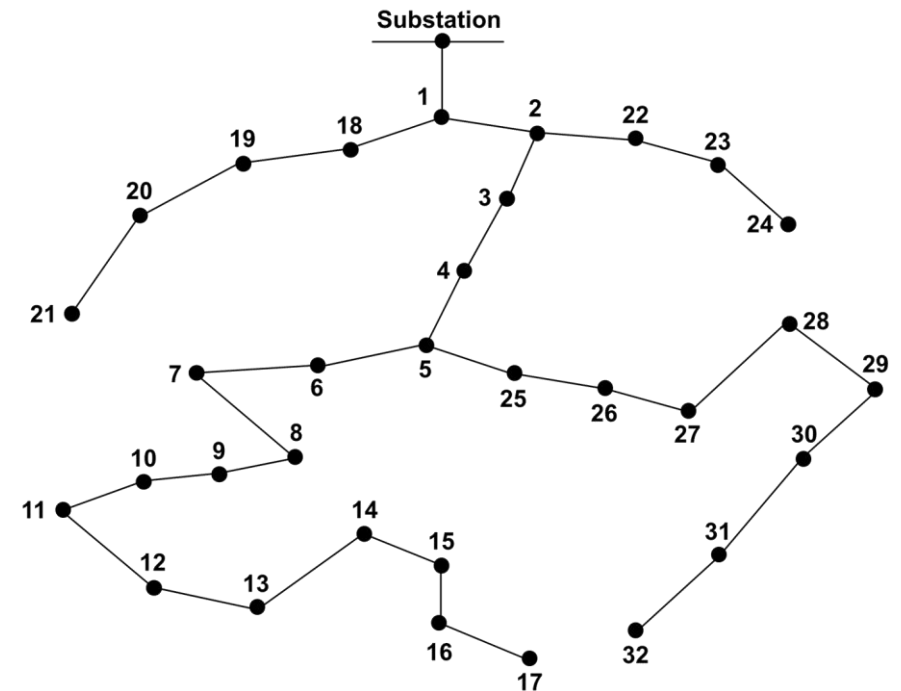


Few Examples of Potential Earnings

Flexibility provision: the potential monthly revenue by providing flexibility to a DSO MV/LV transformer can be up to 700 DKK/month. (study done by Insero)

Reactive power provision: with efficient chargers, EVs are able to minimize the grid losses. (around 1000 DKK/month)

Reactive power provision: increase EV penetration from 100 to 150 EVs (30% penetration), 50% more EVs in the grid, without DSO new investment.



- **How will the collaboration between services work?**

A DSS can be provided individually, in combination with other DSSs, or in combination with the transmission system services.



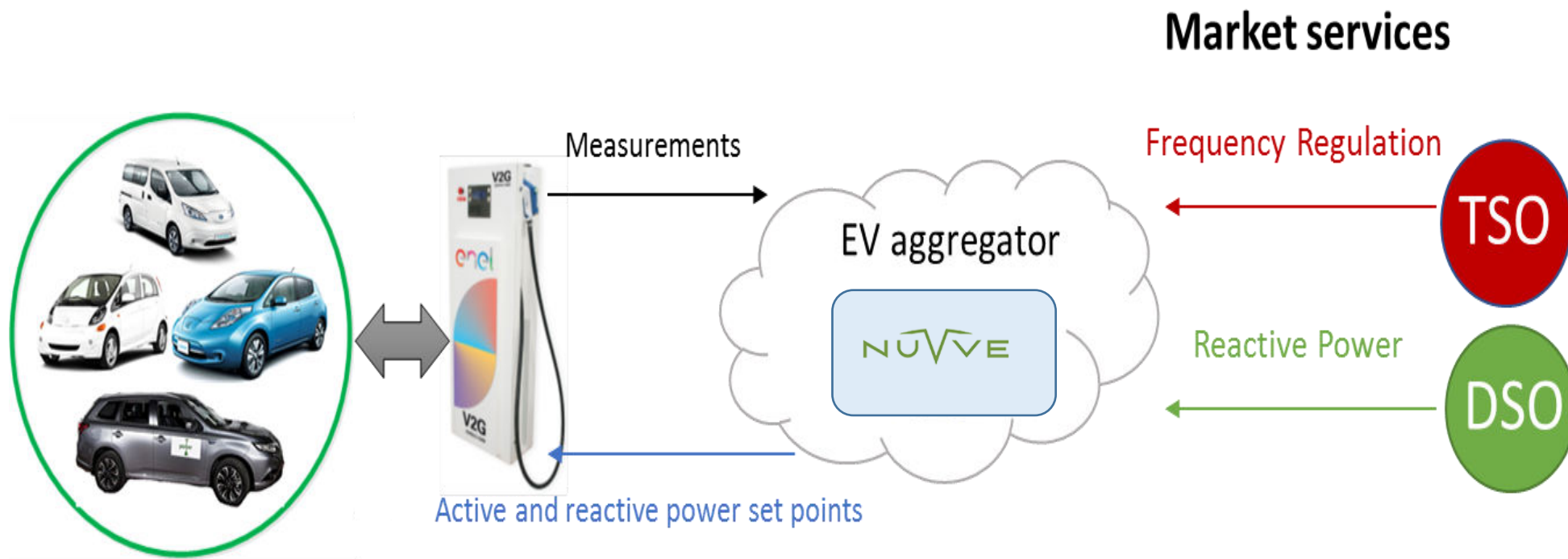


Assessment of the Stackability of DSS

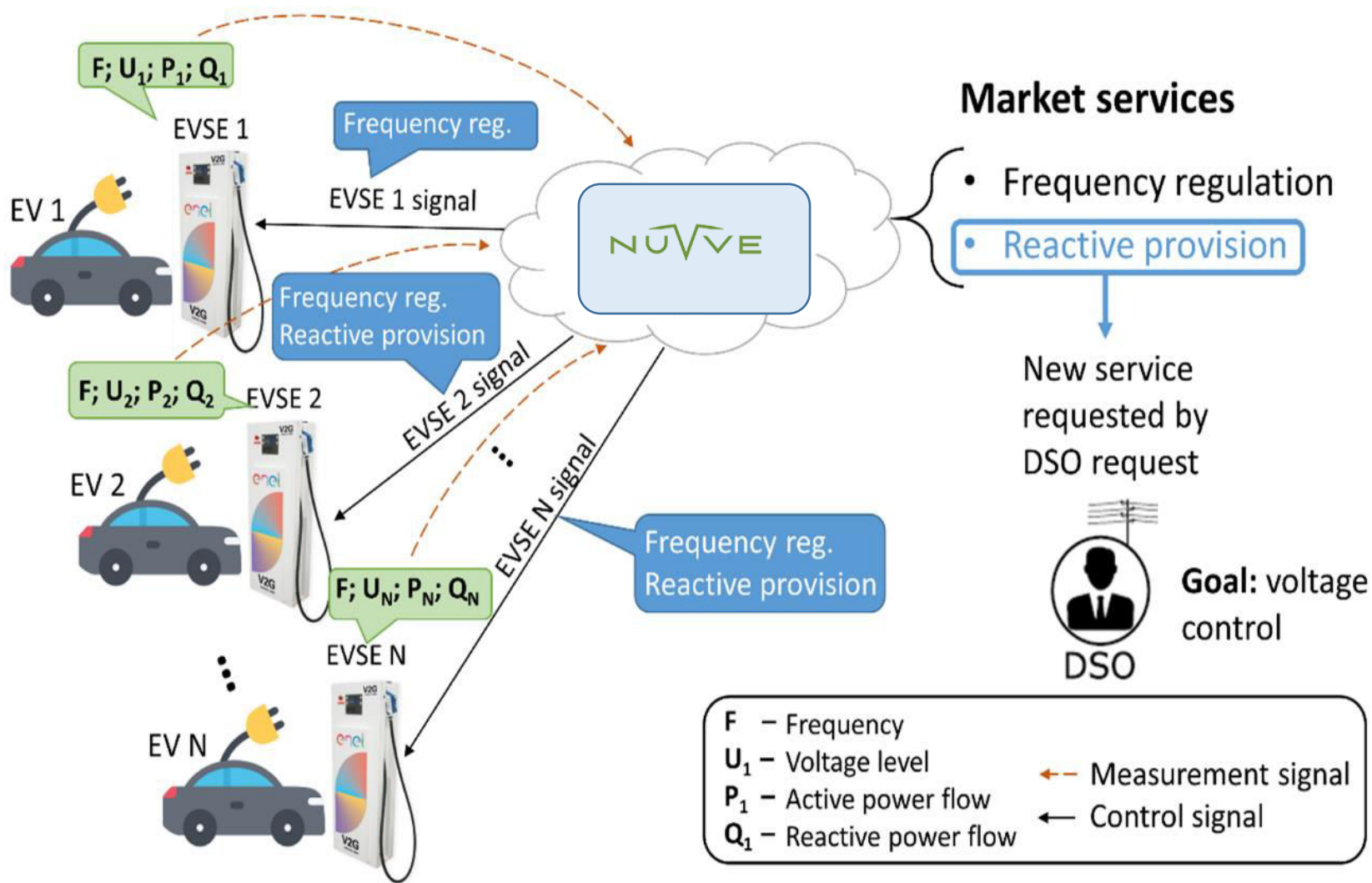
	Scheduled				Simultaneous			
Category	Active power	Reactive power	RES integration	FCR-N	Active power	Reactive power	RES integration	FCR-N
Active power	-	H	H	H	-	H	M	L
Reactive power	-	-	H	H	-	-	H	H
RES integration	-	-	-	H	-	-	-	M

H - High level, M - Medium level, L - Low level.





Stacked Services: Reactive Power and FCR-N Provision



- Stacking distribution and transmission system services can provide extra benefits to the both DSOs and customers.
- Improving the controllability and efficiency of charges can potentially help commercialization of distribution system services.
- **More Information:**
 - **Journal Paper:** Distribution System Services Provided by Electric Vehicles: Recent Status, Challenges, and Future Prospects, under review.
 - **Journal Paper:** Raising the Potential of a Local Market for the Reactive Power Provision by Electric Vehicles in a Distribution Grid, under review.





Thanks for your attention

Questions?

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