ADVANCED ENERGY STORAGE CONFERENCE 2024

PART 3

TAASTRUP
NOVEMBER 28, 2024

DANISH TECHNOLOGICAL INSTITUTE

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EXHIBITORS 2024

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TABLE OF CONTENTS

ADVANCED ENERGY STORAGE CONFERENCE 2024

Energy management for a flexible market

Philip Holgersson, Aire Energy

Aire

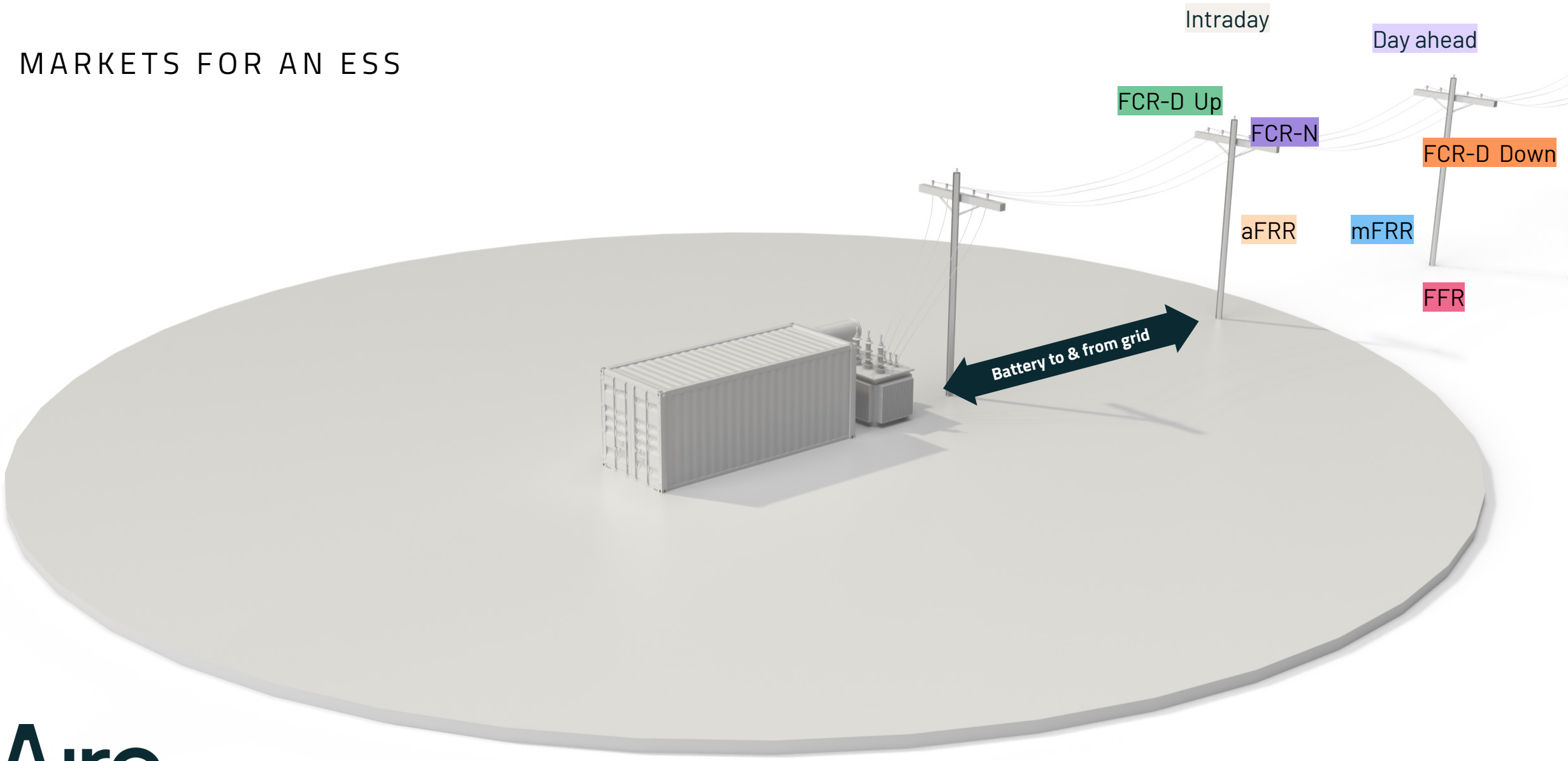
Energy Management in a Flexible Market

Philip Holgersson
CTO Aire Energy

Aire

Aire is a Swedish company founded in 2022 with the mission to enable flexibility for a sustainable future. We focus on B2B clients, working with resources of at least 100 kW.

MARKETS FOR AN ESS



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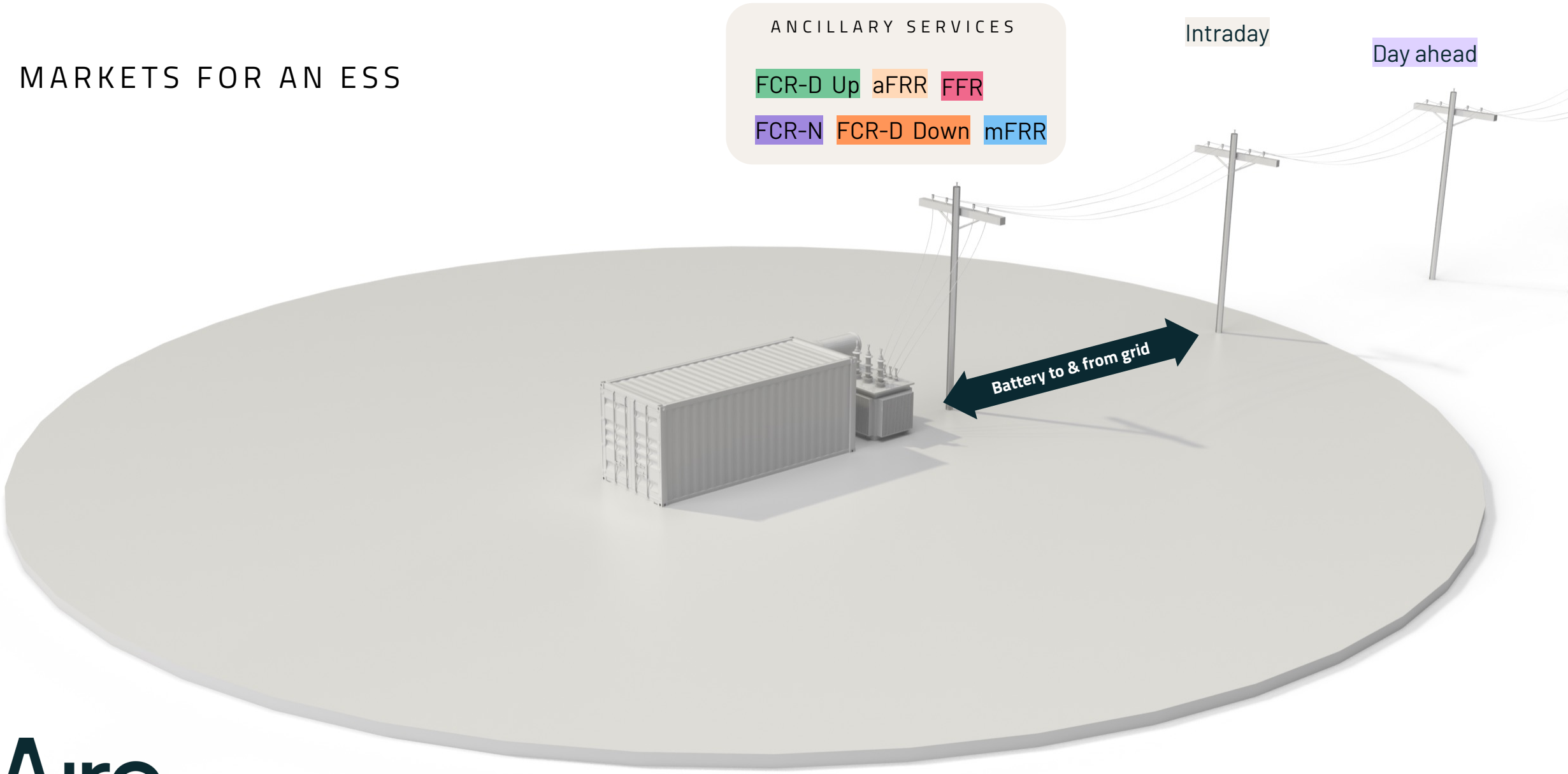
MARKETS FOR AN ESS



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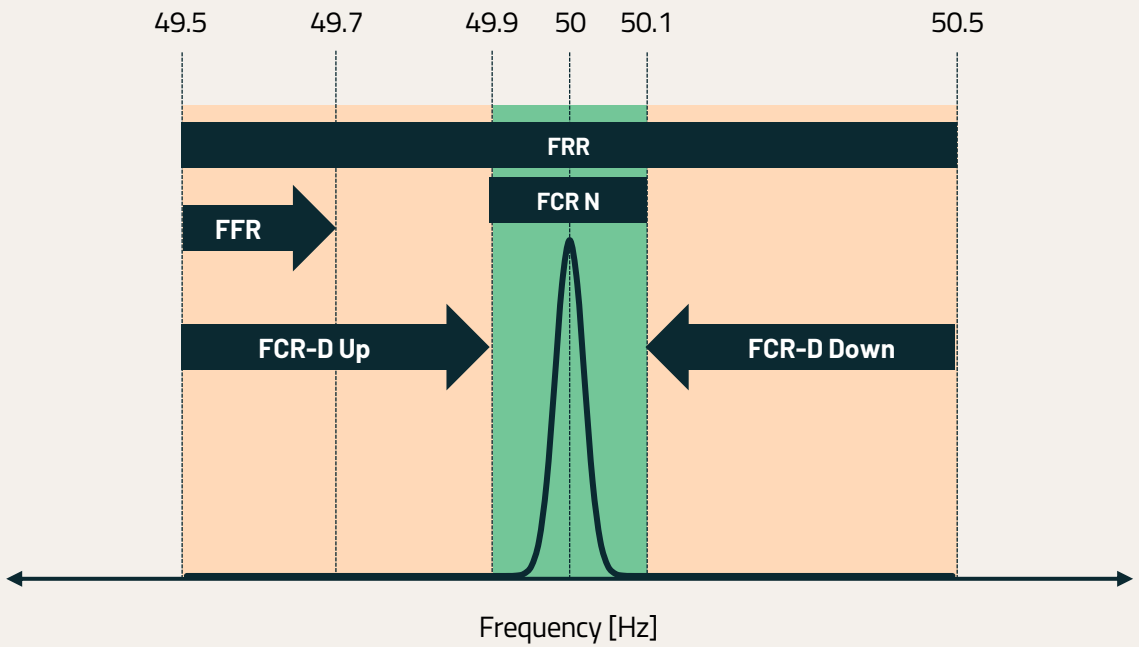
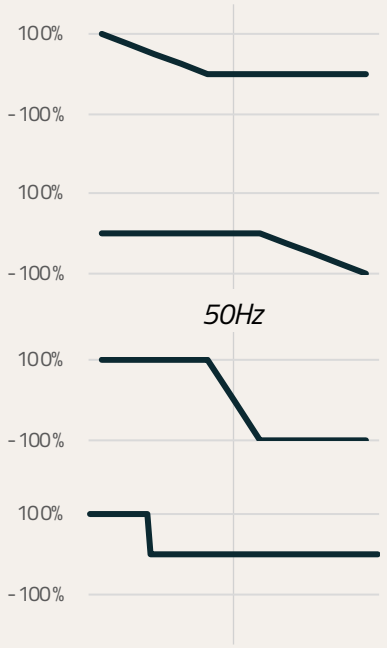
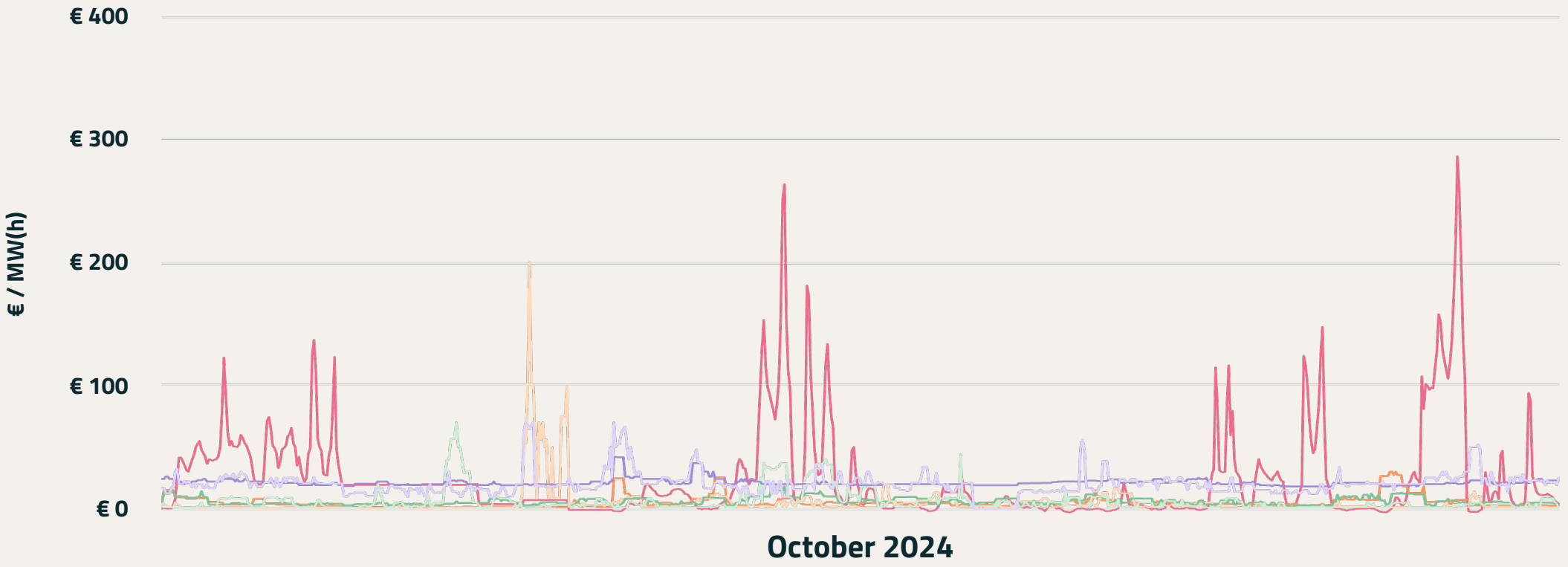
ANCILLARY SERVICES → MAINTAIN 50 Hz



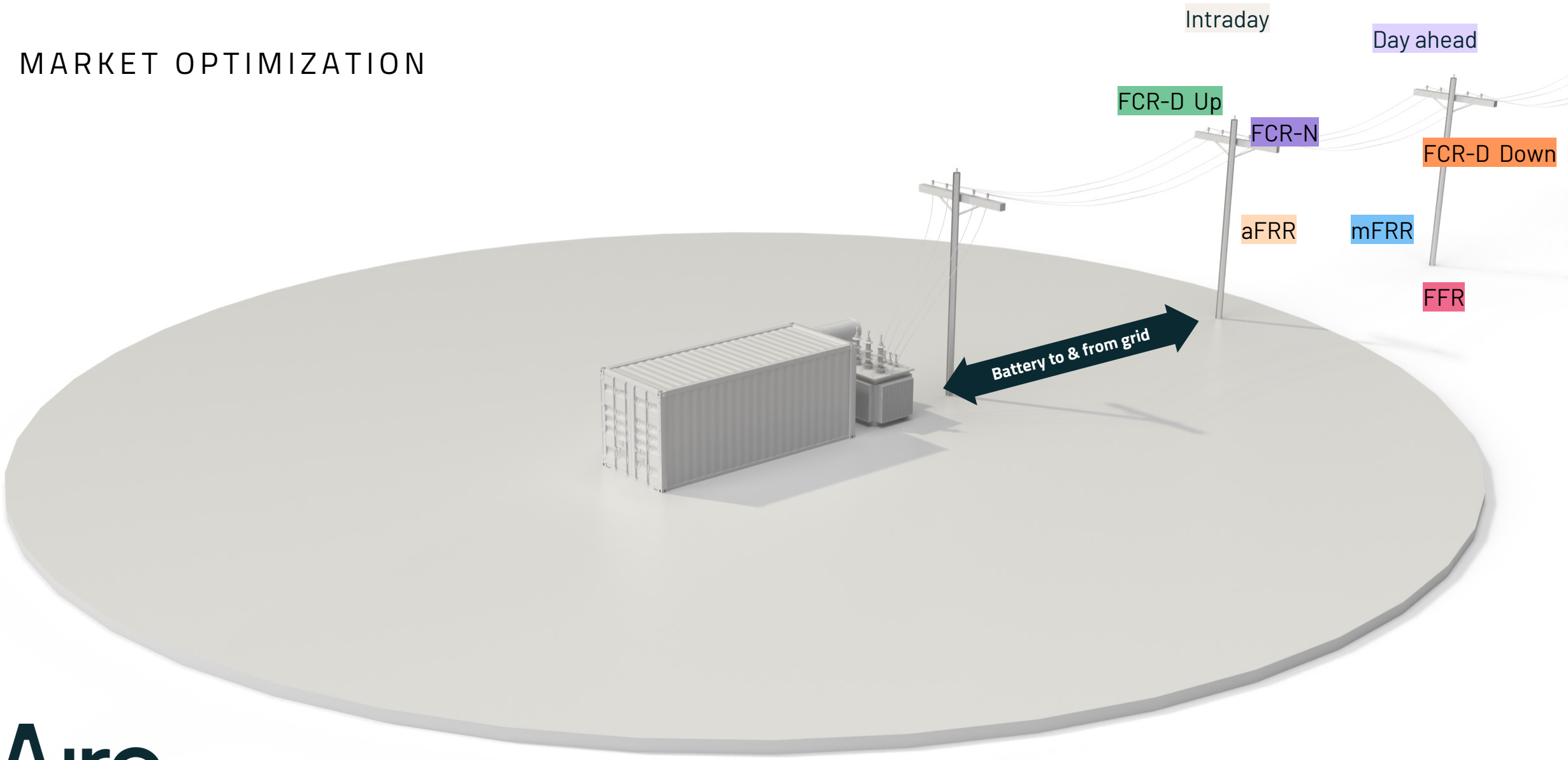
ANCILLARY SERVICES

	Activation profile	Endurance	Response Time	Average activation
FCR-D Up		20 min	Seconds	0,05%
FCR-D Down		20 min	Seconds	0,05%
FCR-N		60 min	Seconds	15%
FFR		5-30s	<1 Second	<0,05%
aFRR	Activation signal from TSO	60 min	Minutes	
mFRR	On demand from TSO	60 min	Minutes	

MARKET DYNAMICS



MARKET OPTIMIZATION



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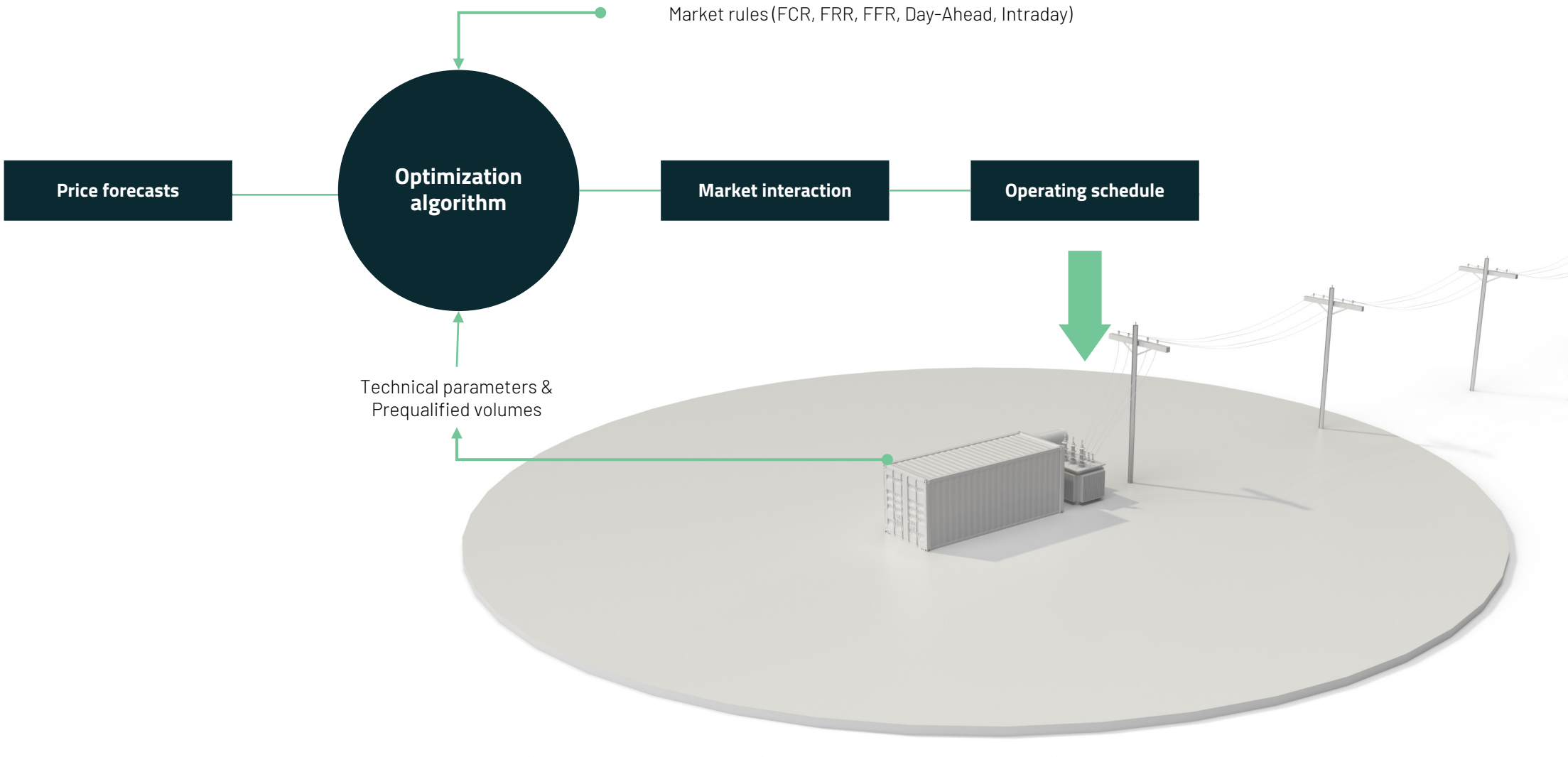
MARKET OPTIMIZATION



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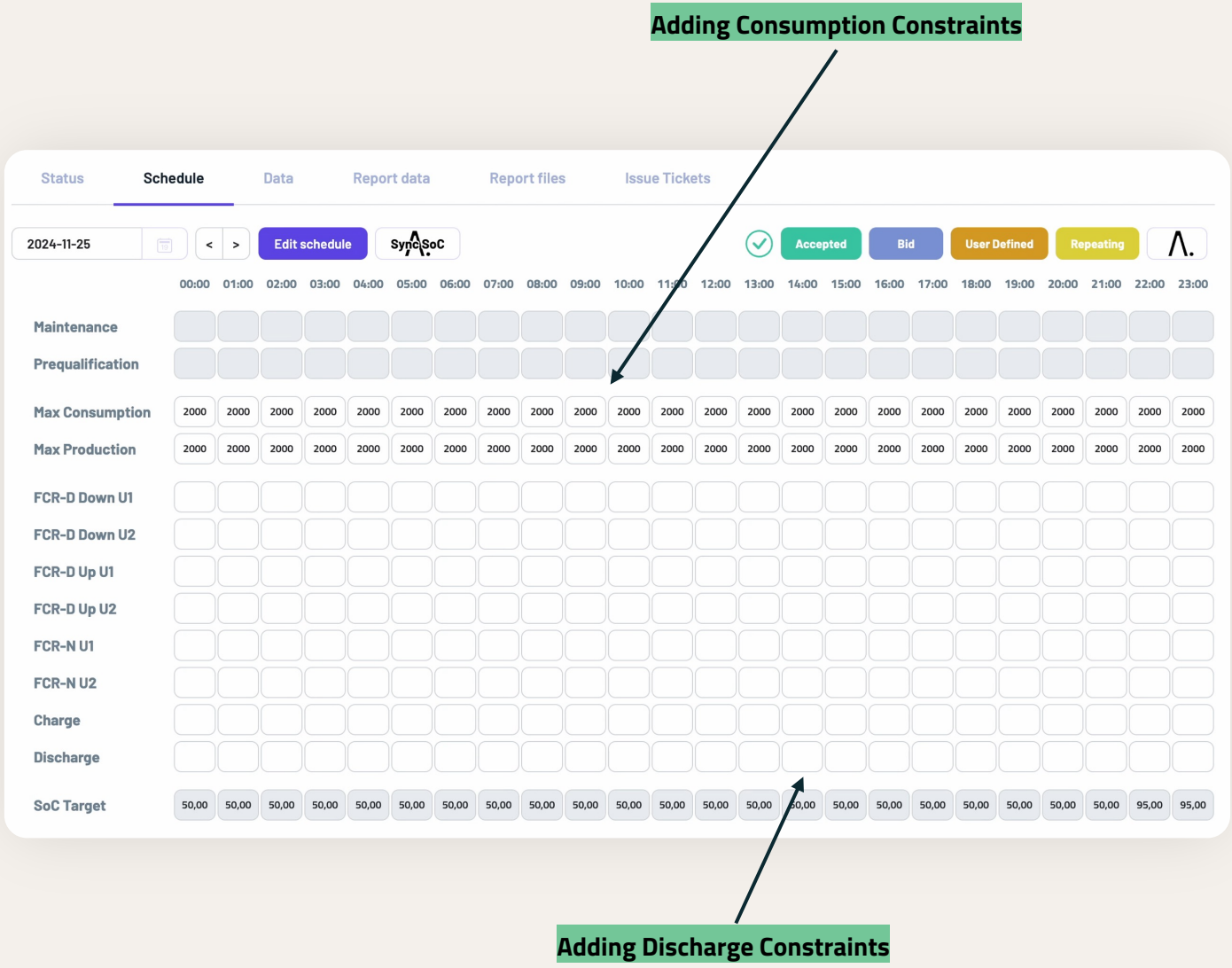
SCHEDULING

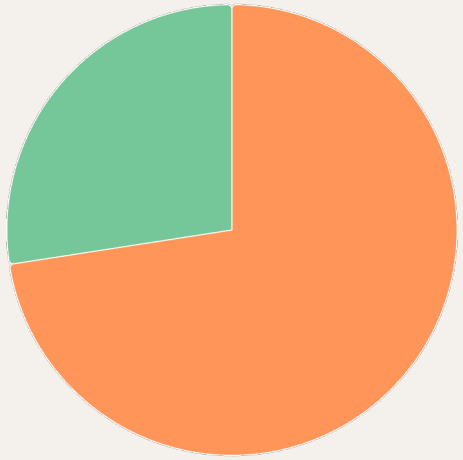
The scheduling interface allows for additional constraints, which is key to achieving a high degree of utilization for complex sites.



PERFORMANCE

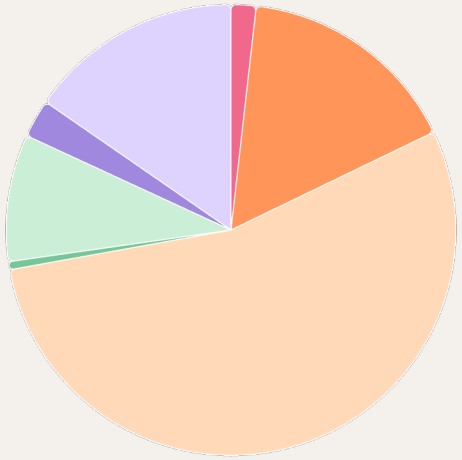
Since Feb 1st 2024 1MW 1C Battery SE4

Profit
€ 204 k



Baseline

Profit
€ 329 k
+60%



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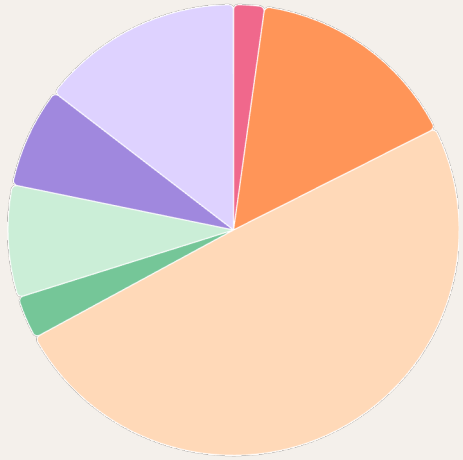
Profit
€ 495 k
+142%



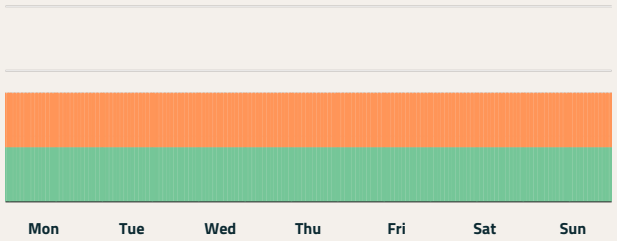
Maximum

Aire

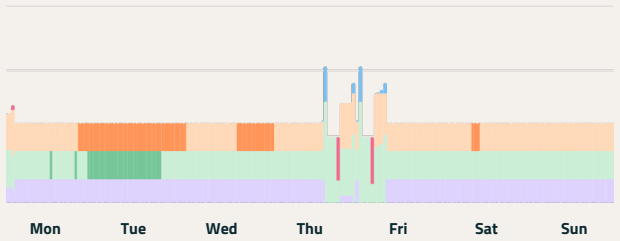
FCR-D Up U1 | FCR-D Up U2 | FCR-D Down U1 | FCR-D Down U2 | Arbitrage | FCR-N U2 | FCR-N U1

EXAMPLE SCHEDULE

1st week October 2024 1MW 1C Battery SE4



Baseline



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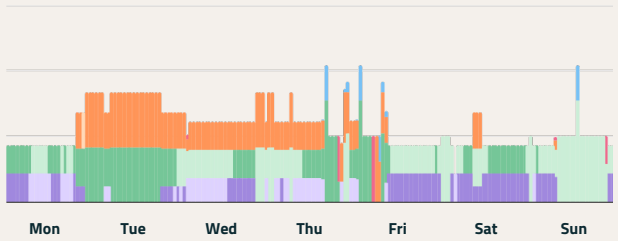
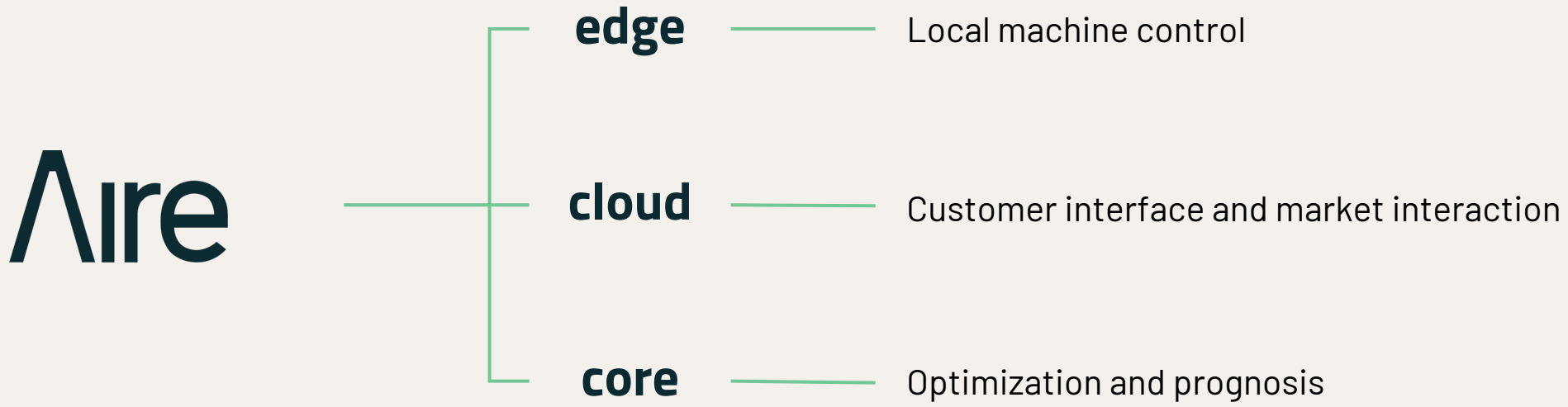


Maximum

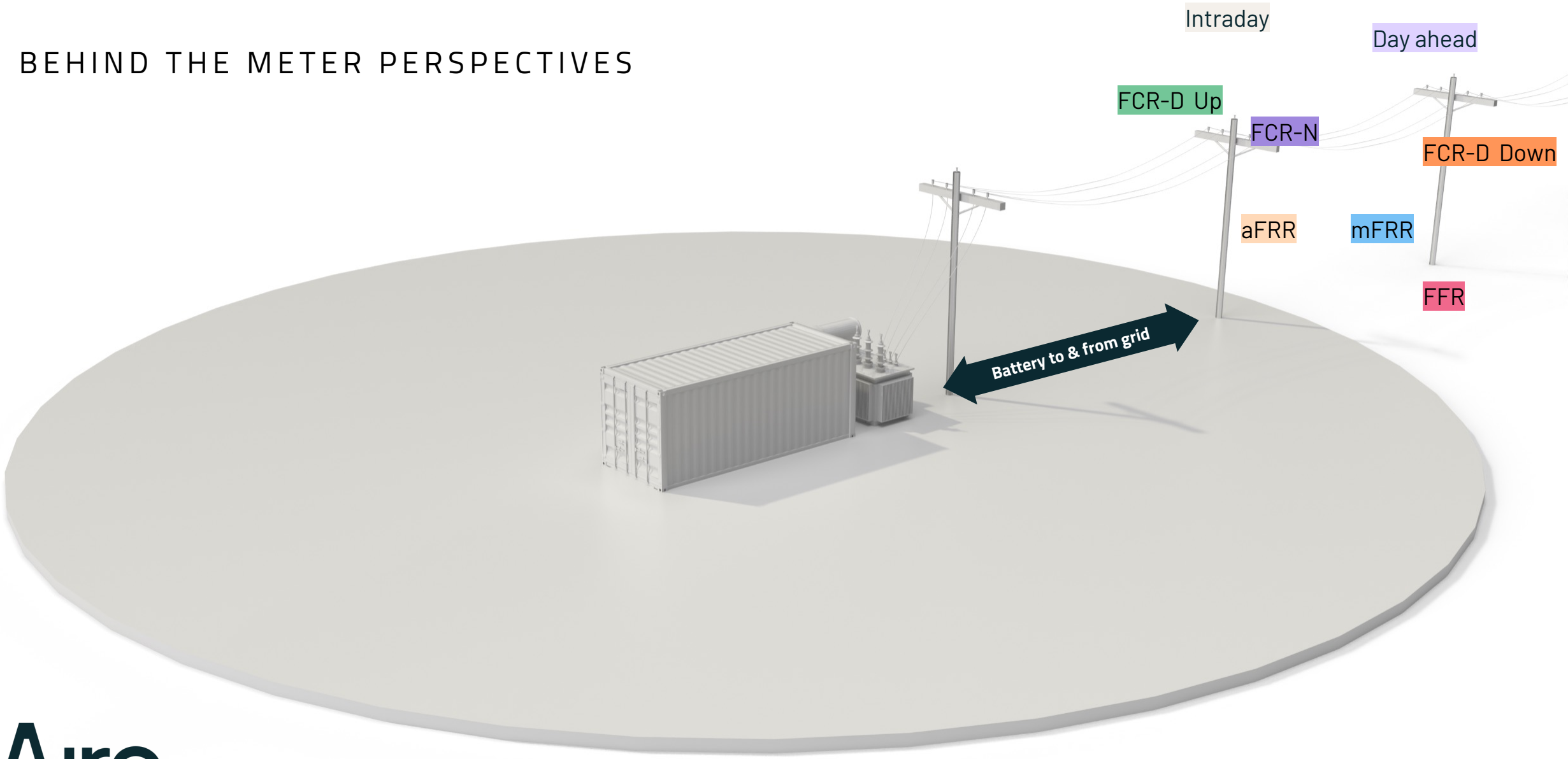
Aire

FCR-D Up U1 | FCR-D Up U2 | FCR-D Down U1 | FCR-D Down U2 | Discharge | Charge | FCR-N U2 | FCR-N U1

INFRASTRUCTURE



BEHIND THE METER PERSPECTIVES



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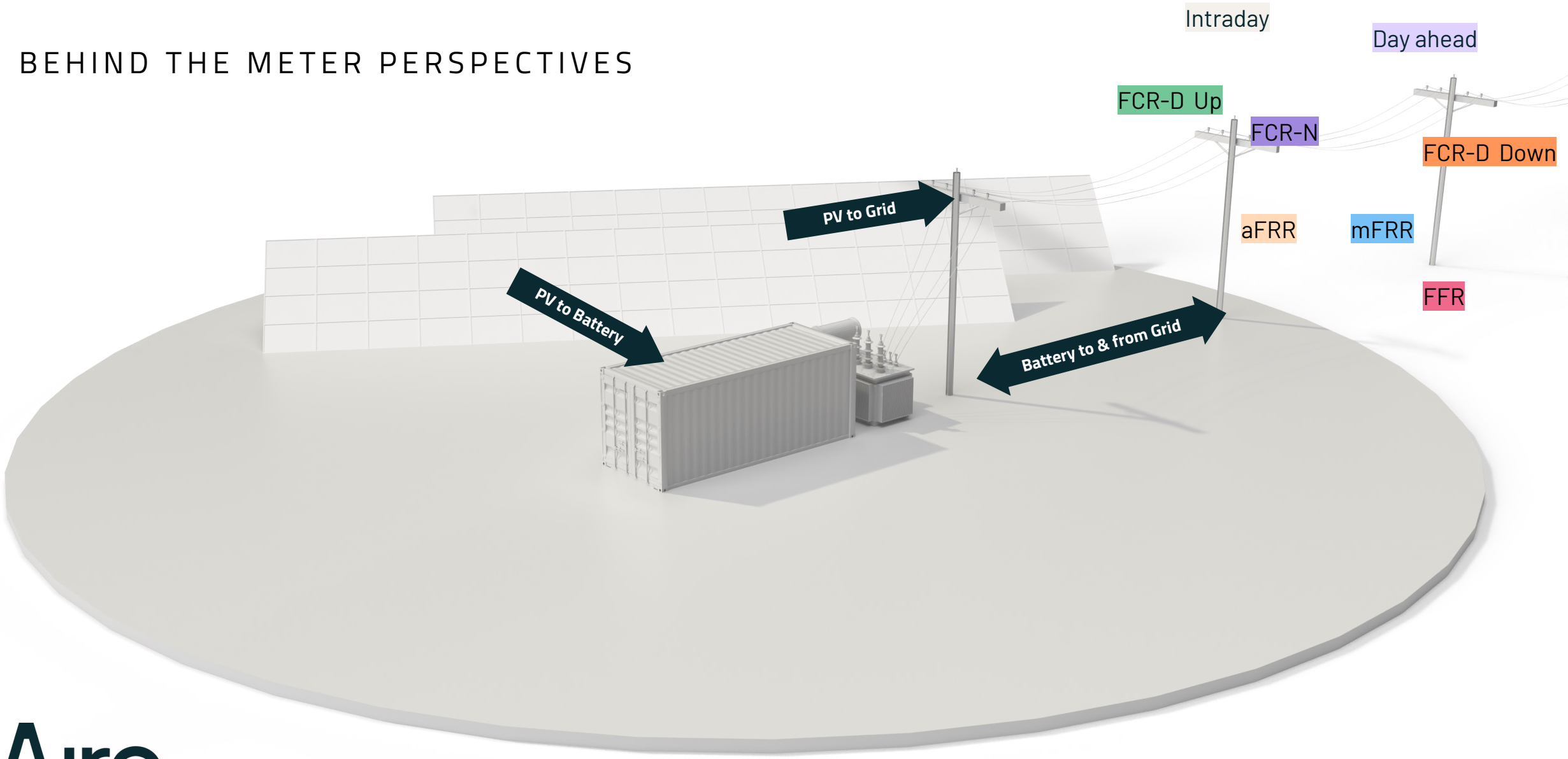
BEHIND THE METER PERSPECTIVES



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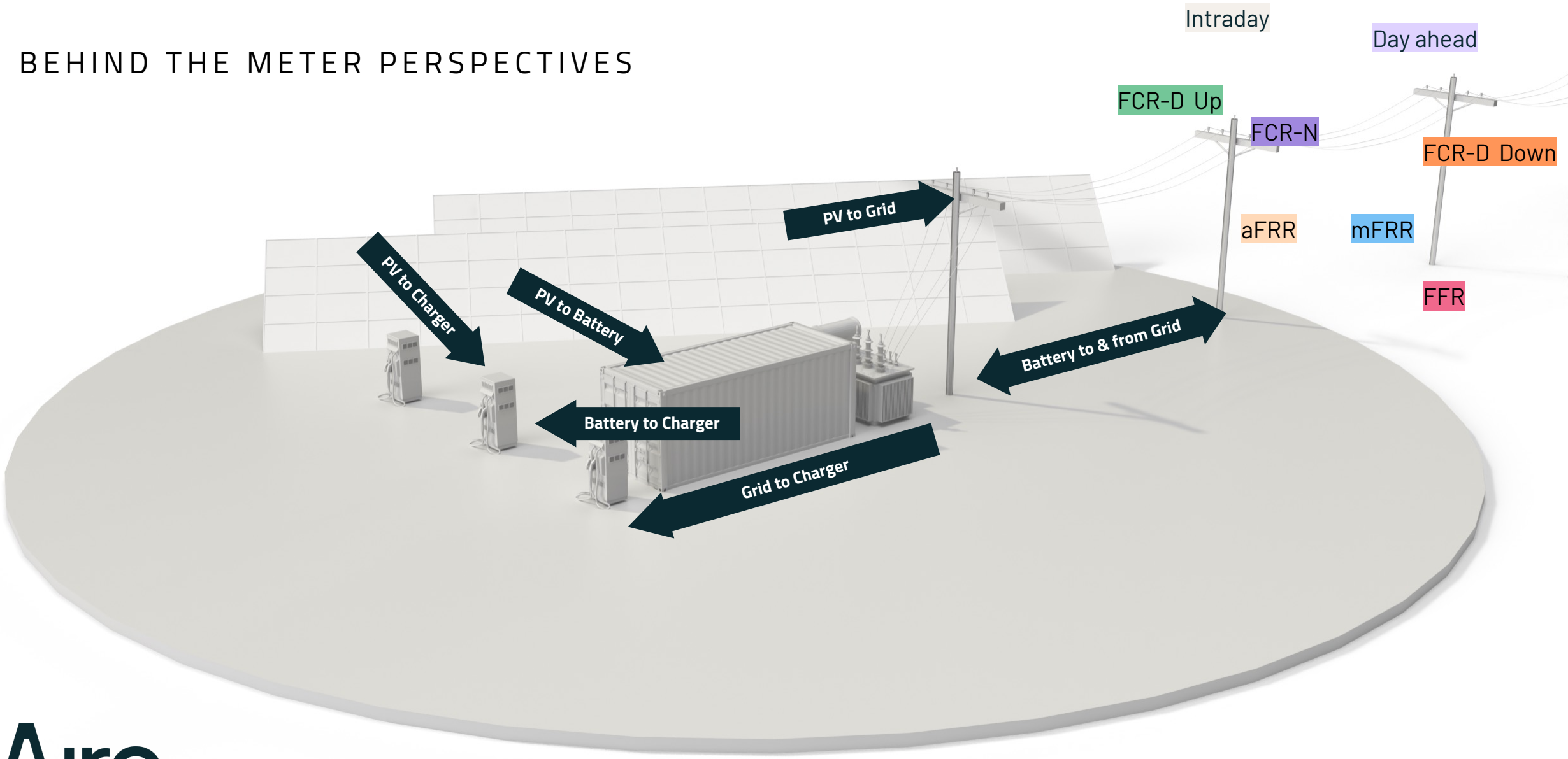
BEHIND THE METER PERSPECTIVES



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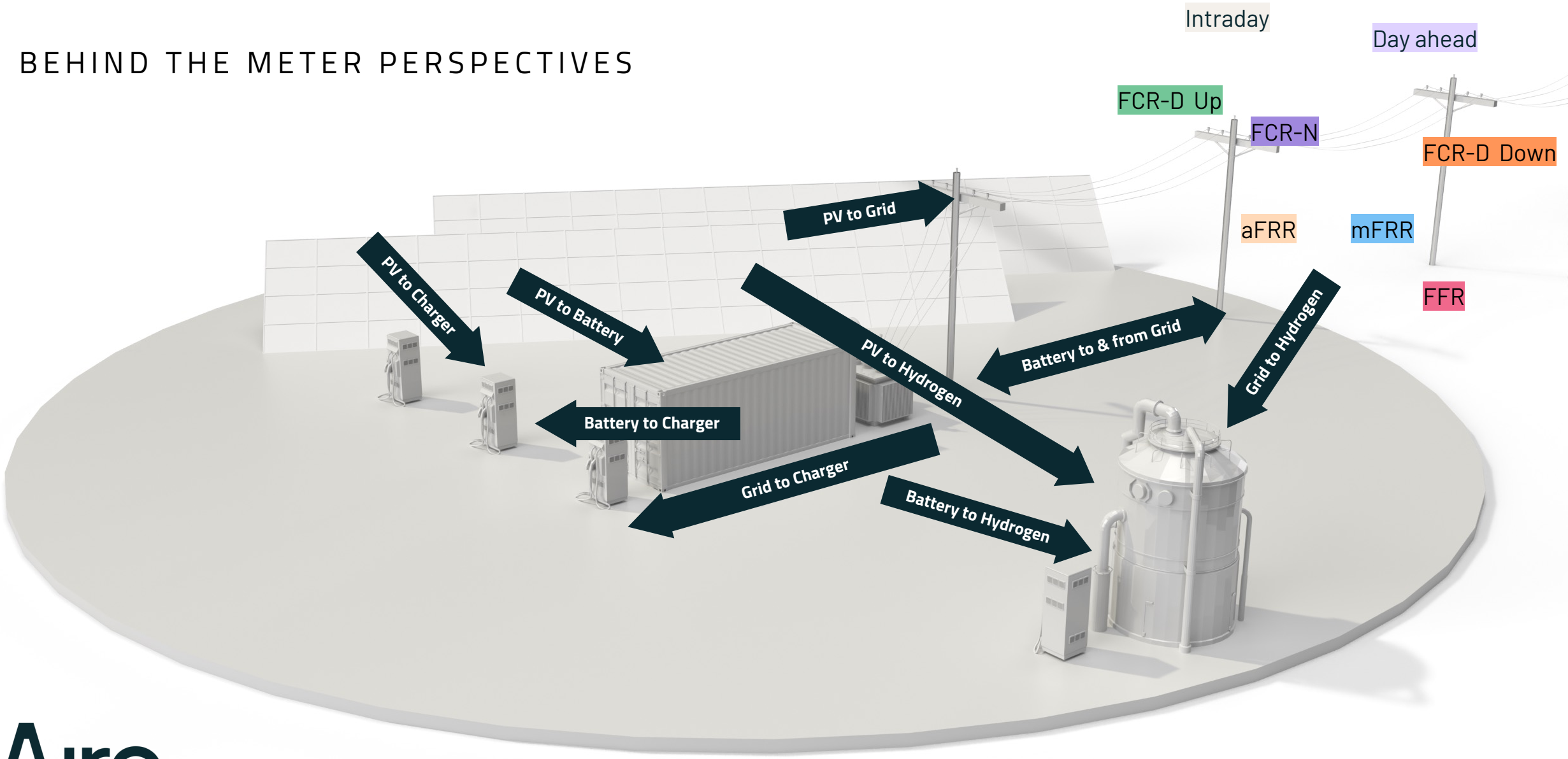

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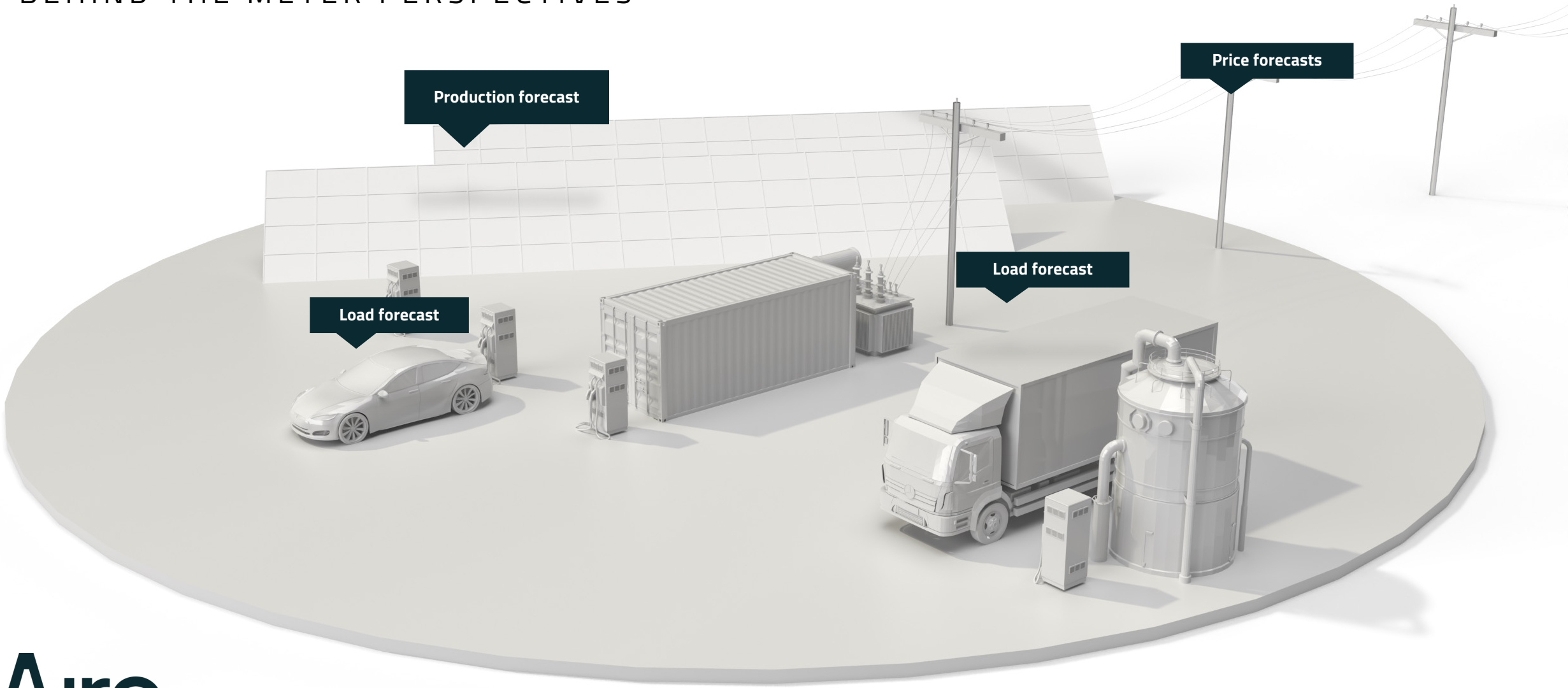
BEHIND THE METER PERSPECTIVES



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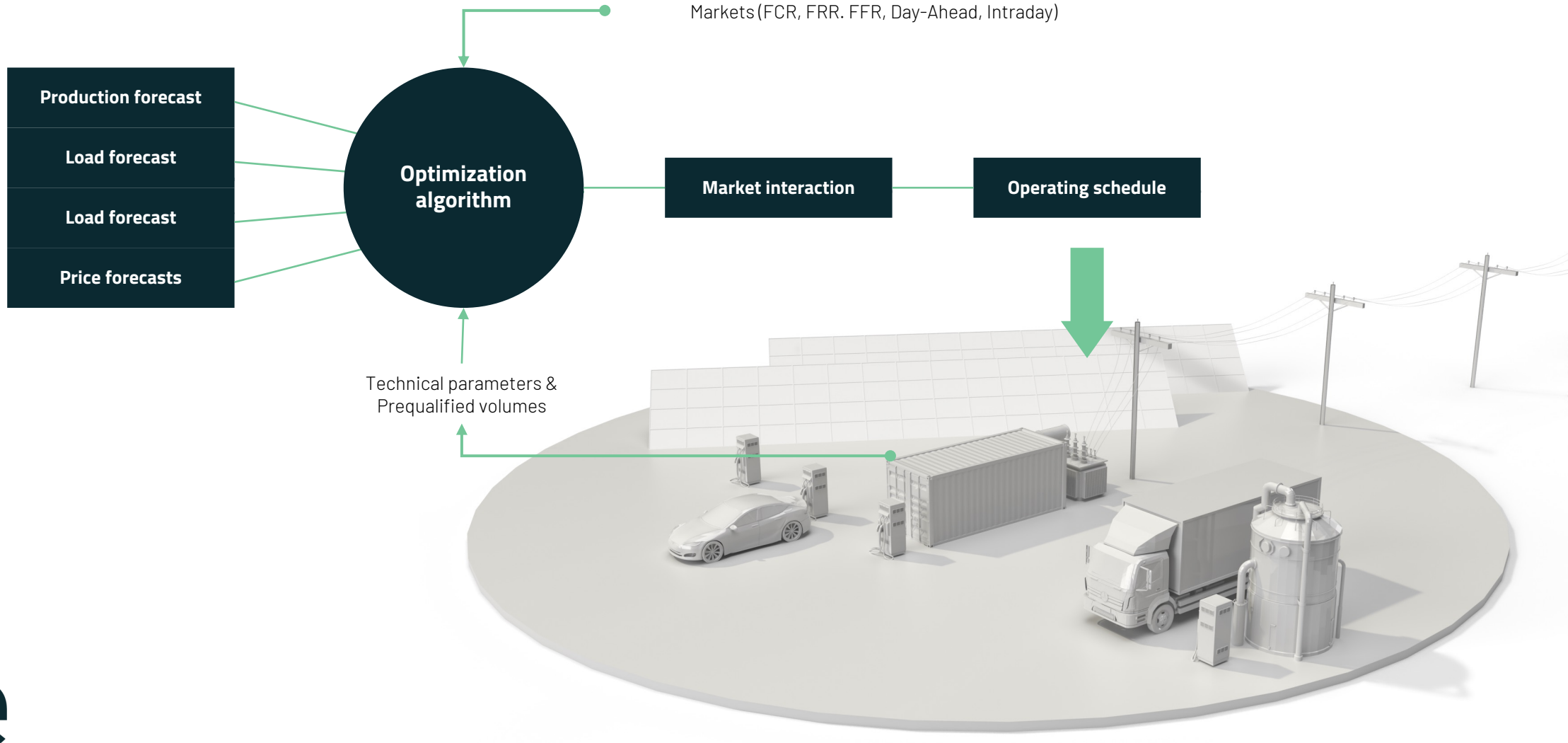
BEHIND THE METER PERSPECTIVES



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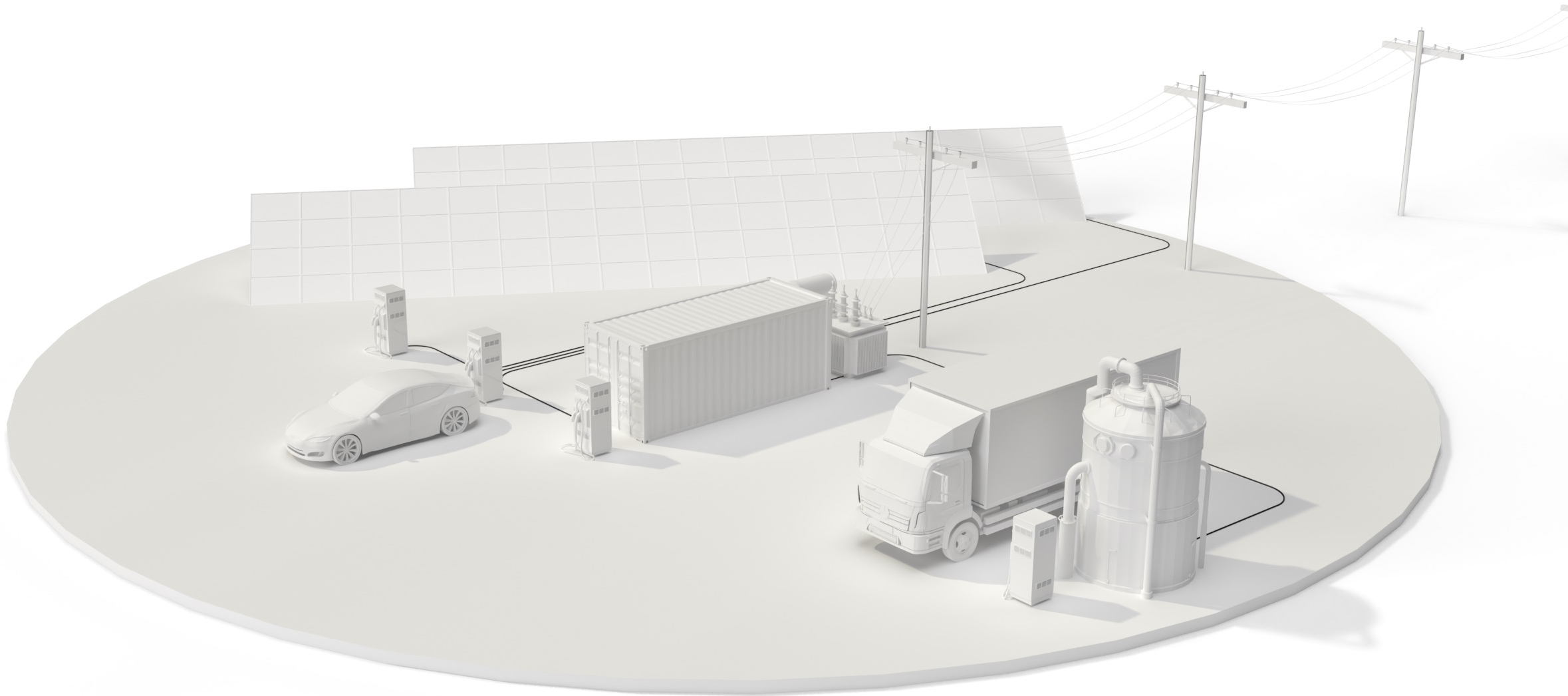
HYBRID SITES



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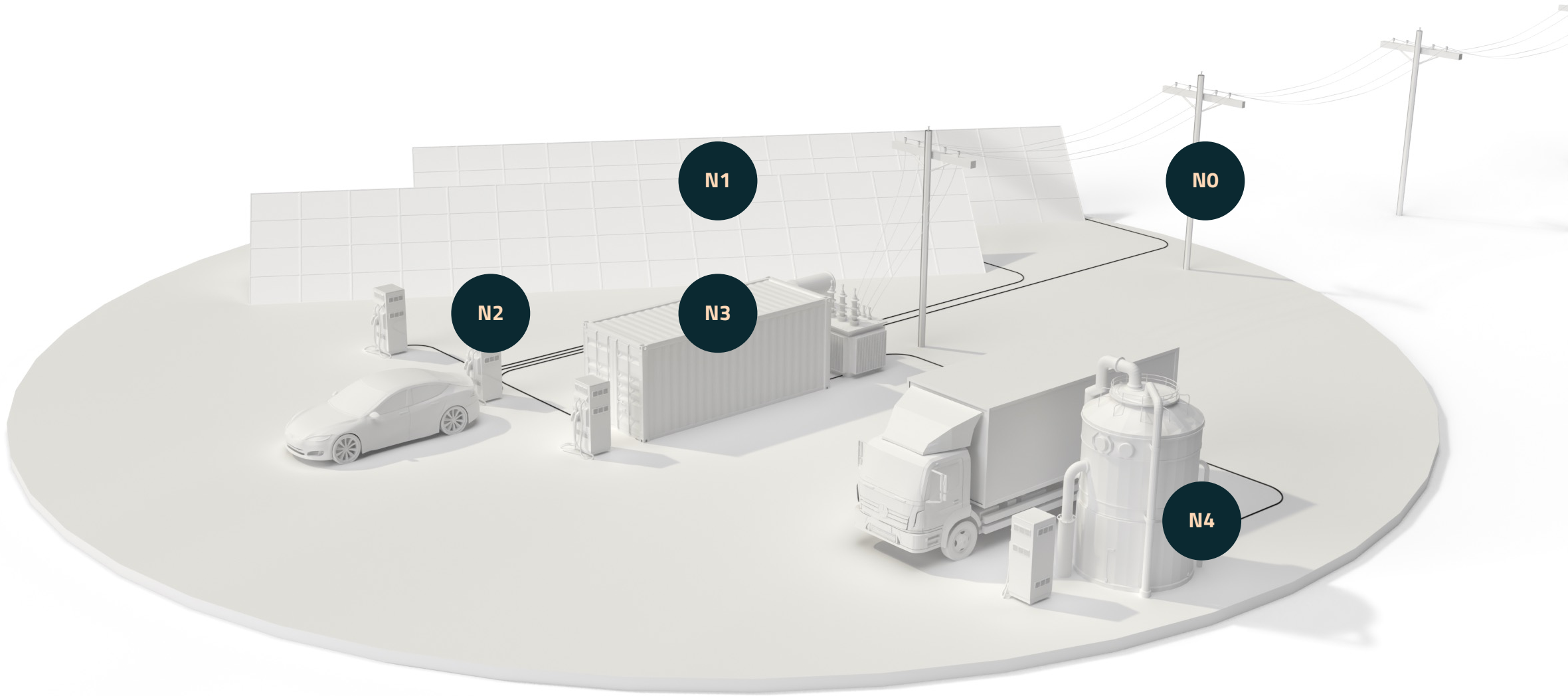
HYBRID SITES



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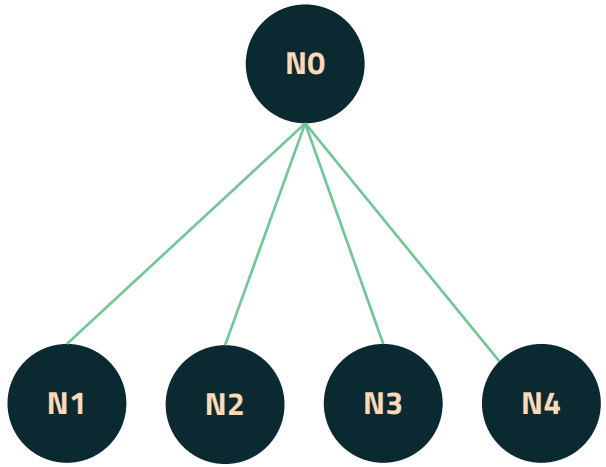
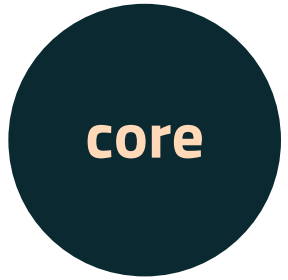
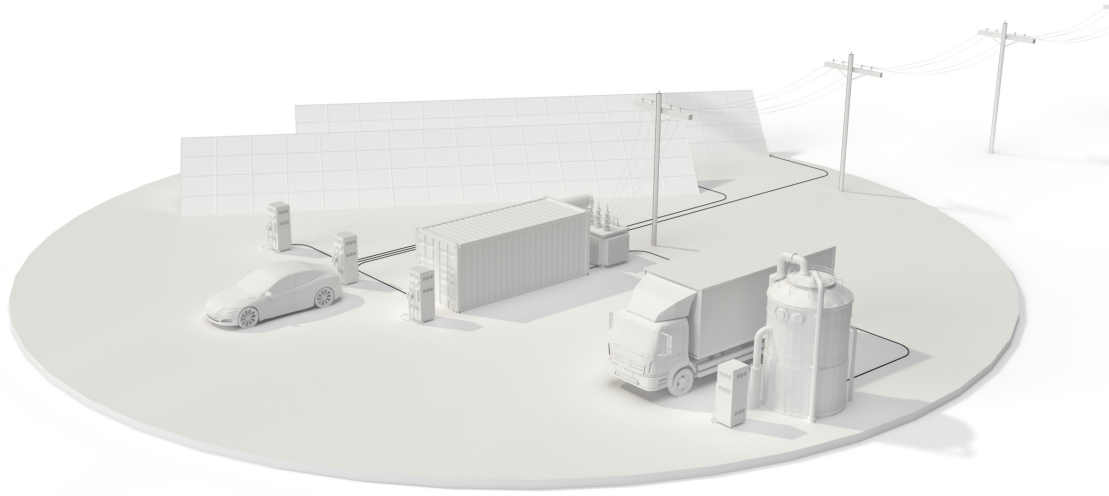
HYBRID SITES

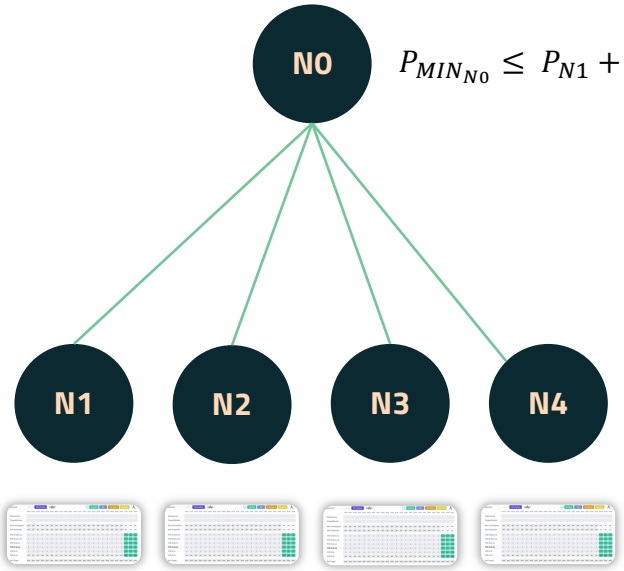




$$Maximize\ \{Profit_{NO} = Profit_{N1} + Profit_{N2} + Profit_{N3} + Profit_{N4}\}$$

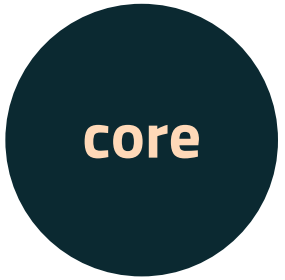


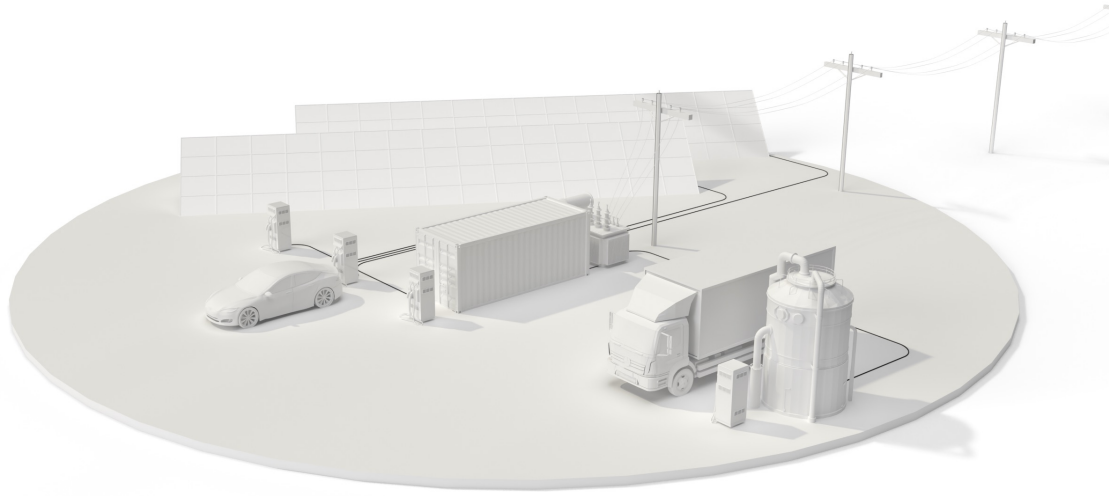
HYBRID SITES



$$P_{MIN_{N0}} \leq P_{N1} + P_{N2} + P_{N3} + P_{N4} \leq P_{MAX_{N0}}$$

$$Maximize\ \{Profit_{NO} = Profit_{N1} + Profit_{N2} + Profit_{N3} + Profit_{N4}\}$$





Thank you!

Questions or comments?

ADVANCED ENERGY STORAGE CONFERENCE 2024

Energy storage and the power grid – too much is not good enough

Gunnar Rohde, Danish Technological Institute

TEKNOLOGISK INSTITUT

Energy Storage and the Power Grid

Too much is not good enough

Gunnar Rohde

28. November 2024

Most energy systems follow a similar architecture

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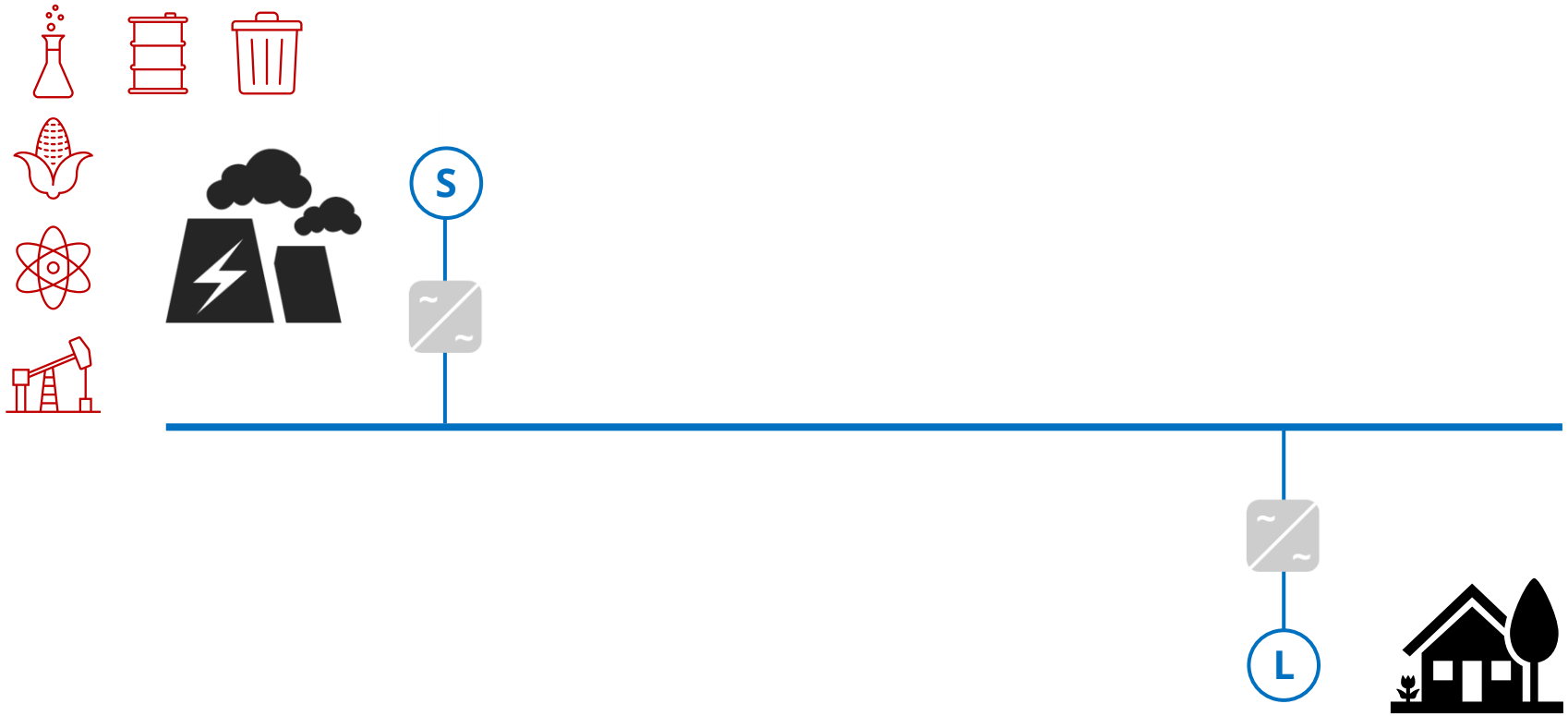
In old days, an energy system was *easy* to control

Because there is energy storage



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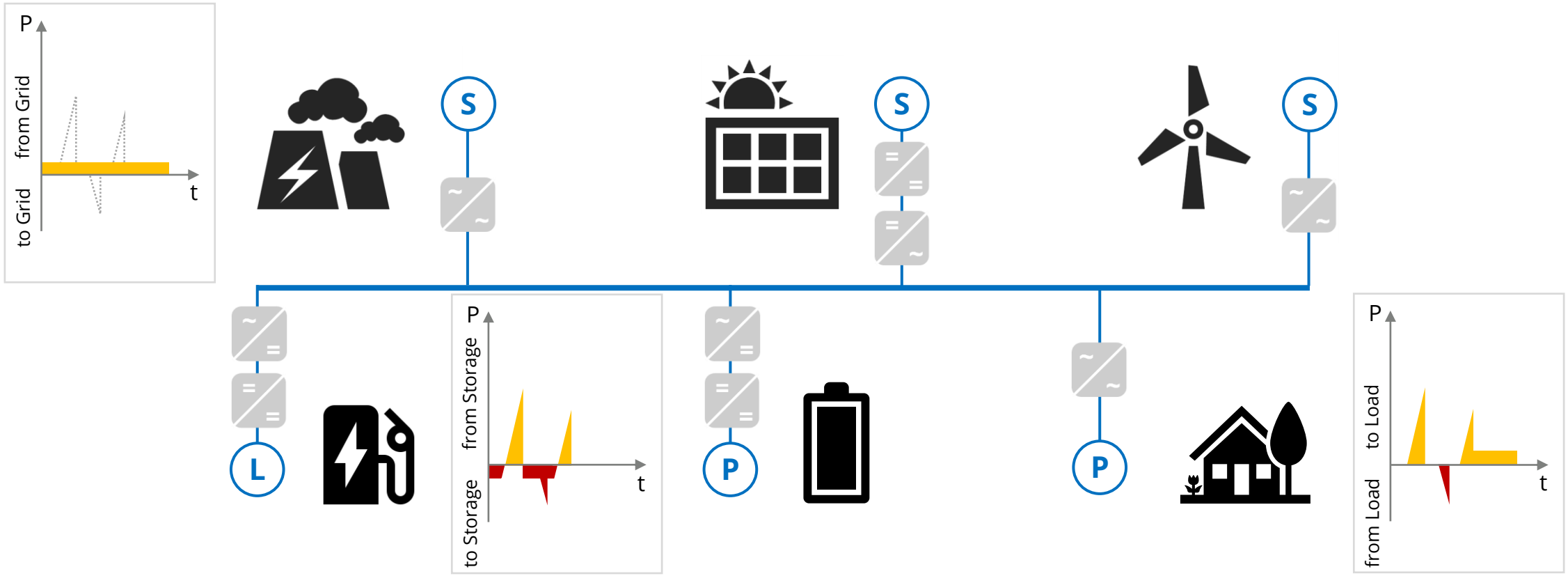
Today, energy systems are in transition



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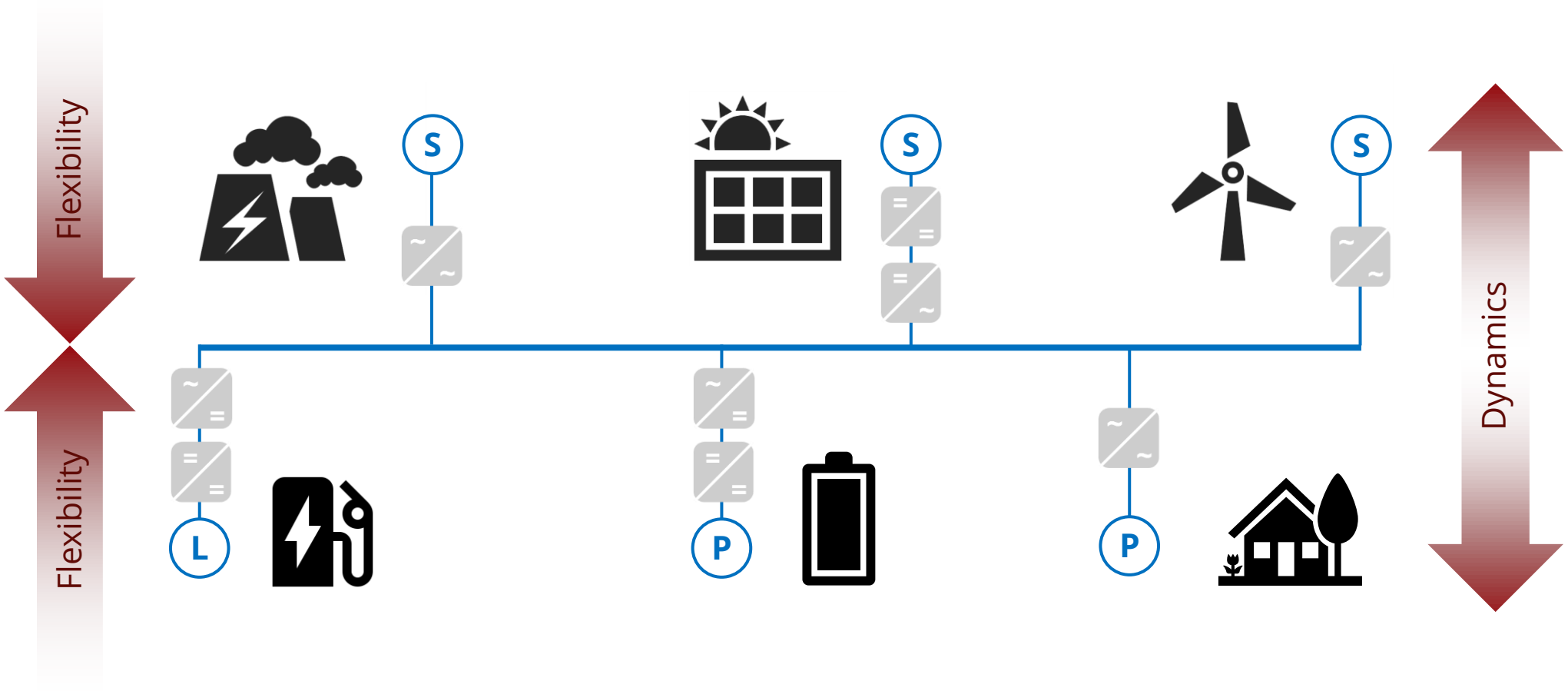
The challenge is sufficient flexibility within energy systems



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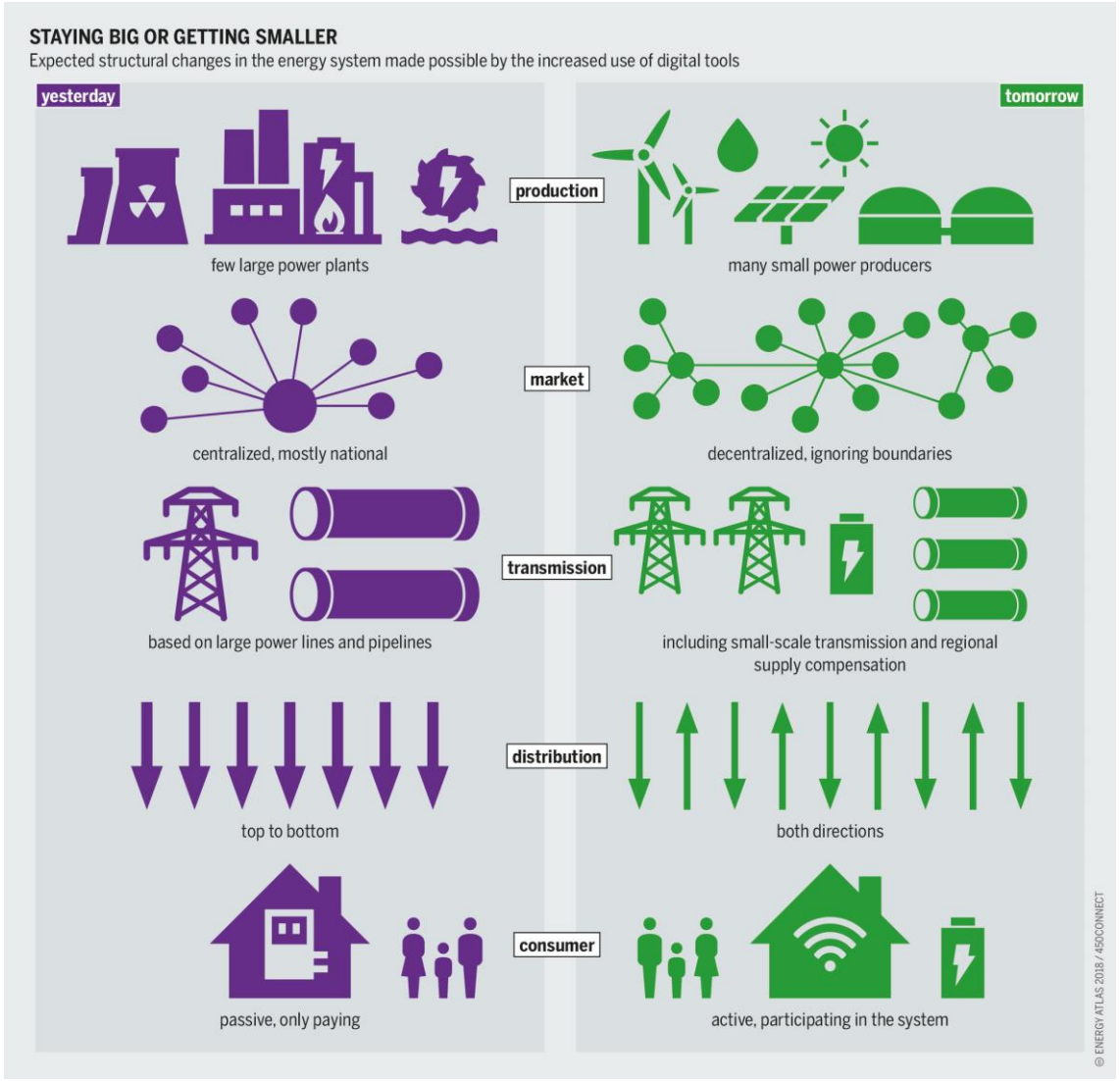
Smart grids and advanced storage are the primary tools



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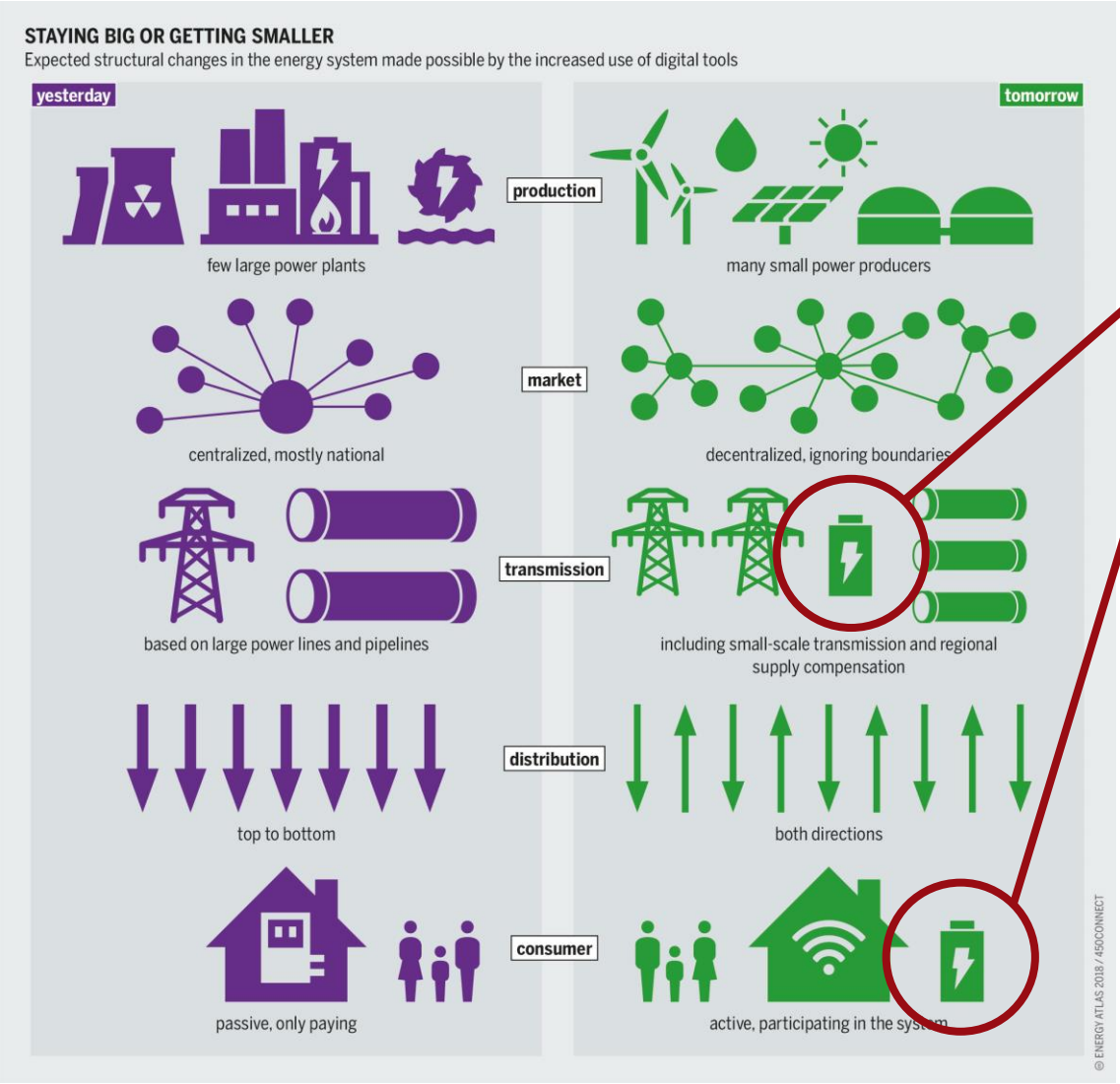
However, a shift from primary to secondary storage is needed



- Where to place energy storage?
- When to charge energy storage?
- When to discharge energy storage?

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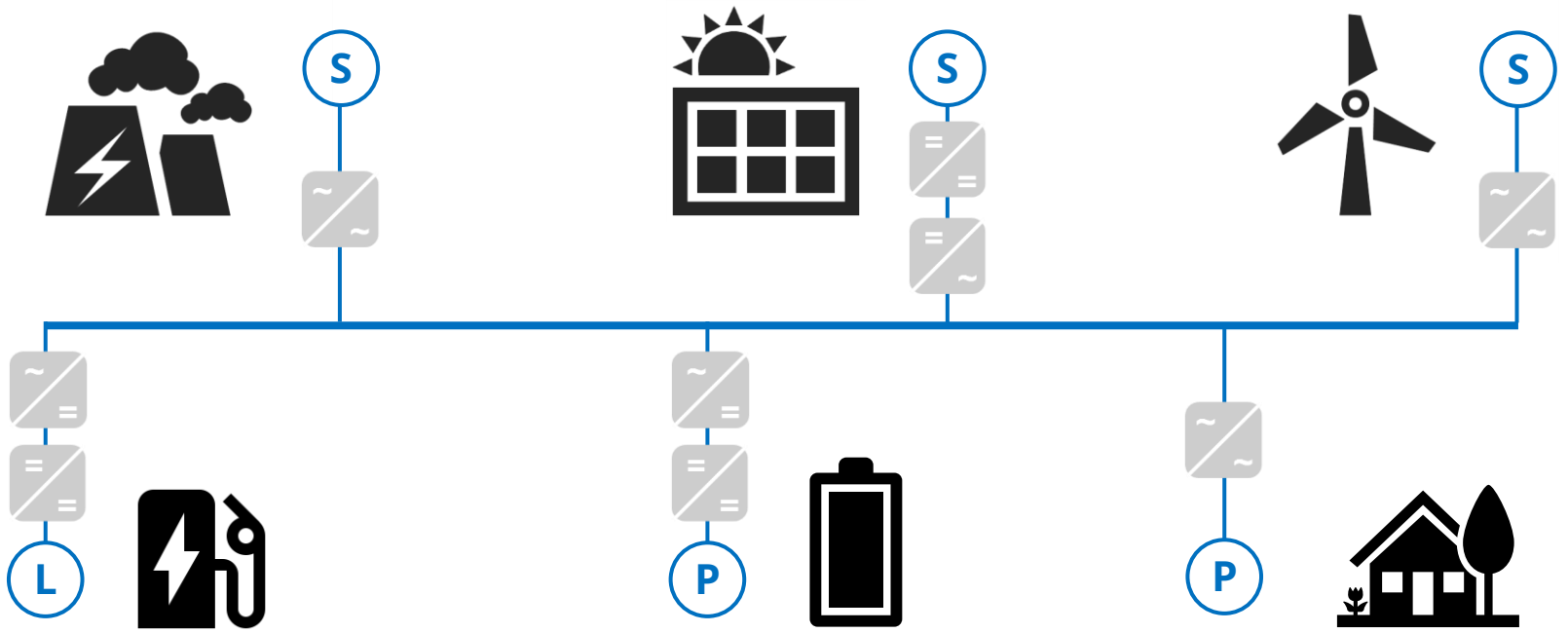
Where to start placing advanced energy storage?



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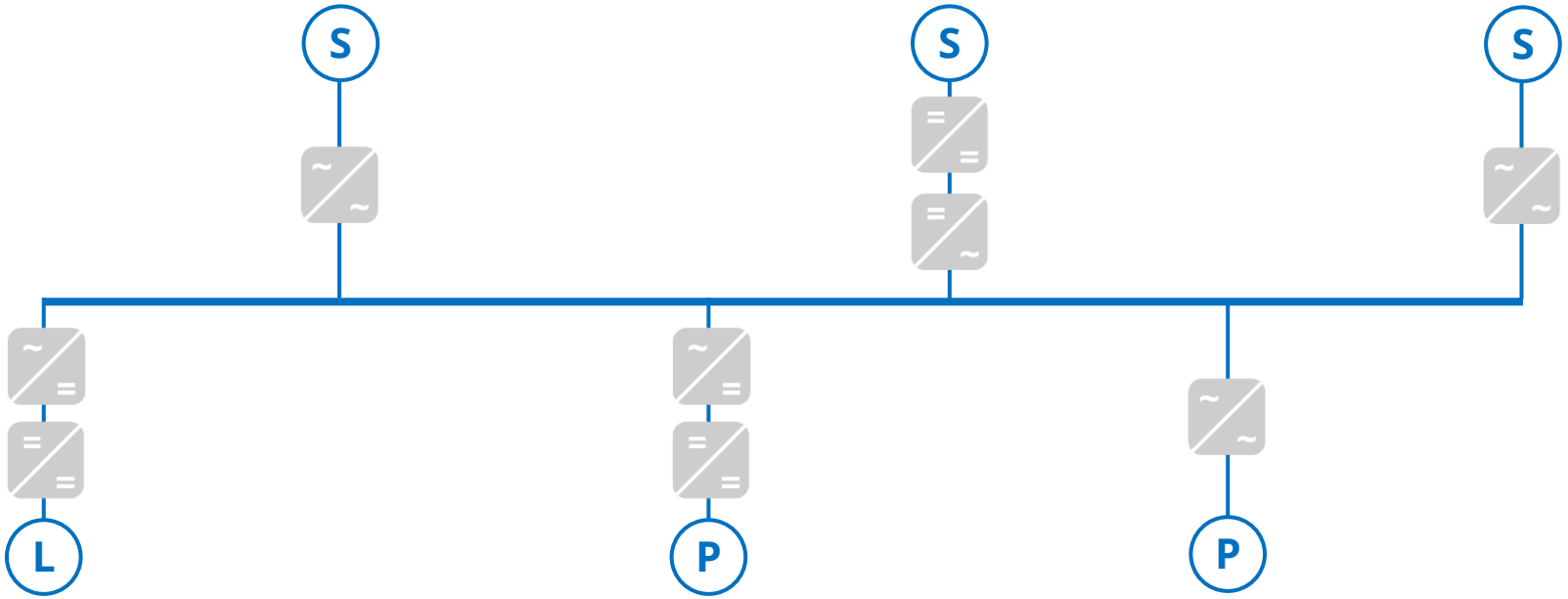
We start at the points of grid connection



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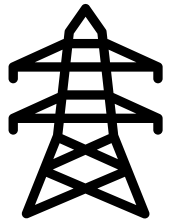
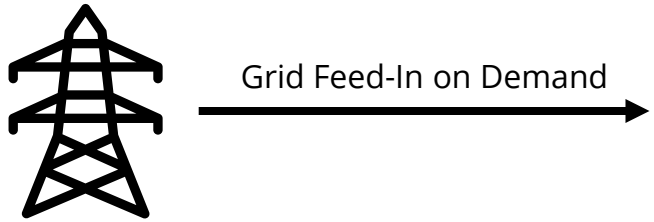
Let us consider a specific point of grid connection

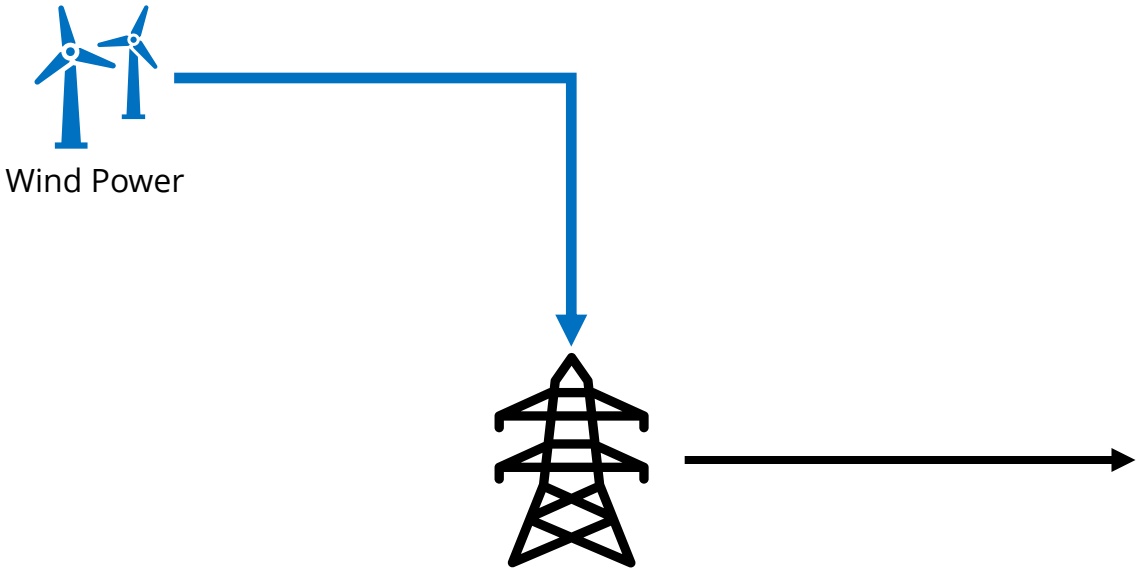


Point of Connection
(PoC)

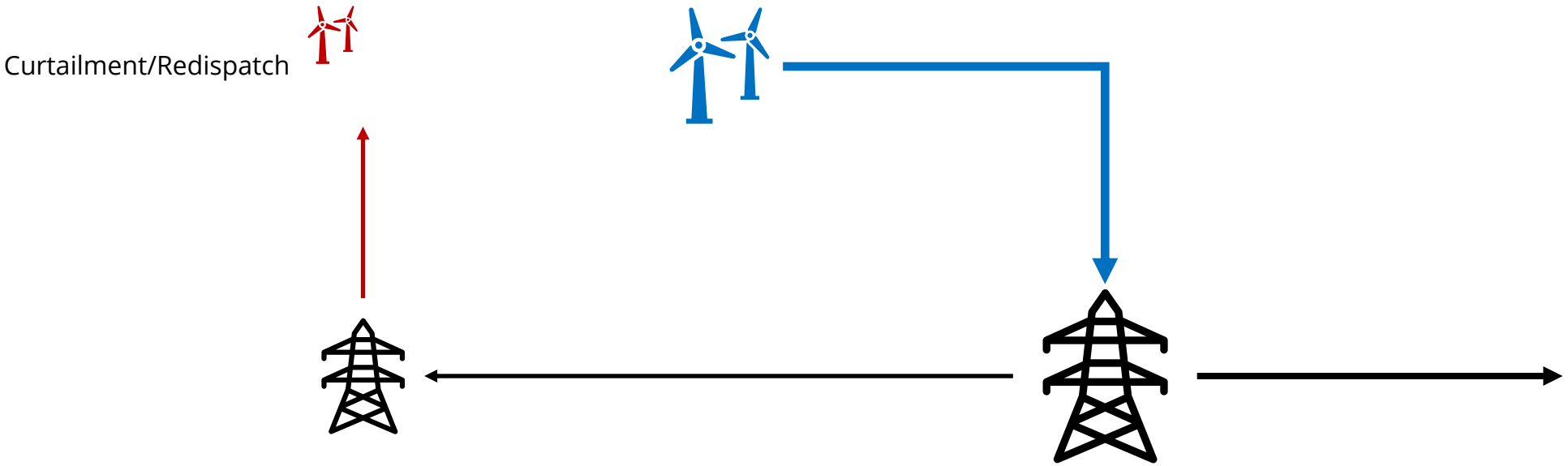
Feed-In should be optimised according to capacity and demand



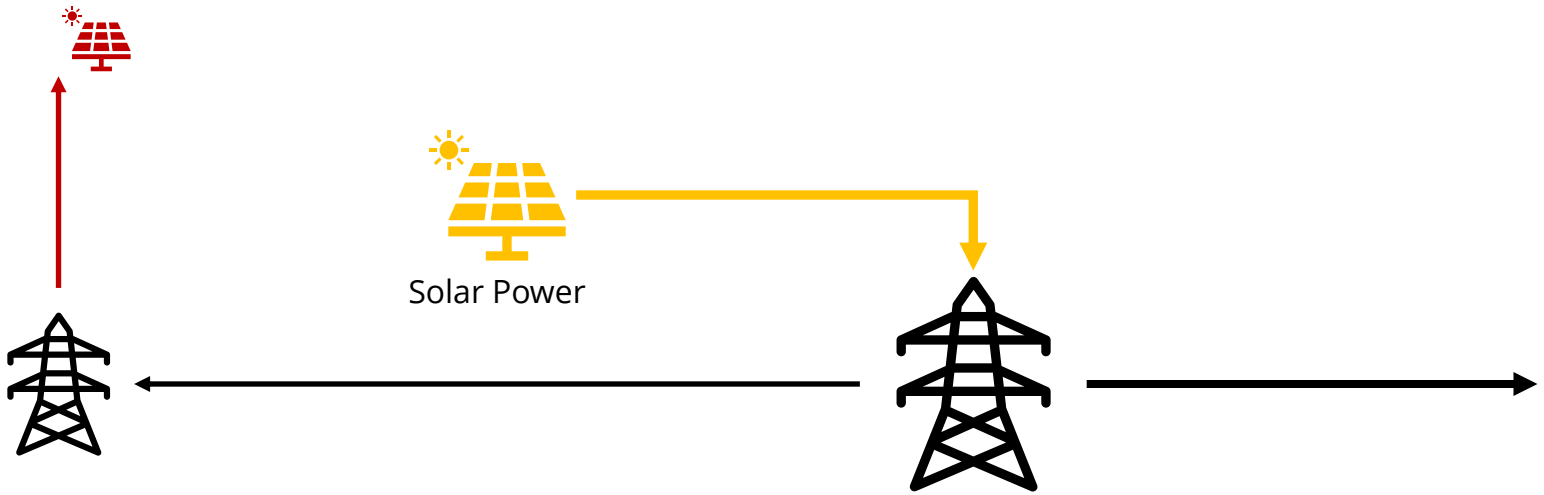
Renewable power dimensioning needs to take volatility into account



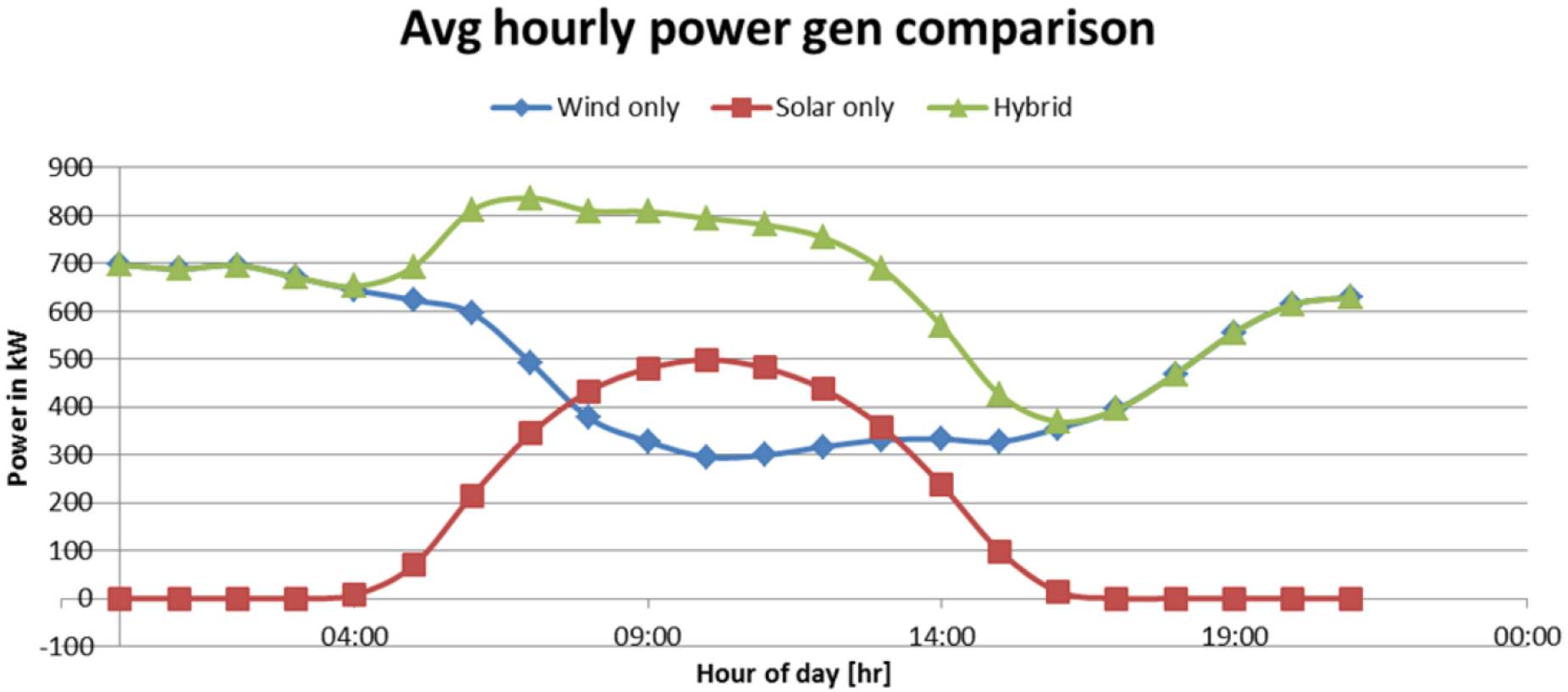
During high supply excess power is curtailed/redispatched



Basically, the same situation with another type of supply



Often, possible synergies are not exploited



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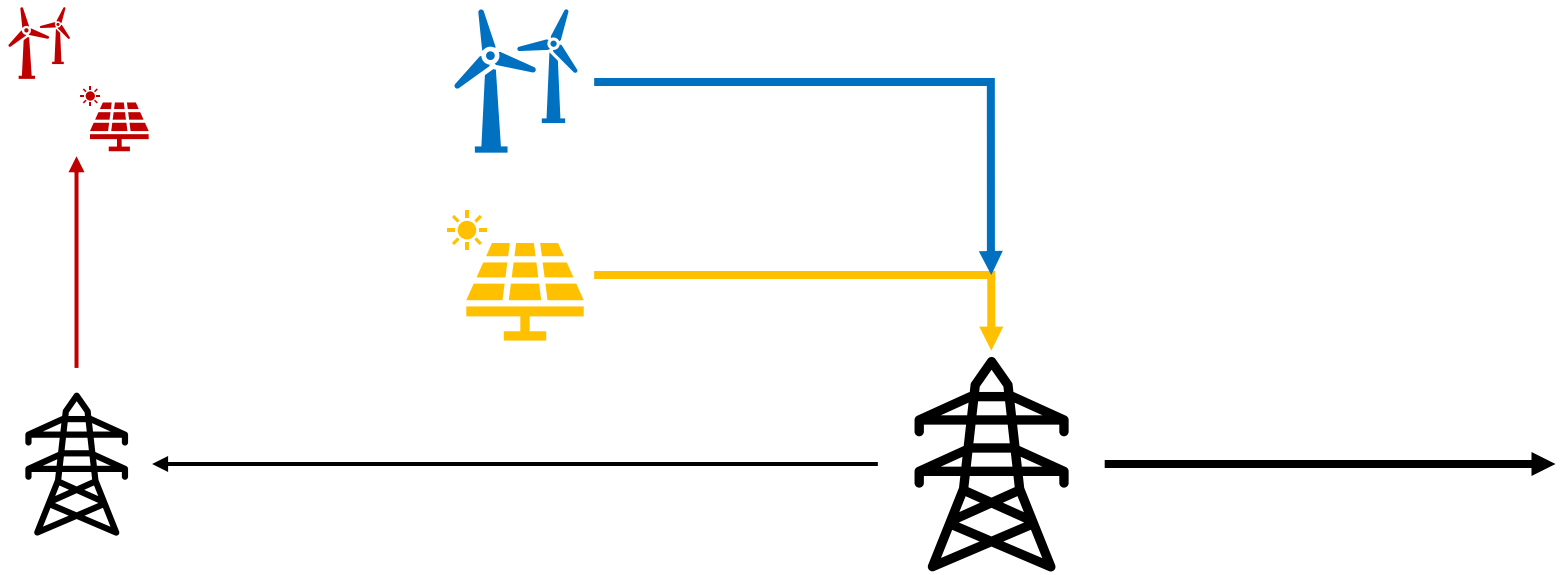
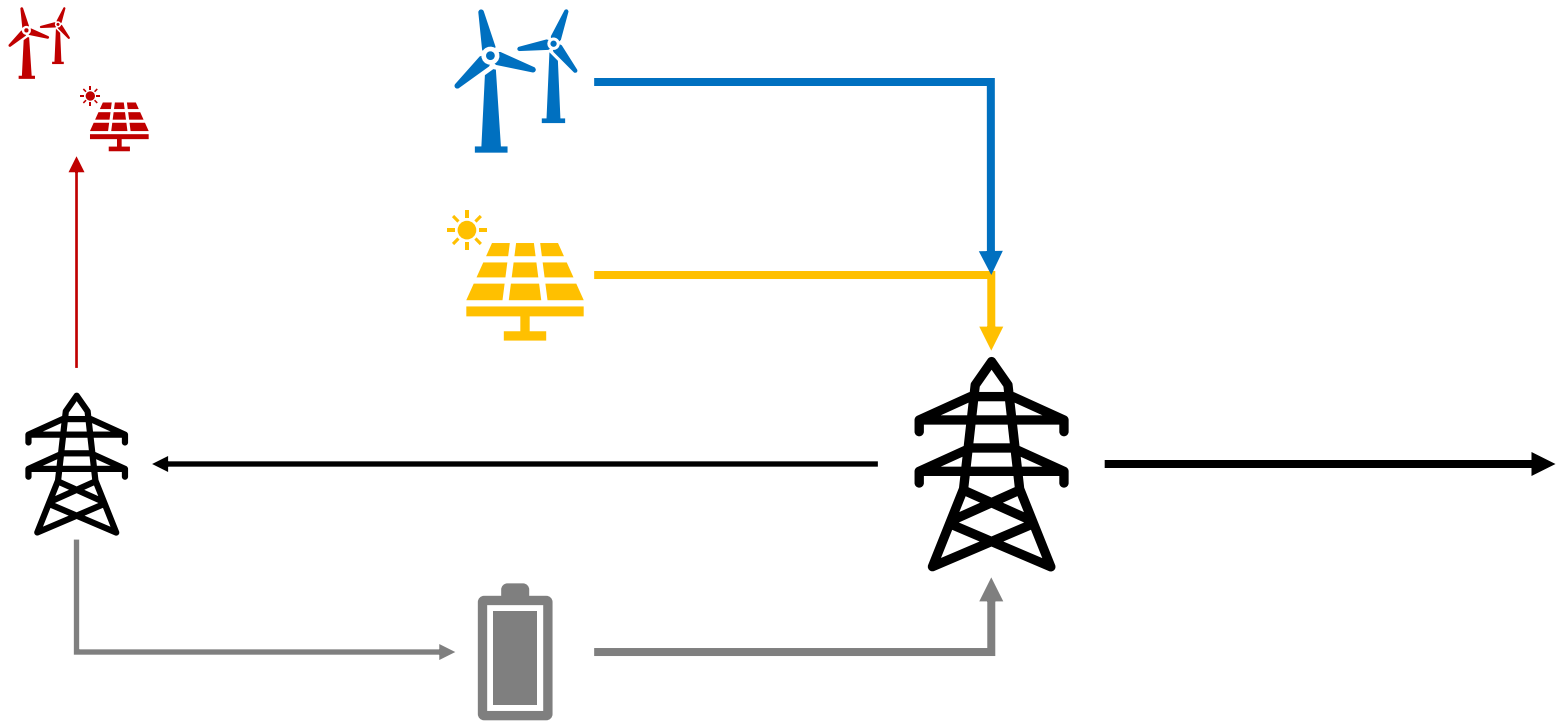
Hybridisation of energy supply reduces curtailment/redispatch



Adding energy storage allows for shifting excess power



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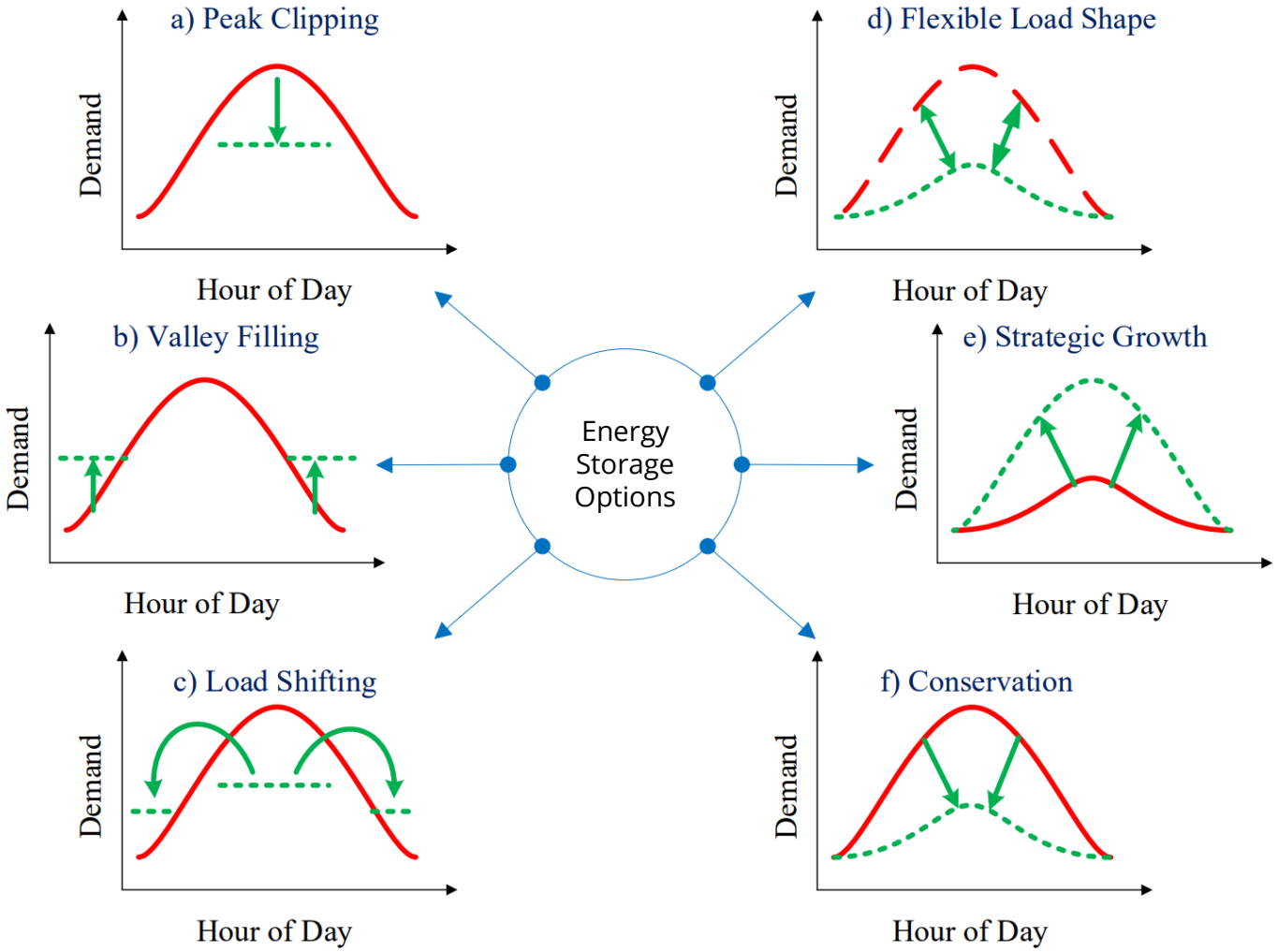
Energy storage offers various options



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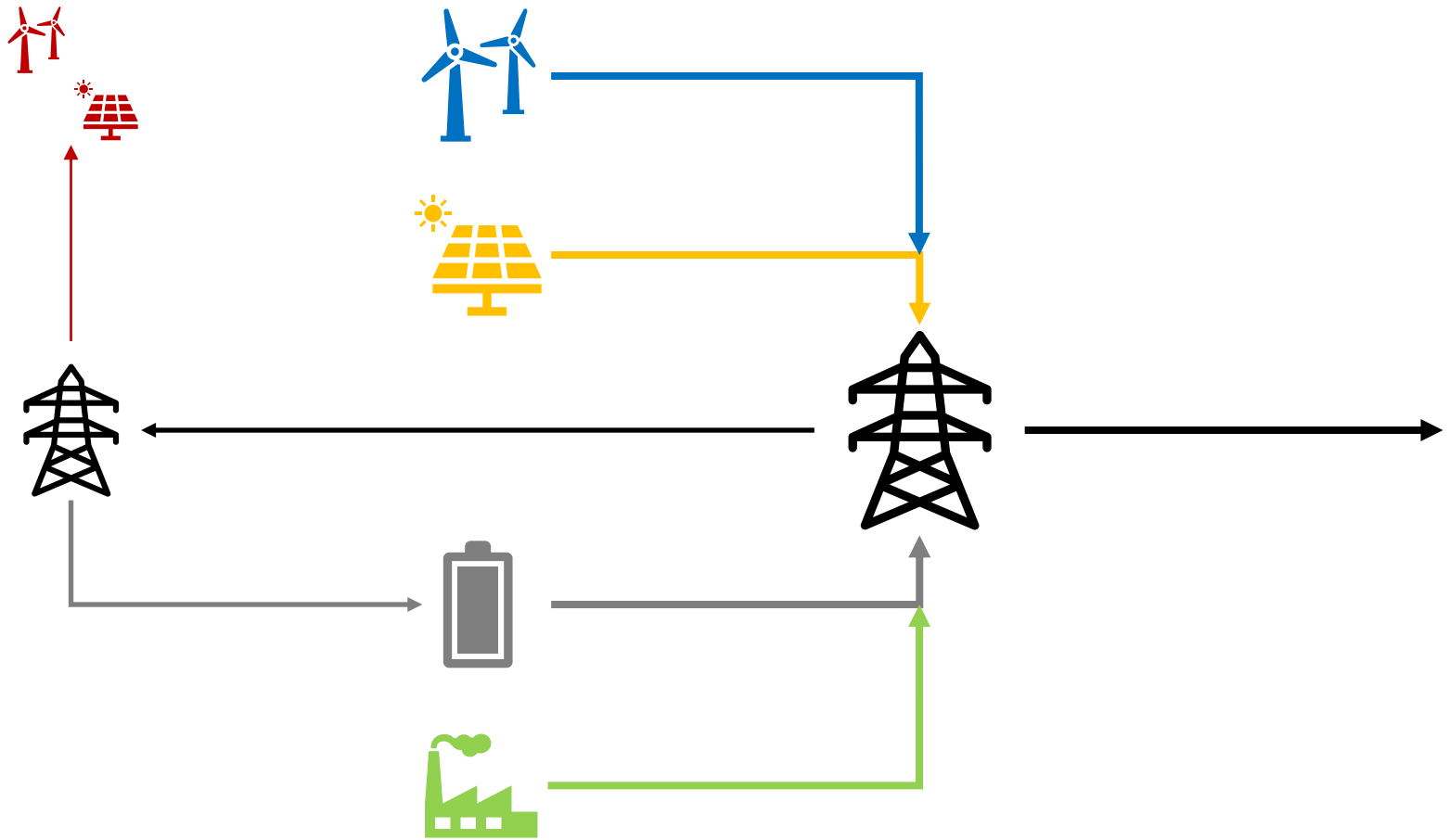
Non-volatile supply can bridge any *Dunkelflaute*



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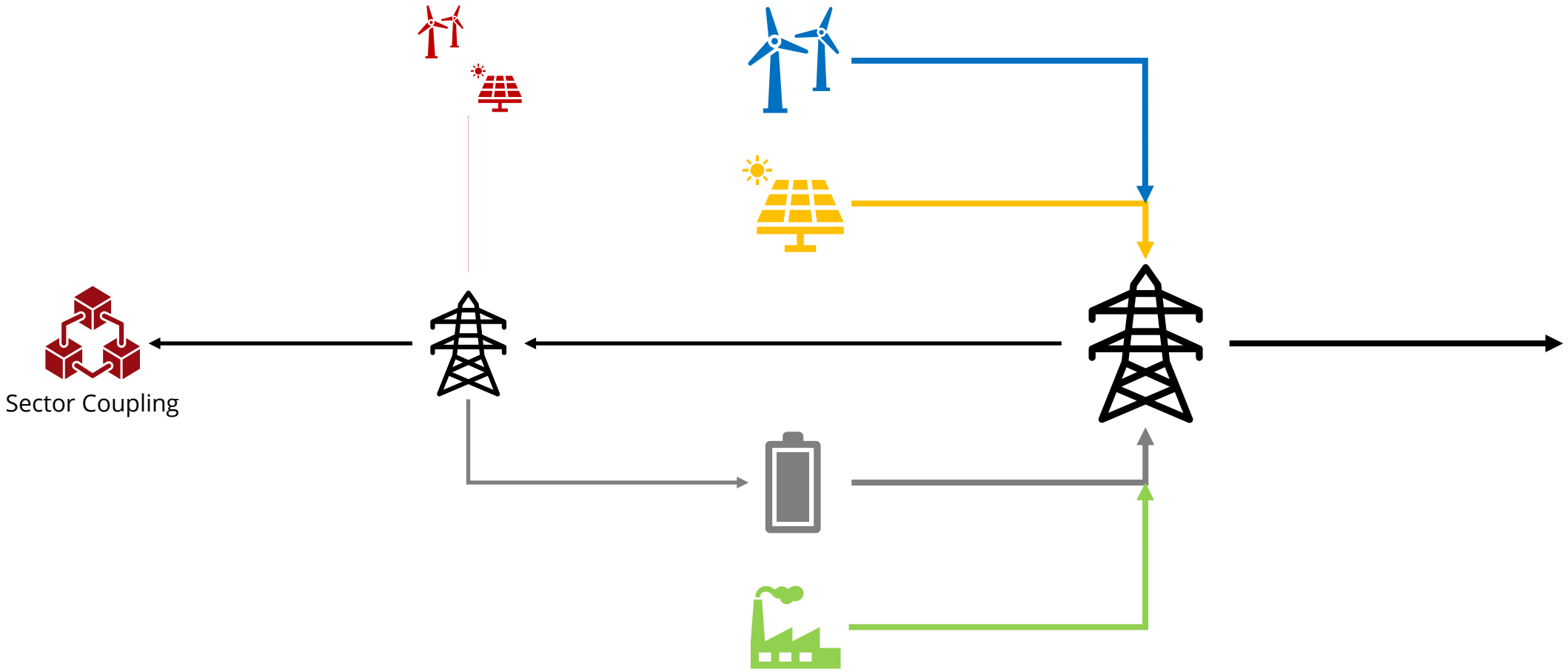
Coupling integrates Flexibility of other Energy Sectors



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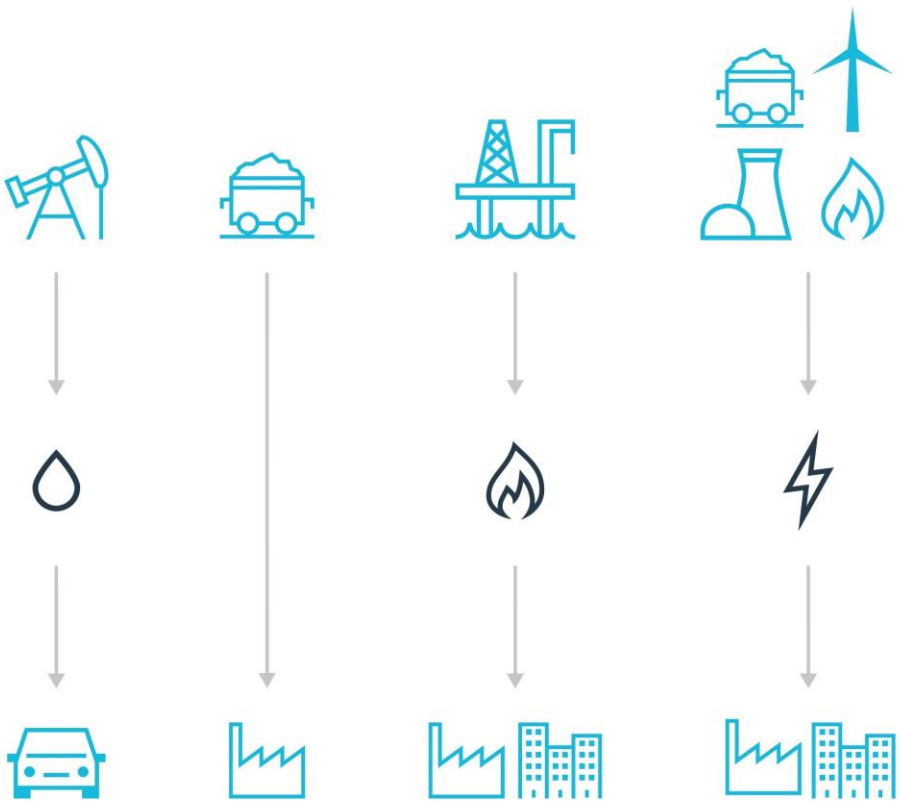
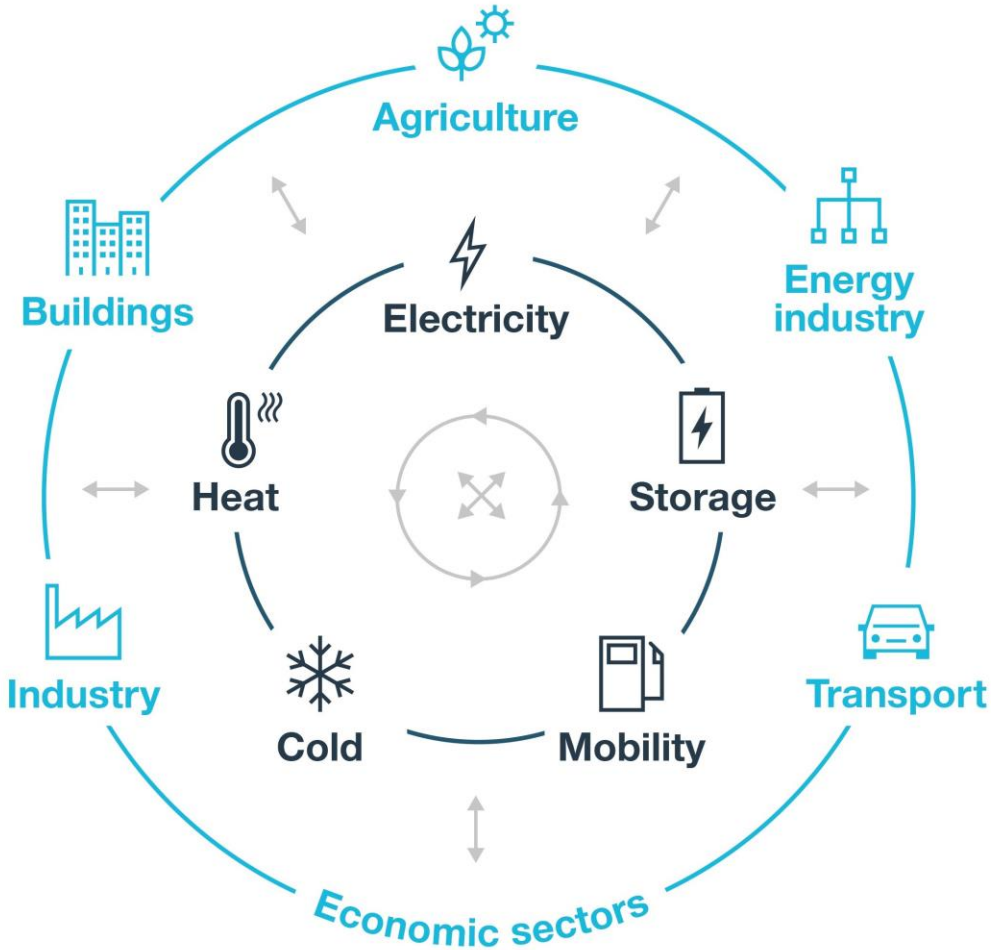
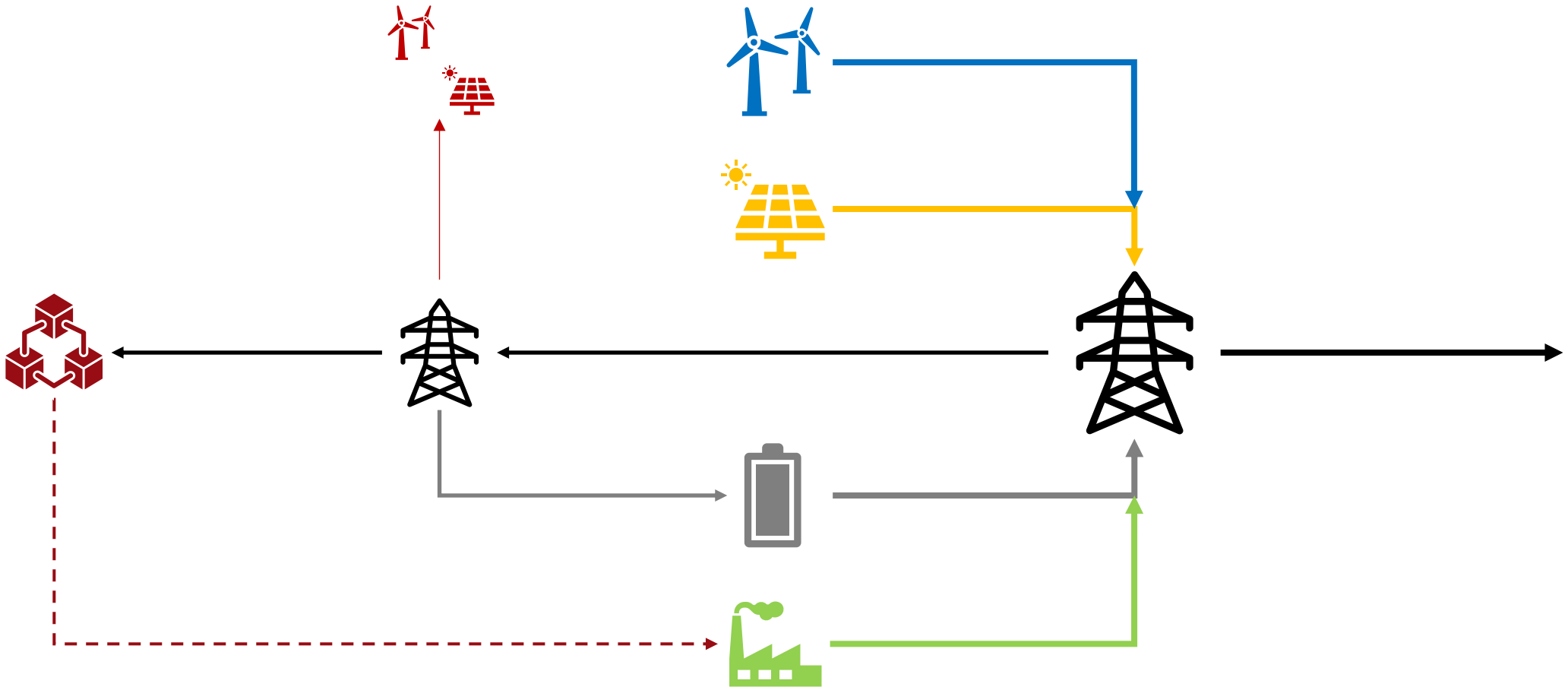
Sector coupling should be another flexibility strategy



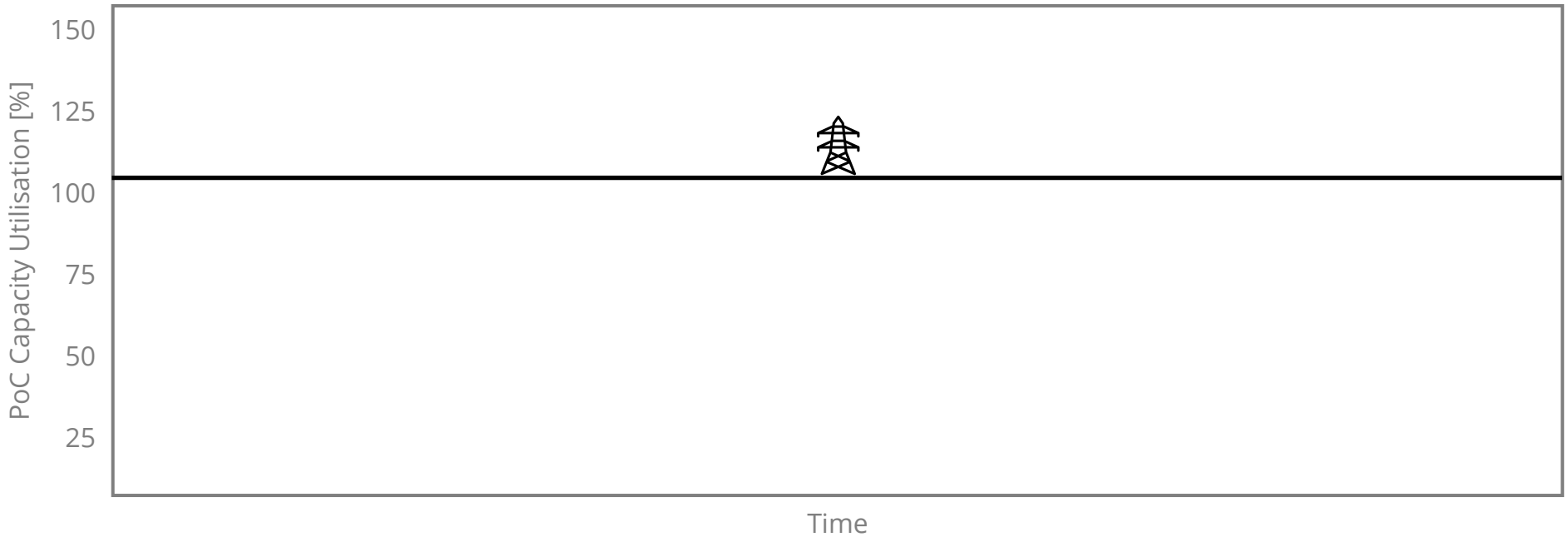


Energy flows between consumers and producers

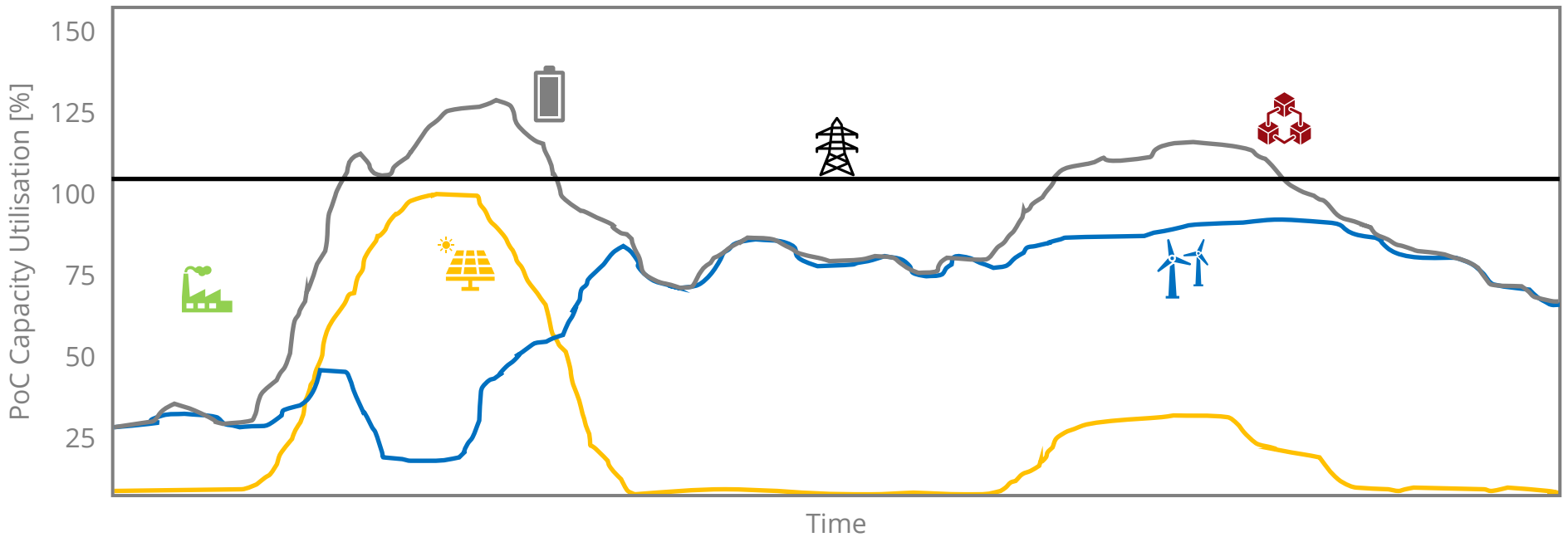
In an optimal scenario, some of the coupled energy is stored



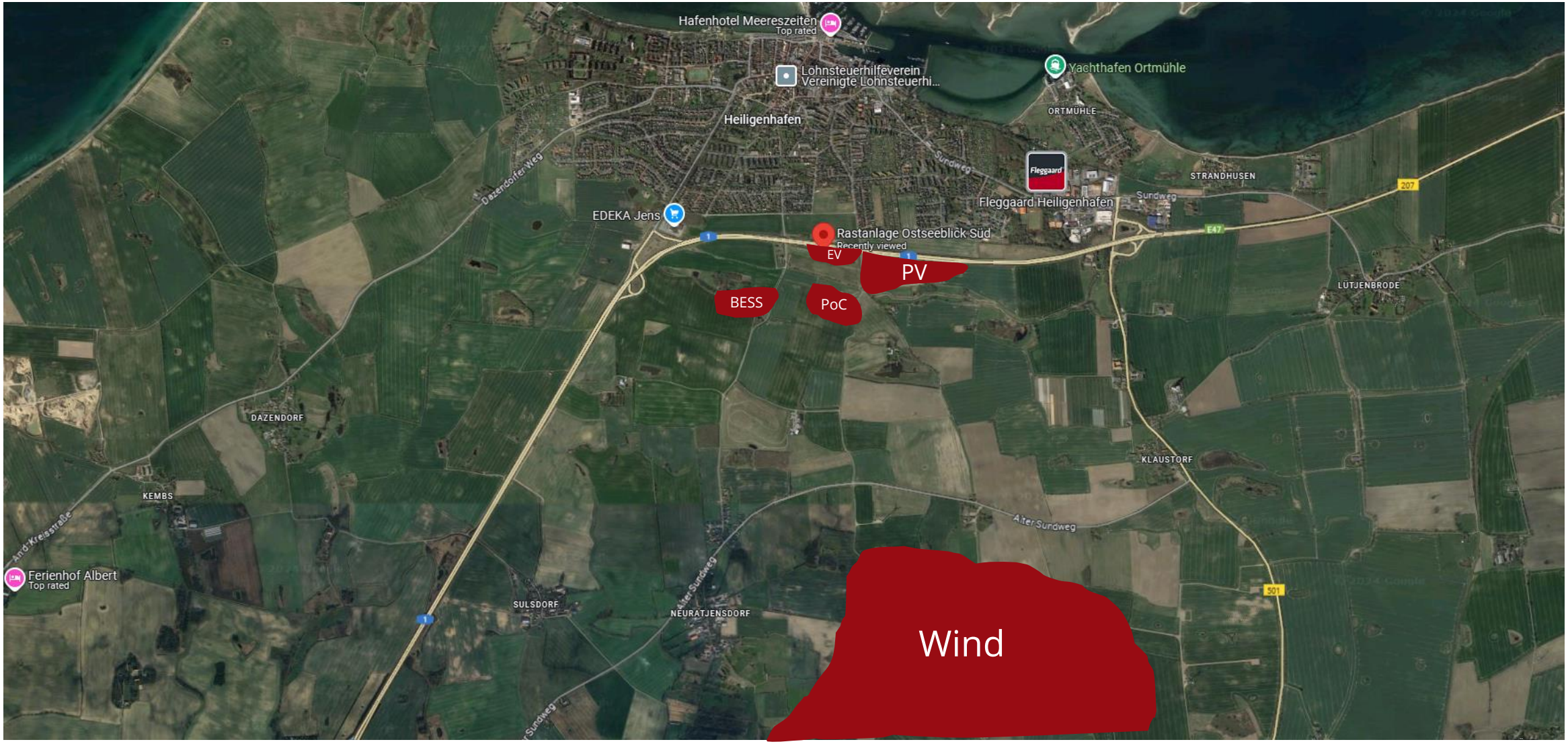
An optimal resource utilisation is the target



With predictive Control, optimal Resource Utilisation is possible



Is there a *positive* example?



Take Aways

1. Advanced energy storage, together with smart grids, constitutes a kind of spacetime for electrification and the green transition.
2. With volatile energy supply, energy storage flexibility is required to balance between the dynamics of supply and demand side.
3. The paradigm shift is that advanced energy storage needs to be implemented within the energy system and moved from primary to secondary storage.
4. An optimal integration of renewable power is mandatory for implementing advanced storage – if no energy is worth being stored, the is no need for storage.
5. If also energy storage is implemented optimally, it should also support the power grid with grid and/or system services – but without destructive interference.
6. Overcapacity at the grid connection points with the integration of energy storage systems can accelerate the roll-out of renewable energies and reduce curtailment or redispatch.

Efficiency without Effectiveness is lost!

ADVANCED ENERGY STORAGE CONFERENCE 2025

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See you in 2025 for
Advanced Energy Storage 2025
4 December 2025 - Aarhus, Denmark