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Distributed Energy Storage Solution

Telco infrastructure turned into virtual power plant

A sustainable future through digitalization

NOG meeting 15th of November 2023

Content

- Why does the energy transition matters – also for telcos?
- Case Elisa Finland
- Monetization
- Network quality

How to tackle climate change?

1.5°C

Under the 2015 Paris Agreement the world agreed to cut greenhouse gas emissions "to limit the temperature increase to 1.5°C above pre-industrial levels". The major component of that change is the energy transition from fossil fuels to renewable sources of energy such as wind and solar.

22% to 42.5%

EU 27 target for proportion of total energy generated by renewable energy in 2030 compared to actual figure for 2022

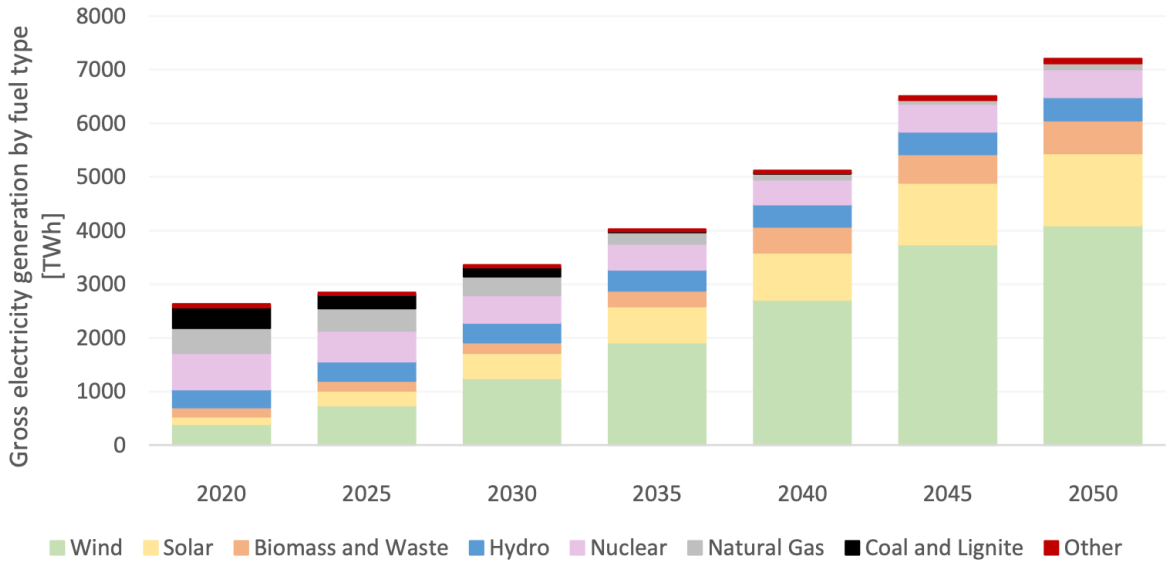
16, 20, 30GW

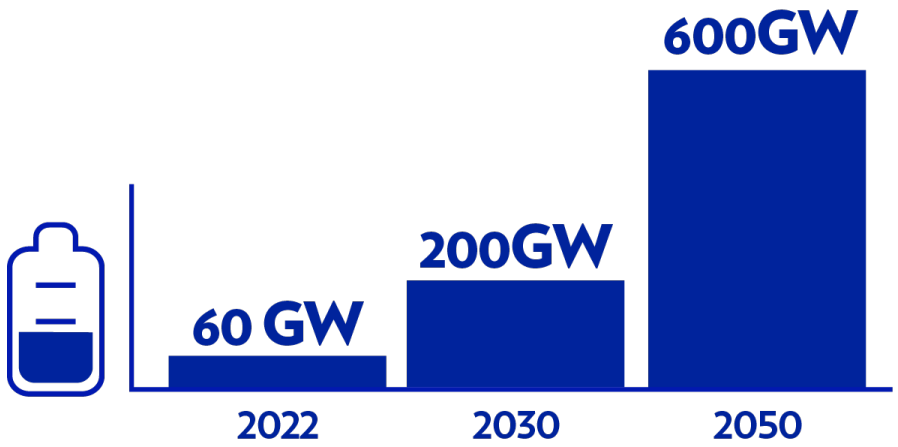
GW of wind energy installed in EU 27 in 2022, per annum forecasts for 2023 to 2027, requirement for EU to meet target

A huge distruption is under way…

From fossil fuels and large centralized production units …

… Towards Zero Carbon and distributed, **intelligently controlled,** systems





EU Energy storage capacity forecasts from 2022 to 2030 and 2050.

*source: EU JRC analysis

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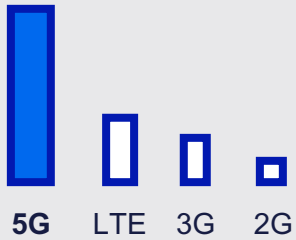
Reality where we are with energy – telco view

Energy consumption constitutes between

20-40 %

of network OPEX



5G can increase

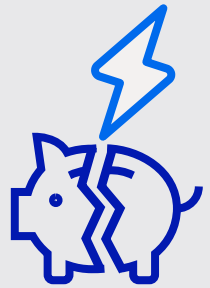
+30 %

energy consumption

Electricity market price **volatility** in last few years even

+500 %

Due to increase in variable renewable production



The only way to avoid high prices:

OPTIMISE CONSUMPTION

or do not use electricity

TELCO'S COMMITMENT TO SUSTAINABILITY DEVELOPMENT

Source: GSMA & Nord Pool

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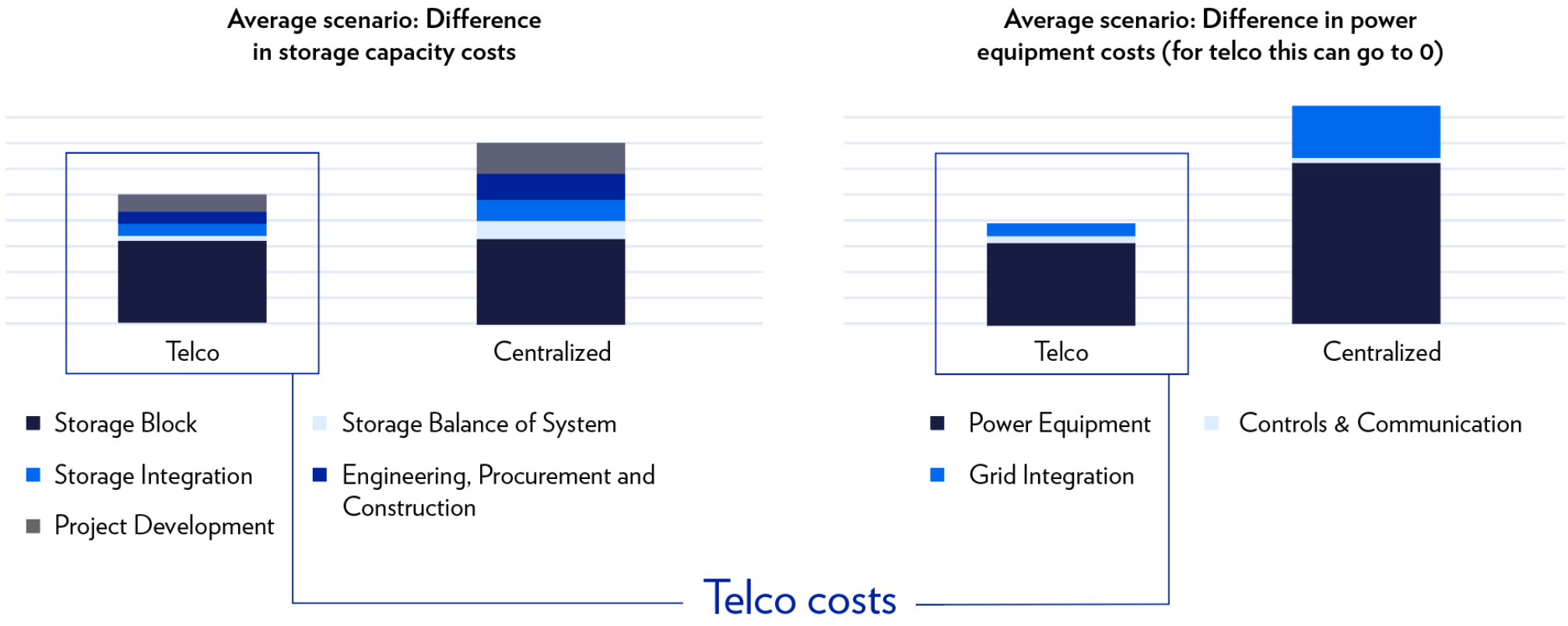
Why this is relevant to telcos? Why telco infra is good for battery storages?

- Comparison of distributed batteries at telco mobile basestation sites vs centralized grid batteries



Sources: US Department of Energy, Energy Storage Grand Challenge: Energy Storage Market Report December 2020 & Elisa analysis

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Elisa DES Solution

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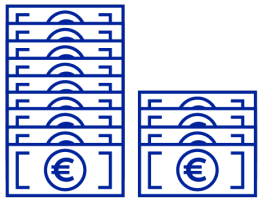
DES solution **reduces electricity costs** and **earns profit** from electricity markets by **controlling distributed battery systems in telco network**



>50%

Combination of revenue opportunity and cost savings from DES can add up to more than half an operator's current electricity costs

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Elisa lithium battery project

2020

- Elisa started to investigate lithium batteries. Same time we started to **build remote control network** to our base stations power equipment

2021

- First lithium battery order for pilot end of 2021

2022

- The first lithium **pilot installations** in the beginning of 2022
- **Reserve market certification** in June 2022 (aFRR)
- **Market participation** in Q4-2022
- Full **network roll-out planning** & system development for scale

2023

- Lithium battery rollout
- **New market places**
- **24/7 electricity market operations**
- **New power equipment compatibility**

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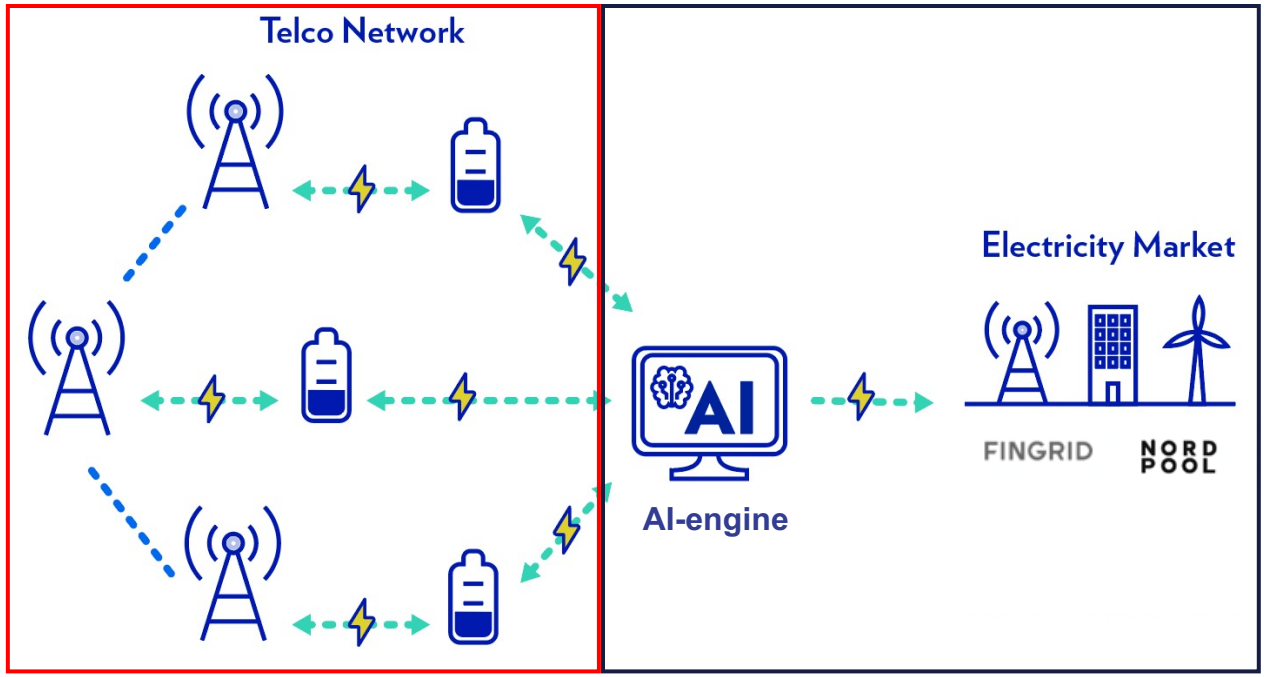
Elisa DES & Case Finland

Elisa's mobile network in Finland is hosting the largest distributed virtual power plant in Europe

- 2100 sites
- 150 MWh
- CO2 down by up to 20900t / year

Telco network

Elisa DES



Elisa's Distributed Energy Storage brings

- **Savings** in electricity procurement
- **Revenue** from electricity balancing services to electricity transmission system operators
- Supports renewables & **decreases emissions**
- Improves telco & electricity grid **resilience**
- Savings for everyone during peaks

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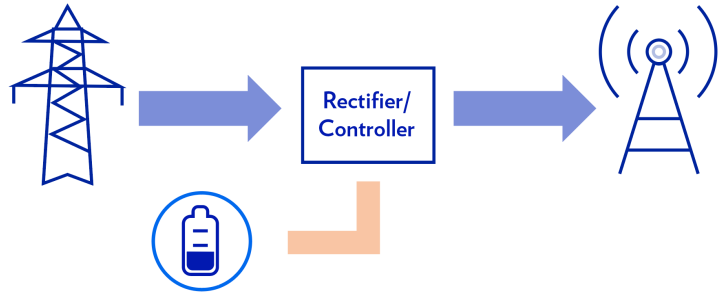
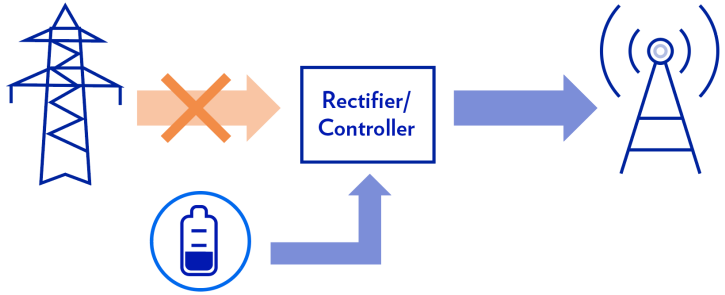
Funded by the European Union – NextGenerationEU

What we do in practise? Control of power equipment

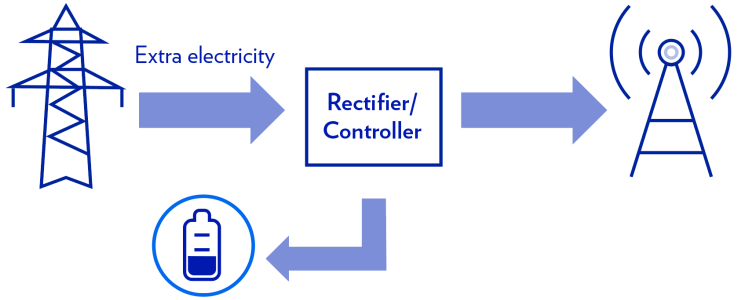
Default mode: Battery not discharging nor charging, site consuming electricity from grid as usual



Up regulation mode, grid needs more power: Battery discharging, No electricity from the grid



Down regulation mode, excess electricity in grid: Battery charging plus electricity feed to radios from grid



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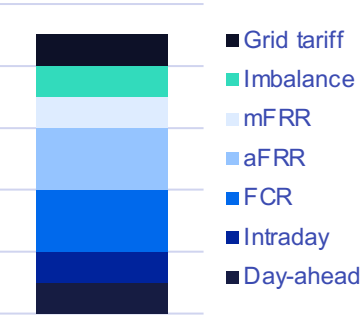
Optimization and value stacking are the key

Opportunities for batteries & demand response

Power exchange (financial trading)	Power exchange (physical trading)		TSOs		
Nasdaq	NORD POOL	epexspot	50hertz, Statnett, FINGRID, nationalgrid, SVENSKA KRAFTNÄT, ENERGINET, eSett		
Trading					
Financial market	Day-ahead market	Intra-day market	Balancing power market	Delivery	Imbalance settlement
			Reserve market		
10 years- one day ahead	Auction: Tomorrow	Continuous trading: Tomorrow and present day	Real-time		After delivery
Products					
Futures, DS futures, options Annual, quarterly, monthly, weekly	Hour-15 min	Hour-15 min	1–60 min		Imbalance power

Products:
FFR
FCR(-D)
FCR(-N)
aFRR
mFRR
RR

Value stacking



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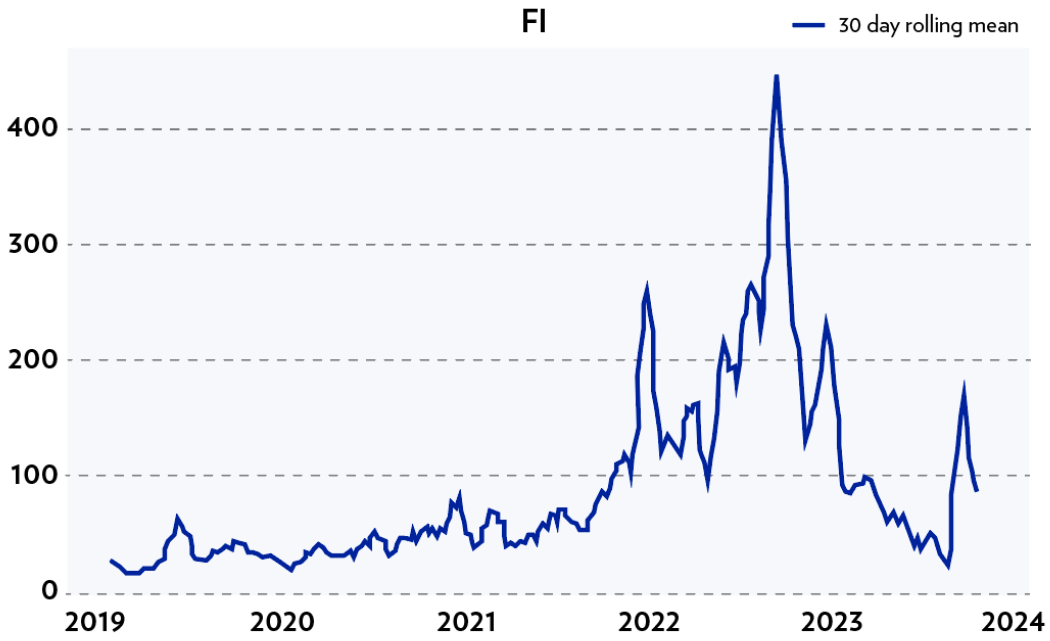
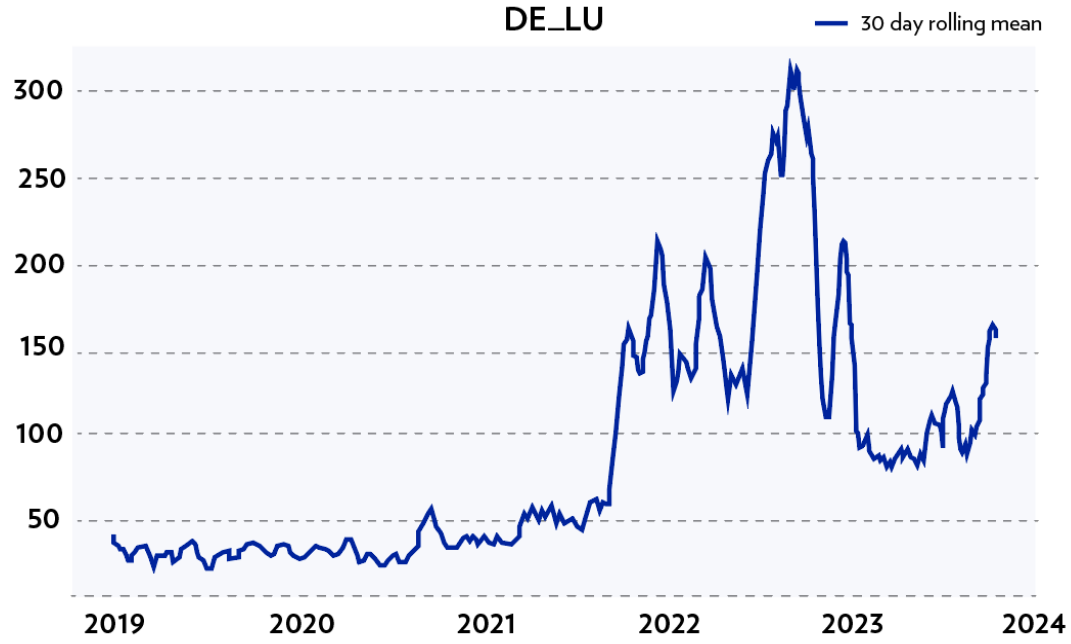
Monetization

Volatility in last years in Finland & Germany

– price difference between highest and lowest hour of the day





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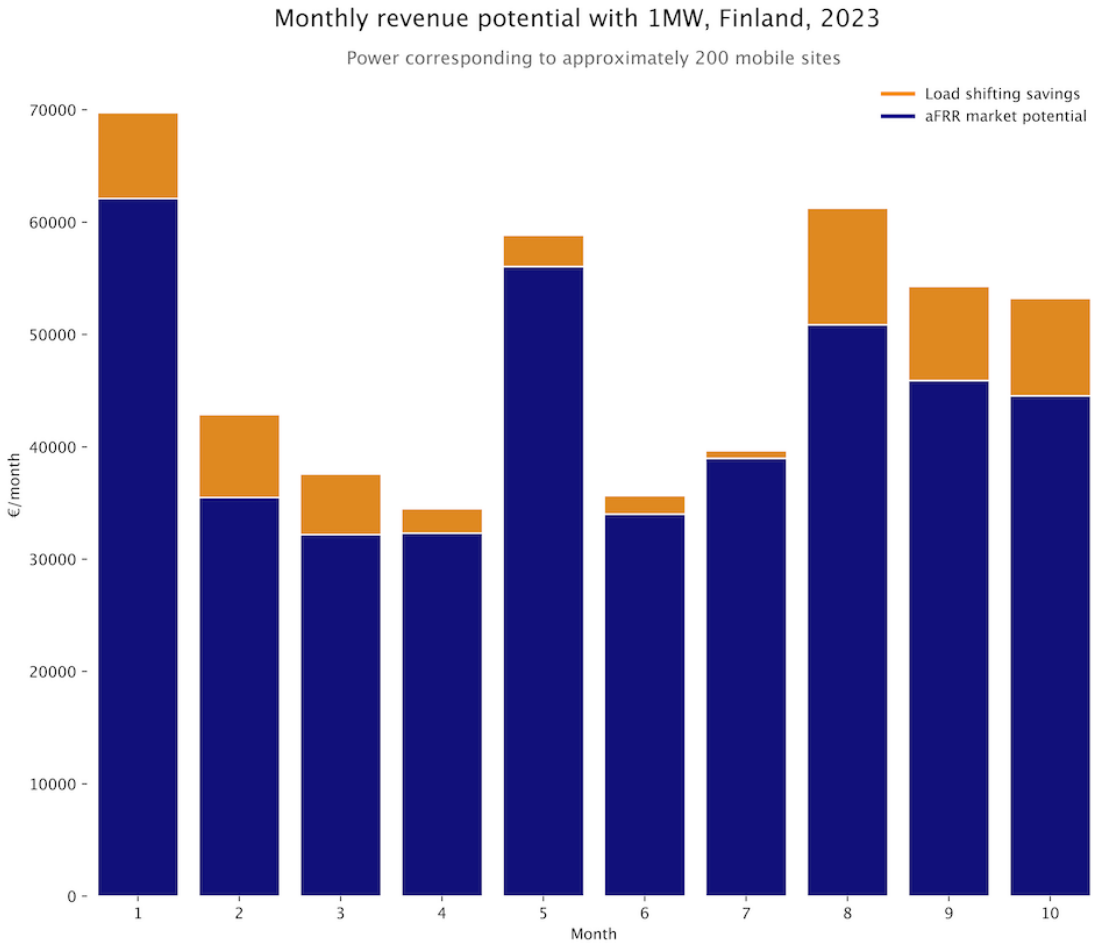
Finland case example



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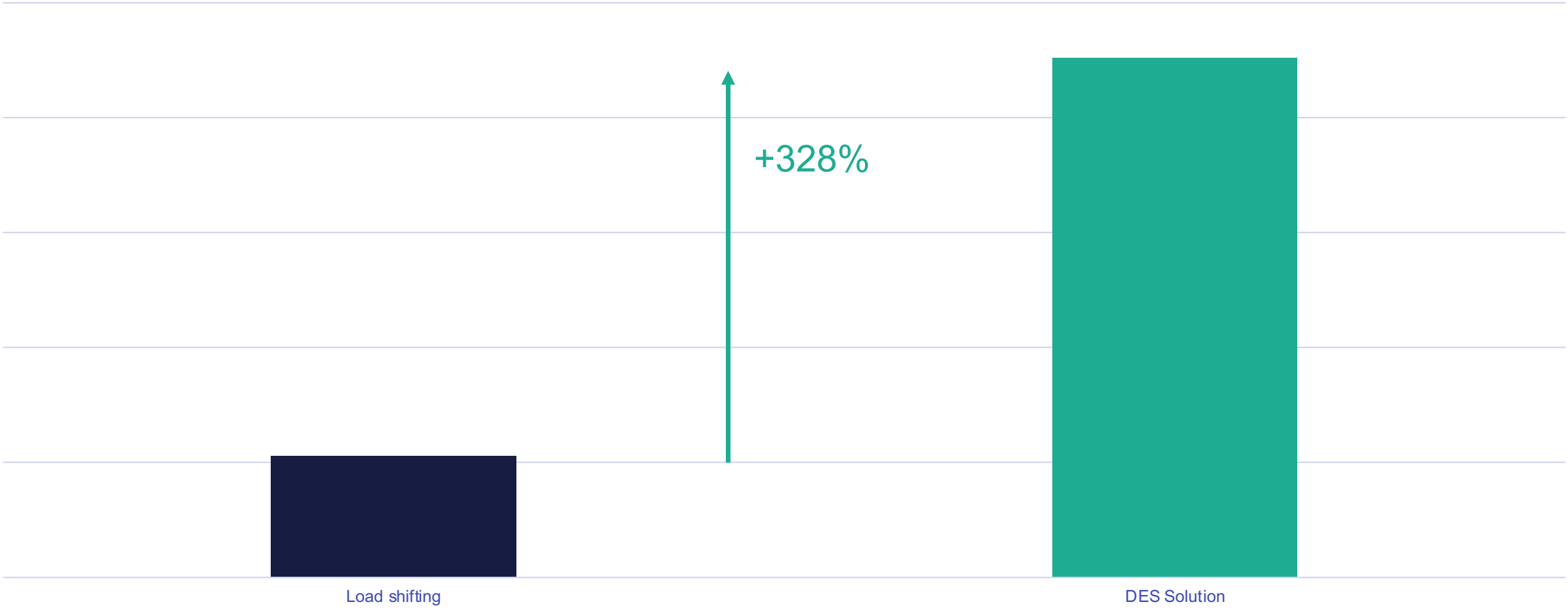
Monthly benefit 1 MW of capacity, comparison of different optimization



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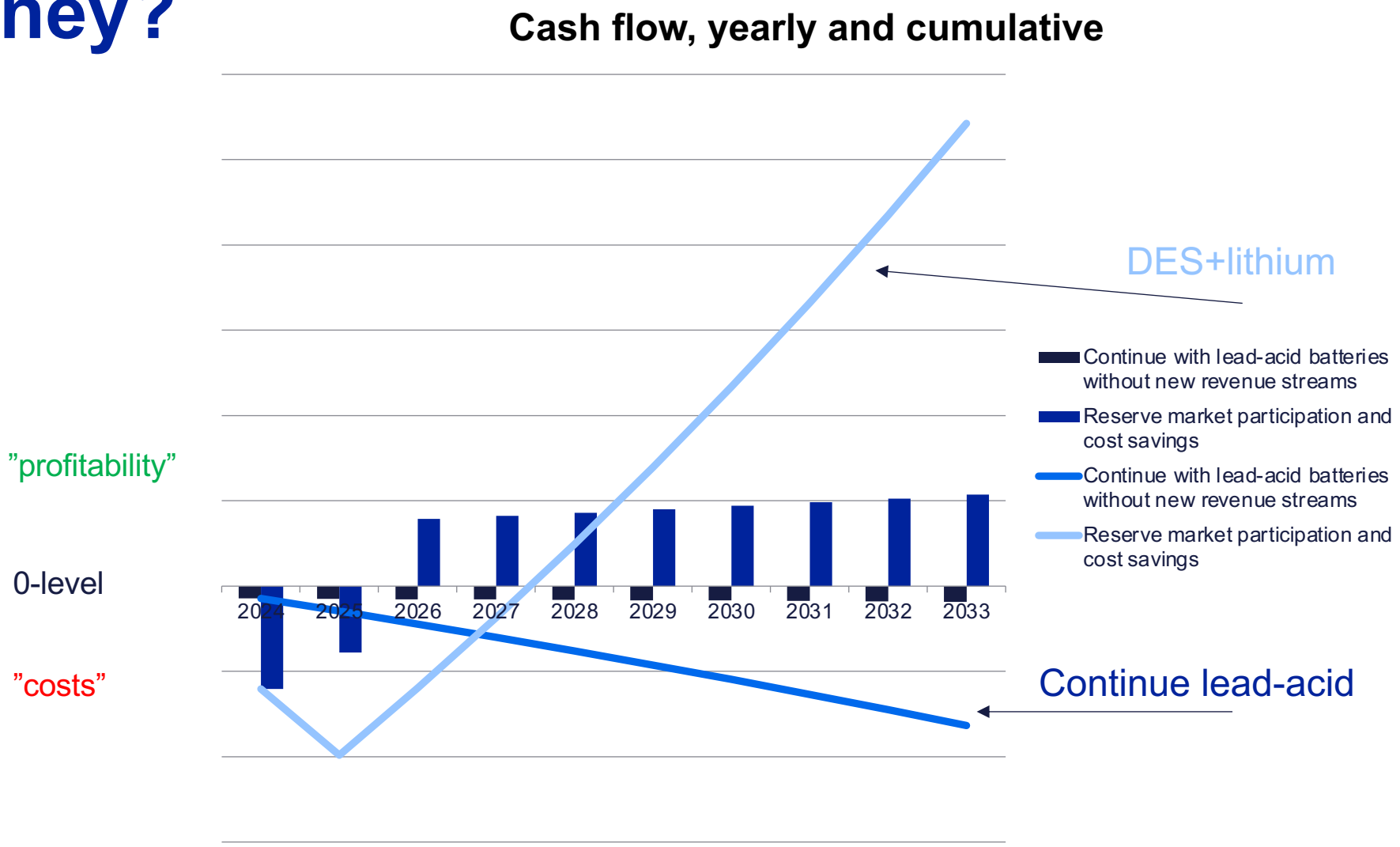
To continue with lead acid or increase battery capacity accelerated pace with lithium and earn money?



Illustrative example

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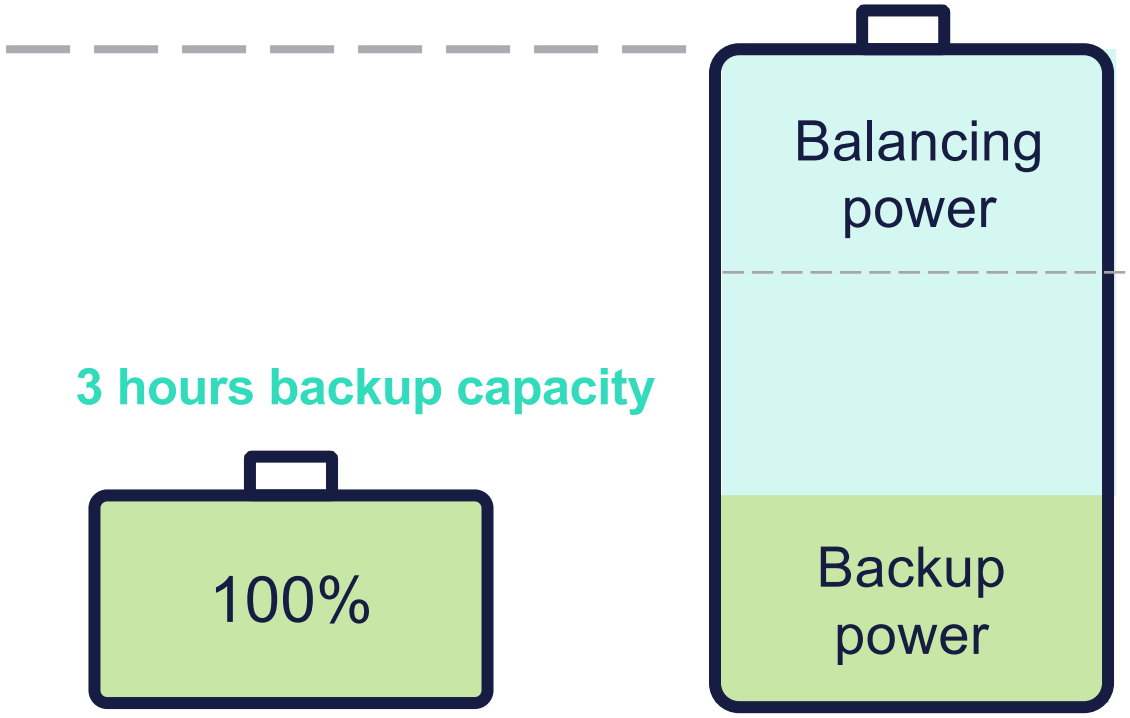
Effect on network reliability

DES effect during power shortage

Traditional back-up

DES



Max SoC

6 hours backup capacity on average + more reliable battery operation

Average SoC
~ 60-70%

3 hours backup capacity

Minimum SoC

At lead acid sites there has been 9x more errors compared to DES sites

Summary of benefits

- Financial benefits
- Environmental impact
- Reliability of network

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ENERGY STORAGE AWARDS 2023

- Evaluation criteria emphasized: "The key is to display project characteristics that are not only notable within the scope of the project, but also demonstrate potential for replicability at scale."

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Thank you!

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