Holistic approach to BESS projects in Finland

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Presentation agenda

- Who is Merus Power?
- How Merus® ESS project development works
- What happens in the development phase?
- BESS designs in Finland
- BESS construction phase
- BESS operation & optimization
- Overall project management

BESS = Battery Energy Storage System

Merus Power Plc

2008
Founded

140↑
Personnel
11/2024

29 M€
Revenue
2023

70+
Countries with our solutions

We design, manufacture Finnish innovative energy storage and power quality solutions (STATCOM, SVC & active harmonic filters).

Merus Power headquarters, R&D, production and test laboratories are in Ylöjärvi, Finland. Sales offices in Helsinki, UAE, Colombia and Germany.

Scalable and modular power electronics, Control & Trading software, full ESS project development capabilities, and ESS simulation models.

As a Nordic ESS market leader with 15 MW-scale projects in Finland, Merus Power is expanding to other European ESS markets.

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Merus® ESS references from Finland

2019 Lidl distribution center

Järvenpää – 2.6MW / 2.3MWh

2020 LEMENE Energy Community

Lempäälä – 1.6MW / 1.3MWh

2020 TuuliWatti 21MW wind farm

Simojoki – 6MW / 7MWh

2021 S-Ryhmä, distribution center 1

2021 S-Ryhmä, distribution center 2

Sipoo – 1MW / 1MWh and 1MW / 1MWh

2023 Helen, Mankala hydropower plant

Mankala – 0.3MW / 0.3MWh

2023 Elenia, Securing electricity distribution 1

2023 Elenia, Securing electricity distribution 2

0.6MW / 0.6MWh and 0.6MW ja 0.6MWh

2024 Taaleri, grid balancing

Lempäälä – 30MW / 36MWh

2024* Sallila Energia

1.7MW / 1.7MWh

2025* Herrfors, electric boiler

Pietarsaari – 7MW / 7MWh

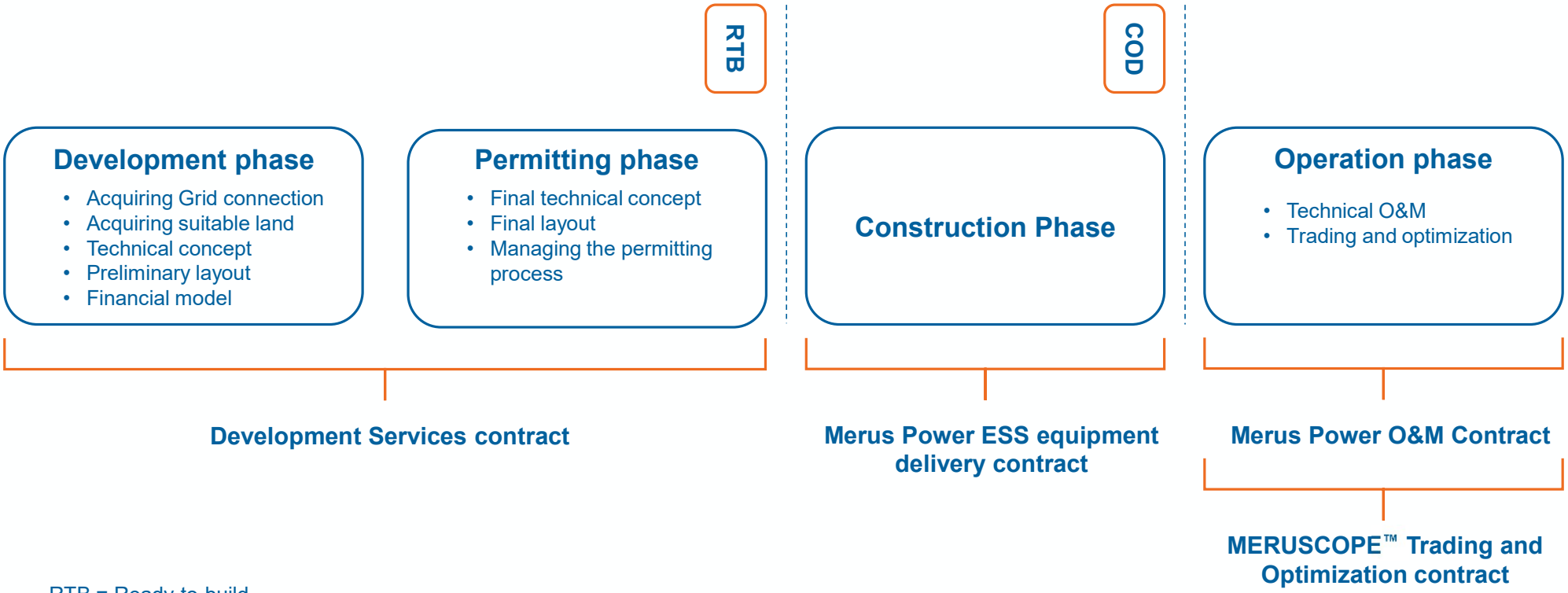
2025* eNordic, Lappeenrannan Energia, Ardian

Lappeenranta – 38MW / 40Mwh

2025* Alpiq, Valkeakoski, grid balancing

30MW / 36Mwh

How Merus® ESS project development works



RTB = Ready-to-build

COD = Commercial operations date

O&M = Operation & Maintenance

What happens in the development phase?

- **Grid connection capacity** and **land** defines the project boundaries (location, schedule & design)
  - Land + connection agreement ≠ RTB project
- Understand and report how BESS connects to existing grid and impacts its surroundings
  - Important for both hybrid & stand-alone BESS projects
- Align your **business and financial model** in the early stages to lock technical execution, site layout, and connection infra
- **It's not just buying batteries** – a multi-faceted approach is needed in the early development phase
- **Permitting** – connection permit from TSO/DSO, building permit, and fire security matters with municipalities
  - Finalized concept & design for permitting

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BESS designs in Finland

- **Duration & design**: 1h, 2h, or more?
  - Align MW/MWh ratio based on your project financial structure
  - AC & DC blocks sized based on secure electrical design
- **Outdoor conditions**: Extreme Finnish weather (freezing temperatures, snow and ice)
  - Merus Power has containers rated up to -40°C and shelter design for batteries
- **Augmentation plan**: Now or never
- **Lifetime assessment**: Degradation based on calendar & cyclic aging
  - Oversizing to fight degradation influence?
- **SJV2024 vs. SJV2019**: Know the difference and choose grid forming PCS
  - System classification: Type A, B, C & D
  - Reactive power requirements: Size PCS accordingly
- **>10 MW or 110kV BESS requirements (Type C & D)**: Ensure that your BESS supplier has PSCAD and PSS®E simulation capabilities to validate system performance

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BESS construction phase

- **Full EPC** – Small risk of forgetting crucial tasks
  - Ground works, foundations, site deliveries, installation, cabling, BoP, connection, commissioning, Fingrid tests, etc…
- **Know your site and soil** – Batteries are heavy
- **Augmentation** – Leave room and infra if possible (MW or MWh)
- **SJV/VJV requirements & tests as a part of commissioning and SAT**

EPC = Engineering, procurement, and construction
BoP = Balance of Plant

SAT = Site Acceptance Tests
SJV, VJV = Fingrid grid codes

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BESS operation & optimization

- O&M – Maximize BESS availability
  - Not only yearly maintenance visits
  - Spare part management
  - 24/7 hotline to improve availability
  - Remote operation platform
  - Control room services
  - Site upkeep
  - Site guarding, etc.
- Optimize your asset by choosing the best markets to participate
  - Follow market development and battery degradation
  - FCR saturation – plan accordingly
  - **Revenue stacking**
- Recycling batteries – Importers' responsibility after EoL in EU

EoL = End of Life

Overall project management

- **This is what you need to master**
  - Land acquisition
  - Business and financial model development
  - Permitting
  - Electrical and mechanical engineering
  - Battery technology and power electronics
  - Electrical markets
  - Local grid codes
  - Construction and delivery process
  - Operation and maintenance (O&M)
  - Optimization and trading
  - Recycling, augmentation or repowering

Did you know that Merus Power does all the above?

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Thank you for your attention!

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