iiESI - Power Hub

A commercial Initiative to Utilise Decentralised Assets to Integrate Renewables

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Power Hub Technology
International B2B Sales

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DONG Energy: A leading energy group in Northern Europe

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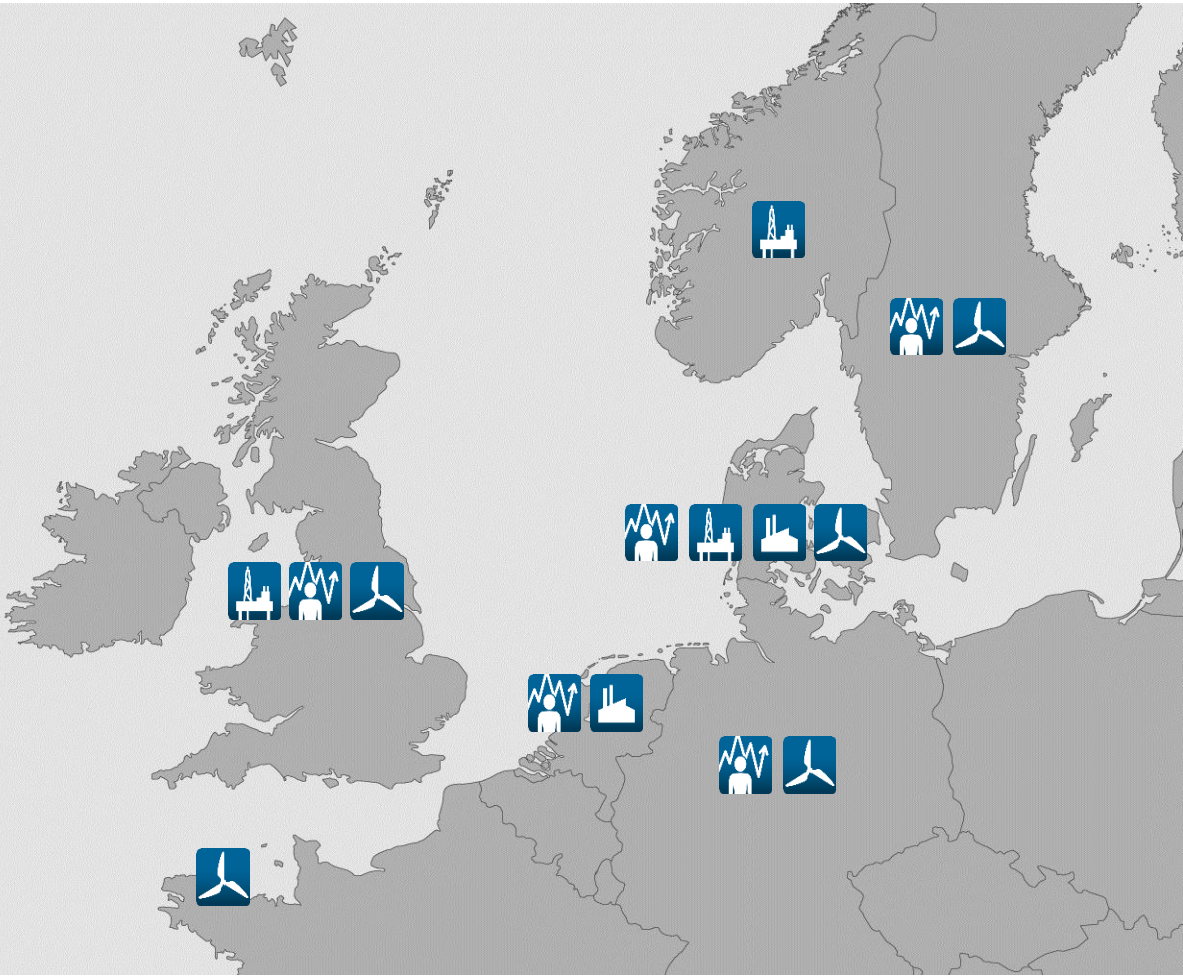
Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe.

We have approximately 6,500 employees and generated DKK 73 billion (EUR 7.6 billion) in revenue in 2011.



- **Exploration & Production**
- **Wind Power**
- **Thermal Power**
- **Customers & Markets**

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With the increased penetration of renewables into the power systems more flexibility is required to stabilize the system

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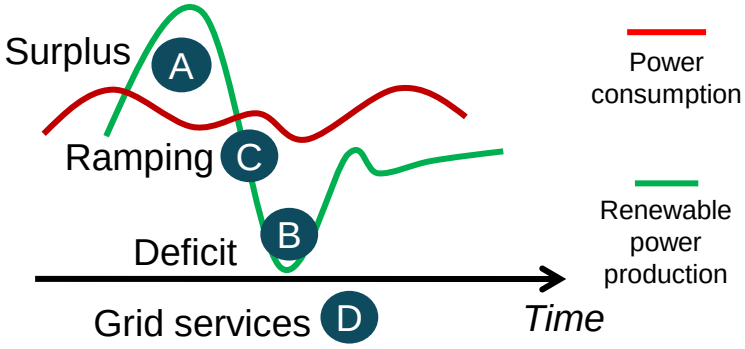
Increased penetration of renewables into the power system requires more flexibility



Should flexibility come from the conventional **supply** sources?

or from **flexible demand** or **decentralized** generation?

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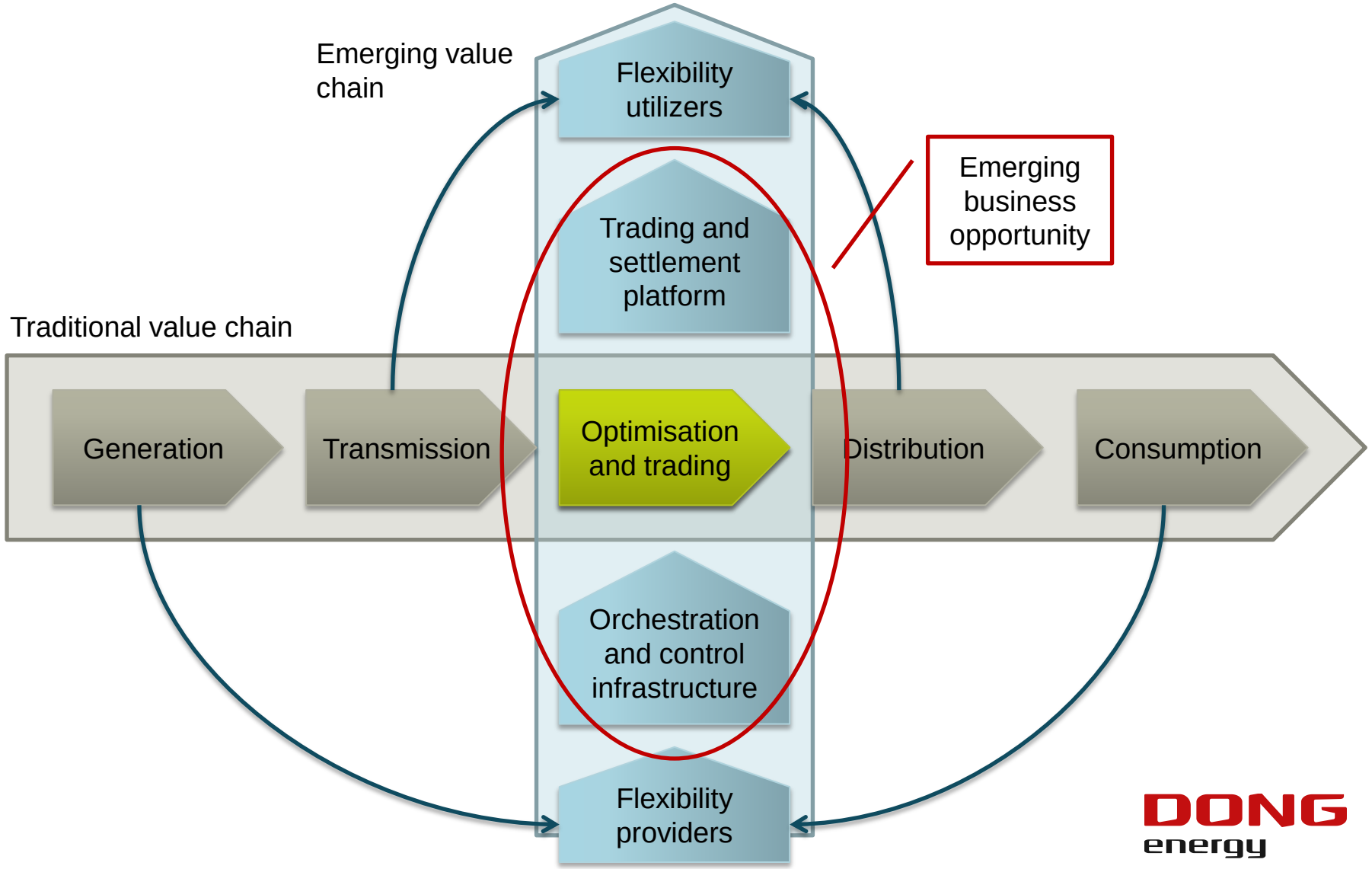
A new value chain is emerging – bringing flexibility providers and flexibility utilizers together



DONG Energy has developed the Power Hub Technology to capture the economical value of flexible assets.

Power Hub – enabling renewable energy integration

Apply forecast capabilities | **Utilise inherent system flexibility** | **Connect different assets**

Energy and reserves markets

nordpool spot

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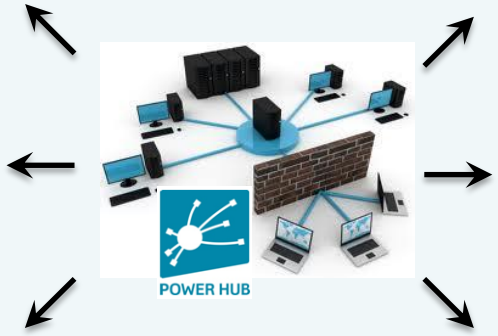
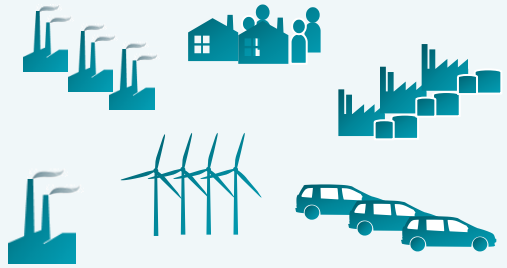


Assets – Individual or aggregated



Real time connection of physical assets and markets

High performance, scalable and reliable information flow and data management is vital

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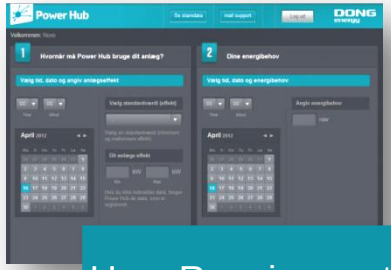
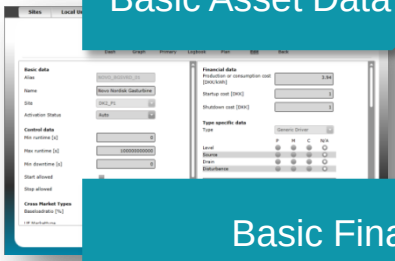


User Requirements

Technical Restrictions

Basic Asset Data



Basic Financial Data

Prognosis

Cross Market Optimisation

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Market Bids

Market Contracts

Schedules & activation

Measurements

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Customer Case: Lem Kær Wind Farm & Energy Storage

Demonstration site for Power Hub

- Providing all ancillary services from a wind form and energy storage

Lem Kær wind farm

Energy Storage System @ Lem Kær sub-station

Customer Case: Novo Nordisk

Demonstration site for Power Hub

- Utilizing excess generation capacity for balancing purposes

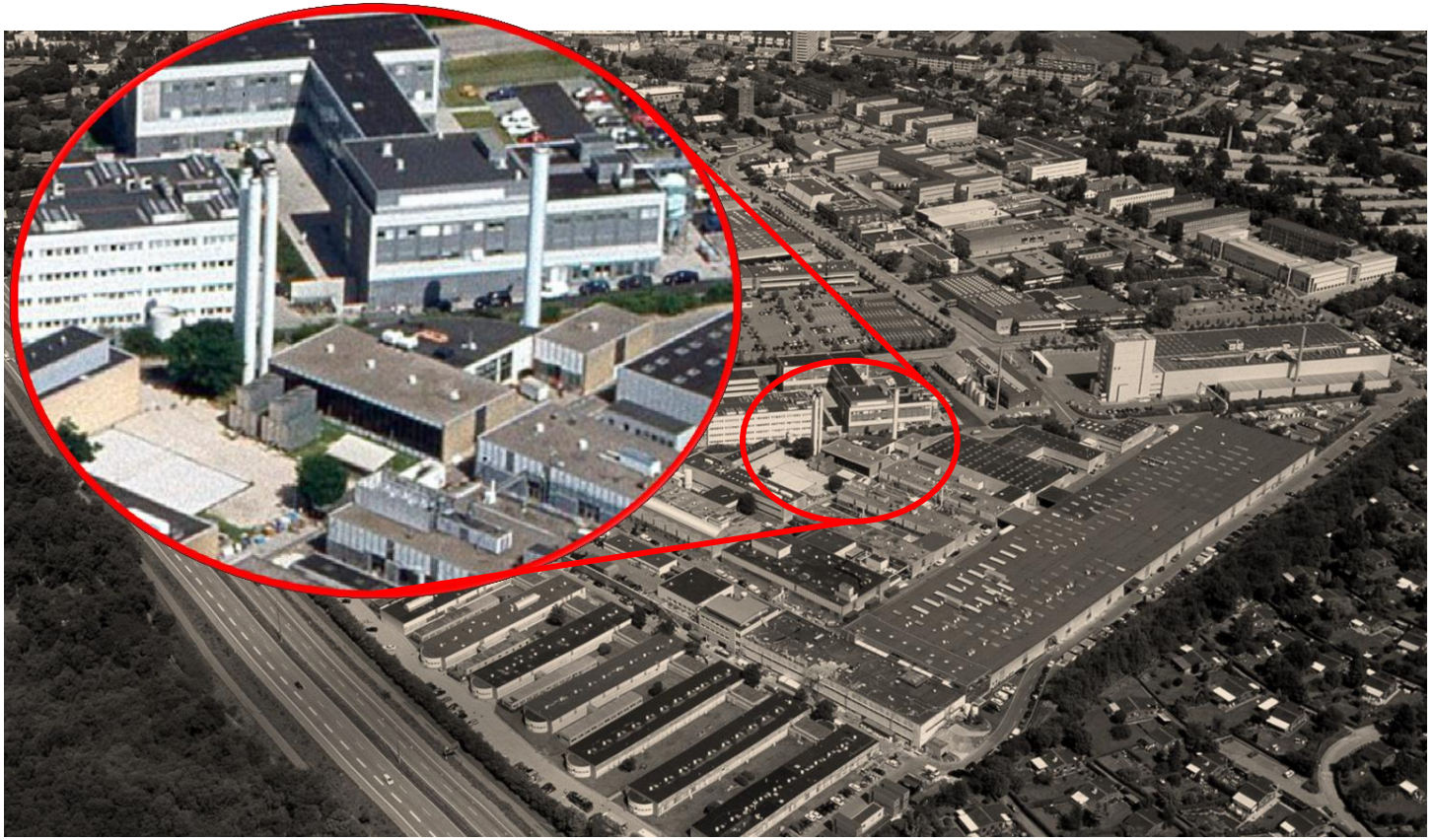

Photo courtesy of Novo Nordisk A/S

Customer Case: Faroe Islands

Demonstration site for Power Hub

- Providing sub second frequency demand response and distributed energy resource reserves to an isolated energy system

The Schneider-Electric / DONG Energy partnership builds on the Power Hub platform

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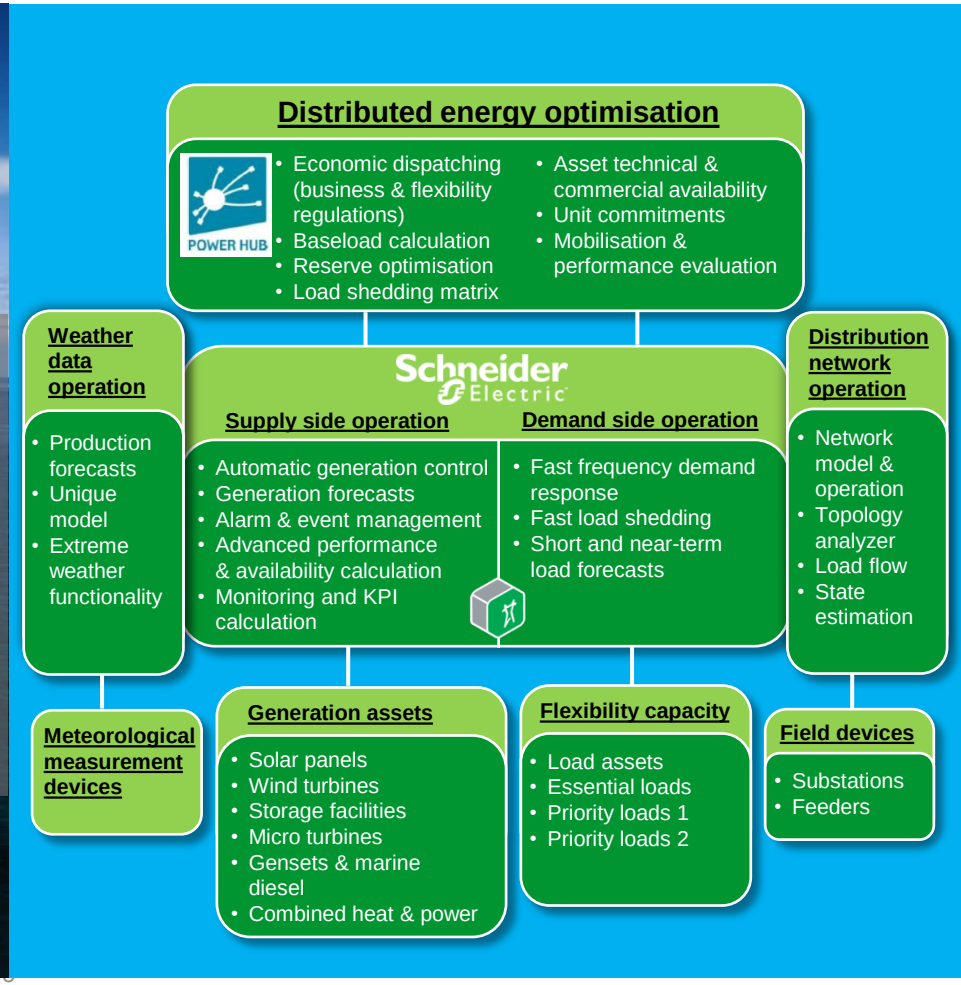
A 3-level architecture for system optimisation

3 Optimisation of supply & demand

2 Real-time operation & control

1 Data operation & automation of field devices



Schneider Electric

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Conclusions!

Power Hub shows it can be done, but strong barriers to commercialisation prevail

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Complexity rules in the real world

- Building the operational platform and business process integration is not trivial
- Varying DER regulation capabilities and control technology impacts mobilisation
- Poor communication and data management

Standardisation and Smart Grid enabling

- Necessary modifications to DER control technology often ruins the business case
- Of the shelf Smart Grid enabled/compliant units could accelerate smart grid roll out
- Real time connectivity is paramount

DER owners awareness of capabilities and potential

- Flexibility, ancillary services and reserves markets are not commonly known topics
- Linking flexibility to business processes rather than technology is paramount

Market reforms and regulatory changes

- Restructuring markets in terms of bid size, duration and gate closure
- TSO approval of a VPP as a single unit instead of approval of every unit in portfolio
- Unbundling of supplier and balance responsible party

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Questions/Answers

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