

NEW 4.0

Norddeutsche EnergieWende

www.new4-0.de



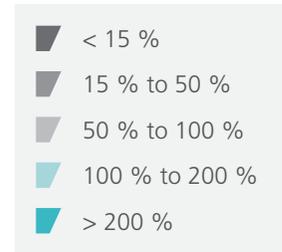
Innovation Alliance of Hamburg
and Schleswig-Holstein
for the Energy System of the Future



A unique innovation alliance comprising partners from the economic, scientific and political sectors, entitled "NEW 4.0", has been formed in Hamburg and Schleswig-Holstein. The goal of this major, cross-regional project is to demonstrate how the entire region, with its 4.5 million inhabitants, can be supplied with 100 percent renewable electricity, safely and reliably, as early as 2035. "NEW" stands for the Northern German Energy Transition (German: Norddeutsche EnergieWende) and "4.0" describes the threshold of the fourth industrial revolution: the digitalisation of industry and the intelligent networking of systems as part of the energy transition. The project is set to run for a four-year period, from 2016 to 2020. NEW 4.0 is aimed at implementing sustainable energy supply and thus strengthening the future viability of the region. Approximately 60 partners in the region bundle all the necessary expertise and problem-solving potential to give make a decisive impact on the energy transition in the north of Germany.

The model region

Share of RE power generation in gross power consumption:



Schleswig-Holstein and Hamburg form an ideal model region for the "Smart Energy Showcases – Digital Agenda for the Energy Transition" programme, which is funded by the Federal Ministry for Economics and Energy (BMWi). With a renewable energy ratio of 40 %, the region has already reached the point where Germany was set to be by 2025, in line with the expansion corridor. While Hamburg represents a high-demand area in which only 3 % of requirements is covered by renewable energies, Schleswig-Holstein, in purely mathematical terms, is able to cover its requirements

almost completely from regenerative sources, thus allowing it to export increasingly more energy. With numerous connections to the transmission grids and to offshore wind farms and owing to its central geographic location between the centres of consumption in the south and Scandinavia's storage power stations in the north, the region is developing into an energy hub for Northern Europe, also at international level.

The approach for mastering the challenge of the growing imbalance between the generation and load situation in the region is to serve as a model for and be transferable to other German and European regions. Thus, NEW 4.0 is a "blueprint" for the energy transition. The purpose of the large-scale practical test is to demonstrate the unique opportunity represented by the energy transition and to show how the necessary transformation of the energy system can succeed.

Moreover, the project is aimed at opening up new market opportunities for the companies involved and making them more competitive in a growing future market. For the federal states, the significant factor is that the regional economy is strengthened, new industrial value chains are formed and thus jobs are secured and created. Schleswig-Holstein and Hamburg are expanding their role as a leading location for innovation.



The goals

The principal goal is for the entire Schleswig-Holstein and Hamburg region to have a safe, cost-efficient, environmentally compatible and socially accepted regenerative power supply by 2035, based solely on renewable energies.

To achieve this principal goal, generation and consumption must be synchronised at all times, taking into account the complete integration of renewable energies into an innovative, sustainable energy system. A core task in this endeavour is to create a flexible and intelligent network of producers and consumers, involving all components connected to the electricity grid. Novel concepts for system control and integration as well as the smart link between generation, distribution, storage and consumption must therefore be implemented in practice.

NEW 4.0 pursues a dual strategy: increasing power exports to other regions while raising the energy self-consumption ratio. Here, particular focus is placed on making power consumption flexible in completely new dimensions and, in contrast to the previous system, adapting consumption to generation. This means converting surplus, renewably generated power into other energy forms, such as heat (sector coupling). The future market design and the interaction between the market partners are also to be tested in NEW 4.0 with the aim of developing solutions for further regulatory development.

In concrete terms, this means developing an integrative system that covers the following tasks:

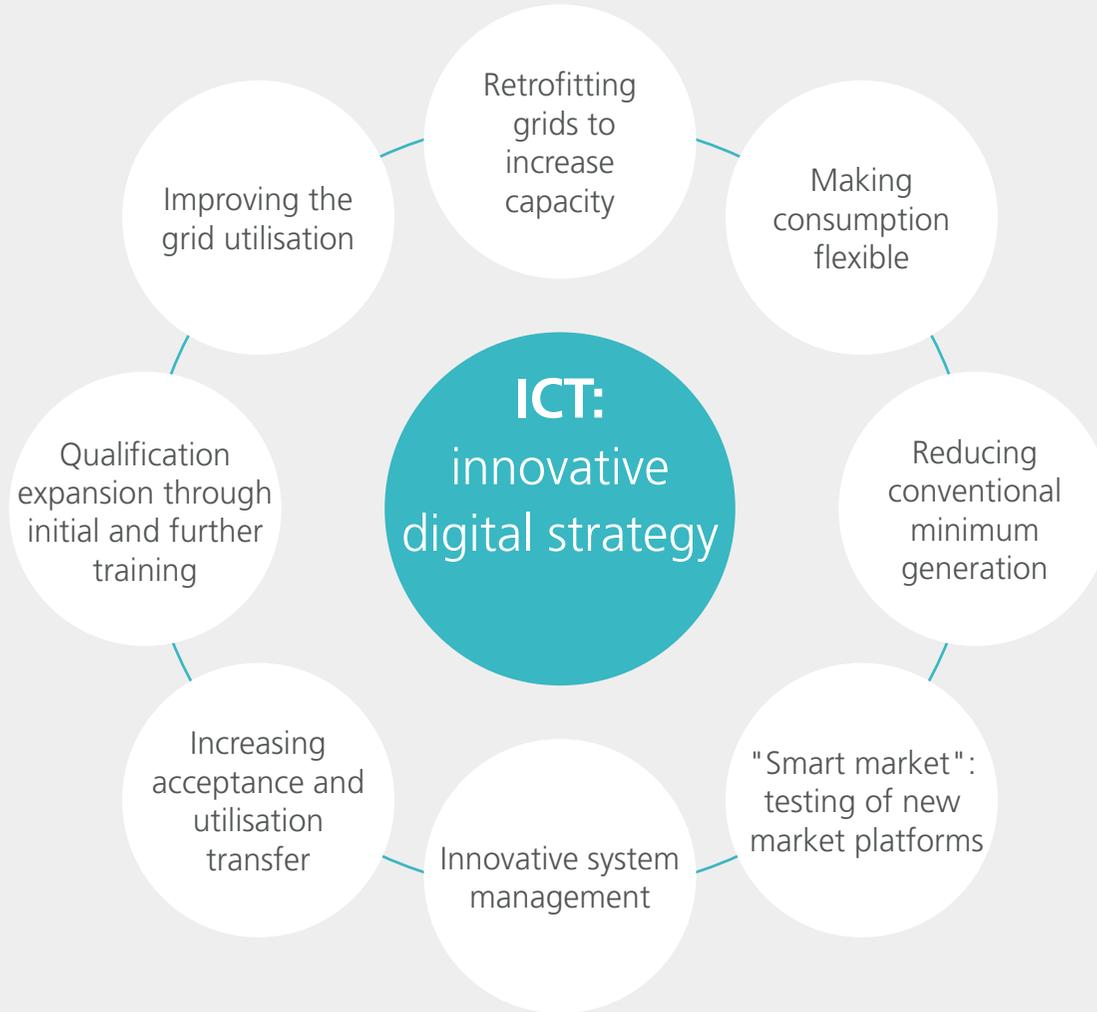
- improving the utilisation and relief of the transmission grids to avoid congestion and feed-in management (such as shutting down wind farms in response to grid overload),
- retrofitting and optimising grids to increase their capacity,
- innovative, grid-friendly system management of renewable generators in conjunction with storage units,
- making consumption flexible by means of load management, storage and sector coupling,
- avoiding climate-damaging CO₂ emissions by significantly reducing conventional energy generation.

For the aims to succeed, an innovative digital strategy must be created by developing central information and communication technology (ICT) structures, taking into account

- the testing of new market platforms which involves creating market-based and regulatory incentives for a new market design, including ones for adapting consumption to the expected generation and integrating storage units into the market,
- the promotion of acceptance and utilisation transfer,
- the expansion of qualification through initial and further training so as to bring expertise into the market.

Dual strategy → increasing power exports + increasing the energy self-consumption ratio

Project aims



The innovation alliance

Approximately 60 partners from all sectors and along the entire value chain in the energy industry have joined together to harness the opportunities offered by the "project of the century", the energy transition, in the north of Germany. These include grid operators Stromnetz Hamburg, TenneT and Schleswig-Holstein Netz; energy providers such as Hamburg Energie, Vattenfall, e.kundenservice Netz and HanseWerk Natur; several public utilities such as those of Norderstedt, Flensburg and Lübeck; and technology firms such as Siemens Gamesa and Coulomb. On the generation side,

in addition to the manufacturers of wind turbines such as Nordex Acciona, operators and operator associations such as ARGE Netz, Wind to Gas Energy, Energie des Nordens and certifiers such as M.O.E. are also involved in the project. On the consumer side, service and production companies, energy-intensive industrial firms such as Aurubis, ArcelorMittal, Trimet and Worlée in Hamburg as well as Sasol in Brunsbüttel are project partners. The involvement of IT firms such as Ponton and cbb software as well as many other partners – SMEs, politicians and administrative bodies as well as

private households – account for the special breadth, diversity and plurality of the alliance. The connections between them lead to holistic problem-solving expertise. Additionally, partners from the field of academia such as Fraunhofer ISIT and IEE, the CC4E of HAW Hamburg, TU Hamburg, the University of Hamburg, Helmut Schmidt University, TH Lübeck, Flensburg University and the Foundation for Environmental Energy Law as well as industry associations such as Handwerkskammer Hamburg and the Renewable Energy Hamburg Cluster are working together intensively on the project.

The partners are collaborating on an interdisciplinary basis in eight task groups:



1. Grids



2. Load management



3. Generation management



4. Information and communication technology



5. Market and regulatory conditions



6. Utilisation and acceptance



7. Initial and further training



8. Holistic system design



The use cases

Six use cases (UCs) are derived from the eight task groups and corresponding project aims for the large-scale practical test. The use cases are representative of urgently needed prototypical applications for the complete, holistic integration of the system. The technological, market-related and socially relevant problem-solving possibilities are to be collaboratively tested in approximately 100 individual project activities with around 25 demonstrators. Here, the task forces form the organisational structure for implementing the use cases. The uses cases are:



Dual strategy



increasing power exports



increasing the energy self-consumption ratio

UC 1

Fast local intraday trading

UC 2

Development of grid traffic lights

UC 3

Smart balancing

UC 4

Balancing energy from decentralised producers and demand side management

UC 5

Virtual inertia

UC 6

Reactive power management

ICT: innovative digital strategy

The funding programme

In the programme "Smart Energy Showcases – Digital Agenda for the Energy Transition" (SINTEG), funded by the BMWi, model regions are to develop solutions for climate-friendly, efficient and safe energy supply with high proportions of renewable energies and demonstrate them on a large scale. The model regions are to show that smart grids can ensure system security and contribute to security of supply on the basis of up

to 100 % renewable energies temporarily, utilising the options for generation and load management. They also show what the interaction between the grid and the market in the smart energy system can look like. Thus, the key objective criteria are the stability of the system, security of supply, affordability, a significant contribution to fulfilling the climate protection objectives and social acceptance.

- Funding body:** Federal Ministry for Economic Affairs and Energy (BMWi)
- Funding programme:** "Smart Energy Showcases – Digital Agenda for the Energy Transition" (SINTEG)
- Project running time:** Q4 2016 – Q4 2020
- Number of partners:** ca. 60 partners
- Investment volume:** approx. €85 million



Project management group



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