

NEW 4.0

Norddeutsche EnergieWende

www.new4-0.de



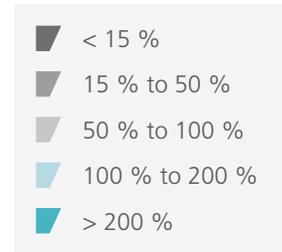
Innovation alliance of Hamburg
and Schleswig-Holstein
for the future energy system



A unique innovation alliance of businesspersons, scientists and politicians has emerged in Hamburg and Schleswig-Holstein under the title »NEW 4.0«. In a major cross-regional project, it is to be shown how the region as a whole, with 4.5 million inhabitants, can be solely supplied with regenerative power – 100% safely and reliably – as early as 2035. »NEW« stands for the Northern German Energy Transition (Norddeutsche EnergieWende) and »4.0« describes the threshold of the fourth industrial revolution: the digitalisation of industry and the intelligent networking of systems within the framework of the energy transition. The project is planned to last 4 years – from 2016 to 2020. NEW 4.0 aims to implement sustainable energy supply and thus strengthen the sustainability of the region. Approximately 60 partners in the region bring together all the necessary expertise and problem-solving potential to advance the energy transition in the north decisively.

The model region

Share of RE power generation in gross power consumption:



Hamburg and Schleswig-Holstein form an optimal model region for the »Smart Energy Showcases – Digital Agenda for the Energy Transition« funding programme tendered by the Federal Ministry for Economic Affairs and Energy (BMWi). With an arithmetical proportion of renewable energies of 40%, the region already finds itself where, according to the expansion corridor, Germany is supposed to be in 2025. While Hamburg represents a high-demand area in which only 3% of requirements is covered by renewable energies, Schleswig-Holstein – in purely arithmetical terms – is

able to cover its requirements almost completely from regenerative sources and is thus becoming an ever more frequent power exporter. With numerous connections to the transmission grids and to offshore wind farms and due to the central geographic location between the consumption centres in the south and Scandinavia's storage power plants in the north, the region is developing internationally into an energy hub for Northern Europe.

The strategy of tackling the challenge of growing imbalance of generation and load situation in the region should be exemplary and transferable to other German and European regions: NEW 4.0 as a »blueprint« for the energy transition. The major practical test is to demonstrate the unique opportunity represented by the energy transition and how the necessary transformation of the energy system can succeed.

Moreover, the project is to open up new market opportunities for the companies involved and strengthen their competitiveness in a growing future market. For the federal states, the significance lies in the strengthening of the regional economy, the creation of new industrial value chains and thus the securing and creation of jobs – Hamburg and Schleswig-Holstein are expanding their role as a leading location for innovation.



The aims

The principal aim is the safe, cost-efficient, environmentally compatible and socially accepted regenerative power supply of the complete region of Hamburg and Schleswig-Holstein by 2035, based entirely on renewable energies.

To achieve this principal aim, it is necessary to ensure the synchronisation of generation and consumption at all times, taking the complete integration of renewable energies into an innovative, sustainable energy system into account. A core task in this endeavour is to create a flexible and smart network of generators and consumers, involving all components connected to the power grid. Therefore, novel concepts for system control and integration and the smart link between generation, distribution, storage and consumption must be put into practice.

NEW 4.0 pursues a twin strategy: increasing power exports to other regions while increasing the energy self-consumption ratio. Here, particular focus is on flexibilising power consumption in completely new dimensions and, in contrast to the previous system, adapting the consumption to the generation. This means converting surplus, renewably generated power into other energy forms, such as heat for example (sector coupling). Moreover, the future market design and the interplay between the market partners are also to be tested in NEW 4.0 in order to develop solutions for regulatory further development.

Specifically, this means developing an integrative system that encompasses the following tasks:

- improving the utilisation and relief of the transmission grids to avoid congestions 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,
- flexibilising consumption through load management, storage and sector coupling,
- avoidance of climate-damaging CO₂ emissions by significantly reducing conventional energy generation.

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

- the testing of new market platforms; this encompasses the creation of market-based and regulatory incentives for a new market design, including for the adaptation of consumption to the expected generation and the market integration of storage units,
- the promotion of acceptance and of utilisation transfer,
- the expansion of qualification through education and training in order to bring knowledge into the market.

Twin 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 come together in order to exploit the opportunities of the »project of the century«, the energy transition, in the north. These include grid operators TenneT, HanseWerk, Stromnetz Hamburg and Schleswig-Holstein Netz as well as energy providers such as Hamburg Energie and Vattenfall and several public utilities such as Stadtwerke Norderstedt and Flensburg, in addition to technology companies such as Siemens and HanseWerk Natur. On the generation side, in ad-

dition to manufacturers of wind turbines, operators and operator associations such as ARGE Netz are also involved in the project. On the consumer side, service and production companies, energy-intensive industrial companies such as Aurubis, Arcelor Mittal and Trimet in Hamburg as well as Sasol and the Chem-Coast Park in Brunsbüttel are partners of the project. The involvement of wind turbine manufacturers such as Nordex and companies from the IT sector such as cbb software GmbH and SAP as well as many other partners – SMEs, political and administrative bodies

as well as private households – make up the special breadth, heterogeneity and plurality of the alliance. The connections between them produce holistic problem-solving expertise. Additionally, scientific partners such as Fraunhofer ISIT and IWES, the CC4E of Hamburg University of Applied Sciences (HAW Hamburg), Hamburg University of Technology, the University of Hamburg, Helmut Schmidt University, Lübeck University of Applied Sciences, Kiel University of Applied Sciences and Flensburg University are collaborating intensively on the project.

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



1. Grids



2. Load management



3. Generation management



4. Information and communication technology



5. Market and regulatory conditions



6. Utilisation and acceptance



7. Education and training



8. Holistic system design



The use cases

Six use cases (UC) are derived from the eight task forces and corresponding project aims for the major practical test. The use cases represent urgently required prototypical applications for the complete, holistic system integration. In approximately 100 individual project activities with approximately 25 demonstrators, the technological, market-related and socially relevant problem-solving possibilities are to be tested in combination. Here, the task forces form the organisational structure for the implementation of the use cases. The uses cases are:



Twin strategy



increasing power exports



increasing the energy self-consumption ratio

UC 1

Fast local intraday trade

UC 2

Development of grid traffic lights

UC 3

Smart balancing

UC 4

Control energy from decentralised power generators and demand side management

UC 5

Current reserves

UC 6

Reactive power management

ICT: innovative digital strategy

The funding programme

In the BMWi's funding programme »Smart Energy Showcases – Digital Agenda for the Energy Transition« (SINTEG), model regions are to develop and widely demonstrate solutions for climate-friendly, efficient and safe energy supply with high proportions of renewable energies. The model regions are to show that smart grids can ensure system security and contribute to security of supply on the basis of tem-

porarily up to 100% renewable energies and under exploitation of the options for generation and load management. What the interplay between the grid and the market in the smart energy system can look like is also presented. Thus, the key objective criteria are the stability of the system, security of supply, affordability, a significant contribution to fulfilment of 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



Bundesministerium
für Wirtschaft
und Energie

Project management group

NEW 4.0



Prof. Dr. Werner Beba
Head of CC4E/HAW Hamburg



Matthias Boxberger
Chairman HanseWerk AG



Dr. Martin Grundmann
Managing Director ARGE Netz GmbH & Co.



Dr. Oliver Weinmann
Managing Director Vattenfall Europe Innovation GmbH



Michael Westhagemann
Chairman Hamburg Industrial Association

Project coordination and management

Prof. Dr. Werner Beba

Alexanderstraße 1
20099 Hamburg

Phone: +49.40.428 75-6937

E-Mail: werner.beba@haw-hamburg.de



Astrid Wolff
Project assistance

Project office

Astrid Wolff

Alexanderstraße 1
20099 Hamburg

Phone: +49.40.428 75-9255

E-Mail: astrid.wolff@haw-hamburg.de

For further information: www.new4-0.de

NEW 4.0

Norddeutsche EnergieWende

www.new4-0.de

Publisher: Project management NEW 4.0
Editors: Jenny Capel, Prof. Dr. Werner Beba
Conception: qub media GmbH

© CC4E of the HAW Hamburg, September 2016

Photo credits:

p. 1: www.mediaserver.hamburg.de / Christian Spahrnier
p. 2: www.mediaserver.hamburg.de / imagefoto.de
p. 4: www.pond5.com/artist/jasol#1/2063, iStock.com
p. 8: iStock.com/kldlife, iStock.com/kynny
p. 9: www.mediaserver.hamburg.de / Andreas Vallbracht, iStock.com/jimiknightley