NEW 4.0

Norddeutsche EnergieWende

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SCHAUFENSTER INTELLIGENTE ENERGIE

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages

www.new4-0.de

North German Energy Transition New 4.0 - Sector Coupling for Future Energy System Services

Prof. Dr. –Ing. Hans Schäfers

Sept. 27th - Paris

Foto: www.mediaserver.hamburg.de / Christian Sparbiehr

Dual strategy of NEW 4.0

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NEW 4.0 solves the main challenges of the energy transition with a dual strategy:

increase electricity export	+	increase local energy-self-utilization
…into other regions through the efficient use and development of the energy infrastructure in the region		…introducing flexibility measurements and sector coupling converting power in other energy forms (heat, mobility, hydrogen)

Intelligent Information- and Communication Technology (ICT)

battery-, high-temperature-, storage, virtual power plants, market platforms	+	power-to-heat, power-to-gas, CHP, power-to-steel, power-to-steam

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Energy situation of the Hamburg /Schleswig-Holstein region

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4.5 Mio.
residents

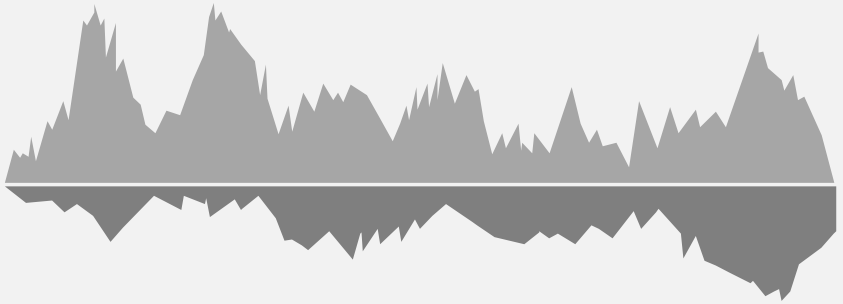
Schleswig-Holstein as a region of production, **Hamburg** as region of consumption, 46 000 RES installed, 9 GW

Industry hub in Hamburg, huge potential of flexibilization

Wind energy production will be quadrupled by 2035, three times more compared to electricity demand

Interconnector: Energy hub north-Europe: Southlink, northlink, west-coast-link, offshore windfarms

Disparities: extreme and increasing disparities between production and load needs to be managed.



The model region provides the main challenges of the energy transition representatively

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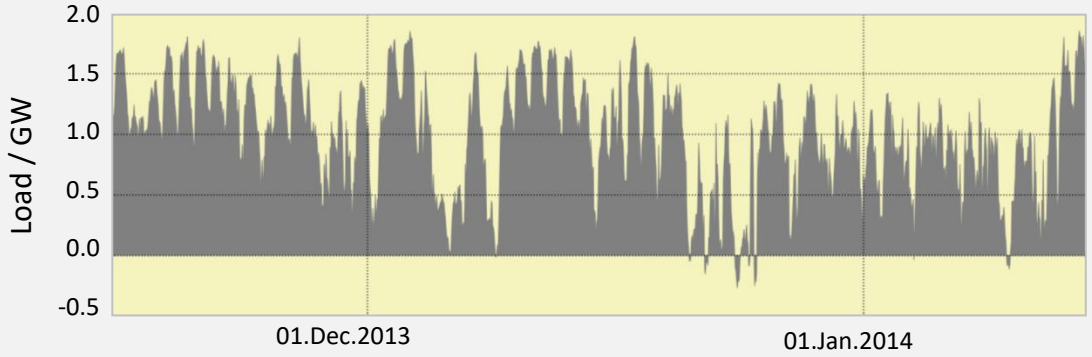
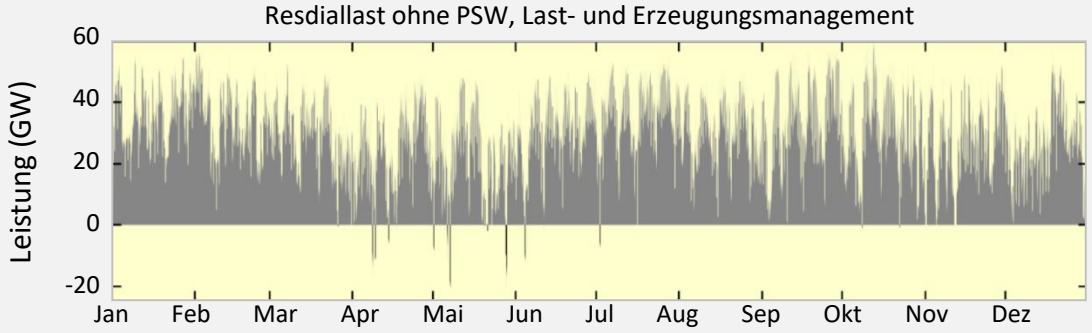
Residual Load Profil of the Model Region

Load, not covered by RES

Model Region today: **Fluctuation of Residual Load in the Model Region today**



Germany 2020 (?): **Fluctuations of residual load expected for a RES share of ~50%**



Quelle: Fraunhofer IWES / HAW Hamburg (Grundlage Wetterjahr 2007)

Partners and project structure

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AP 8: Holistic system design and integration

Fraunhofer IWES, Fraunhofer ISIT, TUHH, CC4E, WIE

AP 1: Grids

TenneT, Stromnetz Hamburg, ARGE NETZ, Fraunhofer IWES, Stadtwerke Norderstedt, Helmut Schmidt Universität, Schleswig-Holstein Netz, M.O.E.

AP 2: Load management and storage

Aurubis, trimet, Hanse Werk, sasol, ArcelorMittal, HPA, Vattenfall, Siemens, Coulomb, stadtwerke flensburg, Danfoss, CC4E, Hamburg Energie, Steinbeis Energie, ivh, Hamburg Airport, Hamburg

AP 3: Production management

CC4E, Nordex, M.O.E., Schleswig-Holstein Netz, Vattenfall, Wind to Gas Südermarsch, TenneT, ARGE NETZ, Energie des Nordens, Fraunhofer ISIT

AP 4: ICT

cbb Engineering, Hamburg Energie, e.kundenservice NETZ, CC4E, PONTON, Fraunhofer IWES, Schleswig-Holstein Netz, Nordex, UHH, TenneT, mdex, WIE, dezera

AP 5:Market and regulatory conditions

TenneT, Schleswig-Holstein Netz, Stromnetz Hamburg, Vattenfall, EKSH Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH, CC4E, Stiftung Umweltenergierecht, UHH, Hamburg, Hamburg, SH, SH

AP 6: Commercial exploration and acceptance

SH, SH, Hamburg, Hamburg, Renewable Energy Hamburg, WIE, EKSH Gesellschaft für Energie und Klimaschutz Schleswig-Holstein GmbH, CC4E, Economic Development Authority, Clean, egeb: Wirtschaftsförderung, Stadtwerke Norderstedt, Handwerkskammer Hamburg, HK Handelskammer Hamburg

AP 7: Education

CC4E, ELBCAMPUS, Fraunhofer ISIT, SH, WIE, IHK Schleswig-Holstein, Hochschule Flensburg, Renewable Energy Hamburg, HK Handelskammer Hamburg, Handwerkskammer Hamburg, UHH

NEW 4.0 – Next step: testing the holistic system integration 2019/2020

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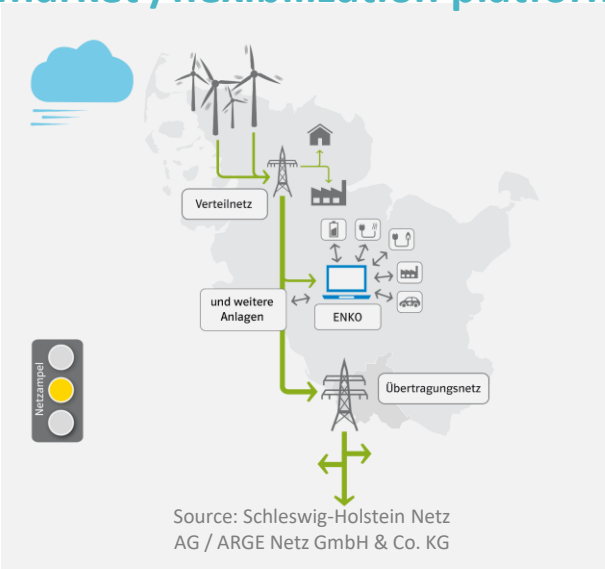
Production management

EnSpireMe 48 MW	**Coulomb** +/- 5 MW
W2G Energy 2.4 MW	**W2G Energy** +/- 2.5 MW
Energie des Nordens 1.3 MW	**Vattenfall, Nordex, HAW** +/- 0.7 MW
ARGE Netz 1.600 MW	**Siemens** +5.4/- 1.8 MW

Network congestion management, market /flexibilization platform



Source: Schleswig-Holstein Netz AG / ARGE Netz GmbH & Co. KG

Load management

Aurubis 20 MW	**Vattenfall** 45 MW	**Worlée** 1.5 MW
Trimet +13.2/-6,6 MW	**Vattenfall** 1.5 MW	**Sasol** 7 MW
ArcelorMittal +/- 10 MW	**Stadtwerke Flensburg** 0.8 MW	**HanseWerk Natur** 3.0 MW
Stadtwerke Norderstedt tbd	**Hamburg Energie** tbd	**HanseWerk Natur** +/- 1.2 MW

- Battery storage
- Power-to-Gas/H2
- Power-to-Heat
- Power-to-x (DSM)
- VPP
- Smart Home
- Mobility

Grid extension

ICT- Structure

Potential: Public transport HH+SH

Fotos: iStock.com/kldlife, iStock.com/kynny, www.mediaserver.hamburg.de / Andreas Vallbracht, iStock.com/jimiknightley

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6 Use cases for a secure and stable energy system

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Dual strategy → **Increase electricity export** + **Increase energy self-utilization, converting surplus**

Regulatory framework

UC 1
Fast intraday trading

UC 2
Real time grid monitoring, market platform

UC 3
Smart Balancing

UC 4
Reserve capacity from RE-generators and demand side management

UC 5
Fast frequency response / inertia

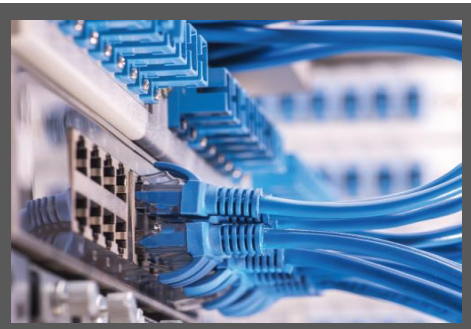
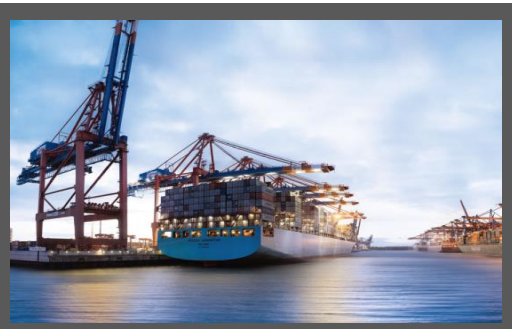
UC 6
Decentralised reactive power supply

Acceptance & Education

ICT: Smart Digital Strategy

- Transparency of grid situation
- Real-time data communication of all grid levels, generators and consumers
- Real-time market place for system services (generators, storages) and flexibility (consumers)



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Thank you for your attention