

Smart Grids and Smart Metering – Perspectives and Challenges for Industrialized and Developing Countries

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Energie
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Elements of the ‚Smart Energy World‘



„... digital, self-healing energy system that delivers electricity (...) from generation sources, incl. distributed renewable, to points of consumption. It is capable of optimizing power delivery and facilitating two-way communication across the grid, enabling end-user energy management, minimizing power disruptions. (...)“

Definition Smart Grid; World Economic Forum/Accenture: Accelerating Successful Smart Grid Pilots (2010)



Grid automation, sensing



Inclusion of distr. Generation, storage, dispatching



Market platform



Smart metering

- Included in MEREGIO, but not necessarily elements of a smart grid -

The German federal Ministry of Economics and Technology has initiated the funding program E-Energy and selected six smart grid projects all over Germany



Research program E-Energy



Sponsor:



Goal:

- › Development of solutions for optimizing Energy markets based on modern information- and communication technology

Budget

- › Ca. 140 MEUR (governmental and own funds)

Test scale

- › These projects will build up the infrastructure for smart grids with ca. 12.000 test users all over Germany

- › **Smart grid pilot** supported by the German Federal Ministry of Economics and Technology.
- › **EnBW is the leader of a consortium** including companies like IBM, SAP or ABB. The scientific part of the project is carried out by the KIT (Karlsruhe University).
- › **MEREGIO started in Nov. 09 with roughly 1000 test customers**, private households and SMEs.
- › Project is aimed to **simulate a complex, almost full-blown smart energy market**.
- › The project duration will be four years.

In MeRegio six partners develop together smart grid solutions for future energy markets



Project consortium



- › Building up a smart grid infrastructure in two model regions in Baden-Württemberg
- › Conception and testing of dynamic pricing offers
- › Leader of project consortium



- › Market platform for new energy products and system services based on real-time metered data
- › Open communication standards for an interoperable system, data protection and data integrity



- › Determination of physically consistent network status and calculation of required system services (e. g. reactive power, control energy)
- › Development and introduction of new network control concepts (Smart Grid)

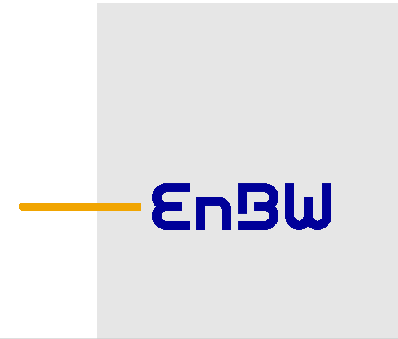


- › Analysis of political/legal framework
- › Identification of new business models based on market platform, dynamic tariffs
- › Developing a certification for a region's energy efficiency

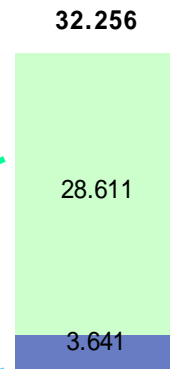
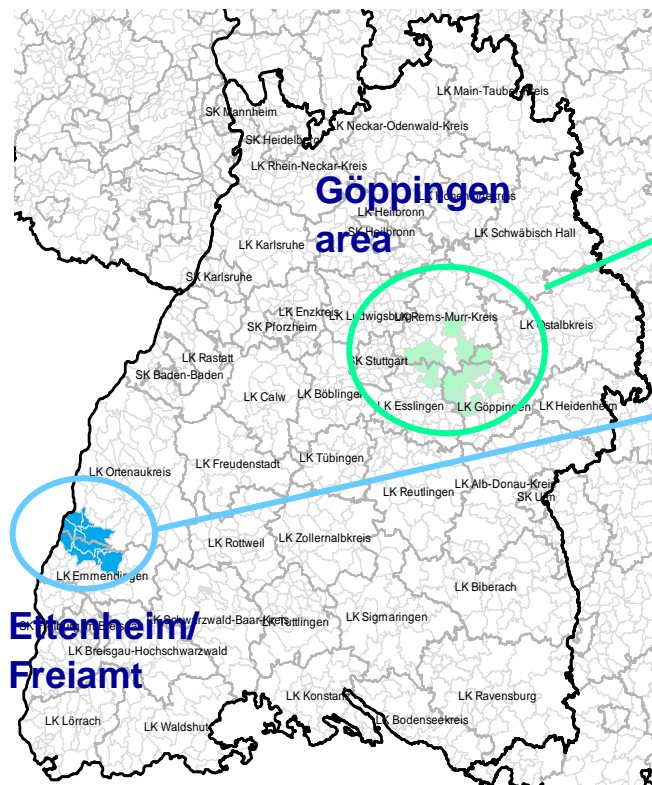


- › Main objective is to develop integrative solutions on:
 - › **business** level (purchase, trade, service)
 - › **technology** level (smart grid/ generation/consumption)
- › Deploy valuable R&D resources and get practical insights from regional testing

Two model regions with sufficient client potential for 1.000 test users and broad range of renewable generation selected for setting up infrastructure



Selection of model regions



Client potential for smart meters

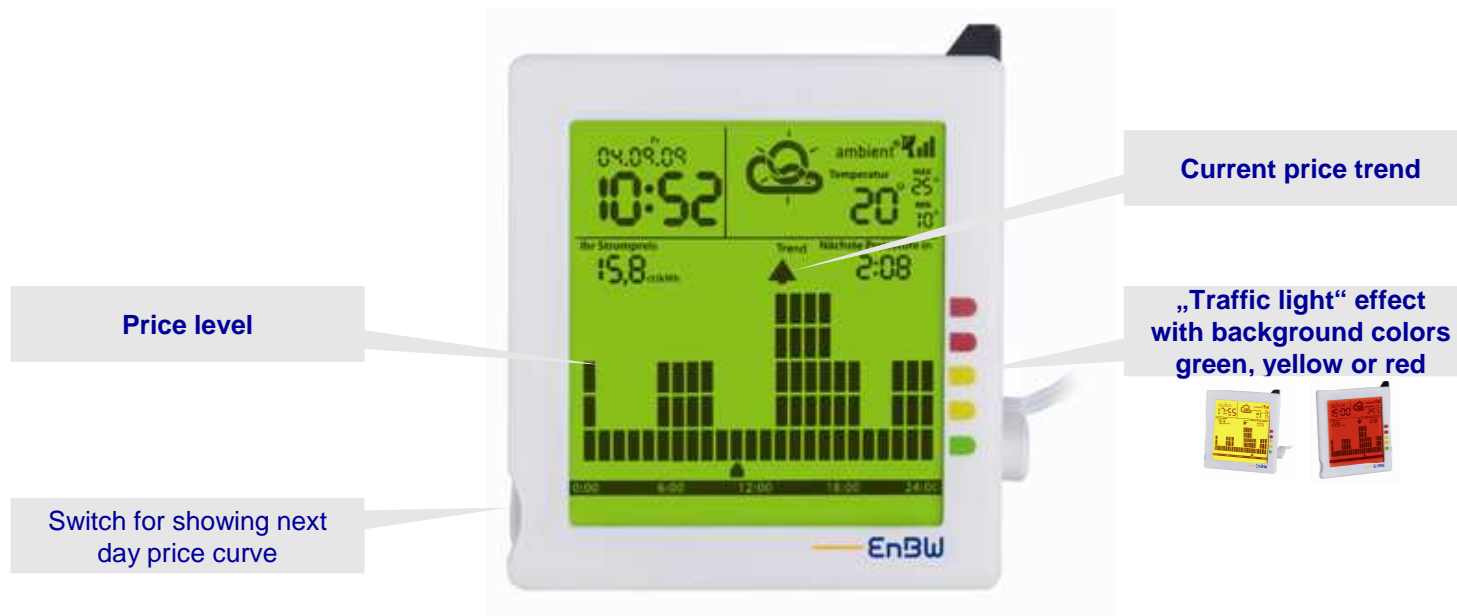
In the late 1990s, the town of Freiamt in Germany's Black Forest decided to take the fight against global warming into its own hands. Three hundred of the town's 4,300 residents chipped in to buy the four 80-meter-tall Enercon wind turbines that now top the surrounding hills, generating 1.8 megawatts each. An additional 270 families put solar collectors on their roofs to heat water and power their homes. Three businesses—two sawmills and a bakery—whose land abuts a gurgling stream have installed old-fashioned water wheels, each providing an additional 15 kilowatts. **Newsweek**

Clients can see the tariff structure for today and tomorrow on their inhouse display (EnBW StromAmpel®)



Inhouse Display Phase 1

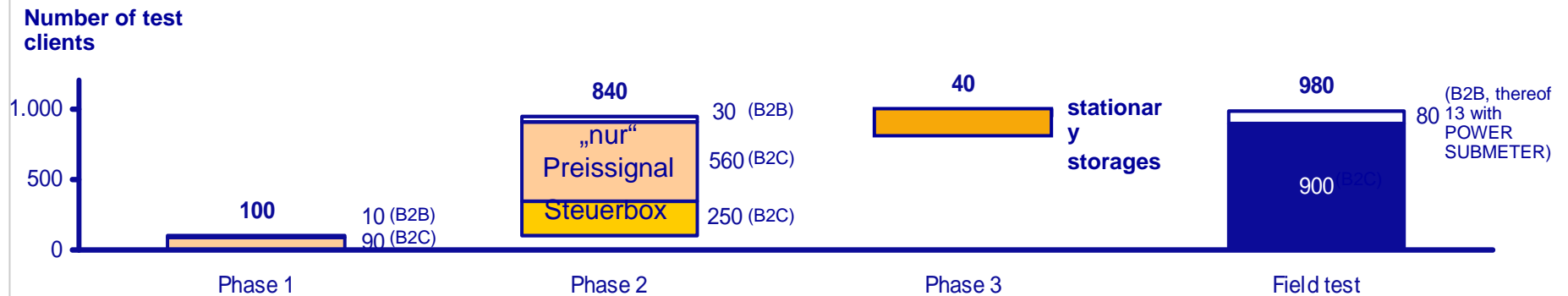
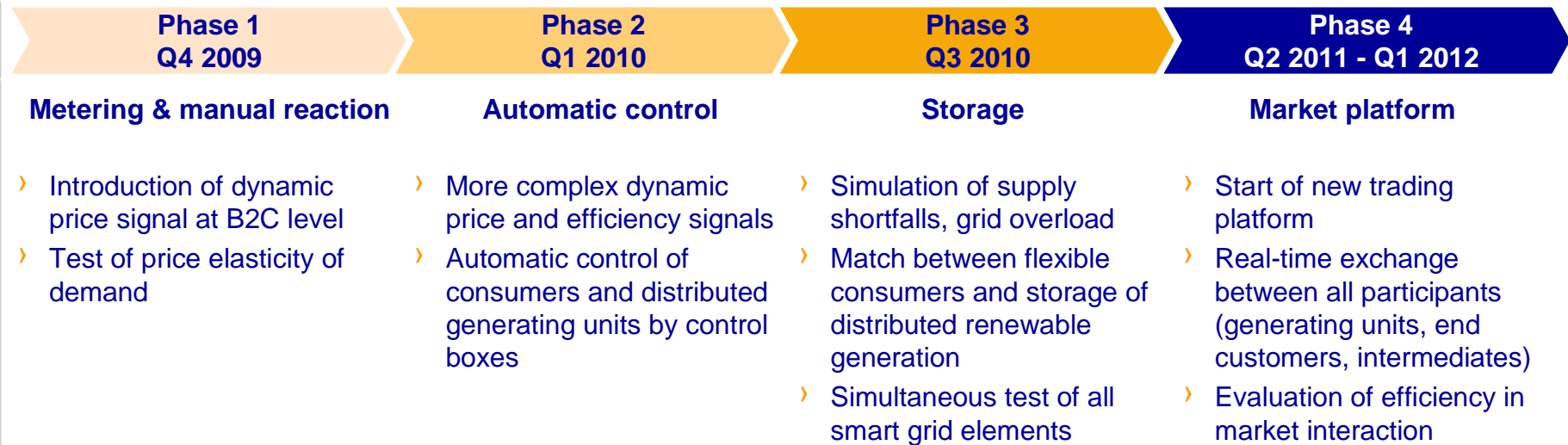
Test focus: price elasticity of B2B customers



In MEREGIO the complex smart grid test infrastructure is gradually built up over four main project steps



Project plan MeRegio



What are the lessons learnt? What remains to be done?



- › **How to design efficient, customer-oriented *markets* based on smart infrastructure?**
- › We need to **model genuine markets in our pilots**; it is of primary importance to learn, how markets established on a smart infrastructure can and will work, consequently
- › **We have to learn more about customer switching behaviour**, especially we need to know more about effects of additional product characteristics like
 - › green products,
 - › customer autonomy,
 - › convenience aspects of products,
 - › effects of market (in-)transparency; “paradoxes of choice”
 - › problems of customers switching to products which objectively reduce their welfare.
- › **Another important information we hope to obtain by the pilot is the magnitude of the load shifting potential (*Hawthorne* –effect?)**
- › **What are consequences for recommendations for the regulatory environment?**

Thank you!

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