Smart Houses for a Smart Grid

Koen Kok
Global Energy Challenge

More energy per person

More people

Climate change
Homes and Office Buildings

- 50% of EU Electricity Demand
- Isolated Passive Units connected to the Energy Grid
- Or: Proactive and Flexible Participants in a Smart Grid
What about the consumer?

I don’t want anybody to fumble with my household!

The consumer:
• wants to minimise cost and footprint,
• has flexibility to offer,
• doesn’t want to be bothered too much,
• ...and she wants to decide for herself!
Smart, Efficient, Sustainable

In-House Technology:
- Energy Management
- Feedback Information
- Dynamic Tariffs

Smart Grid Interaction:
- Smart House delivers Services
- Active Distribution Management
- Energy Trade Optimization

Advanced ICT:
- Web Service Interfaces
- Decentralised Control
- Forecasting techniques
SmartHouse/SmartGrid Project

- EU-funded “ICT for Energy” project
- Timeline: Sep 2008 – Feb 2011
- 6 Partners
  - 50% Industry / 50% Research
  - Impressive track records in EU SmartGrids R&D
Field Test A

Mass-Application Testing of the ICT Architecture

- Automatic Aggregated Coordination of Smart Houses
- Information Exchange with Enterprise Systems
- Data Traffic at Mass-Application Strengths
Field Test B

Domestic Cluster
Mannheim Wallstadt

- End-user: Improve energy efficiency and CO2 footprint
- Local generation: Optimize economic benefit and efficiency
- Energy retailer: New business model to reduce energy cost
- Network operator: Improve security of supply; Reduce network operation cost

ISET MVV Energie
Field Test C

Micro-grid operation Meltemi

- Cluster of Smart Houses
- Security of Supply: Reaction to Critical Situations
- Demonstrate:
  - transition into electrical isolation
  - provision of ancillary services
Impact

Technical Measures

End User Feedback
Decentralized Control of Distributed Generation & Demand Response
Control for Grid Stability and Islanding

Intermediate Gains

Consuming when Clean Electricity is Available
Balancing of Demand and Supply
Islanding Capability
Smart House Reaction to Critical Grid Situations

Efficiency & Sustainability

Use Less
Accommodate more DG

Use Less Peak Power Generation
Less Grid Losses

Grid Management

Efficient Network Use
Less Reinforcements

Higher Supply Security

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Conclusions

- The Smart House is a Source of Power Flexibility
- The Smart House is Vital for a Sustainable Future
- Keep the End-User in the Center
Let The Polar Bears Waltz Again!