Ecologic Institute: An Introduction and Research Overview

Prepared for: Statsbygg, Department of R&D and Environment

Agenda

- Introduction to Ecologic Institute
- Research Overview
  - Smart Grids, *Max Grünig*
  - Local Energy Production and the German Perspective, *Gesa Homann*
  - Energy Performance of Buildings, *Lucas Porsch*
- Discussion and Q&A

Ecologic Institute

- **Founded in:** 1995
- **Type of institute:** Independent, non-partisan, non-profit think tank for applied environmental research, policy analysis, and consultancy
- **Locations:** Berlin (HQ), Vienna, Brussels & Washington D.C.
- **Team:** About 120 staff members focusing on a wide range of issues within environmental / sustainability policy

- Among Top 10 Environmental Think Tanks in 2010 Global Ranking (“Go-To Think Tank Index" of the University of Pennsylvania)

Ecologic Institute‘s Mission

- Influencing policies in the interest of environmental protection, nature and wildlife conservation, and responsible resource management
- Bringing fresh ideas to environmental policies and sustainable development
- Advancing cooperation between nations

Ecologic Institute's Work and Funders

- **Type of Work:**
  - Scientific research
  - Applied policy studies
  - Ecologic Events
  - Ecologic Legal
  - Websites and knowledge management
  - Publications
- **Funders:**
  - Regional (Environmental Ministries of federal states, etc.)
  - National (BMU, BMBF, German Federal Environmental Agency, German Federal Agency for Nature Conservation, WWF, Greenpeace, NABU, foundations, etc.)
  - EU (DG Research, DG Env, DG Agri, DG Trade, EP, EEA, Eurostat, etc.)
  - International (Global Environment Facility, OECD, Worldbank, UNEP, Marshall Fund, etc.)

Ecologic Institute‘s Fields of Work

Ecologic Institute‘s work covers the entire spectrum of environmental issues, including the integration of environmental concerns into other policy fields

- **Areas of expertise**:
  - Agriculture
  - Biodiversity
  - Climate and Energy
  - Soil Protection and Land Use
  - Nature Conservation
  - Development
  - Foreign Policy
  - Economics
  - Waste
  - Transport
  - Water
  - Marine Policy
  - Transatlantic Cooperation

Electricity and Smart Grids

Max Grünig


Value added services
Forecast information
Off-shore wind
Small hydro power
Solar power plant
Hydro power station
Biomass
Low emission power plant
Local control and communication center
HVDC link
Transformer
Microgrid
Wave energy
Residential CHP
Solar
Photovoltaic
Underground info and power transmission
H2 production and filling sation
H2
Demand side management
CHP
Micro storage of electricity
Thermal storage
SMES
Fuel cells
Compressed hydrogen storage
M. SANCHEZ, 2006

Basic principles of the electricity system

- electricity cannot be stored in the grid
- electricity generation has to match power demand exactly in each moment in time, otherwise voltage imbalances occur
- power sources have different degrees of flexibility
  - time needed to reach operating capacity
  - time needed to reach efficient power generation
  - costs of shut down and restart

Basic principles of the electricity system

- electricity providers face the task of matching the load profile with the least costly selection of power plants
  - dispatching of power plants according to the marginal cost of power generation (usually nuclear and wind)
  - flattening load curves to reduce the need to adapt power supply
    - reduced peak loads leading to lower peak production costs
  - establishing a better coordination of power sources and sinks
    - reduced excess generation capacities preventing negative prices
    - **Smart Grid Technologies**

Smart technologies consist of…

- **Smart generation**
  - Renewable energy
  - Virtual power plants
- **Smart transmission**
  - Backbone grids
  - Information exchange
  - Two-way connections

Virtual Power Plant: Uckermark

Source: ENERGTRAG 2010

- 20 MW biogas
- 230 MW wind
- 40 km 110 kV cable
- 75 km 20-kV cable
- 4 transformer stations
- online control (fibre optics)

Smart technologies consist of…

- **Smart consumption**
  - Smart metering
  - Demand management
  - Response management

Source: American Electric Power 2009

- **Smart storage**
  - Traditionally: pump storage
  - Wide range of alternatives: flywheels, compressed air, batteries, ultra-capacitors
  - Electric vehicles

Smart Storage: Focus on Electric Vehicles

- charging with excess night-time / off-peak electricity
- decentralised storage
- feed-in at peak loads
- see also Ecologic Institute‘s project on environmental impacts of electric vehicles for DG ENV
  - http://ecologic.eu/3544

Source: American Electric Power 2009

Smart Energy Dialog

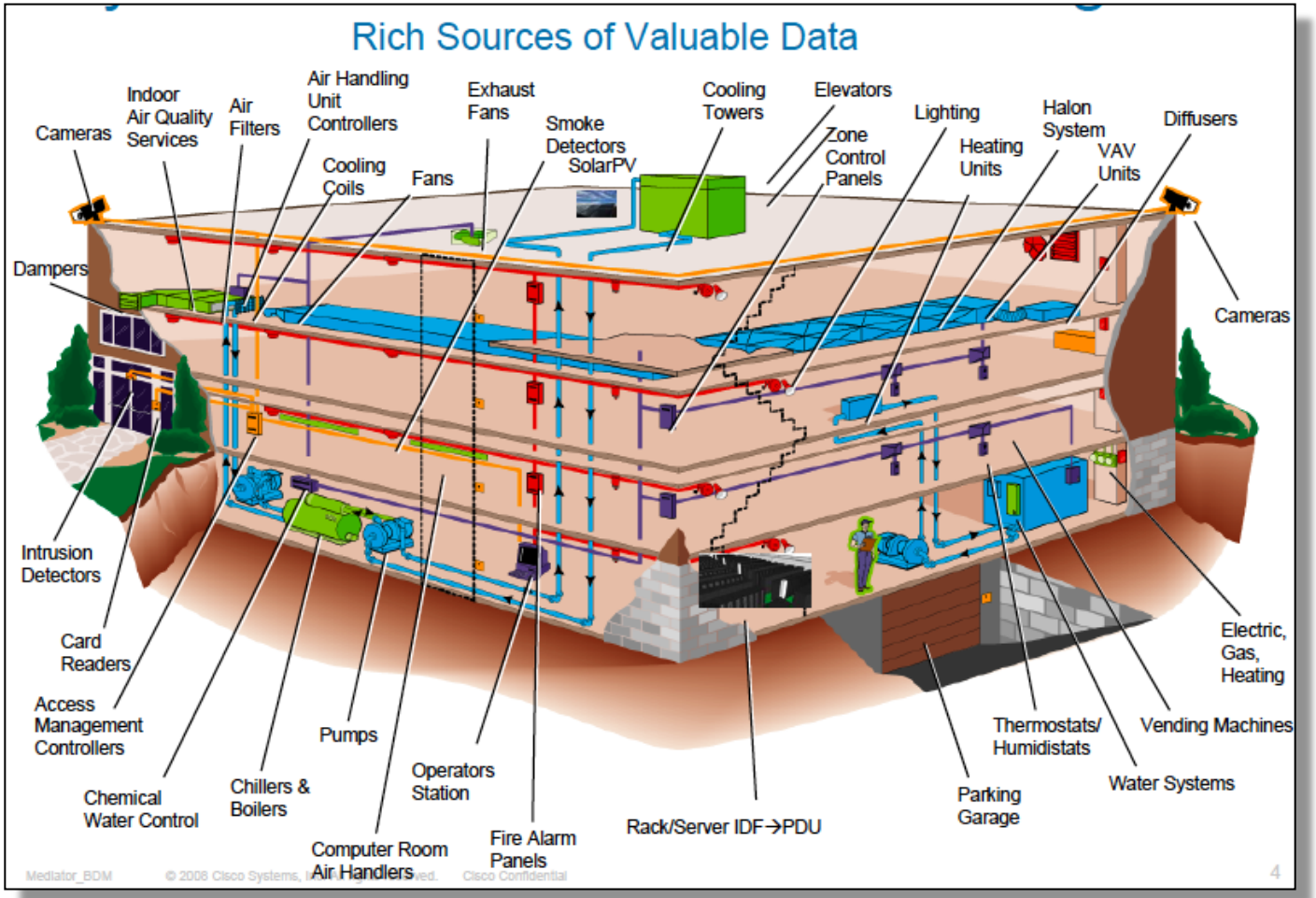
- platform for discussion of smart energy applications
- the virtual power plant; ICT and the grid; demand management; financing; standardisation and regulation

  http://smartenergydialogue.web.ecologicinstitute.eu/about

Smart Energy Dialog

- Vice Admiral Dennis V. McGinn, U. S. Navy (retired), CEO, Remote Reality, **energy security**
- Piers Nabuurs, CEO, KEMA, **smart grids introduction**
- Valerie Speth, Dipl.Ing. and M.Eng.Management, Corporate development, juwi Holding AG, **virtual power plants**
- Klaus Baggesen Hilger, M.Sc.Eng., Ph.D., Senior Innovation Manager, DONG Energy, **wind energy integration**
- Astrid Nieße, Dipl.-Inform. (FH), Dipl.-Biol., Group Manager Energy Management, OFFIS, **standardisation**
- Alexis Ringwald, Co-founder and Director of Business Development, Valence Energy, **smart buildings**
- Georg Riegel, CEO, deZem, **smart buildings**
- Barbara Dörsam, Senior Project Manager, E-Energy pilot region Mannheim, **pilot project**
- Frank Behrendt, FAV Transport Technology Systems Network, **electric vehicles**
- Wouter de Ridder, The New Motion, **electric vehicles**
- Thomas Paesler, Responsible Subject Specialist Energy, Climate Protection, Energetic Vehicle Technology, DB Environment Centre, **railways**
- Tjark Siefkes, Senior Director Product Management, Bombardier Transportation GmbH, **railways**
- John Farell, Institute for Local Self Reliance, **municipal energy financing in the US**
- José González, Dipl. -Wirtsch. -Inform., R&D Division Energy Group "Interoperability and Standards", OFFIS, **norms**
- Antonella Battaglini, SuperSmart Grid, **European smart grids**
- Björn Klusmann, Bundesverband Erneubare Energie e.V, **renewables and the grid**
- John Petersen, Fefer Petersen & Cie, **ethics**

Valence Energy for smart buildings:



Source: Valence Energy

Local Energy Production and the German Perspective

Gesa Homann

Local energy / decentralised energy?

- **General**:
  - no general definition available
  - characteristics are often: energy produced in several small plants; energy production is near demand / use; ownership is not monopolised
  - can be understood in different ways depending on the context (e.g. development policy)
- **In Germany**:
  - energy supply at a regional level (mainly in municipalities) from renewable energy sources
  - targets: energy security, climate protection, reduce costs, value-added in regions, acceptance / energy awareness

Relevant support measures in Germany, e.g.

- Regulatory measures
  - Renewable Energy Act (Feed-In Tariff)
  - Planning / building legislation
- Financial / informative measures
  - National Climate Initiative (280 million €, funds from EU-ETS auctioning) supports a variety of measures
    - Ex. specific support for municipalites via project funding (`Kommunalrichtlinie`)
  - Other projects by the BMU: "100% Erneuerbare-Energie-Regionen" (Renewable Energy Regions); Public Acceptance of Renewable Energy**;** information campaign (e.g. www.erneuerbare-energien.de)

Project: Public Acceptance of Renewable Energy

- organisation of a series of five “future labs” to investigate public acceptance at the regional level / recommendations for policy makers
- representatives from local authorities, NGOs, science, business and other stakeholders participated and developed visions about a positive future
- main results: obstacles include missing concepts on energy policy at regional level, missing network, lack of information, lack of financial resources
- more information: http://ecologic.eu/1526 (download report)

Project: “100% Erneuerbare-Energie-Regionen“

- supports regions / municipalities that want to shift completely to RES
- simultanously, success factors and obstacles regarding the transition to a decentralized energy system shall be identified / recommendations provided to policy makers
- offers information / best practice exchange to actors, e.g. via congresses
- more than 100 participants so far
- check: http://www.100-ee.de/

Energy Performance of Buildings

Lucas Porsch

The Energy Performance of Buildings Directive

- By 2020 all new buildings should be near zero energy buildings
- By 2018 all new public buildings should be near zero energy buildings
- National plans for renovation of existing buildings
- Minimum requirements introduced for replacements and renovations
- Harmonised calculation methodology for minimum energy performance requirements
- Higher enforcement requirements – Fines and certificates

Energon Building in Ulm, planned in accordance with passive house standards. Source: European Commission

German Policies on Energy Performance

- Energy standards for new buildings and major refurbishments
- Minimum renewable energy production / use for new buildings and major refurbishments - Alternative energy savings
- Subsidized loans for energy saving refurbishments (CO_2 Gebäudesanierung) and renewable energy (Marktanreizprogramm and feed-in-tariff)
- In discussion: preferential tax treatment of investments in energy efficiency in buildings

Challenges

- Energy performance of new buildings on track, but energy performance of existing buildings is not improving quickly enough.
  - Economic reasons: Lack of incentives for landlords (net and gross rents)
  - Social reasons: Poor people live in energy inefficient buildings - compulsory standards might increase rents
  - Architectural: Some energy saving refurbishments of old buildings prove unpopular with architects and buyers as historical features get lost

Thank you for listening.

Ecologic Institute, Pfalzburger Str. 43-44, D-10717 Berlin
Tel. +49 (30) 86880-0, Fax +49 (30) 86880-100

www.ecologic.eu