CLEEN
Cluster for Energy and Environment

sgem
Smart Grids and Energy Markets

Smart Grids and Energy Markets

A Finnish perspective, ready for the next level

Jan Segerstam, Development Director, Empower IM Oy

20.5.2014

sgem
Smart Grids and Energy Markets

Content

Smart Grid Platform in Finland “What’s available?”

- Historical development
- Smart meter enabled change 2008-2014
- Products out now

Finnish Smart Grid Development “What’s next?”

- Demand Response as a research vehicle
- Demand Response concept
- Future research topics from SGEM

sgem
Smart Grids and Energy Markets

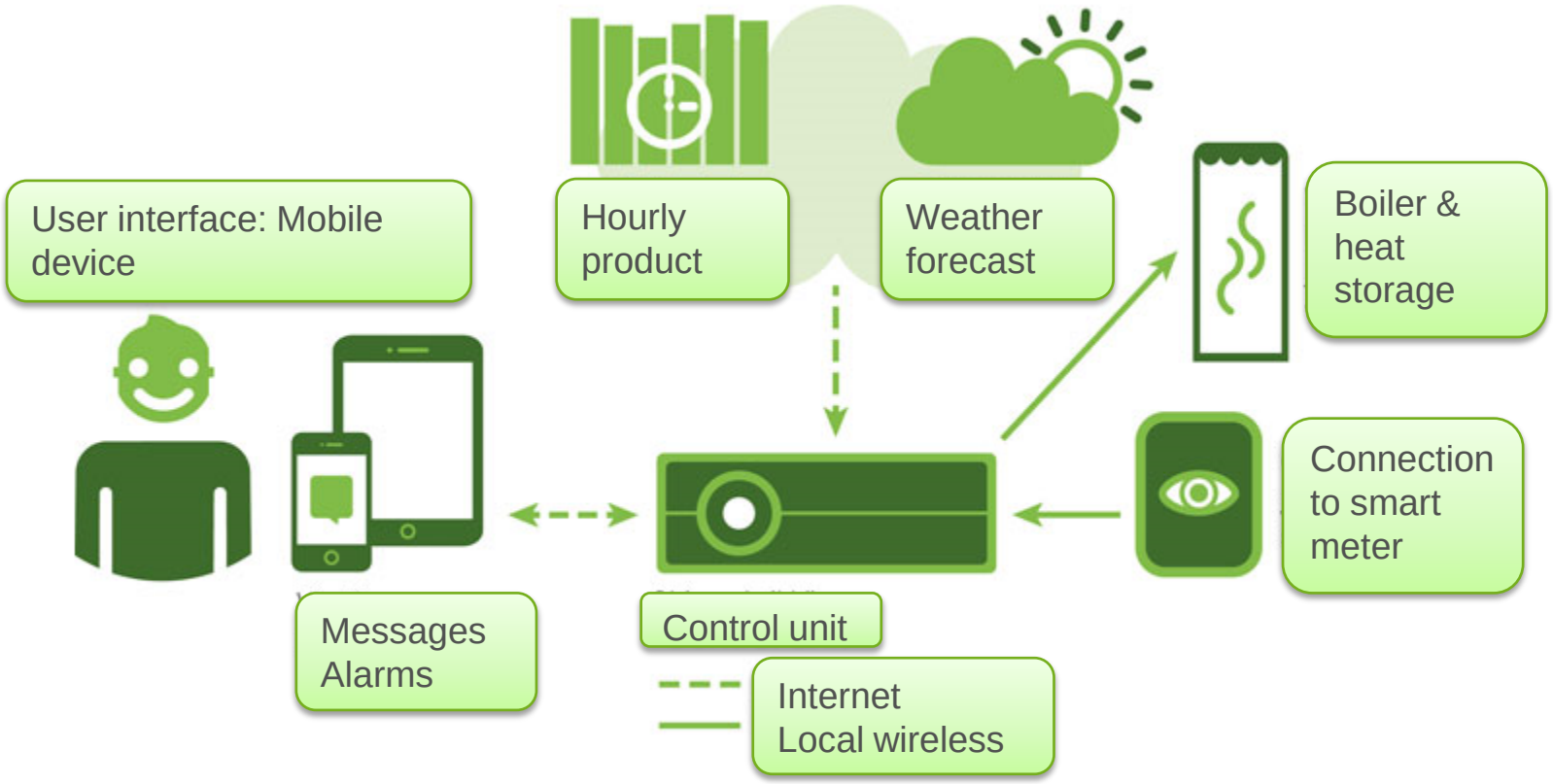
Smart Grid & Market Development in Finland

- 1970s
  - New Generation
  - Need for load shifts to maximize plant usage
- 1980s
  - Implementation of remote controllable loads
  - CHP scaling for efficiency
- 1990s
  - New energy market rules
  - Usage of controllable loads to optimize energy market contract positions
  - Remote disconnectors
  - Retail Market Opening
- 2000s
  - Implementation of intraday commodity trading on hourly basis, continued market development
  - Legal unbundling of distribution
  - Automated Network Control
  - Automated meter infrastructure design
- 2010s
  - Automated meter roll out
  - Hourly balancing and settlement
  - Hourly customer reporting
  - Distribution Grid connected production (PV/Wind)
  - Market based Demand Response Products

Smart Grid & Market Development 2008-2014

- New legislation (2008)
  - Measurement
  - Information Exchange
- After deadlines were set, implementation
  - Roll out plans for every company
  - Procurement of AMM solutions
  - Delivery of AMM solutions
- Market process change
  - Streamlining and certifying information exchange without major change
  - Change of balance settlement
- Minimum requirements for installation
  - Controllability
  - 3rd party information access
  - Transfer of installed remote controllable load base
- Reporting requirements set for suppliers
  - Base data to be provided by DSO
- Data access implementation by DSOs
- Completion of smart meter roll out and initial process changes by the end of 2013
- Focus shift from technology to utilization and market model development

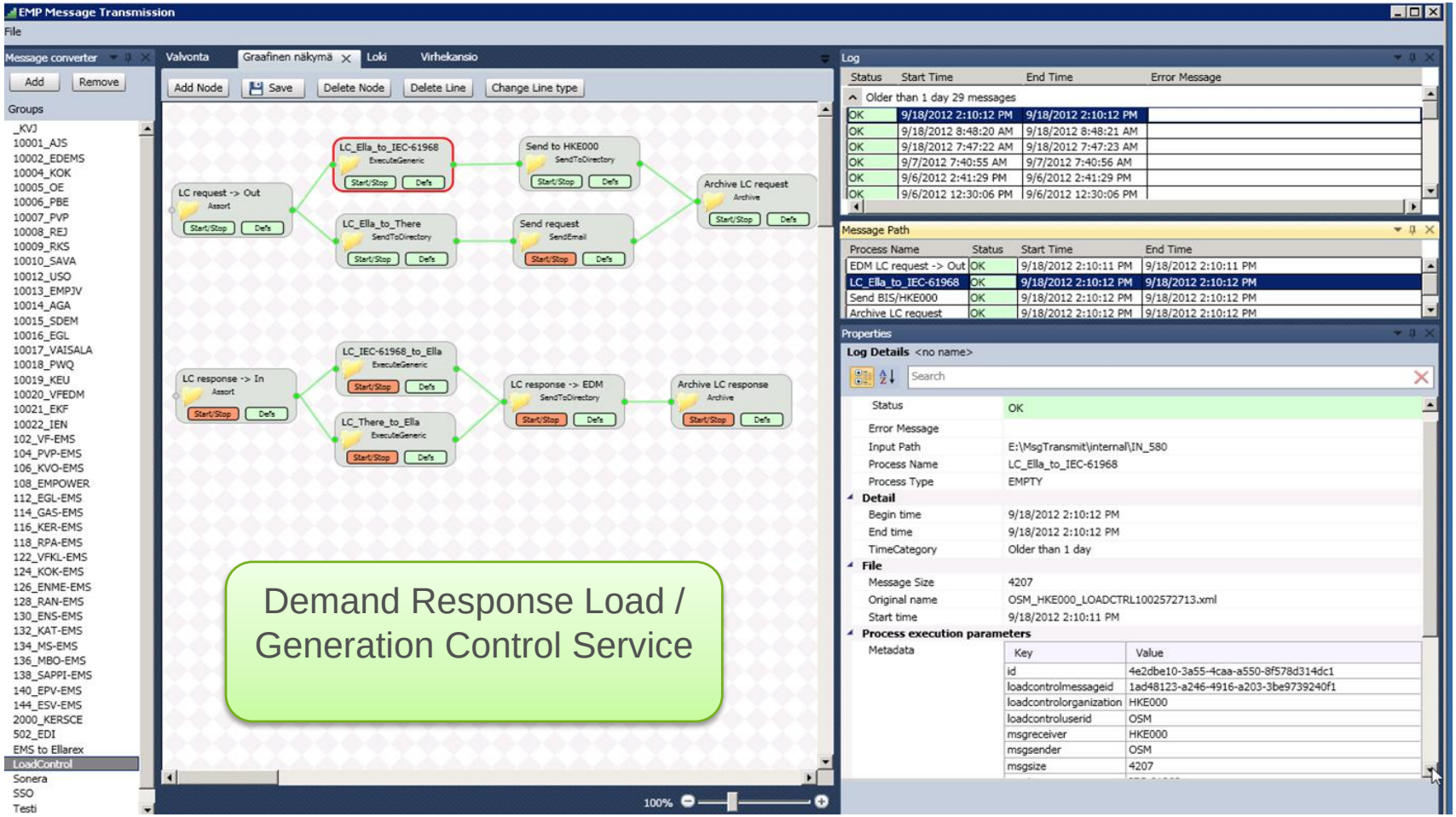
Smart Grid Development, products: Fortum



Smart Grid Development, products: Helen

sgem
Smart Grids and Energy Markets

Smart Grid Development: services, Empower IM



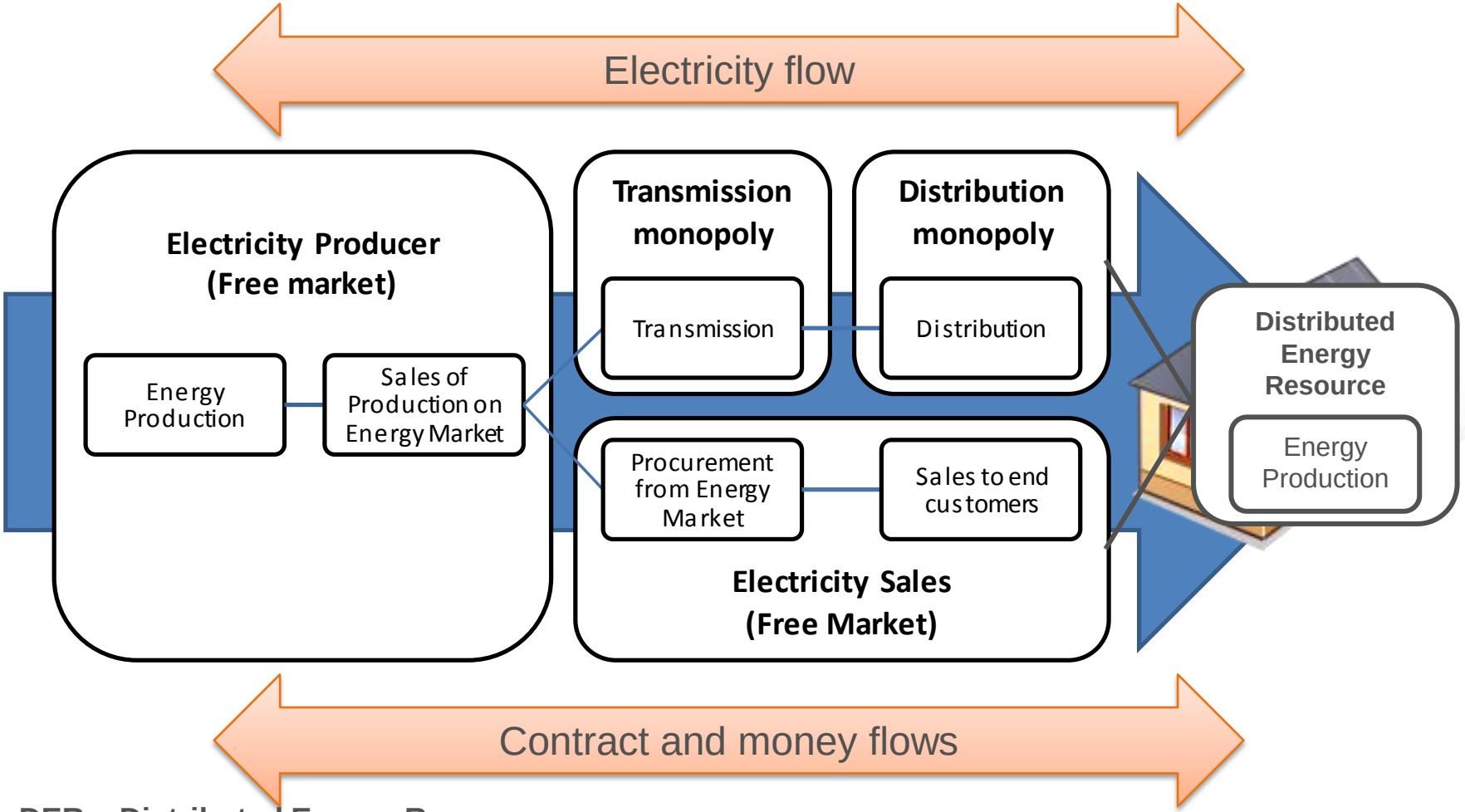
CLEEN
Cluster for Energy and Environment

Demand Response

- Holistic concept embracing change
  - Includes distributed generation processes
  - Includes dynamic market trading models
  - Includes smart technology enablers
  - Includes smart metering leverage

- Research context that enables iterative learning
  - Connects directly to end customer behaviour
  - Multiple players
  - Technology interfaces
  - Market process challenges
  - Regulation incentive evaluation

The Retail Energy Market with DER



DER = Distributed Energy Resources

sgem
Smart Grids and Energy Markets

Demand Response in the Retail Energy Market

DER Electricity for the DSO to deliver

Electricity Delivery by the DSO

Electricity cost from the Supplier

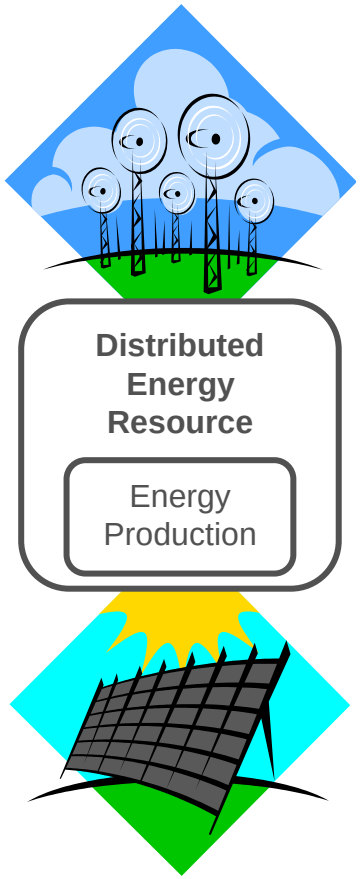
Money to the DSO and Supplier

DER Money from the Supplier/Prod.

Demand Response

Use or Sell DER?
Shift, Decrease or Increase Use?
Participate in network balancing?*

DER Electricity for the customer to use or sell



* Network balancing flows left out for clarity

DER = Distributed Energy Resources

Major Driving Trends for Demand Response

Demand by Production

- Production must equal demand at all times
- Marginal cost of renewable production is zero
- Limiting production brings no fuel savings
- Demand Response maximizes production

From direct sums to aggregates

- Market Processes based on dissecting total volumes
- Smart Grids enable building processes on information of discrete site measurments
- Availability of site specific information enables

Future Research Agenda from SGEM

- Marketwide ICT and process architecture enabling “smart customer functions”
- Enabling Distributed Generation impact on market price and on management of power balance
- Enabling optimal use of active resources in demand response, energy optimization across resources
- Tools to introduce significant portion of customers to use a demand response service and home energy management systems
- Achieving European level electricity market structures and interoperability

sgem
Smart Grids and Energy Markets

Jan Segerstam
- jan.segerstam@empower.fi
- +358 44 425 2218

http://www.cleen.fi/en/sgem

CLEEN
Cluster for Energy and Environment