OGEMA – Open Source Application Platform: Connecting Building Automation and Smart Grids

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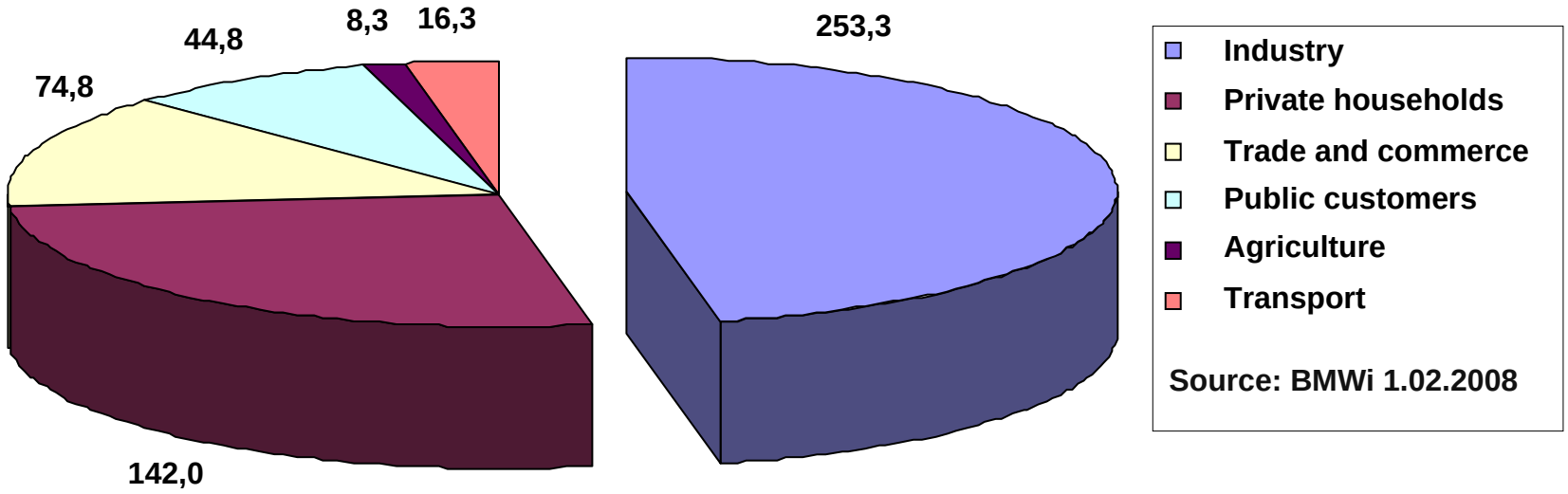
- Decentralized Energy Management
- Open Gateway Concept / Architecture
- Application of OGEMA in field tests
- OGEMA Components and Benefits
- Summary

SEVENTH FRAMEWORK PROGRAMME
EENERGY
Ein Projekt gefördert durch das Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
Förderkennzeichen 0325090 I

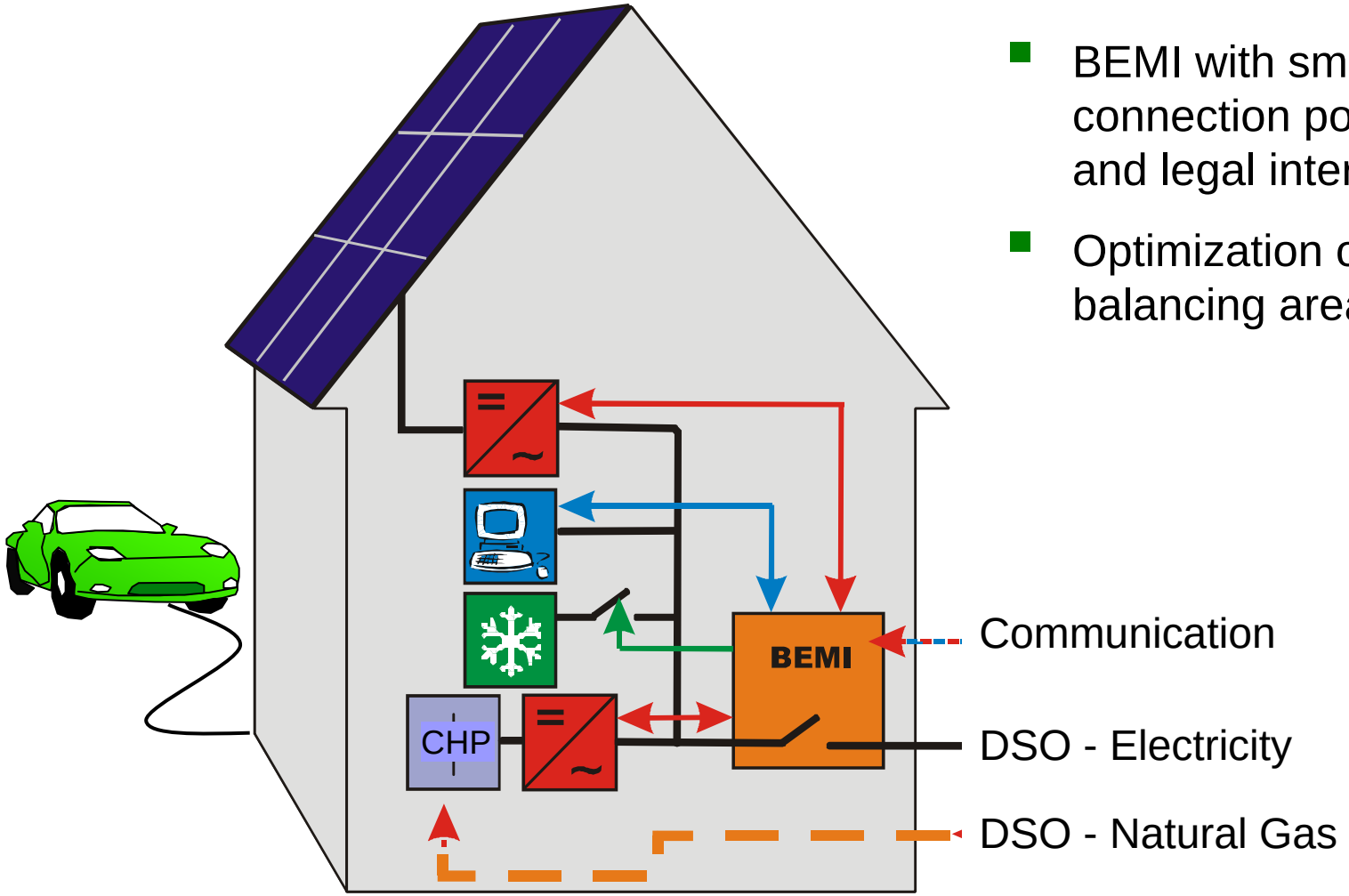
DERlab
Fraunhofer IWES

Electrical Energy Consumption in Germany (TWh)

- 50 % of German electrical energy consumption in the low voltage grid
- Limited decentralized Energy Management by fixed load profiles and ripple control



Bidirectional Energy Management Interface - BEMI



- BEMI with smart meter at grid connection point as technical and legal interface
- Optimization of private balancing area

Test Households in Smart Grid Lab

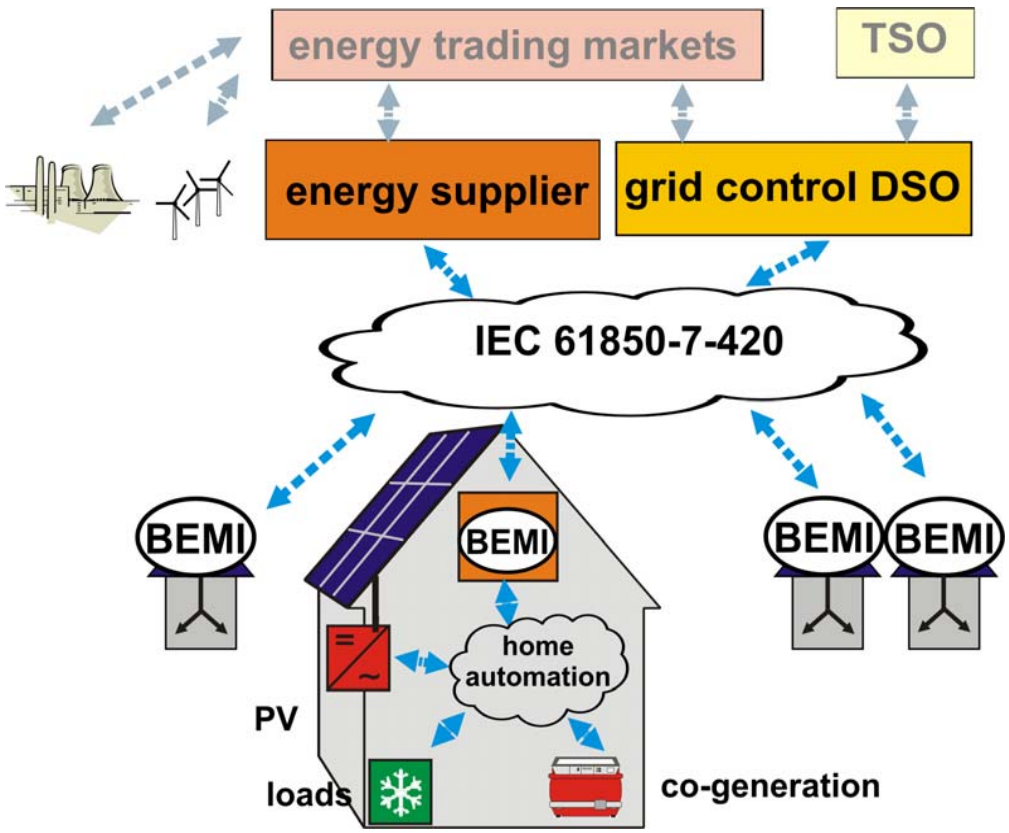
Grid Customer / Prosumer Approach

- Information for energy management available at decentralized locations
- Decisions made by prosumer / executed by energy management interface
- Optimisation criteria:
  - Energy costs
  - CO_2 footprint
  - Renewable energy
  - Regionally produced power

➔ Information has to reach the grid customer's energy management unit

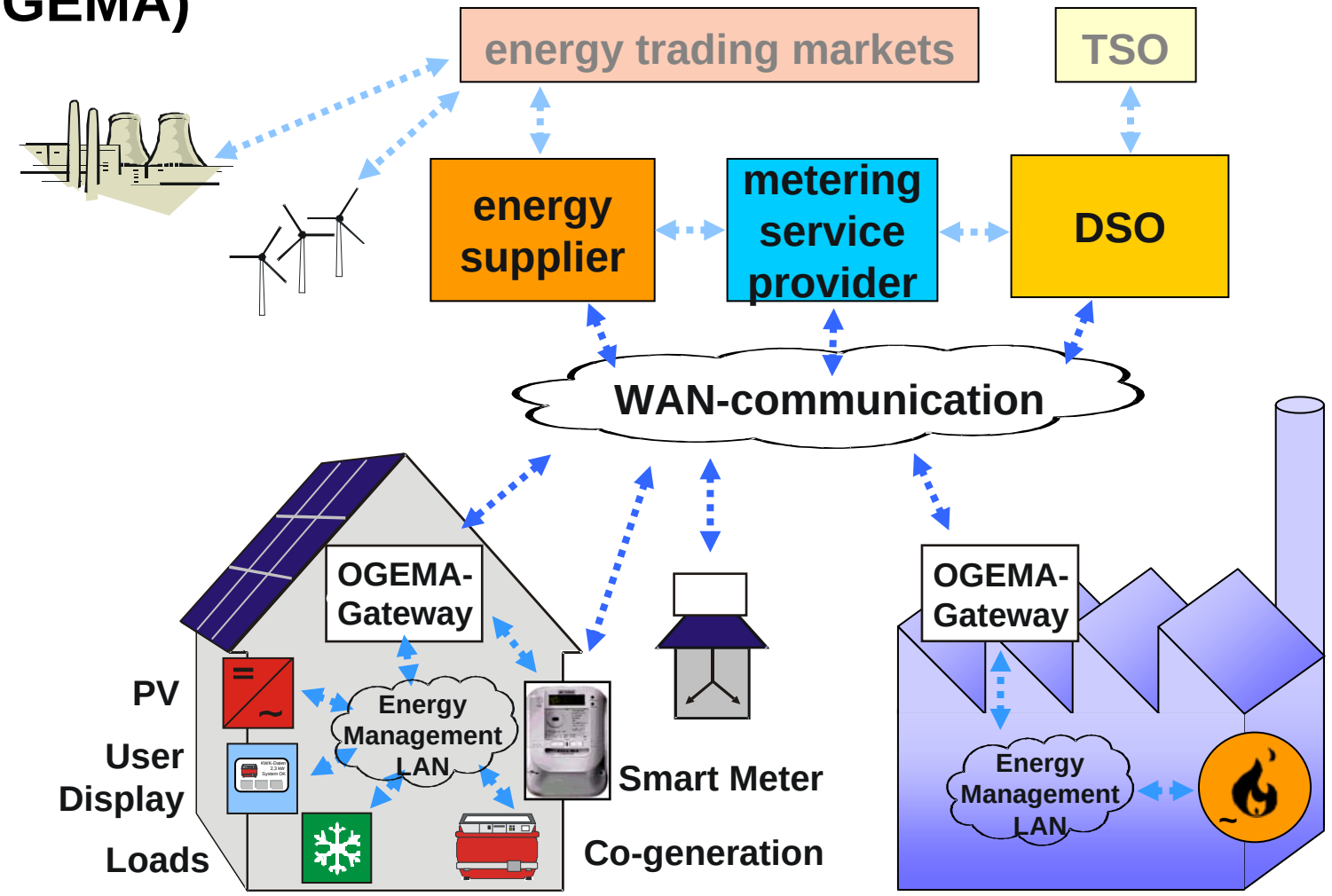
➔ Automated Energy Management (can be controlled by prosumer)

Bi-directional Energy Management Interface - BEMI

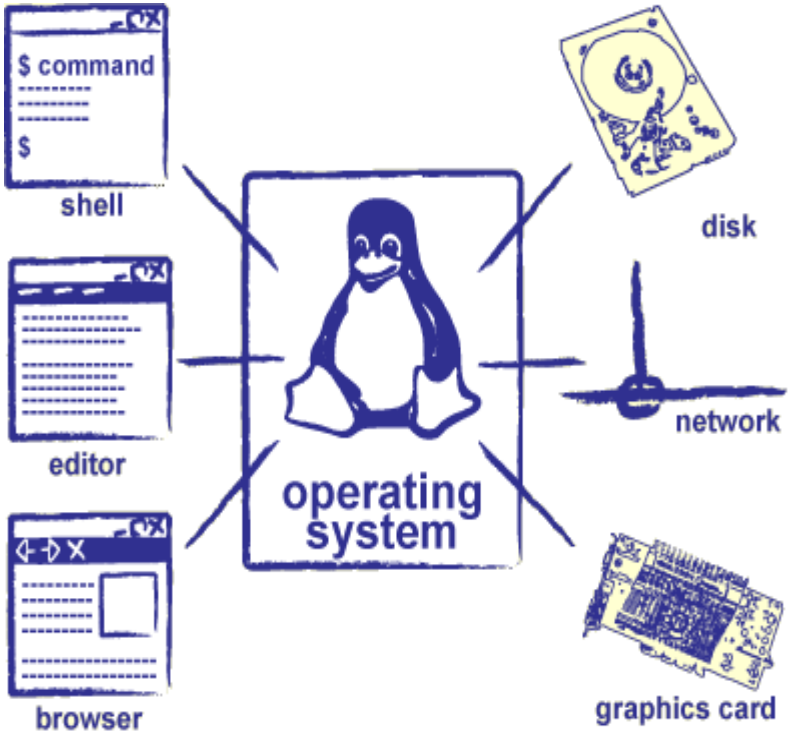


- Variable electricity price
- Energy management computing platform
- Flexibility for each individual customer (private optimization)
- Automated switching of devices
- User interface
- Averaging effect on aggregation level
- Open standards for communication

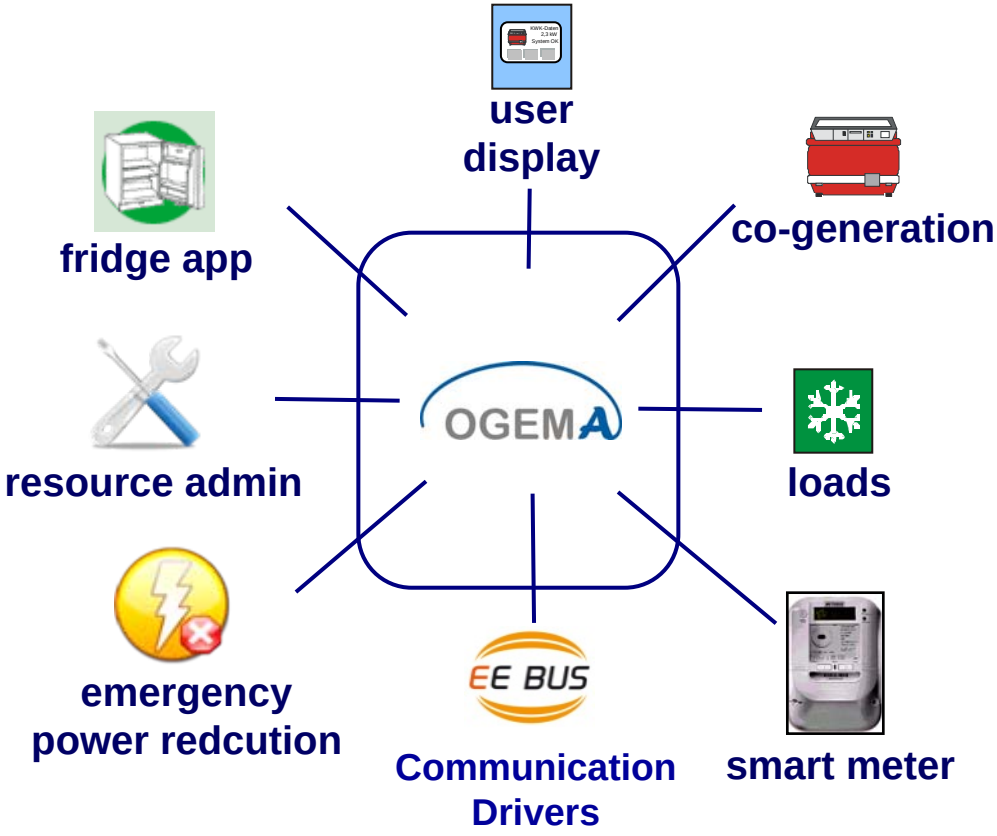
Extended Gateway Specification – Open Gateway Energy Management Alliance (OGEMA)



OGEMA “Operating System” for Energy Management



Open source operating system



Open source energy management platform

Reasons for Open Gateway Approach

- One single software platform for multi-manufacturer applications at customer's site
- Gateway serves as "firewall" between private and public grid
- Enormous potential for applications
  - Energy management
  - Home automation services
  - Smart metering services
  - Agent-based energy trading
  - Ancillary services
  - …

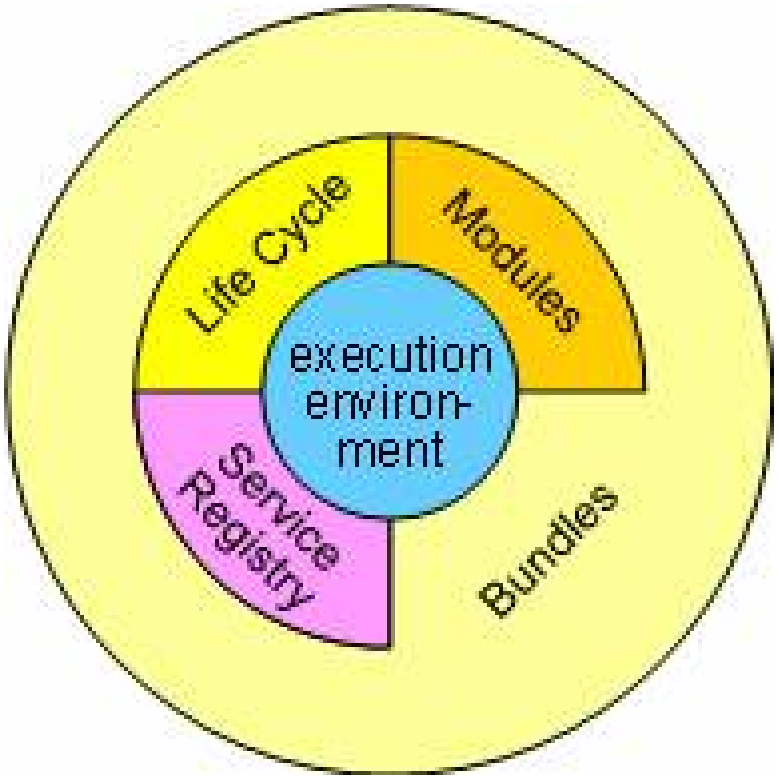
Open Source - Principles

- Free redistribution
- Must publish source code

  ➔ programmers can modify program
- The license must allow modifications and derived works
- Examples: Linux, OpenOffice

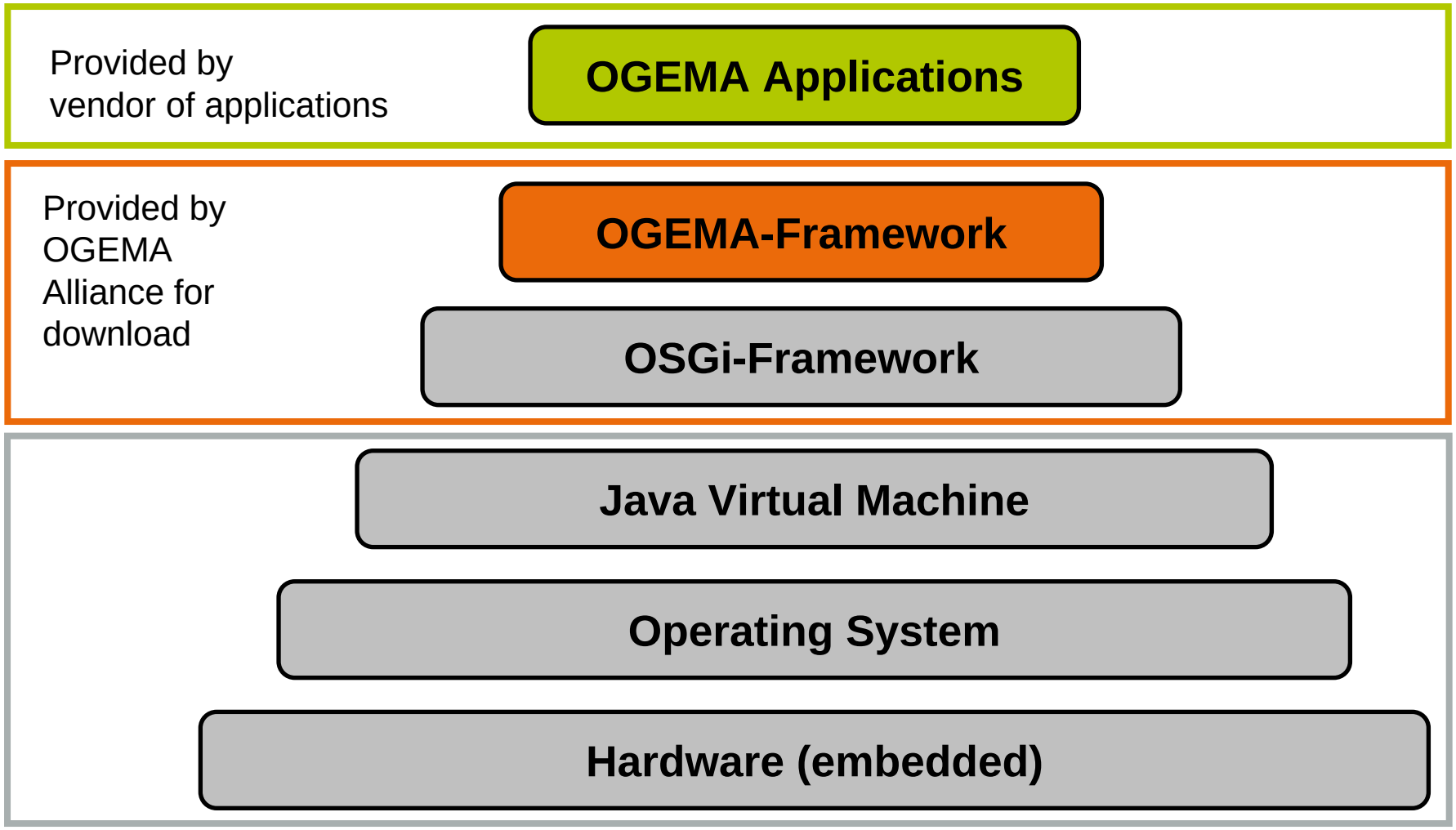
OSGi concept

- OSGi started as “Open Service Gateway Initiative” for Home Automation
- OSGi provides Multi-Application environment
- Execution environment independent of operating system

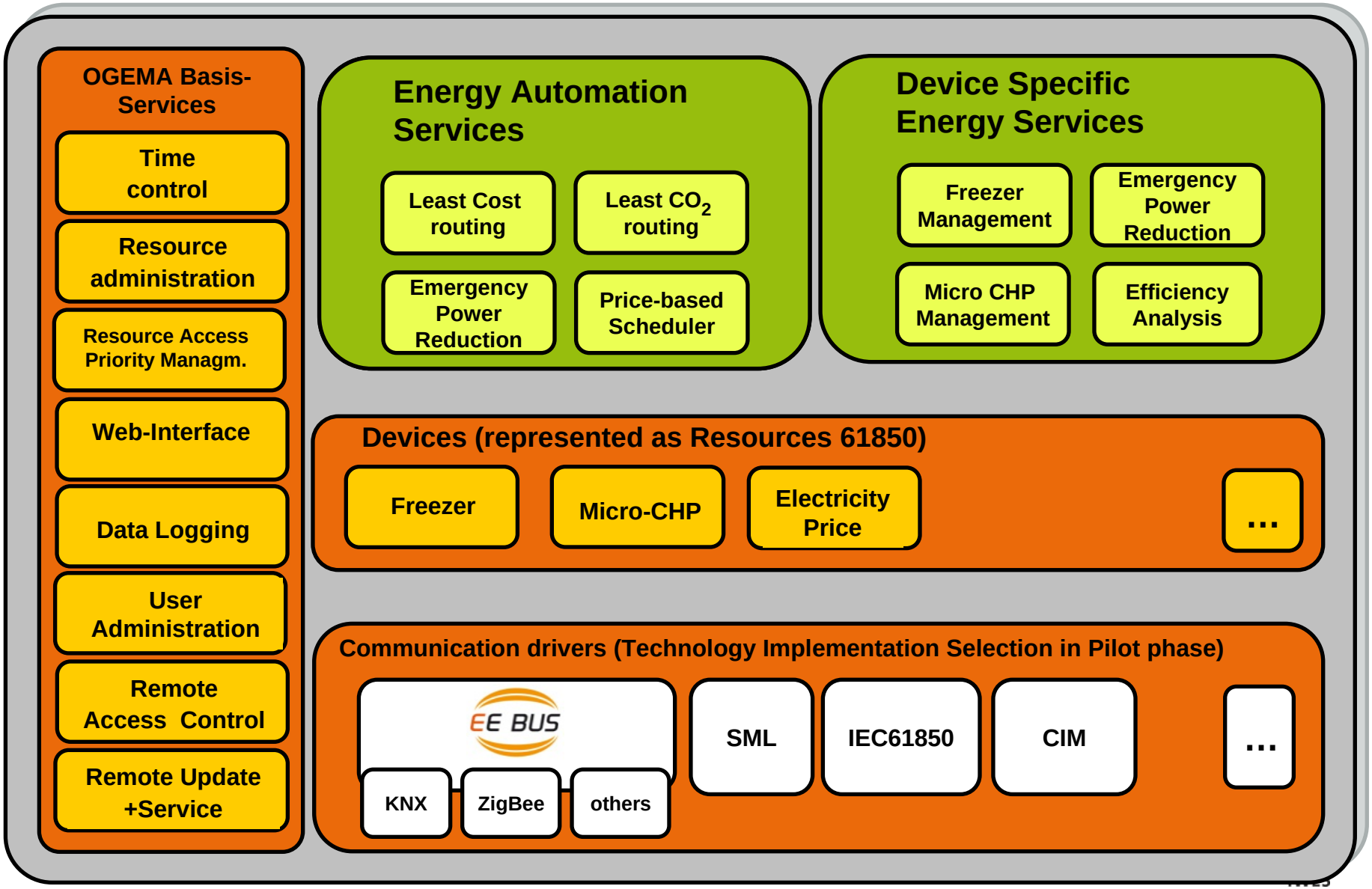


Source: OSGi Alliance

Open Gateway Architecture



OGEMA in the DKE-Competence Centre E-Energy



OGEMA Key Facts

- OGEMA defines gateway core specification
- Environment for parallel execution of different applications with access to smart grid data and devices (e.g. controllable loads)
- Standardized data models and services for different home automation systems
- Support of different in-house and smart grid communication systems

- OGEMA defines a public open standard
- Public (open source) reference implementation for quick start

Application of OGEMA in Field tests

- E-Energy Project “Model City Mannheim”
- E-Energy Project “Model Region Harz”
- EU-Project Smart House – Smart Grid
- Hessian Project “Farmer Education Center Gut Eichhof”
- 3 further Projects under preparation

- More than 1500 Energy management interfaces will be field tested
- Different Applications: CHP, PV Systems, Heat Pumps, Refrigerators, Freezers, Dryers,
- Variable Tariff, PV self consumption, Ancillary Services,…

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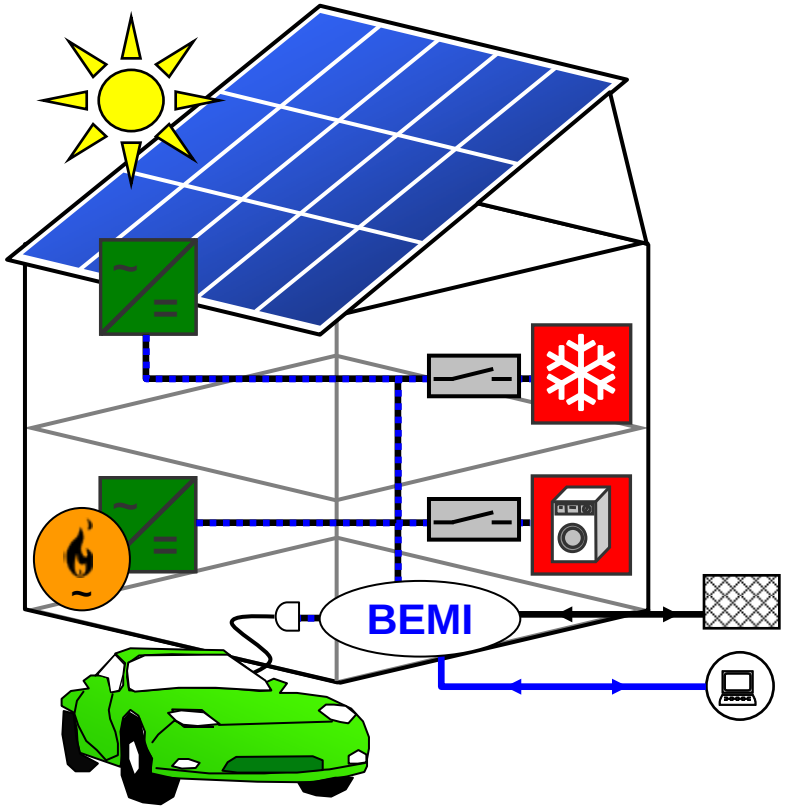
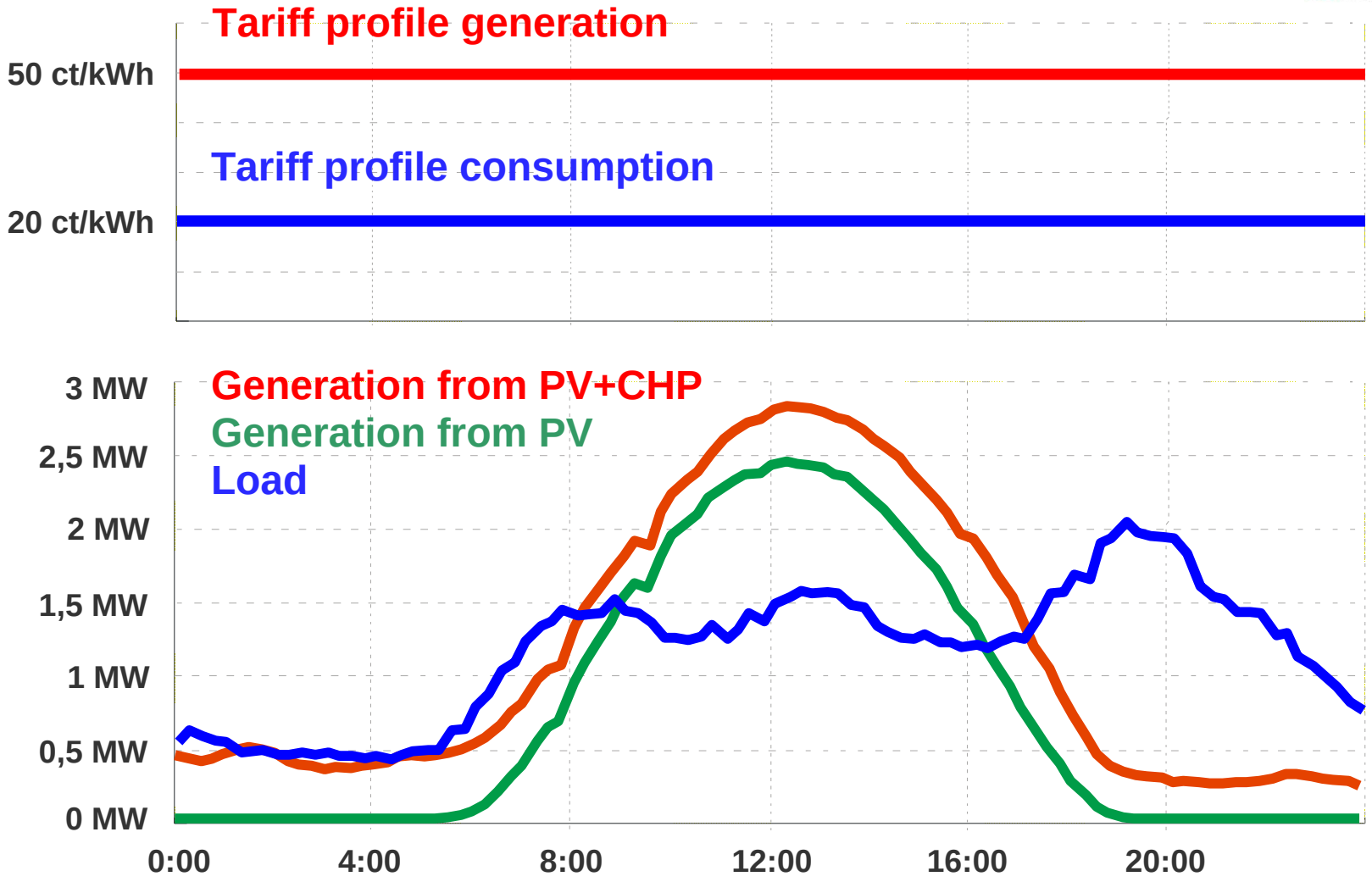
Field Trial B in Smart House-Smart Grid Project
Bi-Directional Energy Management Interface

- 100 Smart Houses in the city of Mannheim
- “Energy Butlers” in Smart Houses carry out automatic load shift according to day-ahead variable tariffs
- “real-life” field trial
- “real-life” billing and involvement of MVV billing department



Simulation:
2500 Households with BEMI, PV and CHP



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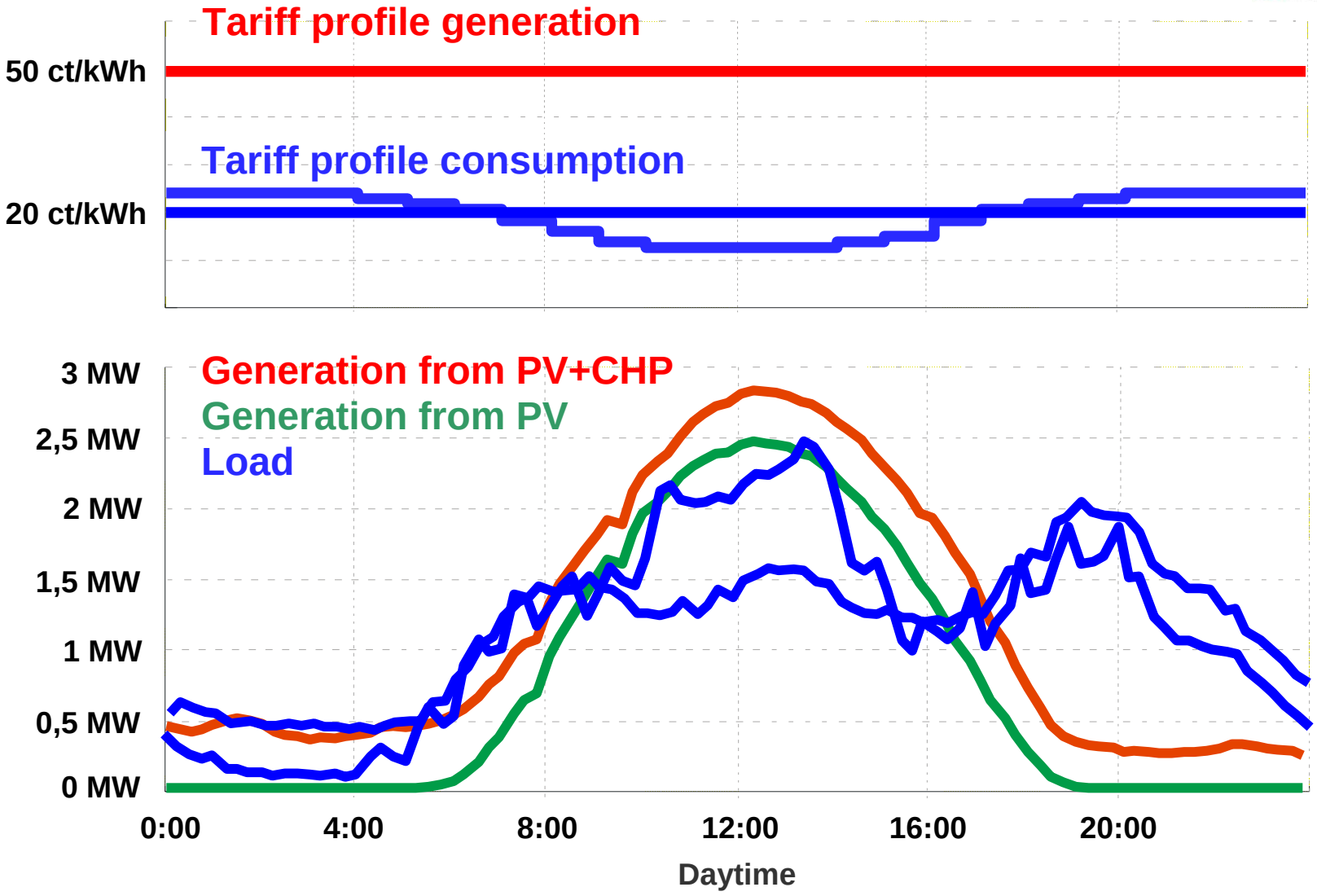

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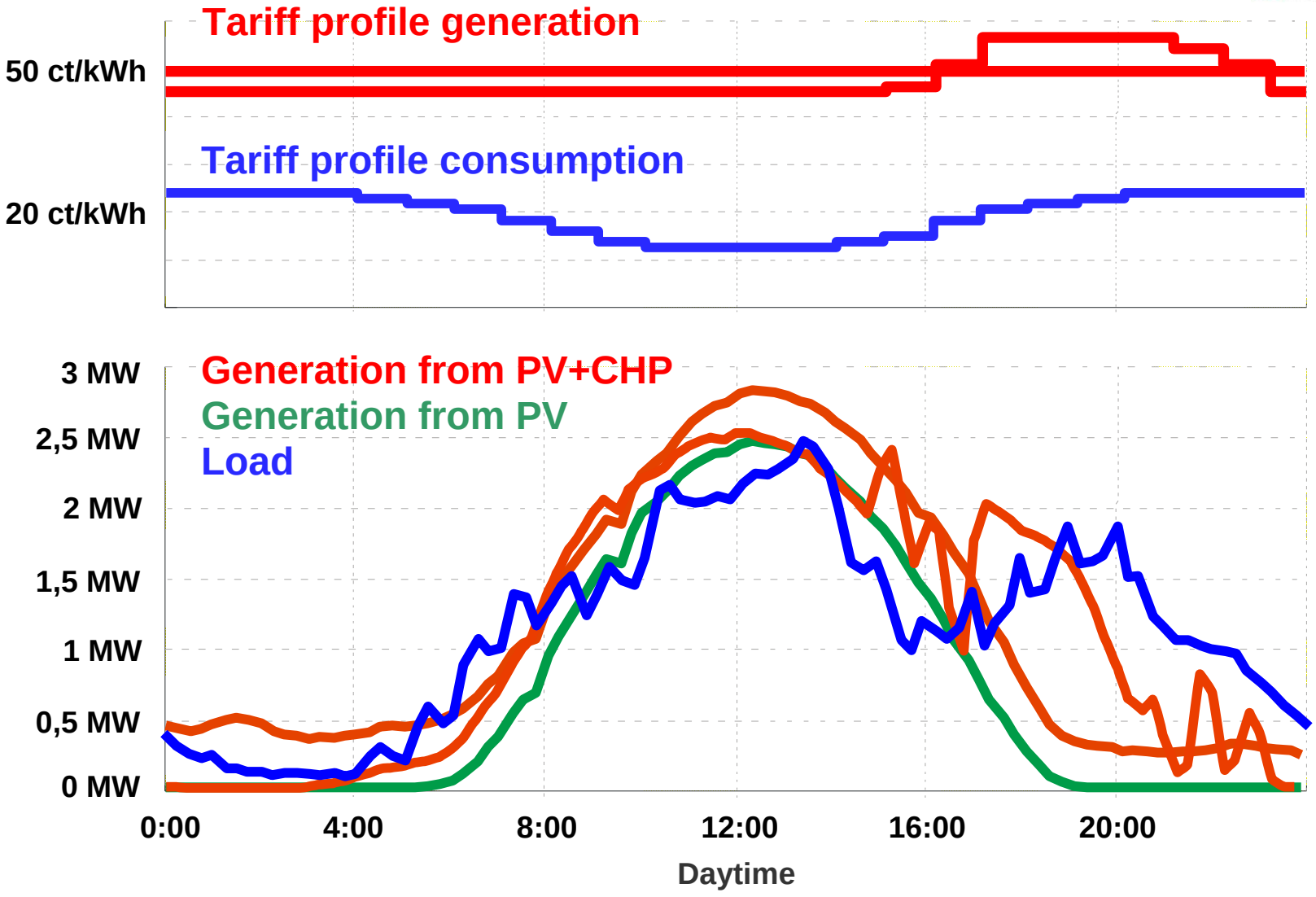
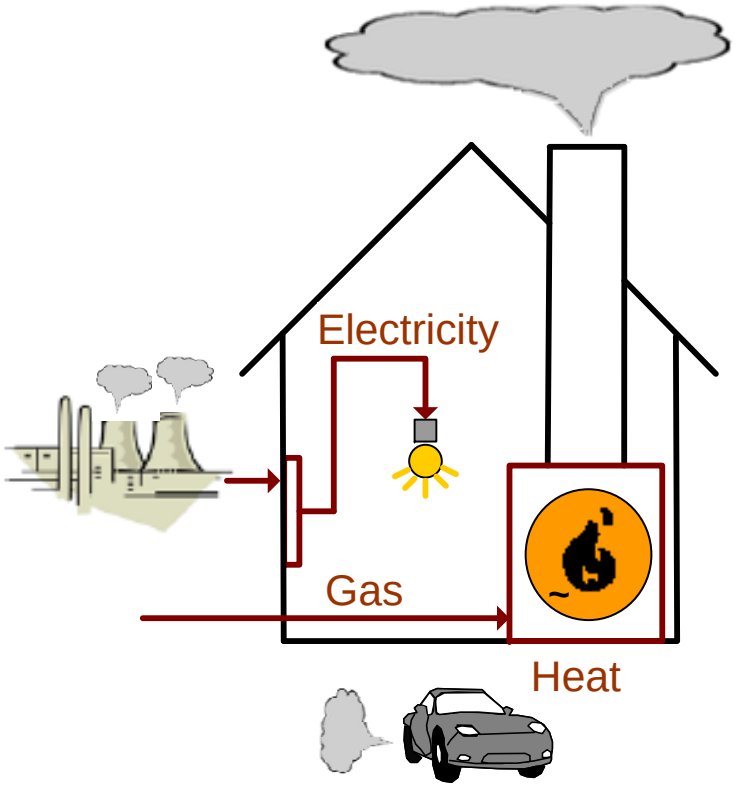
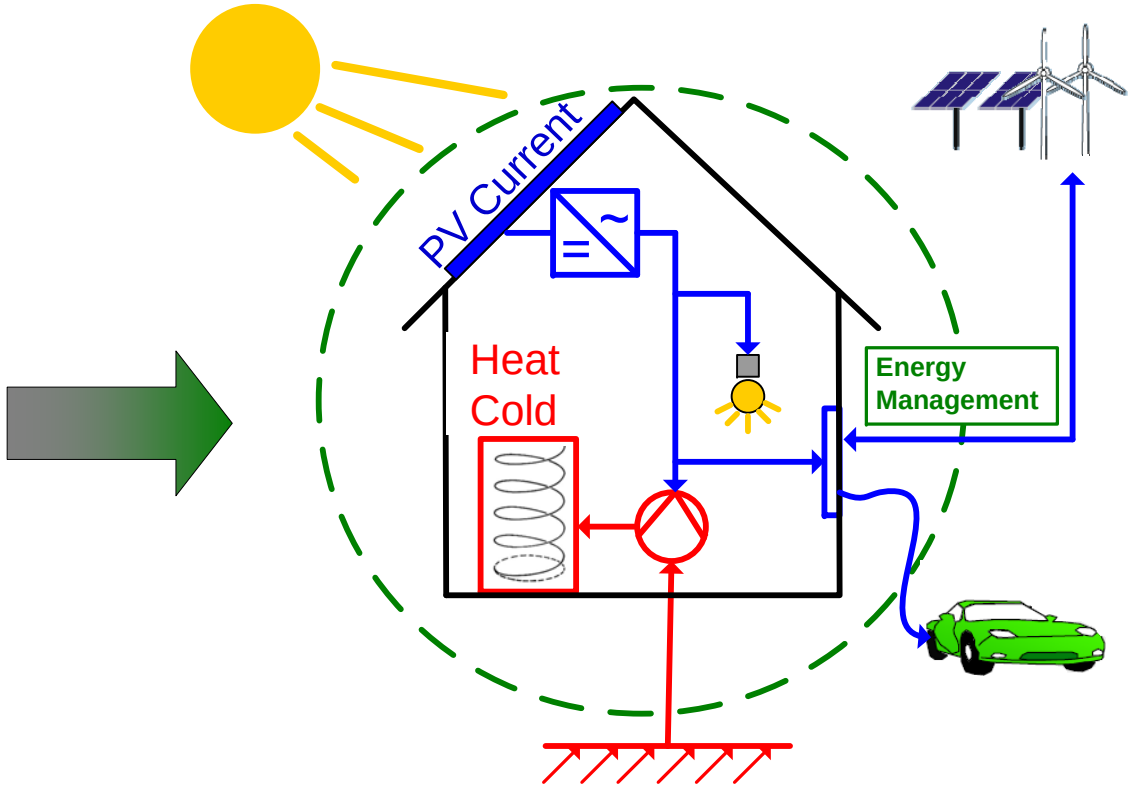


Example for Ogema Application: PV Heat Pump





Getting Started with OGEMA

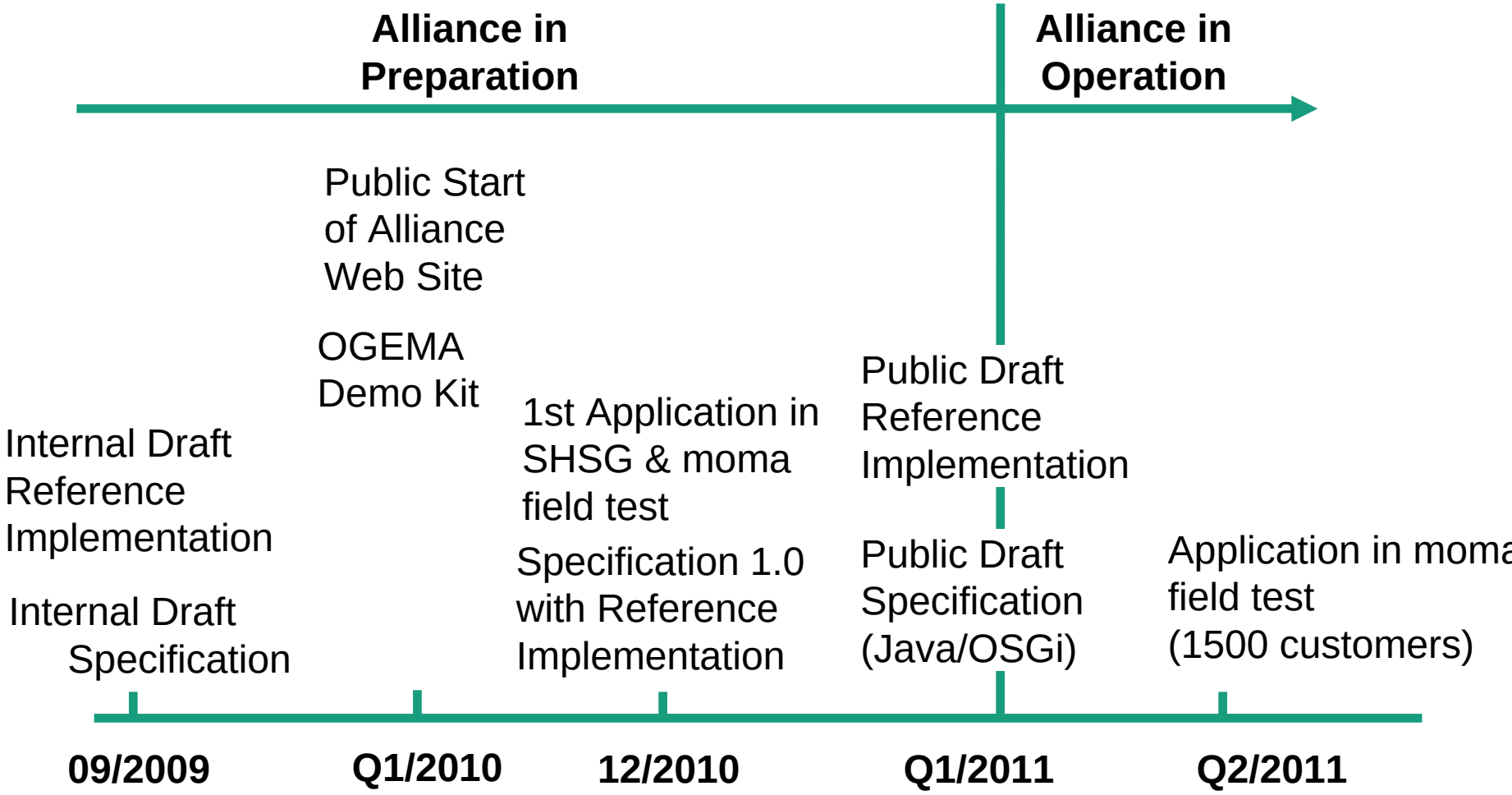
- Framework Specification (Public)
- Reference Implementation of management agent (Open Source)
- Reference Applications (Open Source)
- Reference communication driver (Open Source)
- OGEMA Quick-Start-Guide (Public)
- Applications (provided by suppliers)
- Communication Systems (provided by suppliers)
- OGEMA Contact Point / Website: www.ogema-alliance.org

OGEMA Members can…

- Influence the further development of the specification

  take part in discussions on new specification requirements
- Have early information on specification draft documents etc.
- Receive support from OGEMA contact point
- Opportunity to list own products on the Alliance's web site
- Be part of marketing activities of Alliance
- Promote the standard and the availability of their OGEMA conformant systems

OGEMA Timeline



Summary

- Need for load following generation due to wind and pv
- Variable price gives incentives for decentralized energy management
- Principle of private (automatic) control with increased comfort
- Communication/Control - Firewall between public grid and private grid: access control, data privacy
- OGEMA platform connects Smart Grid with Building Automation
- Open Source “Operating System” for decentralized Smart Grid Applications available
- Customer / Prosumer oriented approach

OGEMA Contact Point at Fraunhofer IWES:

http://www.ogema-alliance.org

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