How can the Future Internet enable Smart Energy?

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on behalf of the FINSENY project

“Smart Energy enabled by Future Internet” Workshop

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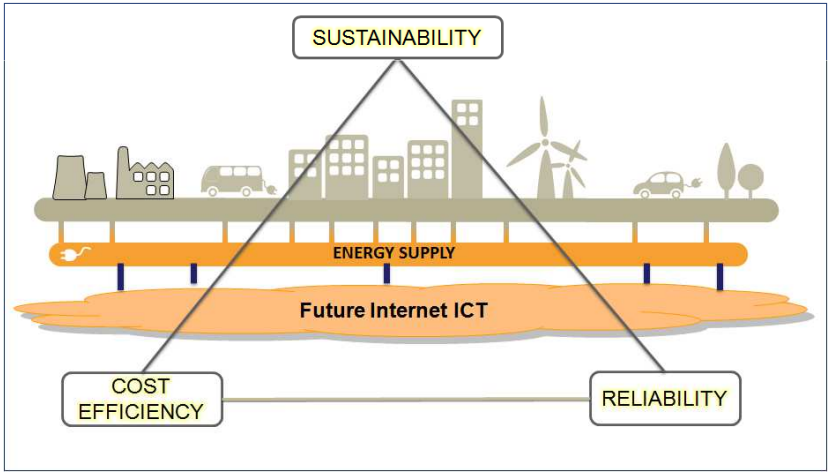
Outline

- Motivation and basic requirements
- FI-PPP approach
- FINSENY consortium, vision and mission
- Scenarios
- Conclusions

Motivation

- In search of a sustainable energy system
  - Europe has committed to 20/20/20 targets *
  - Germany's nuclear power phase out
- Integrate renewable and decentralised energy generation
  - need to cope with volatility
  - need to optimally use existing grid infrastructures
- Liberalisation of energy markets
  - new services
  - new market players
- Combination of action fields
  - smart grid and smart home
  - smart grid and electric mobility



➔ **ICT is the key enabler for the Smart Energy**

* A 20% reduction in EU greenhouse gas emissions from 1990 levels;
Raising the share of EU energy consumption produced from renewable resources to 20%;
A 20% improvement in the EU's energy efficiency.

Source: EU Commission: http://ec.europa.eu/clima/policies/package/index_en.htm

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Can the Internet be useful for Smart Energy?

- The Internet provides
  - A cost-efficient information and communication infrastructure with outstanding scalability and economy of scale
  - Well-proven Internet technologies (e.g. TCP/IP protocol suite) for re-use in private networks
  - Openness to new service providers and business models
- Limitations of today's Internet technology
  - No guaranteed high priority
  - Internet could introduce security gaps
  - Internet technology does not fulfil the short and deterministic latency requirements (e.g. for tele-protections)
- BUT the Internet is evolving fast, often at exponential rates, and adapting itself to users' demands

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Critical features for Smart Energy

Reliability	Minimal interruptions to supply at all customer levels
Safety	All members of society will be protected from dangerous occurrences
Security	Ensure compliance in the use of information and protect the network from unwanted intrusions whether physical or cyber systems
Adaptability	Be capable of operation with a wide mix of different energy sources and be self-healing through decision-making on a local level
Utilisation	Improved utilisation of assets through monitoring and control
Intelligence	The gathering and management of information relating to customers and assets throughout the network and using such information to deliver the features above

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How is the Future Internet likely to evolve?

Evolution of communication networks

- New wireless (LTE) and wired technologies (Fiber-to-the-X)
- Increased bandwidth but also Classes of Services approaching real-time requirements
- Network virtualisation

Internet of Things

- New mechanisms to mange huge numbers of devices
- Sensor data can be collected, aggregated, processed and analysed to derive contextual awareness
- Improved control decisions

Internet of Services

- Facilitates complex business relationships between multiple stakeholders
- Innovative business applications

Cloud Computing

- Elasticity with private or public clouds
- transition of business models towards the “as a service “ paradigm

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How can the Future Internet enable Smart Energy?

Connectivity

End-to-end connectivity between large varieties of grid elements, including distributed energy resources, building energy management systems and electric vehicles using public as well as private communication infrastructures.

Management

Smart Energy introduces a lot of new managed elements with increased data volume. Future Internet offers e.g. concepts for device registries, SW maintenance, Big Data analysis, network management, distributed processing.

Service Enablement

Future Internet enables new service platforms supporting e.g. multi-tenancy, dynamic pricing and billing services for instant collaboration between all relevant stakeholders including the prosumer.

Distributed intelligence

Future Internet Technologies will introduce new technologies into hardware and – even more so – in software, effectively injecting intelligence into the grid, e.g. to coordinate and control Distributed Energy Resources.

Security & Privacy

Future Internet Technologies will provide new and improved means to support security and privacy

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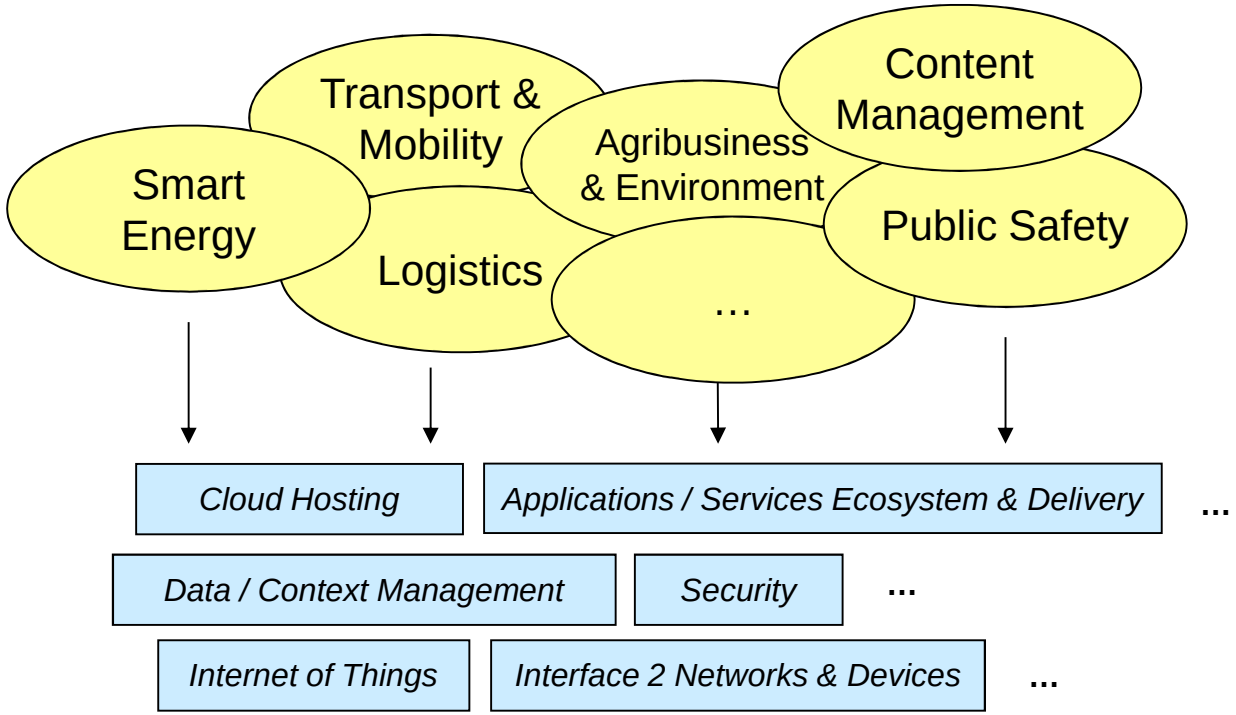
Basic idea of the FI-PPP
(Future Internet Public-Private-Partnership)

Usage Areas like …



… require today
or in future …

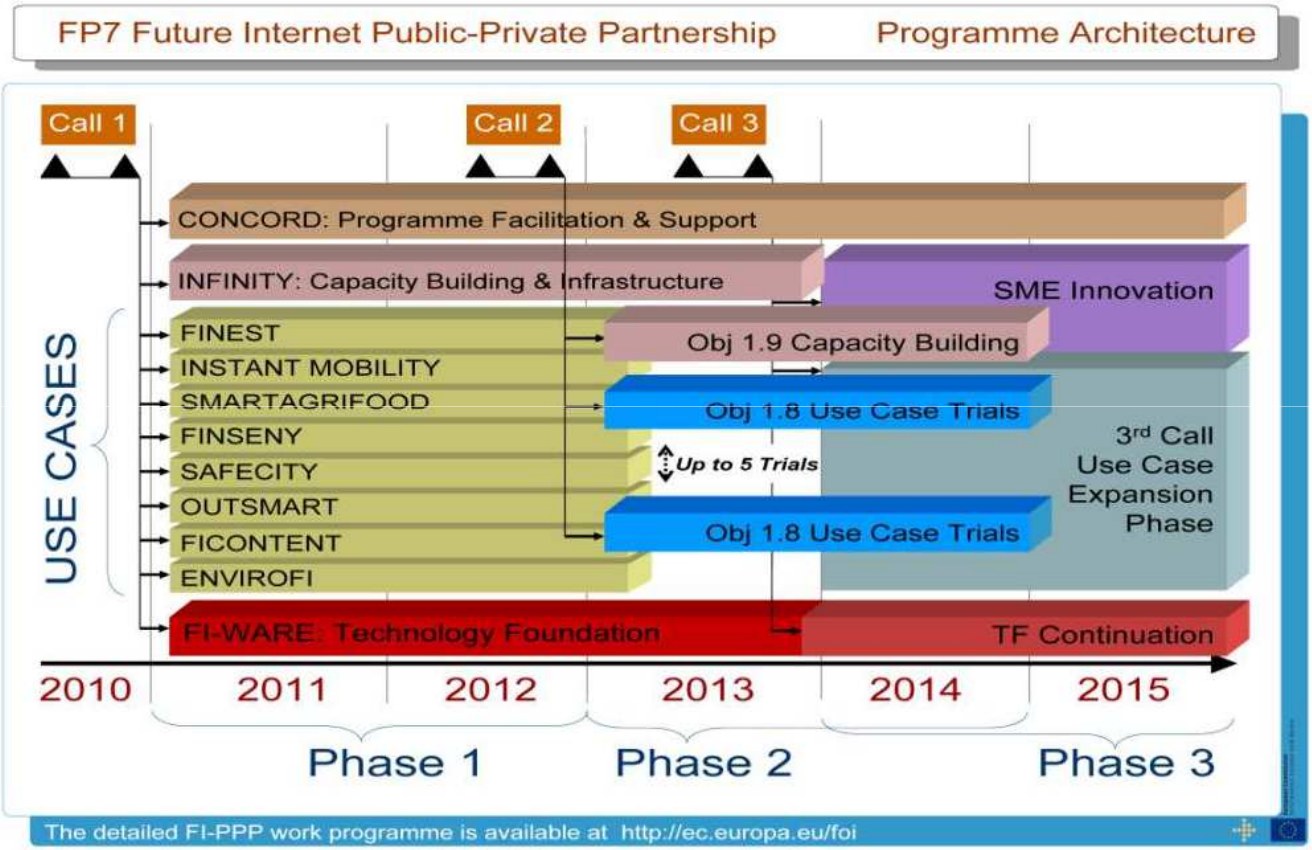
… which should be provided in a generic way by the Future Internet

FI-PPP Programme

Identification of the requirements for each usage area

Generalisation of requirements

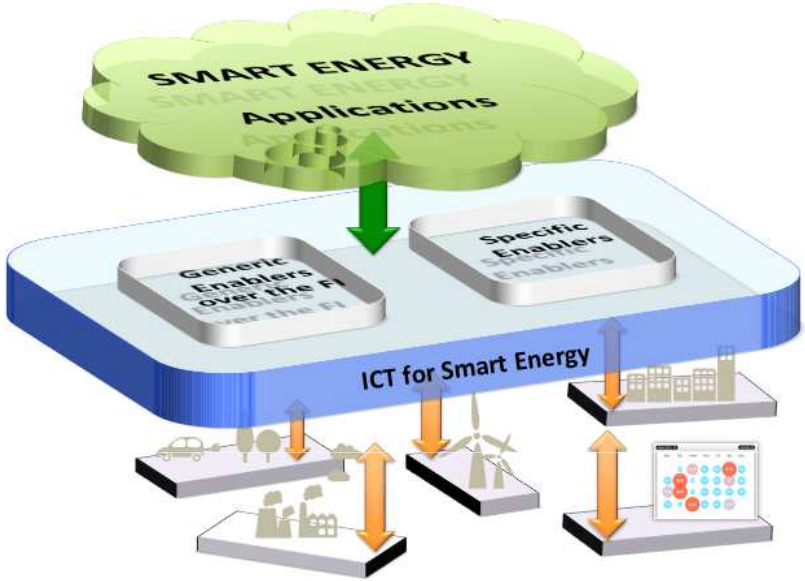
Implementation of generic requirements as core platform



Deploy domain-specific applications on core platform

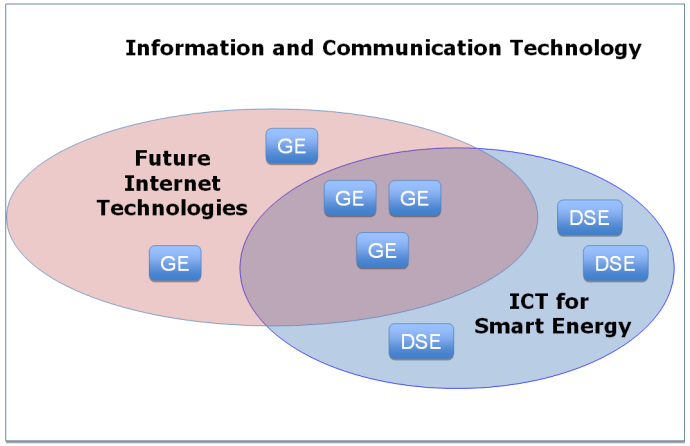
Large-scale testing

Future Internet Technology & ICT for Smart Energy



- ICT for Smart Energy will rely on generic enablers (GE) and domain-specific enablers (DSE)
- GEs will be realised by the Future Internet core platform

- DSEs will add specific capabilities to the FI core platform which have, e.g., to meet the requirements for critical infrastructures
- Smart Grid Applications will be realised on top of the ICT for Smart Energy layer



FINSENY project in brief

Vision
« A sustainable Smart Energy system in Europe, combining critical infrastructure reliability and security with adaptive intelligence, enabled by open Future Internet Technologies. »

Mission
« Demonstrate, by 2015, how open Future Internet Technologies can enable the European energy system to combine adaptive intelligence with reliability and cost-efficiency to meet, sustainably, the demands of an increasingly complex and dynamic energy landscape. »

Project details:

- Duration: April 2011 – April 2013
- Partners: 35 partners from 12 countries from the energy and ICT domain
- Part of the FI-PPP program
- http://www.finseny.eu/

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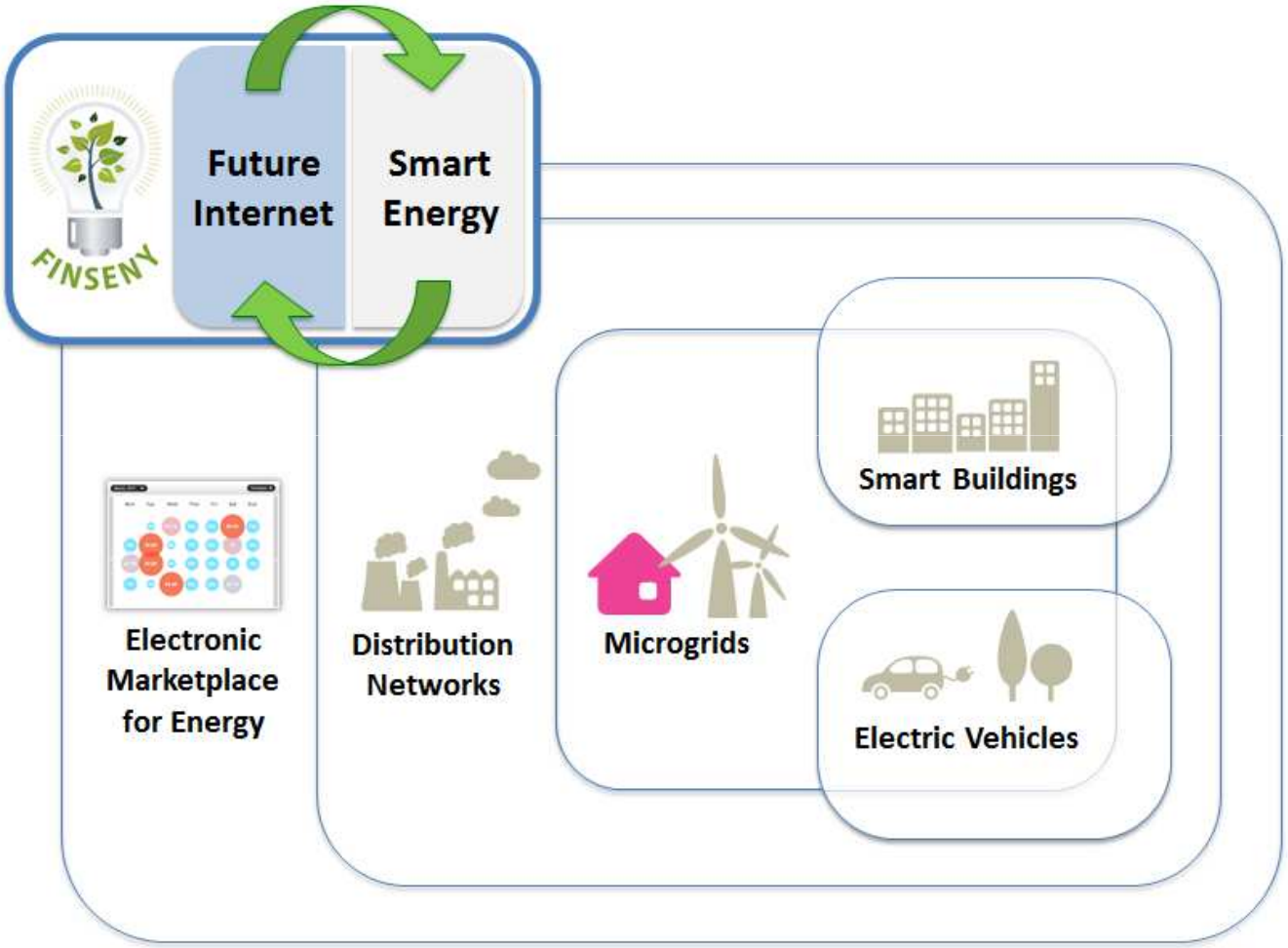
FINSENY Scenarios



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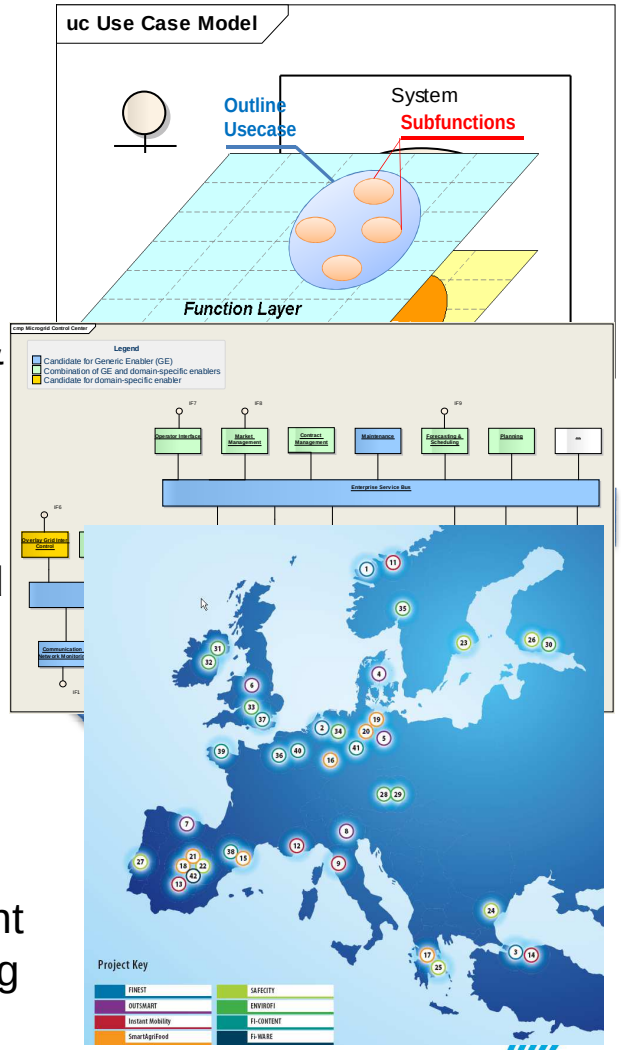
FINSENY's 4-Step Approach

1. Scenario description
   - Identify use cases and actors (market roles as well as systems & devices) according IntelliGrid method
2. ICT requirements
   - Define requirements for communication & information flows as well as services and middleware
3. Functional Architecture
   - Identify key functional building blocks and interfaces, specify data models and communication protocols
   - Develop ICT architecture based on common and domain specific enablers
4. Trial candidates
   - Identify trial candidates taking into account relevance, trial setup and reuse of existing trials



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Conclusion

- The FINSENY project
  - Collected and selected use cases for its five scenarios
  - Provided use case descriptions as input to SG-CG WG Sustainable Processes
  - Identified ICT requirements within scenarios
  - Consolidated ICT requirements in the project
  - Coordination with the other FI-PPP usage areas
    - requirements covered by generic enablers (FI-WARE)
    - requirements covered by specific enablers (FINSENY)
  - Develop consistent functional ICT architecture considering FI-WARE GEs for FINSENY scenarios
  - Plan for consolidated Smart Energy trial

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http://www.finseny.eu/finseny-white-paper/

THANK YOU FOR YOUR ATTENTION!