Smart Cities Concept

Member States Initiative Smart Cities

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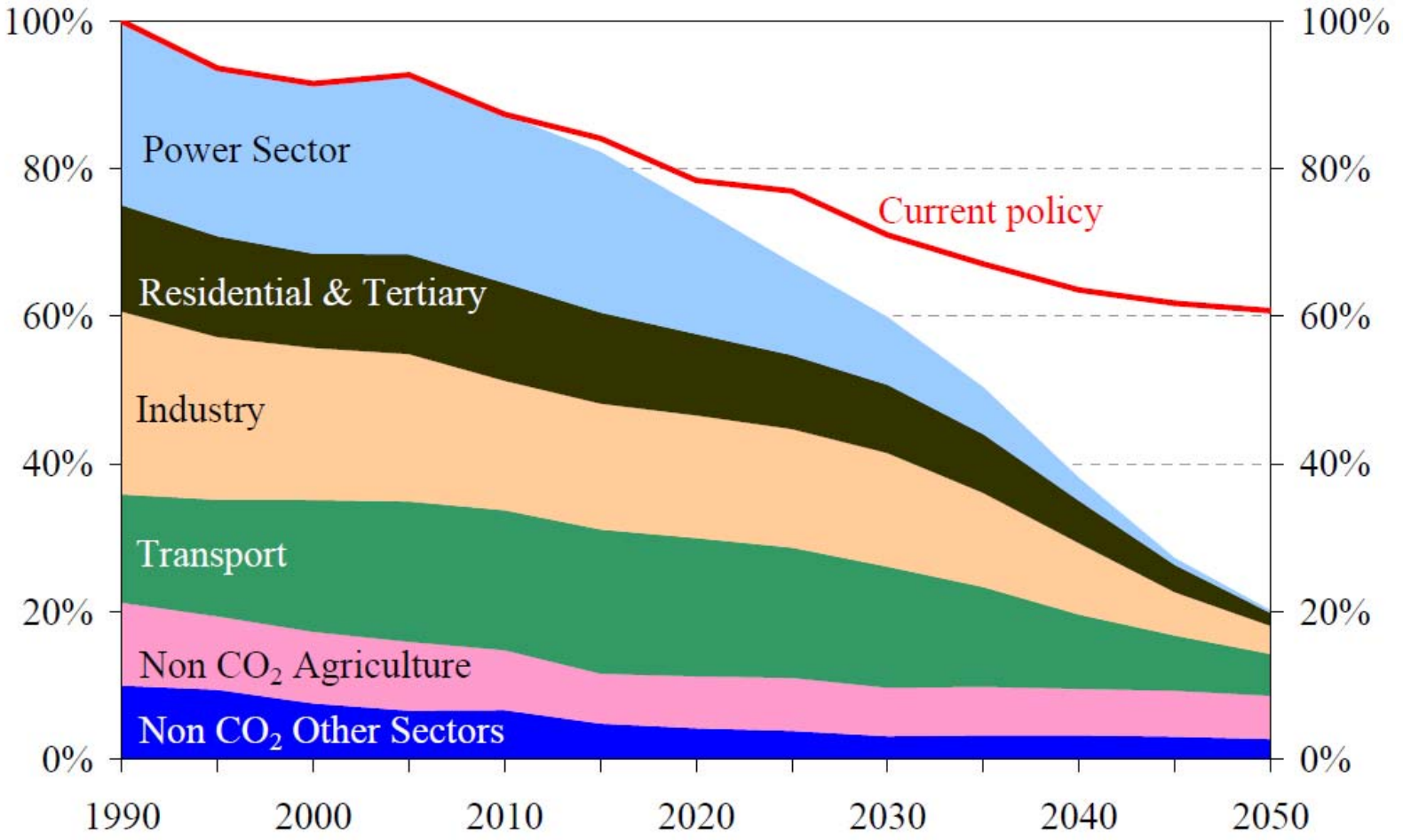
THE CONTEXT

European Low Carbon Economy Roadmap 2050



EU GHG emissions towards an 80% domestic reduction (100% =1990)

The SETPlan and its European Industrial Initiatives

Solar Energy (PV & CSP)	Wind Energy	Bioenergy	Nuclear Energy
Carbon capture and storage	Electrical Grids	Fuel and Hydrogen Cells	Smart Cities and Communities

In the Smart Cities Initiative the European Commission proposes:

- "to progress by 2020 towards a 20 % reduction of greenhouse gas emissions through sustainable use and production of energy", requiring
- "systemic approaches and organisational innovation, encompassing energy efficiency, low carbon technologies and the smart management of supply and demand."

THE SMART CITIES CONCEPT

Smart Cities – the Concept

the *Smart Cities* concept:

- considers the city as a whole in all its complexity (holistic approach)
- focuses on energy (demand, supply, distribution, storage) and resulting carbon emissions
- considers interactions between energy and mobility, water, waste, the quality of life of its citizens and socio-economic conditions within the city

Smart Cities – the Scope

- Energy efficiency in the refurbishment of existing buildings and construction of new buildings; **interactive buildings** that play an active role in intelligent energy networks

- **Smart energy networks**, i.e. smart electrical and thermal grids and their inter-relations

- Local integration of renewable **energy** (and low carbon) **supply** technologies

- Taking an integrated approach to **urban energy planning** considering the interactions between energy and urban planning, mobility, water, waste and socio-economic conditions within the city

Smart Cities – the Method

the *Smart Cities* concept relies on:

1. the **integration of processes, concepts and technologies**:
   - processes (e.g. urban planning, infrastructure planning, financing, policy making, governance structures, stakeholder processes)
   - concepts (e.g. energy efficiency measures; decentralised and centralised energy production strategies for heat, cold, electricity and fuels; mobility, waste and water strategies)
   - and technologies (e.g. CHP, heat pumps, solar PV and thermal collectors, smart electrical and thermal network components).

2. the use of **Information and Communication Technologies** for:
   - an optimal design and operation of the urban energy system
   - the communication between technologies
   - monitoring the performance of the Smart City
   - the communication with end energy consumers.

Smart Cities – a Challenge for Cities

In order to become “smart” cities need support:

1. At the level of **concept planning** in producing a **roadmap** for their transformation into a Smart City (e.g. Sustainable Energy Action Plan, Low Carbon Action Plan)

2. At the level of **detailed design** in **implementing** the **measures** decided with the roadmap

Smart Cities – our Challenge

In order to become “smart” cities need support:

1. At the level of **concept planning** in producing a **roadmap** for their transformation into a Smart City (e.g. Sustainable Energy Action Plan, Low Carbon Action Plan)

   Decision support tool for the **choice of measures** best adapted to the city and the sequence of their implementation in time

2. At the level of **detailed design** in **implementing** the **measures** decided within the roadmap

   Development of **integrated energy strategies** for city neighbourhoods to city districts

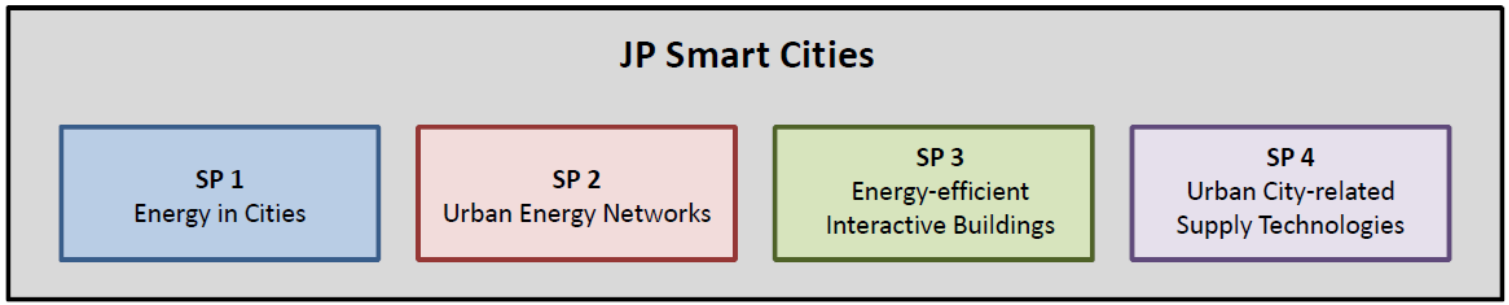

EERA
European Energy Research Alliance

EERA Joint Programme Smart Cities

- 60 research institutions from 14 European countries
  - 15 full participants
  - 45 associated participants
- 2 umbrella organisations
  - UKERC (United Kingdom)
  - BERA (Belgium)
- 4 industry partners
  - ENEL (Italy)
  - Ericcson (Italy)
  - Telecom (Italy)
  - Loccioni (Italy)
- Total contributed human resources: **<u>192.85 py/y</u>**
  - SP 1: 34.60 py/y
  - SP 2: 57.90 py/y
  - SP 3: 77.45 py/y
  - SP 4: 22.90 py/y

JP structure

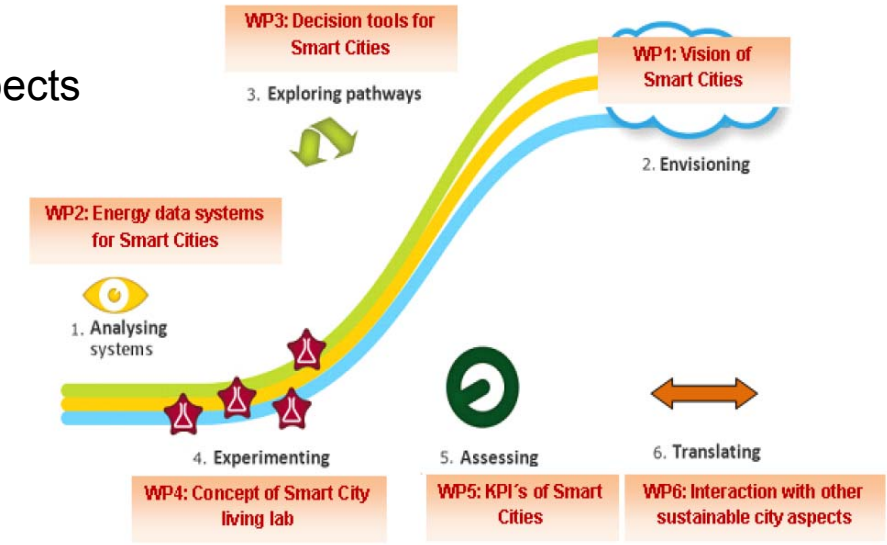
- 4 sub-programmes



- Enabling radical innovation by taking an integrated and multi technology approach
- Focus on “energy” covering entire chain (urban generation – distribution – consumption)
- Focus on energy efficiency
- Extension to further environmental/sustainability issues and mobility aspects planned
- Synergies and interfaces between sub-programmes (e.g. Building-to-Grid)

SP 1 – Energy in Cities

- Smart Cities visions and transition processes
- Development of energy data systems for cities
- Decision support tools for energy roadmaps and action plans on urban scale
- “Living lab” concepts in the context of Smart Cities
- KPI’s and progress monitoring
- Interaction with other sustainable city aspects (water, waste, air,...)



SP 1 – Energy in Cities

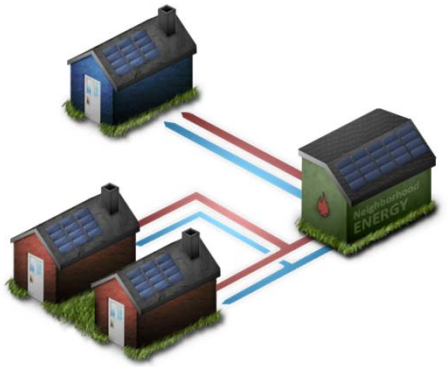
Objectives for 2012:

- State-of-the-art and gap analysis for each work package
- Produce a functional specification (e.g. inputs, outputs, definition of scope, user interface) of the modelling tools to be developed within SP1
- Interaction of these tools with those to be developed in the other SPs

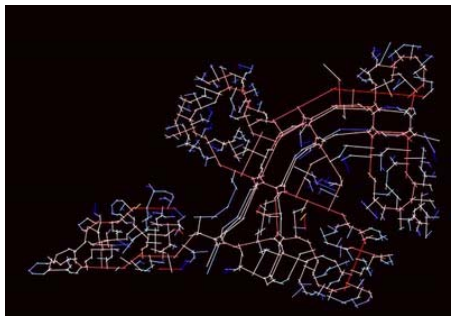
- … preparation of “material” for FP7 calls

SP 2 – Urban Energy Networks

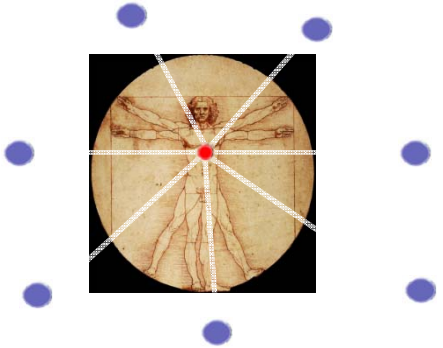
- Smart Energy Districts
  - Building cluster interaction
  - District heating & cooling management
  - Multi-sources energy management/balancing (thermal + electric)
  - Connection of building cluster to smart grid



- Urban network integration
  - Urban sensor networks, data-energy transmission networks
  - Data management
  - ICT architectures of smart streets/districts
  - Integration of smart services in urban networks
  - Energy-mobility network integration

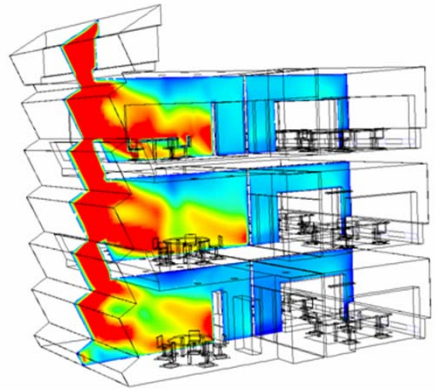


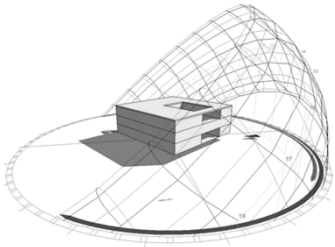
- Human factors: the city-citizen interaction
  - Interaction between citizen and urban networks in public space
  - End-user grid interface



SP 3 – Energy-efficient Interactive Buildings

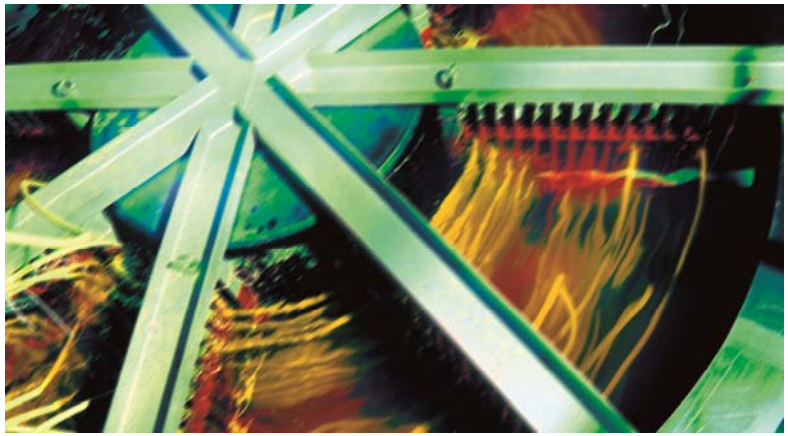
- Building design
  - Design concepts for various types of boundary conditions
  - Modelling and simulation (BIM)
- Innovative building envelope solutions
  - Systems, advanced materials, components, RES integration
- Energy management and grids interaction
  - Building services, smart building management, B2G
- User interaction
  - End/professional users and indoor environment requirements
- Support strategies
  - Policy and market instruments, case studies, dissemination





SP 4 - Urban City-related Supply Technologies

- Focus on solar thermal energy, heat-pumps and thermal energy storage
- Large-scale urban integration
- Development of modelling & simulation framework
  - Numerical component oriented models
  - Design and validation on technology level
- Large-scale test infrastructure, standards and procedures



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JP Management

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- Sub-programme coordinators:
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  - SP 2: Mauro Annunziato (ENEA) and Ralf-Roman Schmidt (AIT, deputy)
  - SP 3: Igor Sartori (SINTEF) + Annemie Wyckmans (NTNU, deputy)
  - SP 4: Lucienne Krosse (TNO) + Michael Monsberger (AIT, deputy)
- JP Steering Group:
  - One representative from each full participant
- Link to EERA Secretariat
  - Massimo Busuoli and Marco Carulli