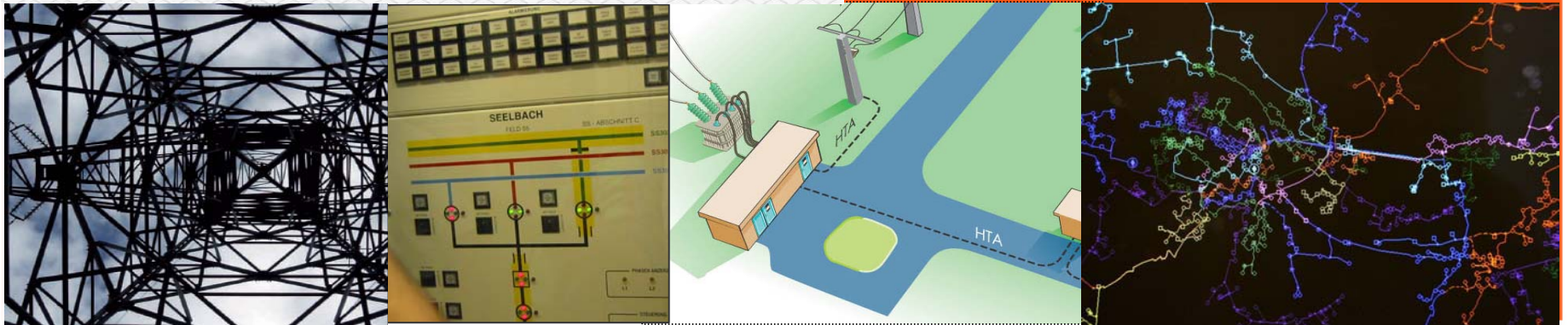


Smart Grids: International Perspective

March 29, 2008
CEC Sacramento



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VP research EDF North America
Gridwise Arch. Council Member
IEC Chair: System Aspects for Energy Delivery

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Outline

- ✓ The world is flat ...
- ✓ European Union Framework Program 7
- ✓ EDF Smart Grid projects
- ✓ Common challenges to make it happen
- ✓ 4 International keys to succeed

Different drivers butsame solutions



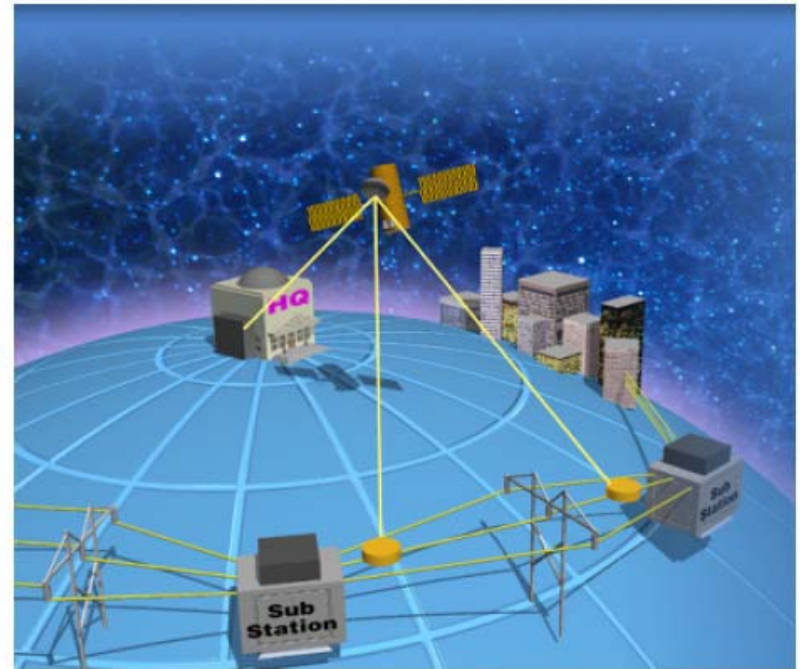


SMARTGRIDS

The IntelliGrid Vision

Makes use of communications, computing & power electronics to create a system that is:

- **Self-Healing** and **Adaptive**
- **Interactive** with consumers and markets
- **Optimized** to make best use of resources and equipment
- **Predictive** rather than reactive, to prevent emergencies
- **Distributed** across geographical and organizational boundaries
- **Integrated**, merging monitoring, control, protection, maintenance, EMS, DMS, marketing, and IT
- **More Secure** from attack



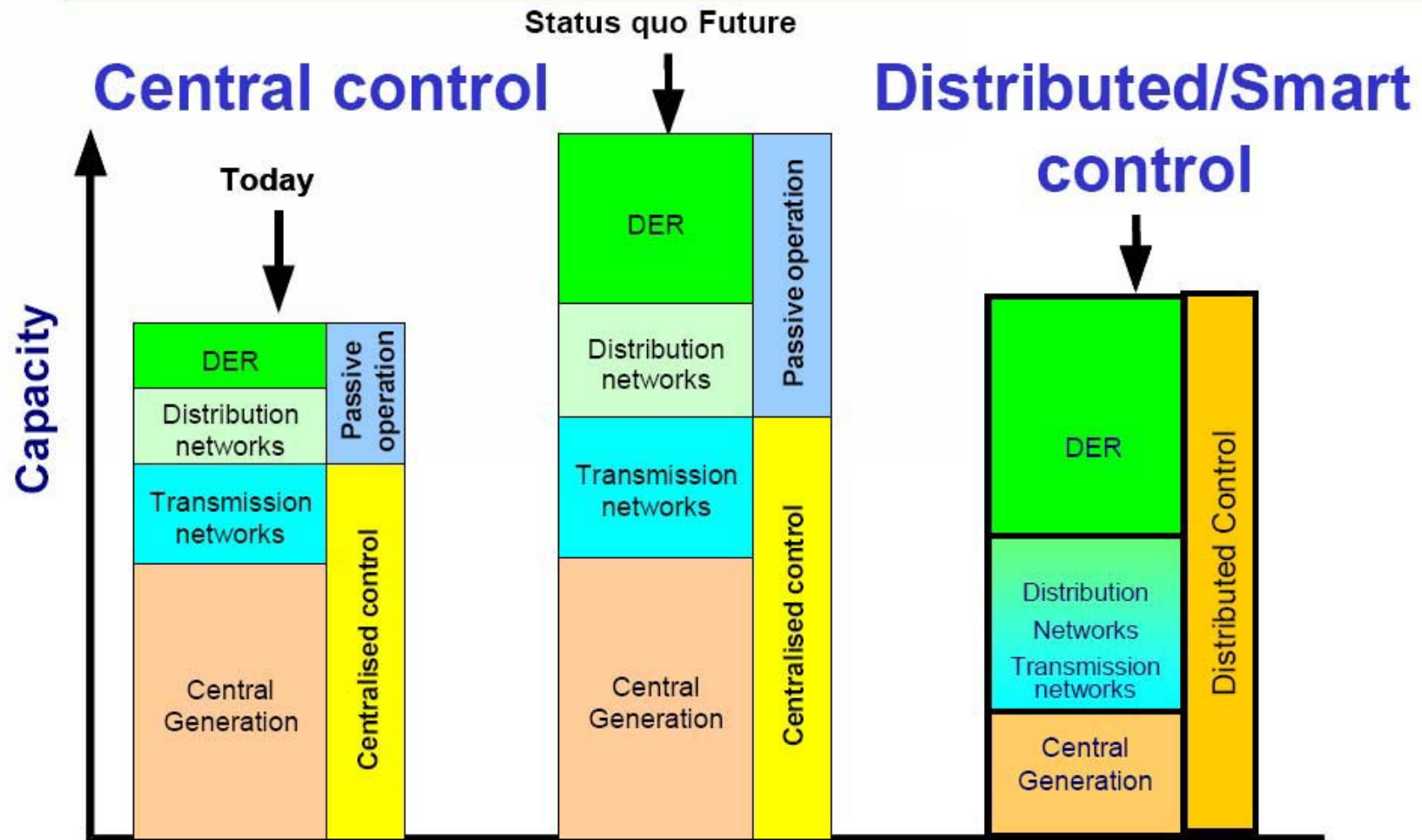


EUROPEAN
COMMISSION

Community Research

Future development options

Connection vs. Integration

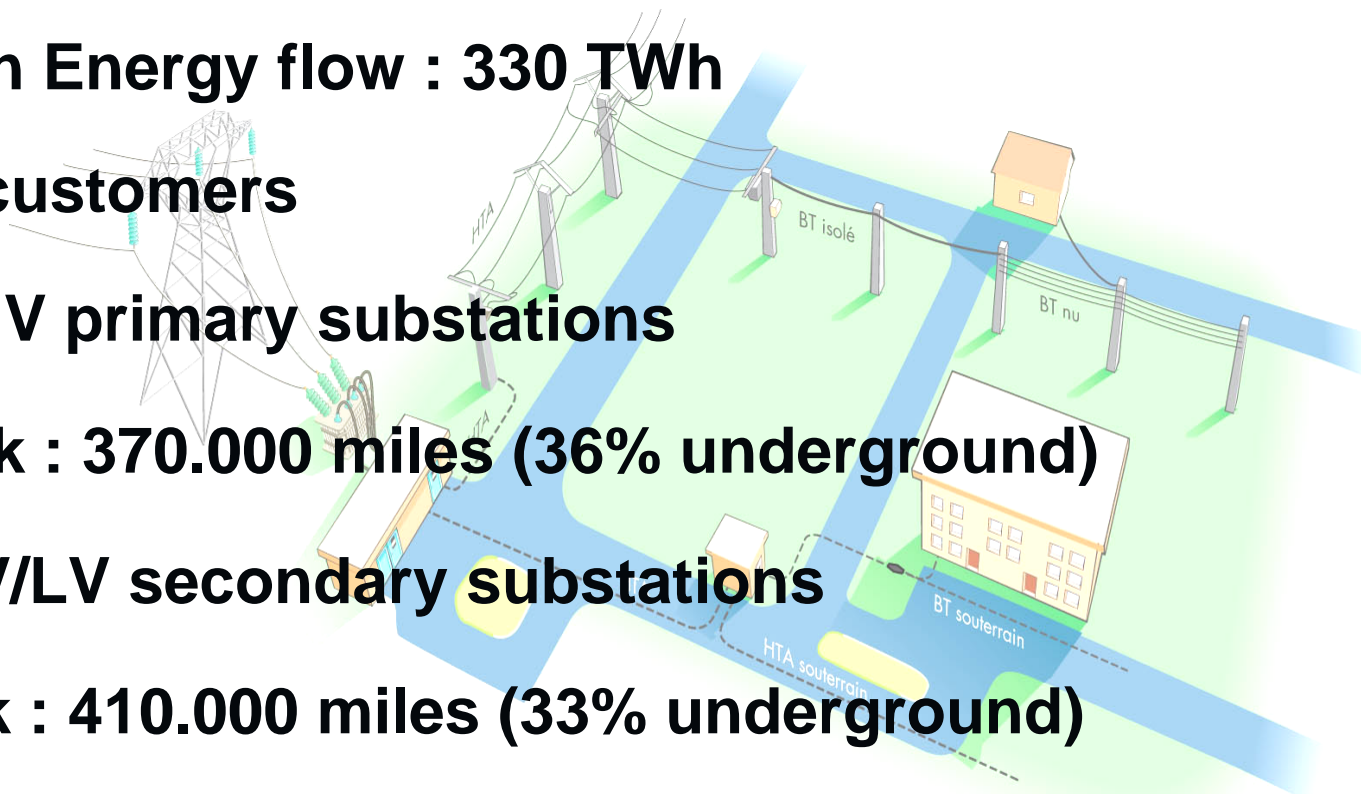


EU Framework Program 7 / ENERGY : 3.6B\$ 2007-2013

7.1: INTER-ACTIVE DISTRIBUTION ENERGY NETWORKS	7.1.1: Control strategies and grid architectures for <u>active networks</u> with <u>large-scale DER & DG</u>
	7.1.2: <u>Simulation and state estimation</u> of smart distribution networks
7.2: PAN-EUROPEAN ENERGY NETWORKS	7.2.1: <u>Simulation and state estimation</u> of smart transmission networks
7.3: CROSS CUTTING ISSUES &TECHNOLOGIES	7.3.1: Grid assets management
	7.3.2: <u>Storage</u> for smart networks

French Distribution Grid in figures

- **Distribution Energy flow : 330 TWh**
- **31 Million customers**
- **2.200 HV/MV primary substations**
- **MV network : 370.000 miles (36% underground)**
- **720.000 MV/LV secondary substations**
- **LV network : 410.000 miles (33% underground)**
- **Mean outage duration at LV level : ~ 60 minutes**



EDF smart grid projects

Advanced distribution operation

Improve life span of grid assets

DER Integration towards
active Distribution Network

“Technology pushed” innovations
for distribution performance

Automatic Meter Management

Energy box
(*Unregulated business*)

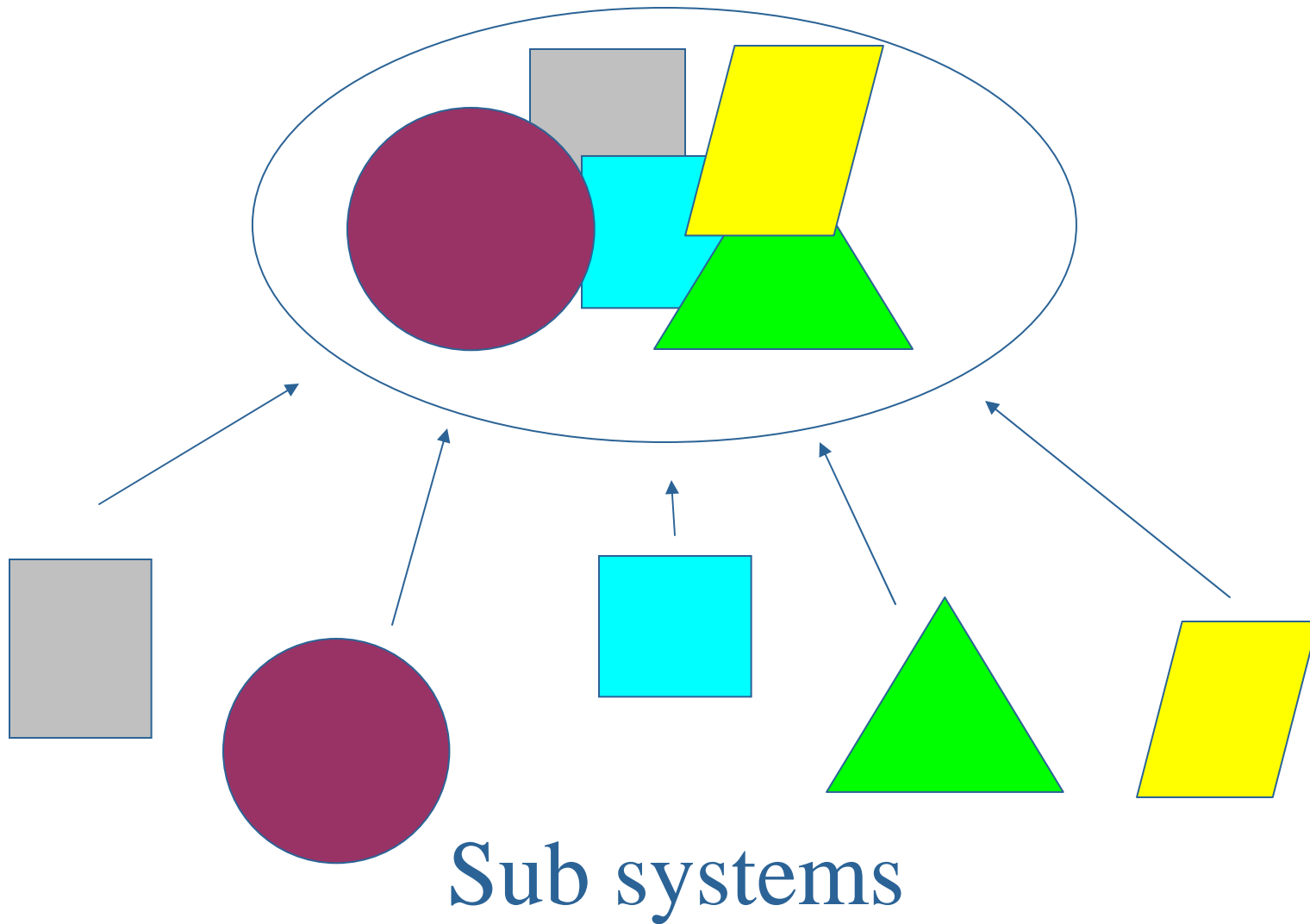
anticipate

optimize

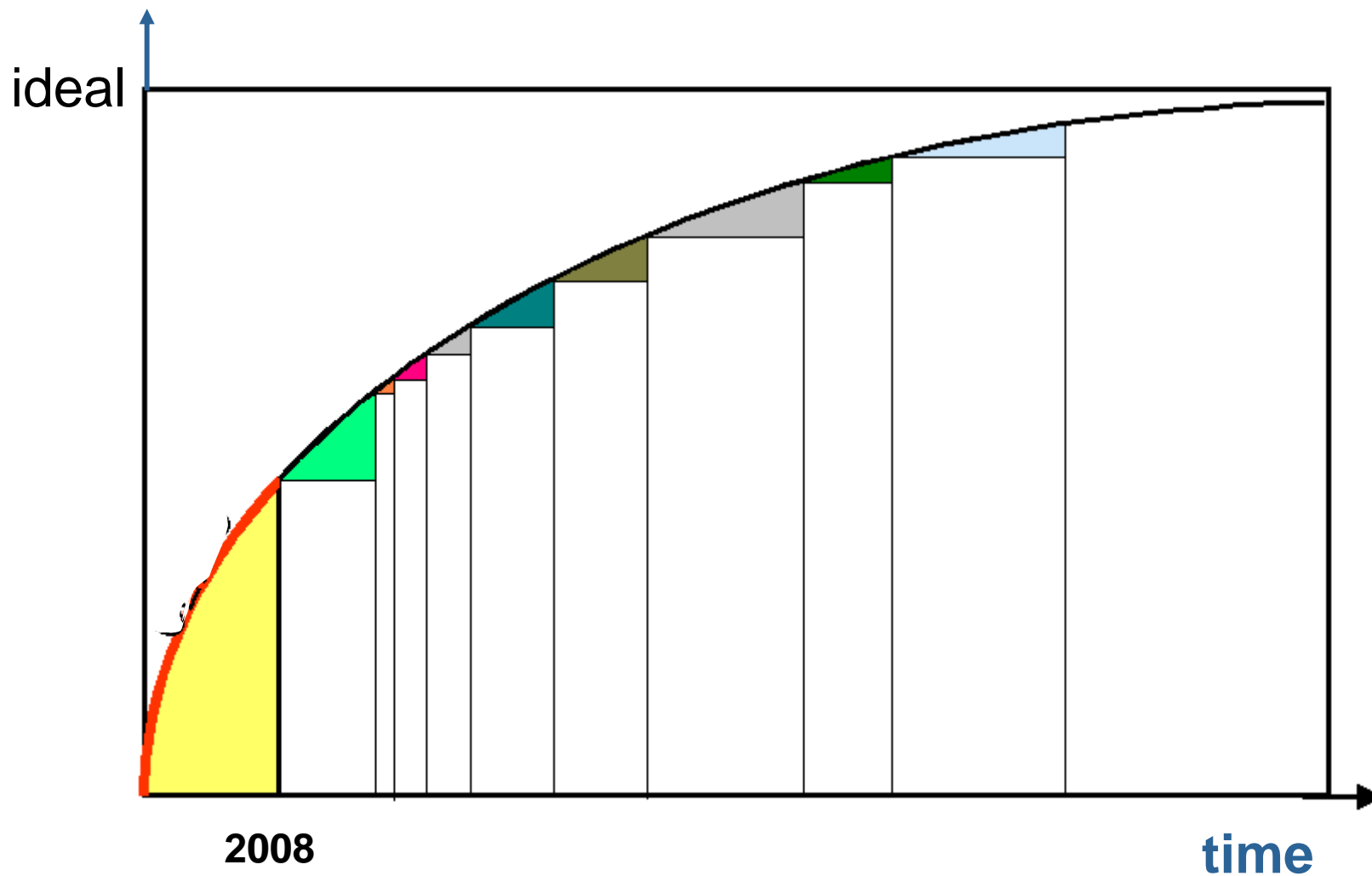
control

observe

Bottom up: the “natural” approach



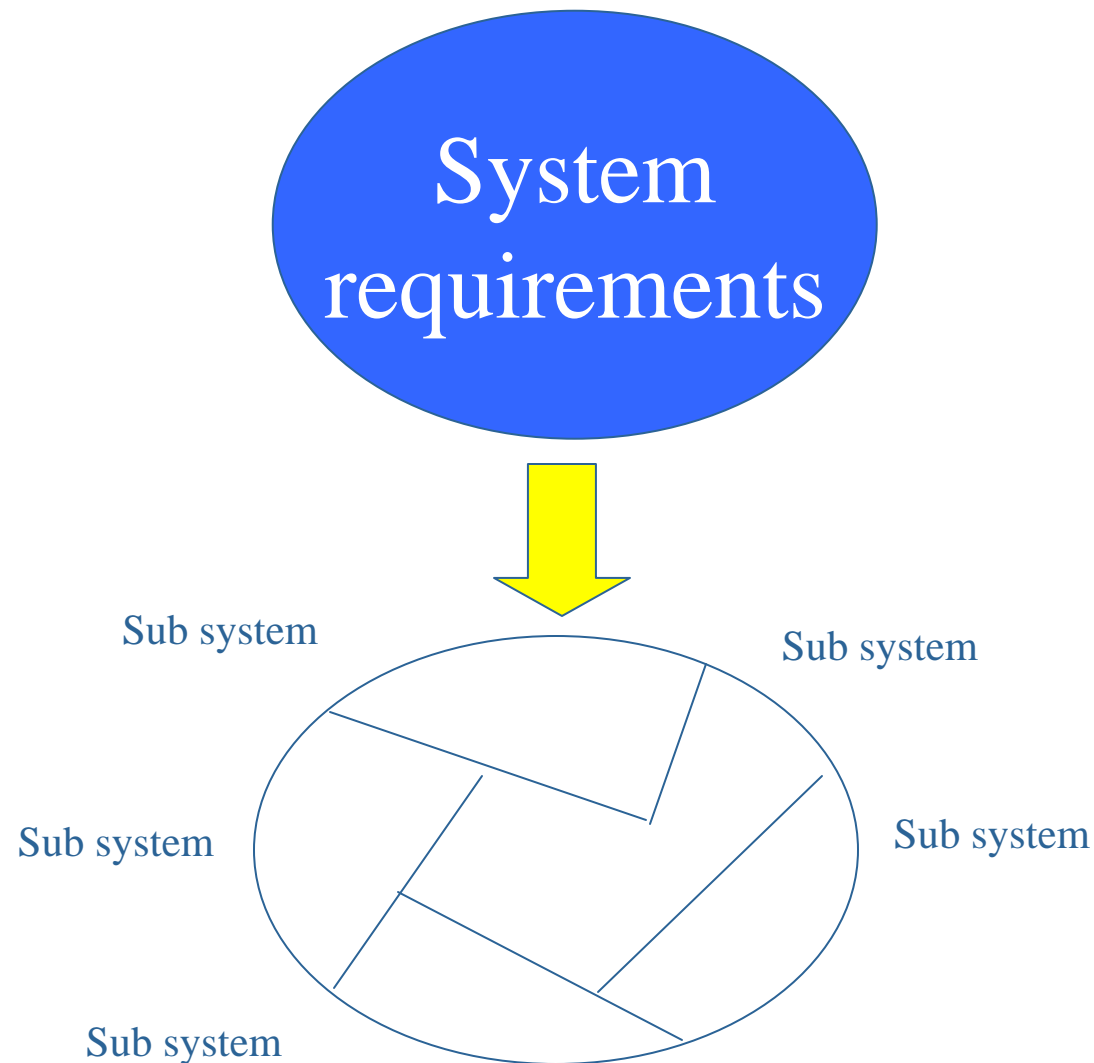
“Smartgridness” over time



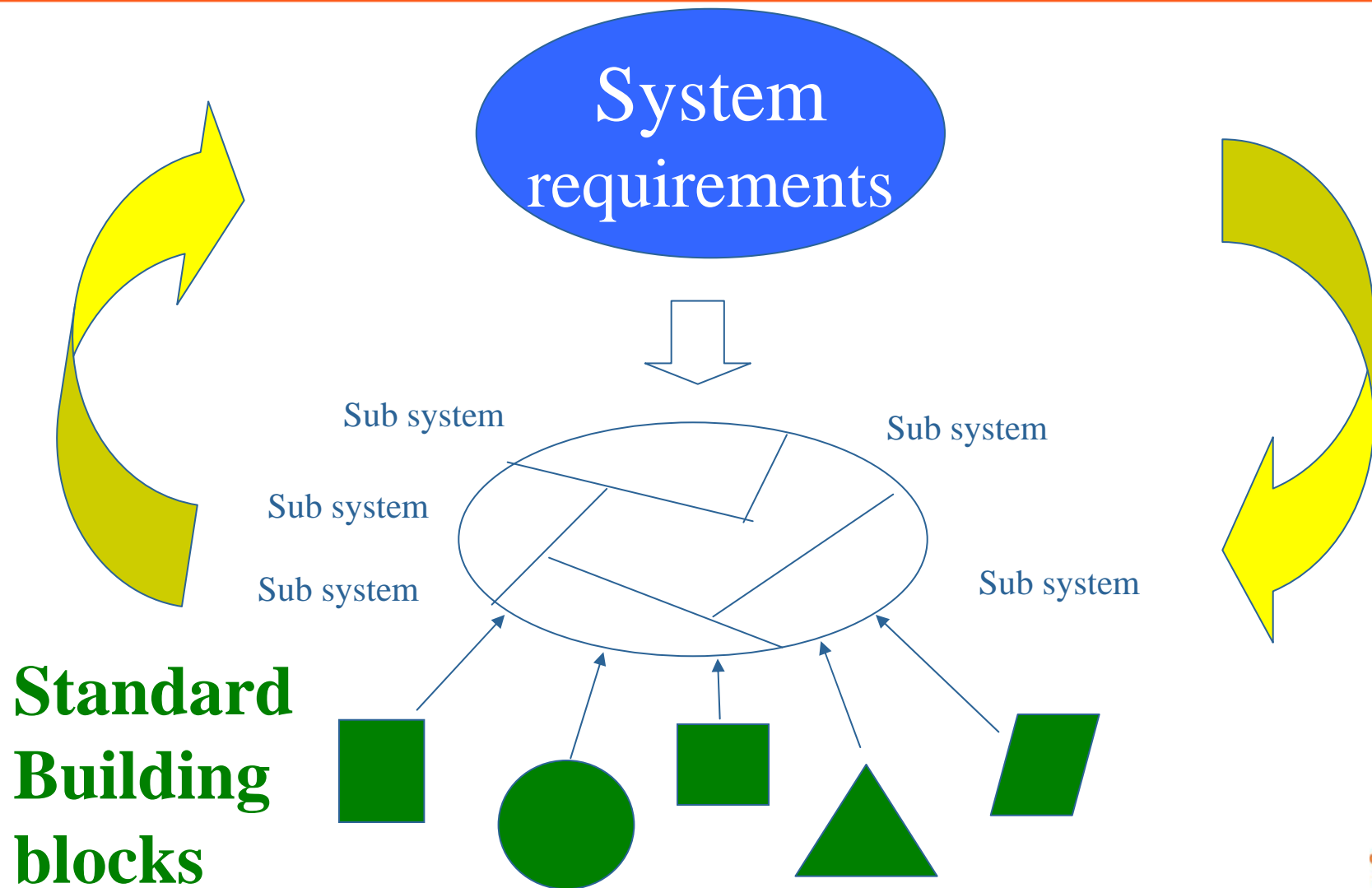
**“Urban Planning” metaphor : legacy & never ending
Building Smart Grids is like building Cities.....**



Top down: the “Mastermind” approach

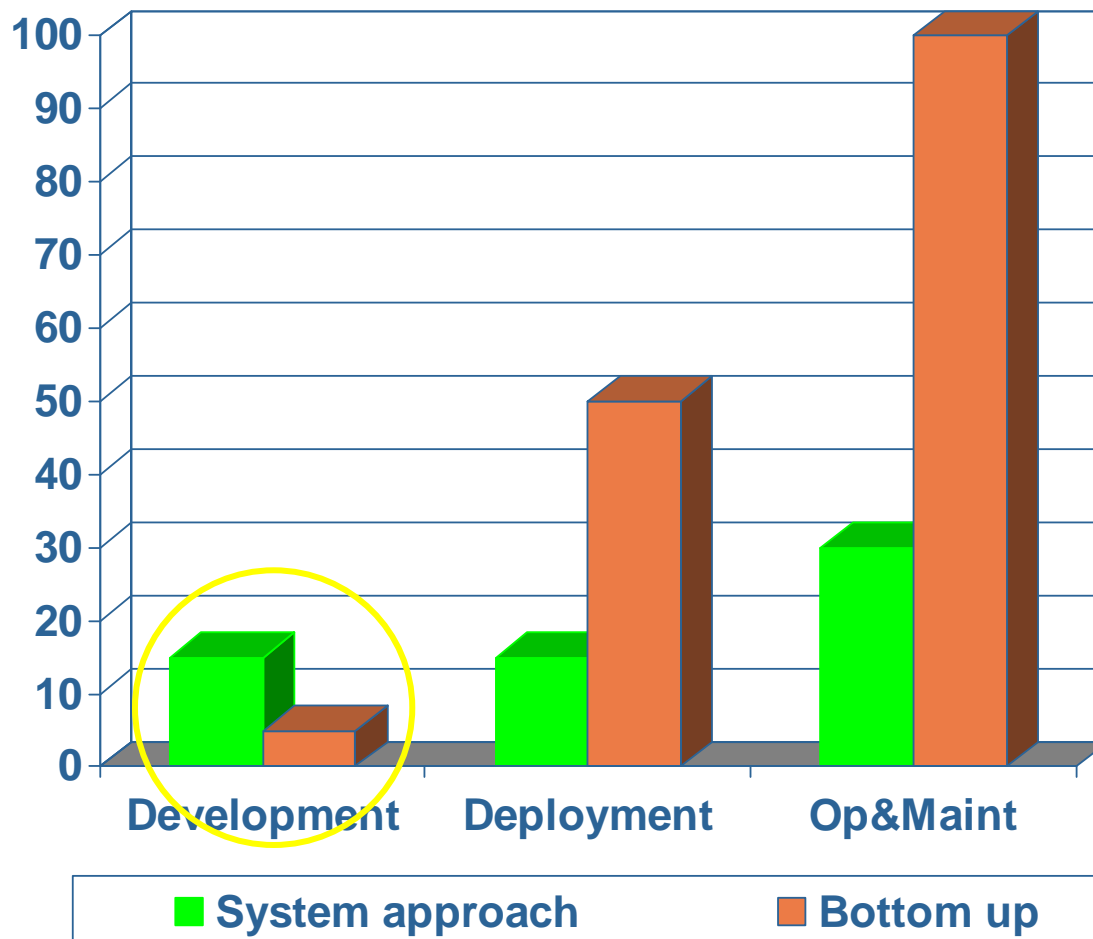


System Approach : the “Winning blend”

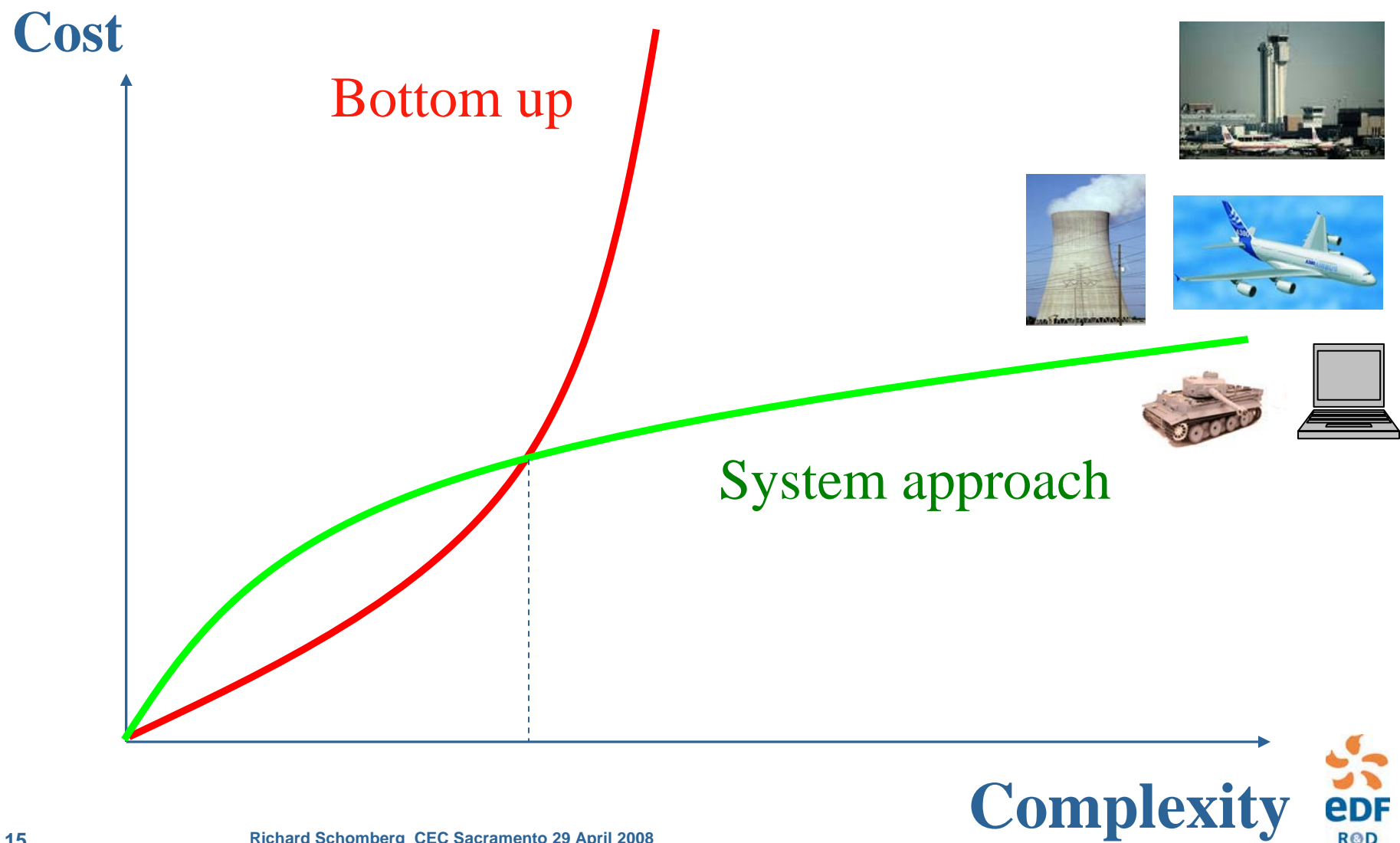


System approach : winner on the long run

Cost



System approach and interoperable building blocks



4 “International” keys to succeed

- 1 - AMI might be a first step towards implementing Smart Grids
- 2 - Smart Grids are more than a collection of detached advanced applications. They will not coalesce by themselves. Likewise Energy Markets cannot create their own conditions of existence, Smart Grids will not grow naturally in the “right direction”.
- 3- “Urban planning” of Smart Grids is necessary to set common directions and suggest reference designs at different levels. An “Integrated Smart Grid Policy Report” at the scale of a region, a state could benefit all the stakeholders. (#1)
- 4 - Smart Grids will be in ever ending evolution. The level of complexity requires a thorough “system approach” from “Requirements” (#2)
- 6 - Standards (#3) and Interoperable “building blocks” (#4) are necessary for the overall feasibility

