PECC Seminar in Perth

Energy Efficiency awareness
The use of smart grids and smart meters

Henri Boyé,
French Ministry of Sustainable Development

Summary

A new context

Networks of the future: concept and vision

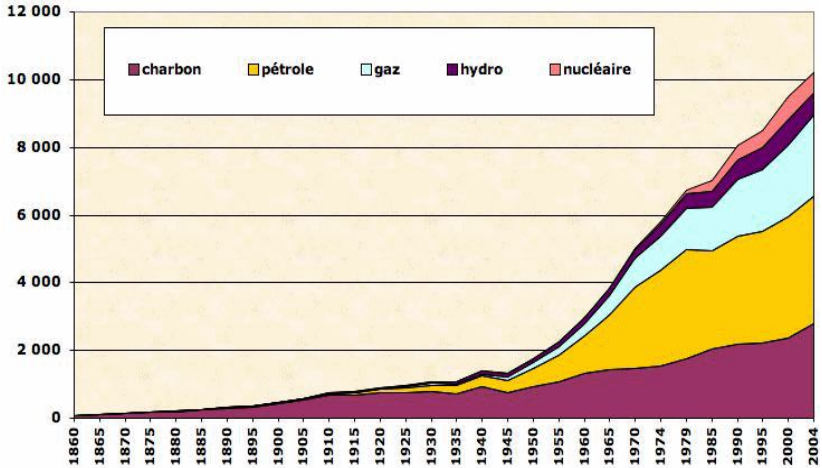
A revolution in energy market and services

A huge investment process along one or two decades

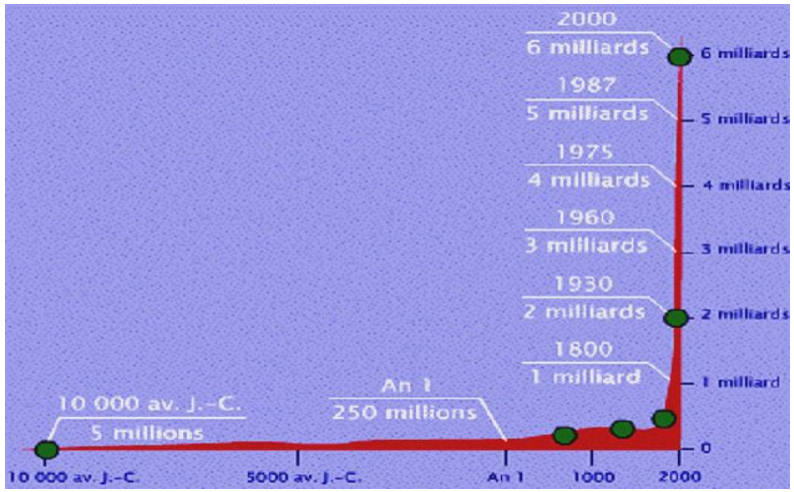
The actors of this mutation : utilities, government, regulators, industry, appliances manufacturers, telecommunications, customers,

Non sustainable trajectories for energy and environment

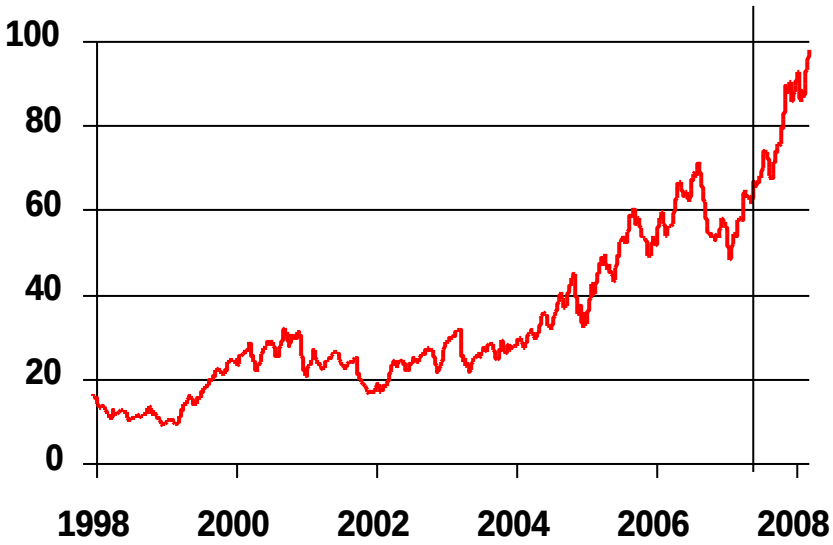
World energy consumption (Mtoe)



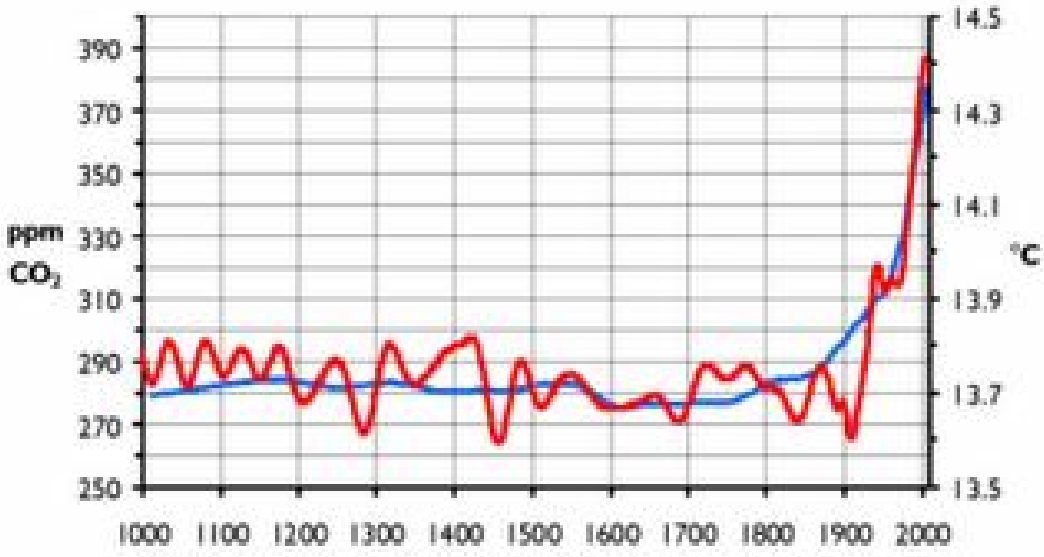
World population (billions inhabitants)



Oil price (US $/bl)



CO_2 concentration in atmosphere (ppm)



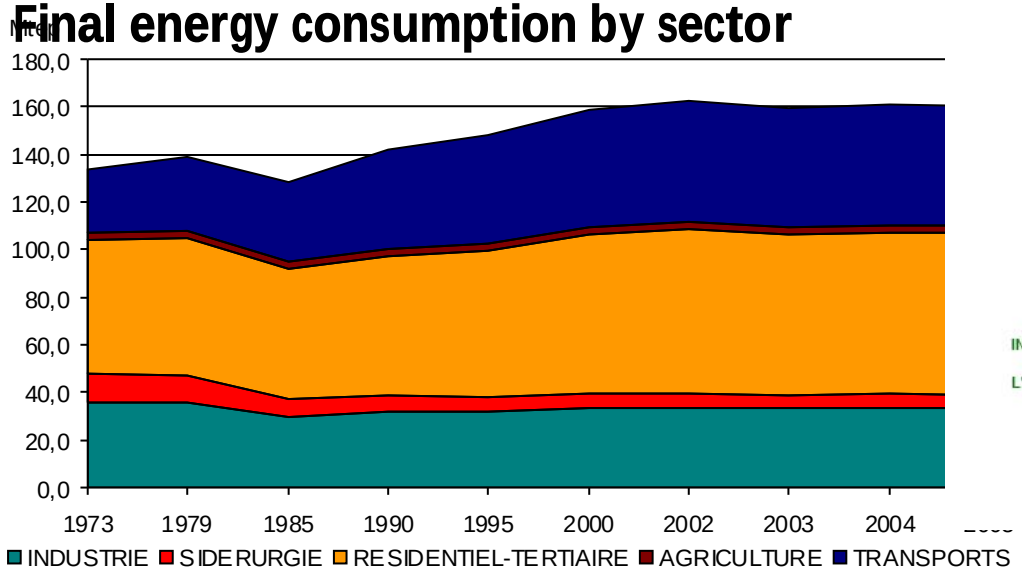
Why resource efficient and low carbon cities ?

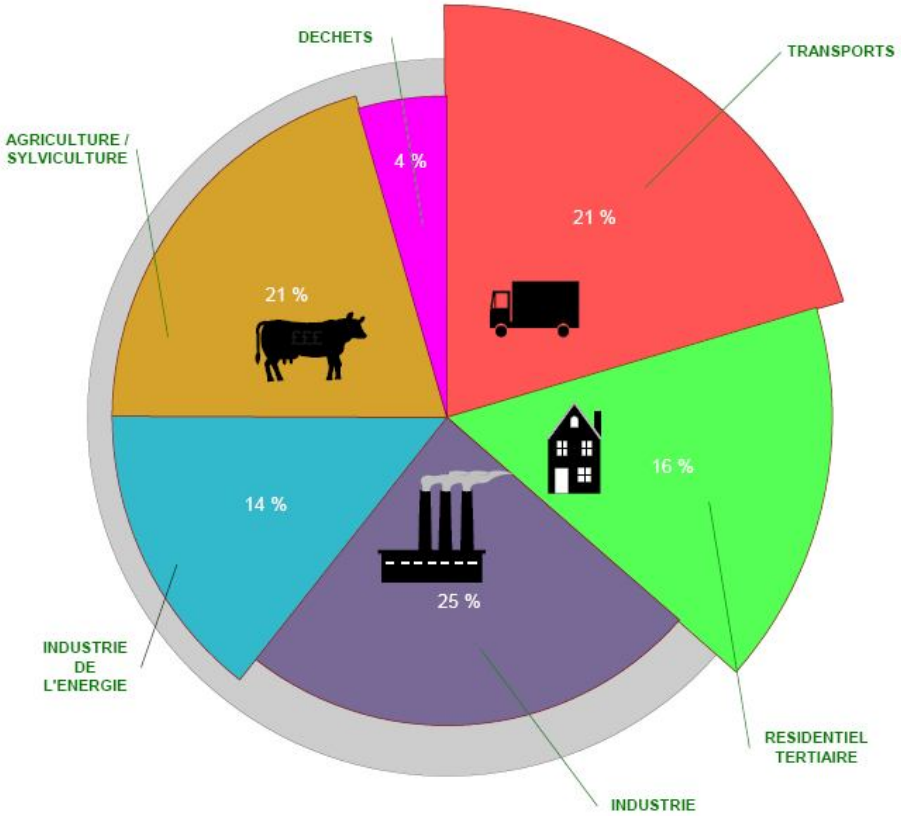
- **Imagine a green city , energy efficient**
- **Promote sustainable transportation and waste management**

- **As cities are also vulnerable to the impacts of climate change, they need to take bolds actions to mitigate climate change and adapt to its impacts.**

Buildings and transport : two priorities for most emitting sectors

Final energy consumption by sector





GHG emissions 1990-2005

Buildings

- Stakes :

  Most energy consuming sector

  44 % of total energy consumption (71 Mtoe)

  20% of national GHG emissions

- Grenelle objective:

  decreasing by 40 % energy consumption by 2020

Grenelle measures for buildings

New buildings energy regulation 2012	**50 kWh primary energy / m2 /year (vs 100 kWh/m2/year RT 2005)**
New buildings in 2020	**Regulation :Positive energy buildings**
Existing buildings to 2020	**Reducing by 38% existing buildings consumption (240 kWh/m2/year in 2008, 150 in 2020)**
Public buildings refurbishing (120 Millions m2) to 2018	Reducing by 40% energy consumption and 50% GHG emissions
Social households (800 000)	Reducing energy consumption from 230 kWh EP / m2 / year to 150.

Research priorities on new energy technologies in France

- **Transports : vehicles and organization**
- **Buildings efficiency, sustainable cities**
- **Capture and storage of CO_2**
- **Solar energy (Photovoltaïc)**
- **Bio-resources and biofuels**
- **Smart grids, energy storage**
- **Ecotechnologies : energy efficient processes**
- **Marine energy**
- **Fuel cells**

Technological research for positive energy buildings…

Development of super thin insulation materials
(aérogels de silice nanostructurée ou Polyuréthane nanostructuré)

Electrochroms windows, intelligent windows

electrochrom roof Saint-Gobain Sekurit©

Phase changing materials

PCM within glass bricks

Intelligent facades with double shell with dynamic solar protections

...and renewable energy integration

Very low energy consuming buildings :
Superinsulation of enveloppe,
Air impermeability, high performance windows,
Ventilation systems with heat recovery

Passive house in France

Solar systems (water solar heaters and PV)

Fig. 1 : Maison solaire « Misawa Homes Z »
(Source : Misawa Homes Co., Ltd)

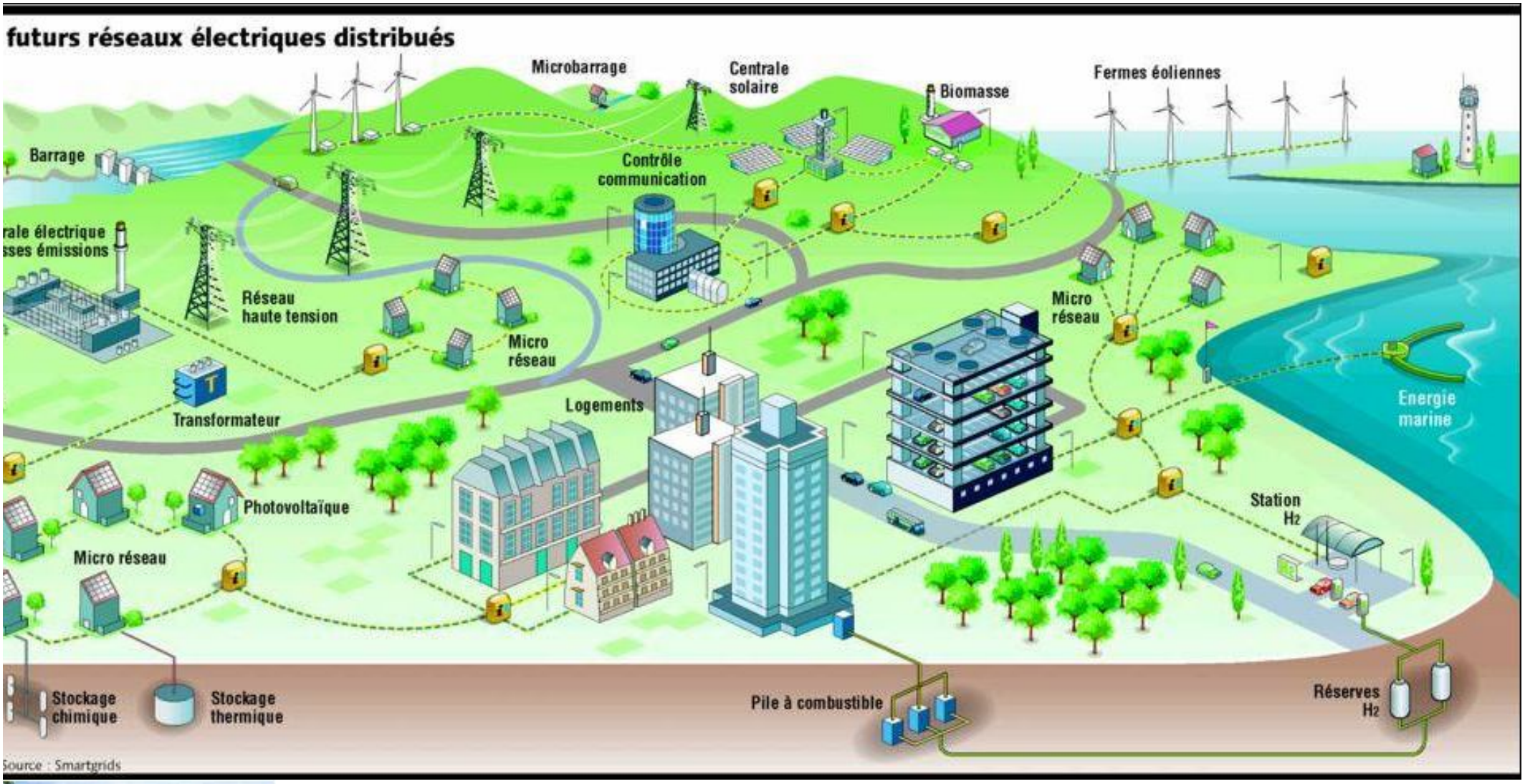
« Zero Energy Homes »

Two definitions of Smart Grids

- «A smartgrid is an electricity networks that can intelligently integrate the behavior and actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies»
- **European Technology Platform SmartGrids**

- « A smart grid uses information technology to manage electricity networks to promote energy efficiency and cost efficiency. »
- **Financial Times Lexicon**

Future intelligent electricity grids

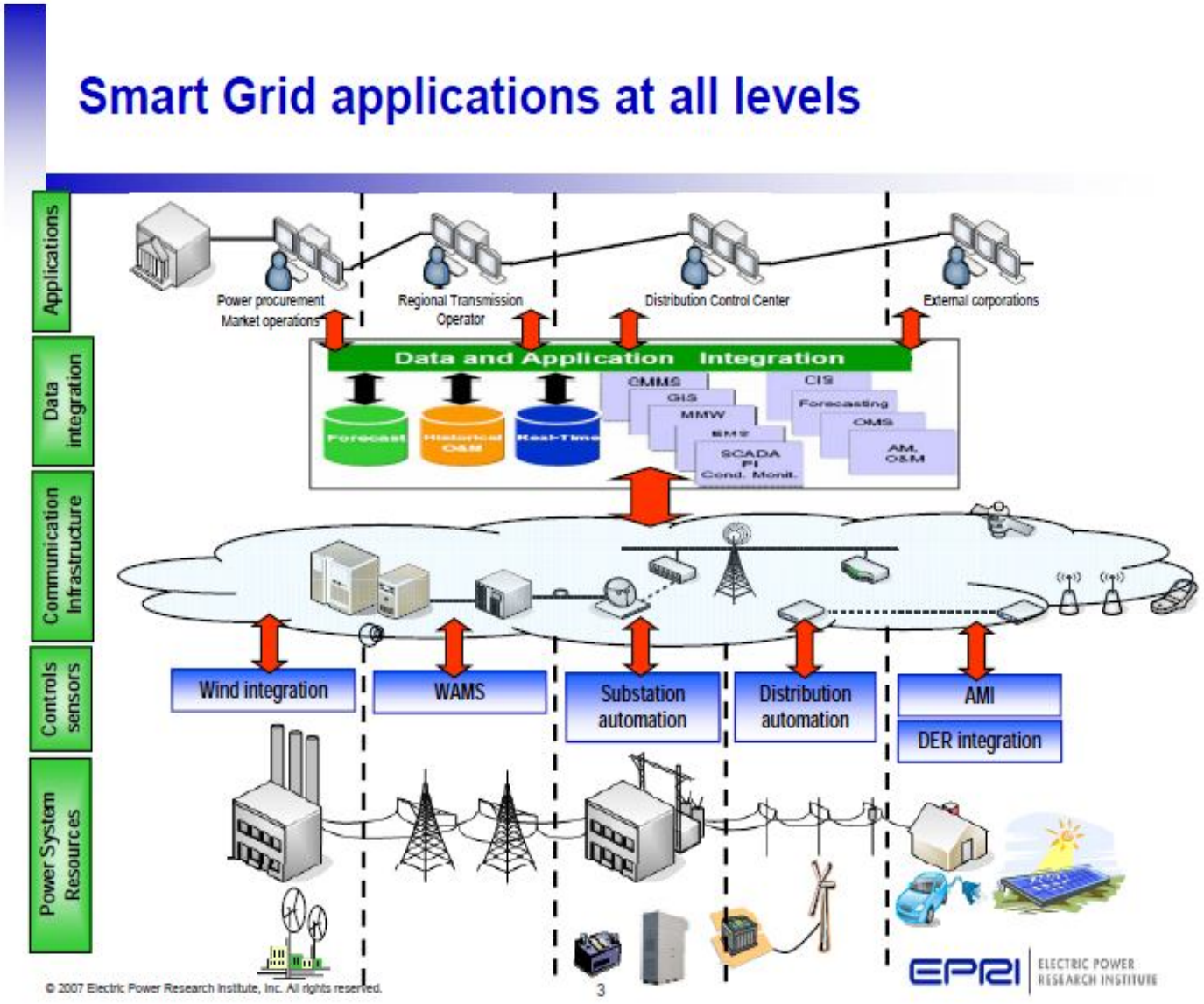


: Maison solaire « Misawa Homes Z »

Electricity decentralized storage

Networks of the future: concept and vision EPRI

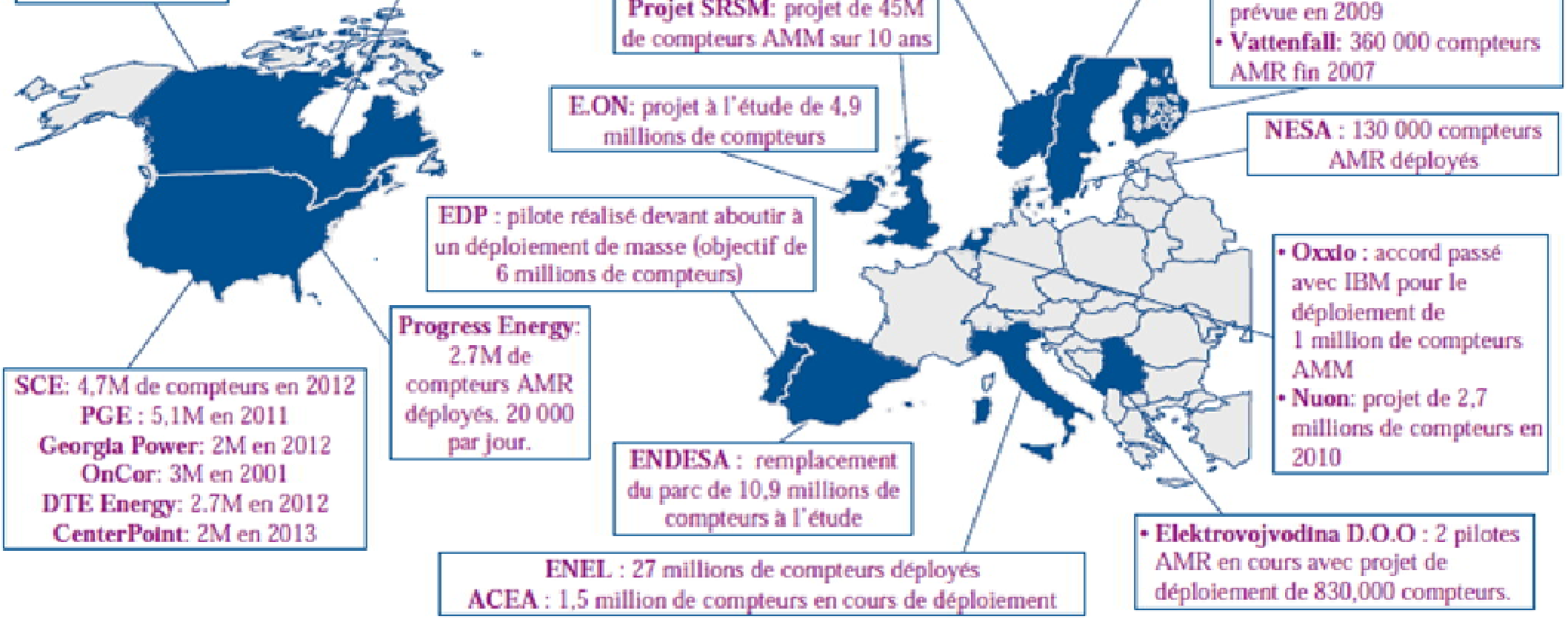
Electric Power Research Institute



EPRI Vision (US)
(Electric Power Research Institute)

Structured around communication system and data management

Smart Meters World Situation



Smart meters implementation examples

Italy over 27 million customers ENEL 2005

France Linky project conducted by ErDF Electricité Réseau Distribution France involving 300,000 clients 2011

United Kingdom

Japan

Canada Ontario , British Columbia,

United State California

Australia, Victoria

New Zealand

Status on Smart Metering developments in EU-15 countries

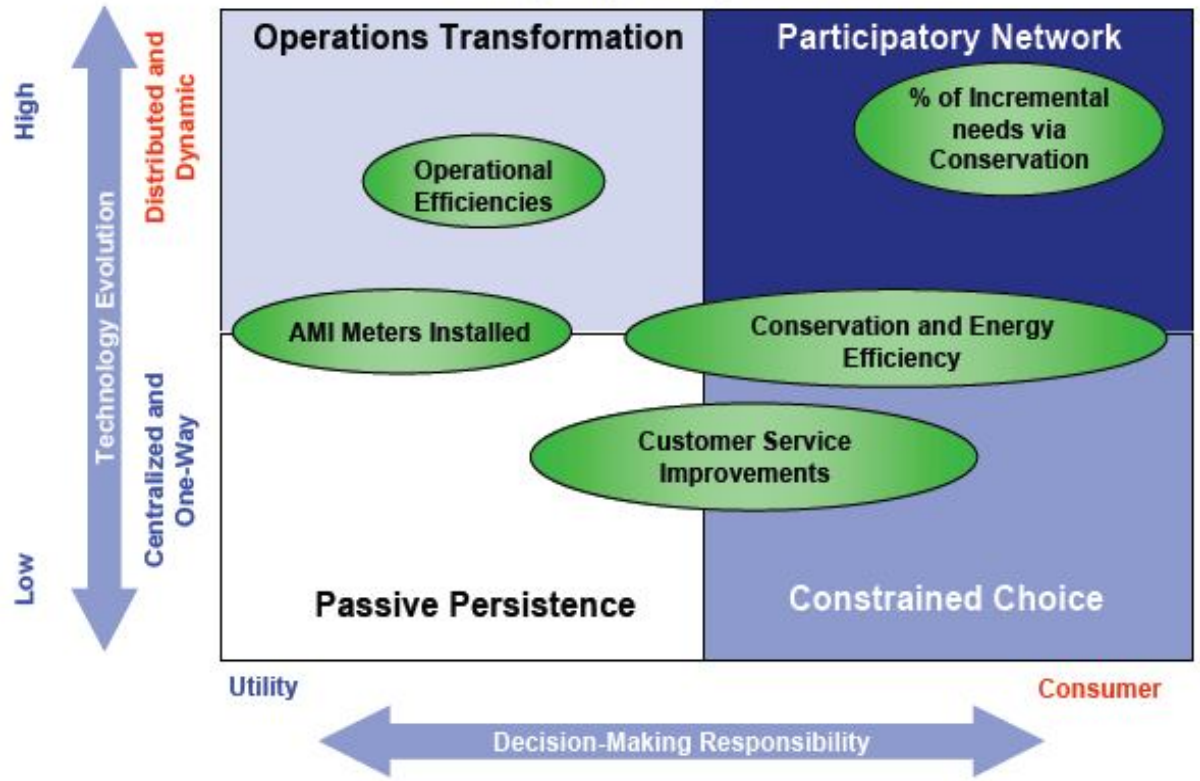
	Smart Metering penetration			Current interest in DR	Comments
	2010	2020 Moderate scenario	2020 Dynamic scenario		
Austria	1%	50%	100%	No	Ongoing analysis by Utilities and the government
Belgium-Luxembourg	1%	80%		No	Ongoing trials
Denmark	10%	90%		Yes	Small trials – Wind is the key issue – DR is viewed as a solution for compensating wind variability
Finland	20%	90%		Yes	Voluntary rollout of SM already in progress, estimated will reach 1,400,000 by 2010. Working paper from Ministry of Labor and Economy suggests 80% SM rollout by 2014
France	1%	100%		Yes	A 400,000 smart meters pilot planned for 2009
Germany	1%	30%		Yes	SM will take place if regulatory barriers are solved – if not Germany will be the last country with manual meters in the EU. Some Utilities estimate that SM penetration will be as low as 20-50% in 2020
Greece	1%	50%		No	However, looming power crisis ought to make DR seem more appealing
Ireland	5%	100%		No	DR pilots likely to happen. Wind development is a driver.
Italy	90%	100%		Yes	Utilities required to make TOU tariffs an option for all customers.
Netherlands	1%	100%		Yes	Heated discussion – Wind is a big issue – if the Government does not put tariff rules in place, most network companies will adopt them at least for the network part of the tariff
Portugal	1%	50%		No	TOU tariffs and Direct Load Control are both being considered by the regulator. EdP is seriously involved in DR.
Spain	5%	50%		No	Wind is driving Spain to look at some form of DR
Sweden	100%	100%		Yes	TOU is already mandated
UK	1%	60%		Yes	OFGEM has it in the White Paper and has made free in home displays available through the network company to anyone who wants one. This is being fought as an unfunded mandate by the network companies.

Sources : Capgemini, Enerdata, VaasaETT

A revolution in energy market and services

Achieving DSM and energy conservation benefits will require the consumer to be a more active participant in energy related decisions

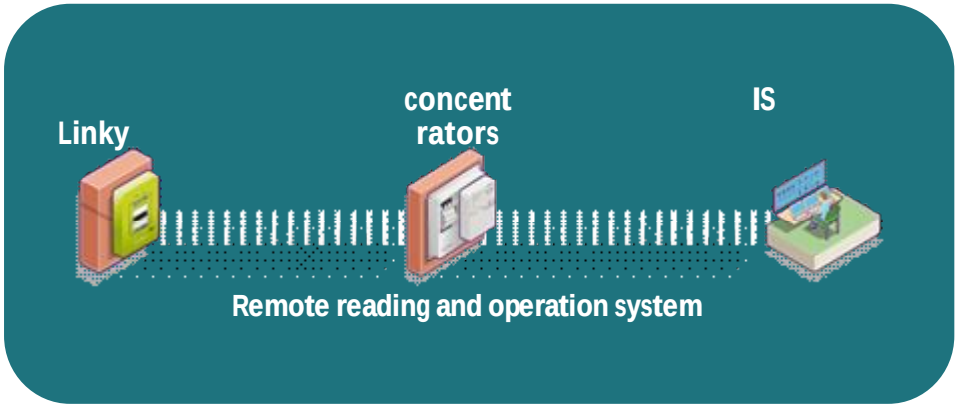
Evolving Utility Industry Models 2008—2018



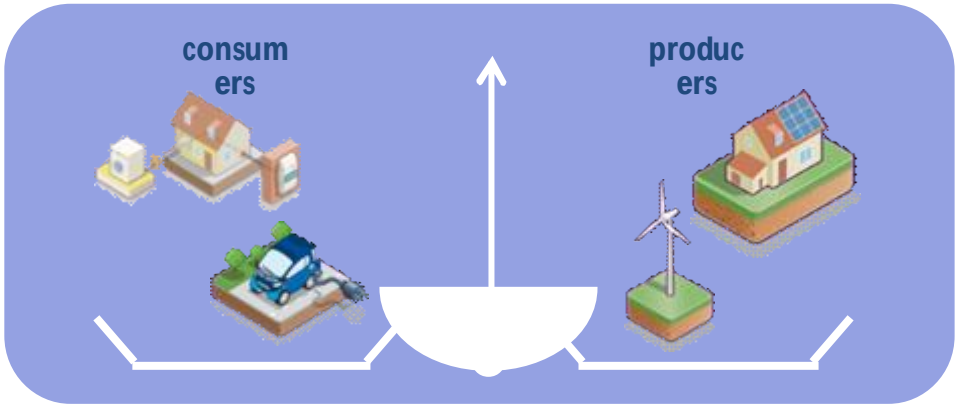
France's ErDF smart meters Linky

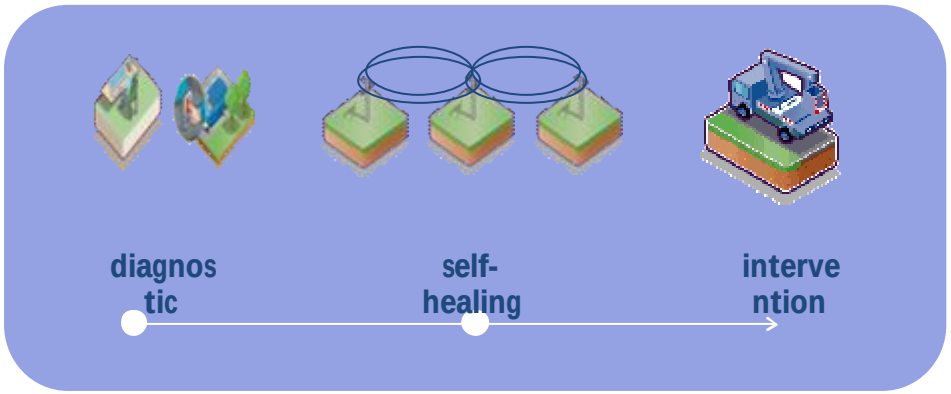
A fundamental brick for "smart grids"

Remote control
via the electric meter



Adjusting the local balance
production / consumption





A faster intervention time
on networks

- Collection system (Linky) and data analysis
- Risk management and preventive maintenance

"What cannot be measured, cannot be improved"
Lord Kelvin (physician 1824 - 1907)

Better targeting
of network investiment

The distributor's strategic project :

Linky par ERDF
ÉLECTRICITÉ RÉSEAU DISTRIBUTION FRANCE

The clear determination of public authorities

European directive requires 80% of smart meters in 2020

Theme forming part of the Grenelle Environment Forum – Letter from the Minister JL Borloo July 2009

The reply from ERDF paves the way for the future

Linky transforms constraints into opportunities

To the basic functionalities imposed (remote meter reading),
Linky adds more advanced services (remote operations, locating incidents , …)

Linky is, above all, a strategic choice for the future :
- international technological leadership
- an essential building block to develop both smart grids and DSM

"The future" starts in 2010

Last year, ERDF launched a pilot project relating to 300,000 meters

It is progressing successfully and enables the technical and economic hypotheses of the general roll-out project to be validated

Linky, of course is an electric meter...

Designed from “CBE” functionalities (Compteur Bleu Electronique)

In the same volume as this CBE,

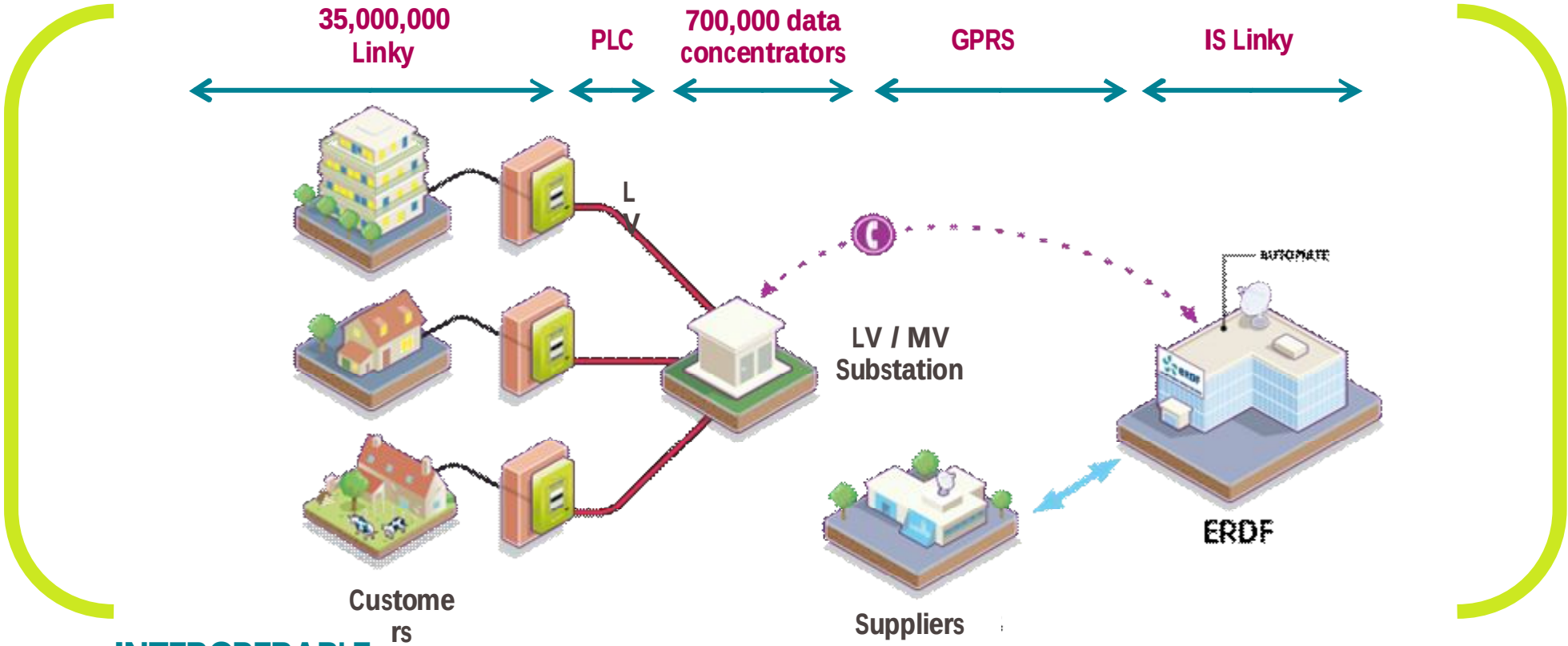
With 5 main supplementary attributes

Responding to customer expectations.

.... But first of all, it's a system

"Linky is more than just an electric meter".

It's a system of communication to serve customers and players in the market.



INTEROPERABLE (interchangeable equipment, standard communication protocol)

2 WAYS (communication from the SI to the electric meter and vice-versa)

EVOLUTIVE (system and components; stage by stage)

New advantages for the client

Invoices based on actual consumption

Fewer complaints

Daily readings

Faster call-outs

Work done without troubling the client

70% of work done remotely

Improved quality of supply

Reactivity of repairs and improved knowledge of the network parameters

An optimised network

Better targeted networks :
sizing of networks and
maintenance of optimised infrastructures

Reduction of Non Technical Losses

Faster diagnosis in case of failure
/ crisis

Enhanced knowledge of the network

Management of a large stock of renewable energy producers

Loading infrastructure for a stock of electric vehicles and other uses

Linky, first way to build a smart grid (data collect, ability to act up to the last yard)

Smart energy demand, energy efficiency and demand response

Smart energy demand is a broad concept.

It includes any energy-user actions to:

- *Enhancement of reliability*
- *reduce peak demand,*
- *shift usage to off-peak hours,*
- *lower total energy consumption,*
- *actively manage electric vehicle charging,*
- *actively respond to solar, wind, and renewable resources,*
- *buy more efficient appliances and equipment over time based on* ***a better understanding and awareness of how energy is used by each appliance or item of equipment***

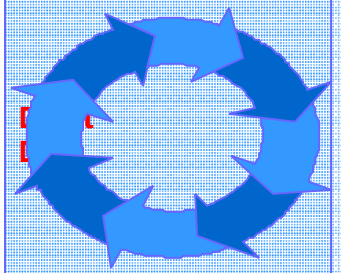
The Demand Response Ecosystem

Source: Capgemini analysis
Alain Chardon

Direct DR

Utilities
se infrastructure to set up
ariffs, incentives &
Direct Load Control
and change business model

Smart Grid Optimisation



Real Time
Offer/Demand
Saving/Shifting

Markets Price Signals

Generation: Schedulable
- Classic Thermal
- Hydro Lakes
- Biomass, Biogas

Generation: Intermittent
- Run-of-river hydro
- Wind
- Solar PV

Supplier
- Generation & Sourcing portfolio standards
- Demand Response portfolio standards

Supplier, Third parties
- Energy diagnosis
- Energy management
- Aggregation

Other Utilities
- Gas
- Water
- District Heating

Meter management | Energy Box Management

Distribution

Supplier, Distribution, Telco, Other service companies

Databases

Consumptions, Load Curves

arketing Profiles:
ividuals

arketing Profiles:
onings

Process & Communications

HOUSEHOLDS, COMMERCIAL BUILDINGS

Marketing & Recruitment Campaigns for DR

Micro-Gen
- Intermittent: Solar PV
- Schedulable: Gas cogen, Biomass, Biogas

Feedbacks
Web
SMS
Invoice

Display
Kitchen/Living-room
Classic / Disruptive

Tariffs & Pricing schemes

Smart Meter
and
Energy Box

Direct Load Control: Appliance(s)
Heating
Boiler
Air Conditioning

Other Meters
Gas, Distr. Heat., Water

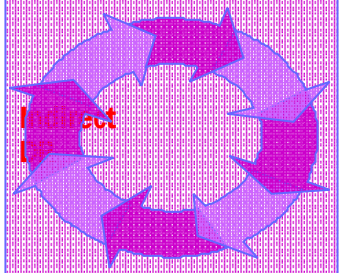
Efficient equipments, Building improvements

Other appliances for other services

Indirect DR

Utilities and Other Businesses use this rich information to foster the penetration of energy efficient equipments and develop new businesses

Snowball effect on EE markets



Efficient Equipments, Insulation & Building improvements

Use Marketing Profiles

To improve Targeting & Geomarketing

- Sales Forces Construction, Windows, Insulation...
- Specialised Mass Merchandisers
- Efficient White & Brown goods
- Sales Forces Renewables

And to create new products & services

Synergies with extensive DR programs on communication & awareness

Enhanced Energy Efficiency National Policies

Insurance, Fire, Security, Elder & Disabled care, etc

(+ Sharing / Hiring box infrastructure for other services than DR)

Obstacles to the widespread adoption of smart grid technologies

- In Europe and the US, significant impediments exist to the widespread adoption of smart grid technologies, including:
- ***The high cost of the investment***
- regulatory environments that don't reward utilities for operational efficiency, ***not the good incentives***
- ***Consumer concerns over privacy***,
- ***Social concerns over change in tariffs***, T. O.U vs. flat rates.

Energy efficiency implementation

- **Public Buildings** Energy management and monitoring in public buildings, Financing of energy efficiency activities, Public procurement of energy services, ESCO business, EPC contracts, Remaining barriers and issues
- Residential Buildings **Capital reconstruction and modernization**, requirements and financing, Assist Reforms in Housing and Communal Services Sector, rehabilitation funds, what's next ? Remaining issues and barriers;
- **Demand side management**, demand response,
- **Smart grids, smart meters, smart customers**
- **Awareness, behaviour, Sobriety**

The future : eco-efficiency & cooperation

- Eco-efficiency in the construction of new buildings
- Improved energy efficiency, our new target in all renovation works
- Carbon-dioxide emissions of traffic to be reduced
- - by developing public transport, bicycle and pedestrian traffic and logistics systems,
- - by supporting low-emission motoring…
- Smart grids and smart meters
- The future : international and international trends towards merging/harmonizing tools, Assist in comparability, and may increase uptake of tools