SMARTGRIDS

ESMIG
WE MAKE ENERGY SMART

Market Access

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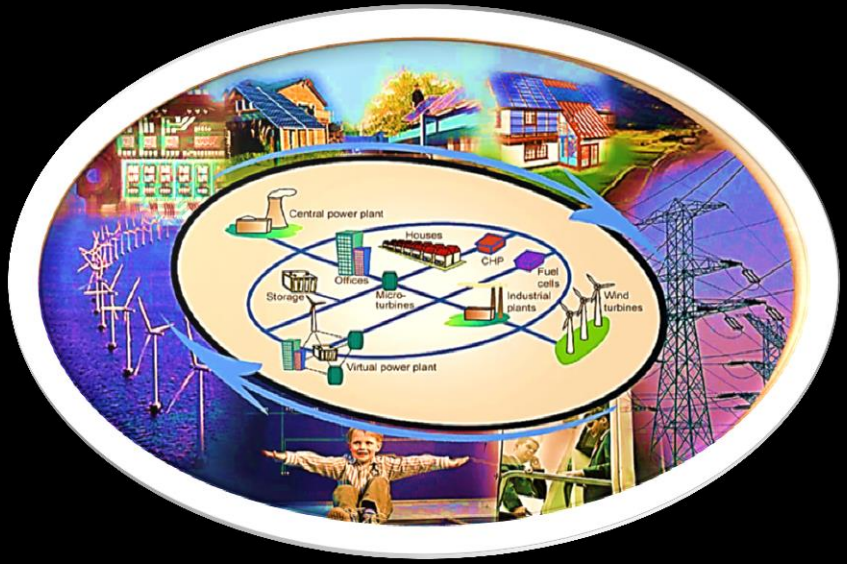


1 **Market Trends**

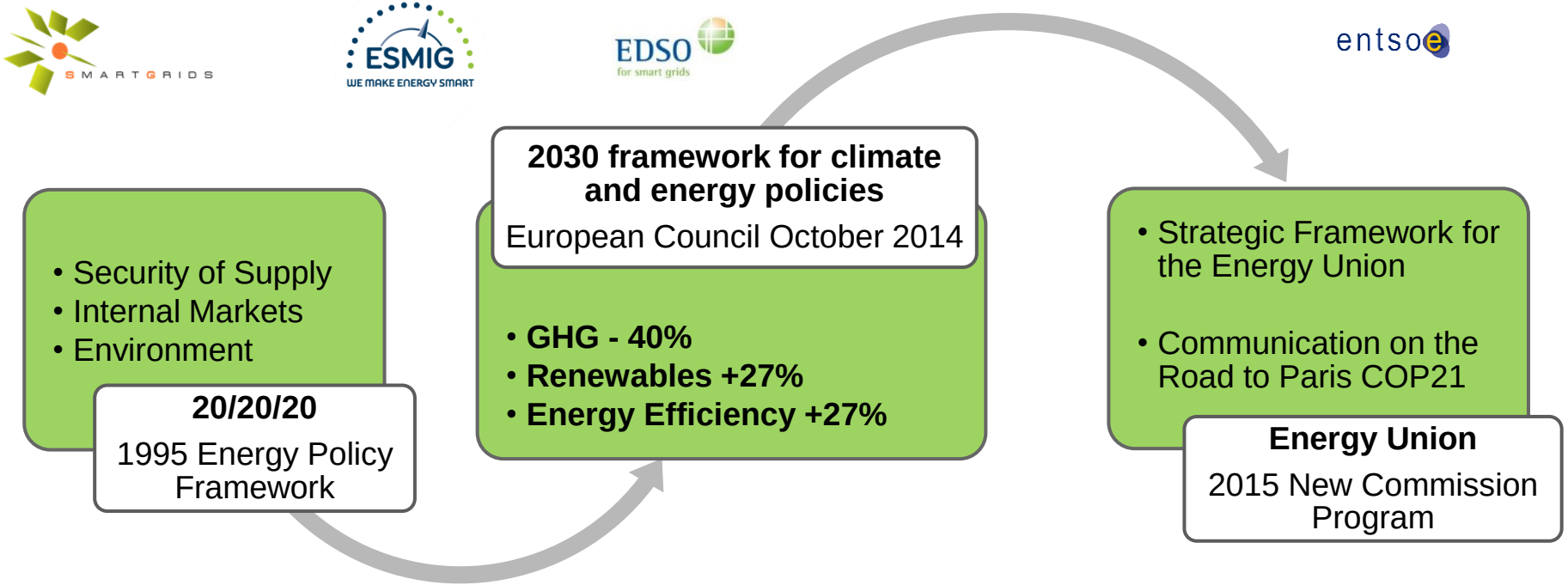
2 **Market Structure**

3 **Exchange Platforms**

4 **Way forward**

European Energy targets 2020, 2030, COP21, Energy Union

Increasing targets for Energy Efficiency and Renewables and CO2 horizon 2030 and beyond
Energy is becoming a cross-border union topic



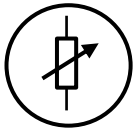
5 active end-users trends within SmartGrids

Self-generation

User investment in own or community-owned electricity generation stimulated by commercial attractiveness versus grid-delivered electricity (government support schemes, economies of scale).
Based mainly on commercial, non-regulated market products/services.

Electrification

User investment in replacing primary energy by electricity for basic needs such as heating and mobility.
Based mainly on commercial, non-regulated market products/services.



Flexibility

User participation to power system optimization by offering Controllable load or generation.
Based mainly on commercial services for regulated market.

Market participation

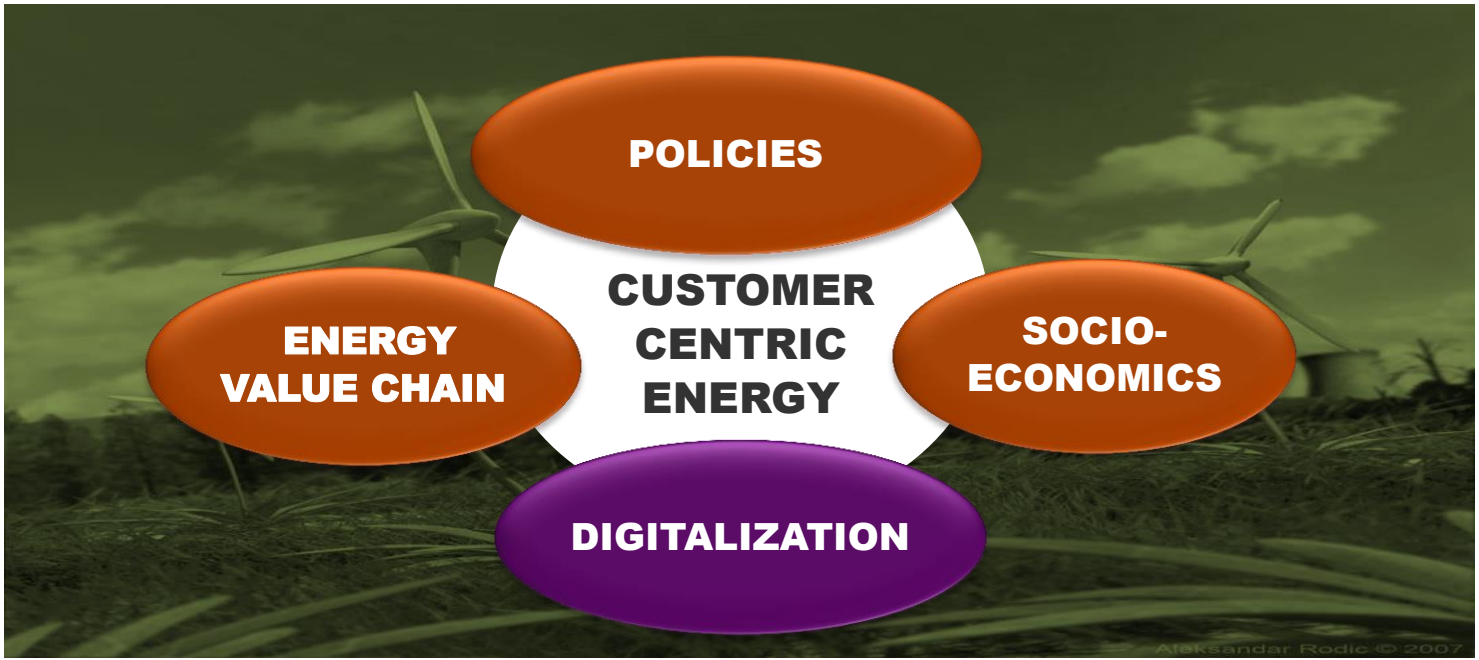
User participation to electricity markets by offering generation or negative-generation (load).
Based mainly on commercial, non-regulated market products/services.

Grid divorce

User investment in becoming as independent as possiblefrom grid-delivered electricity.
Based mainly on commercial, non-regulated market products/services.

Customer Centric Smart Energy : A challenging Equation

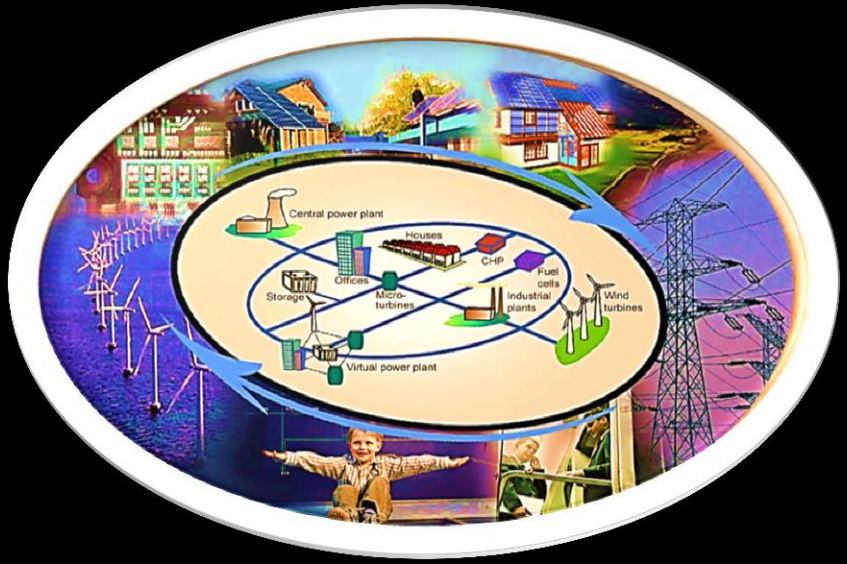
These factors have been considered but not as ONE Equation or ONE Model.
2016 … 2020 SET Plan should put it all together in ONE integrated Strategic Energy Technology Plan



My Smart Energy Portal for European Consumers

As a well-informed consumer is crucial to achieve our goals, ESMIG and EDSO for Smart Grids have developed a consumer information portal,

www.My-Smart-Energy.eu.



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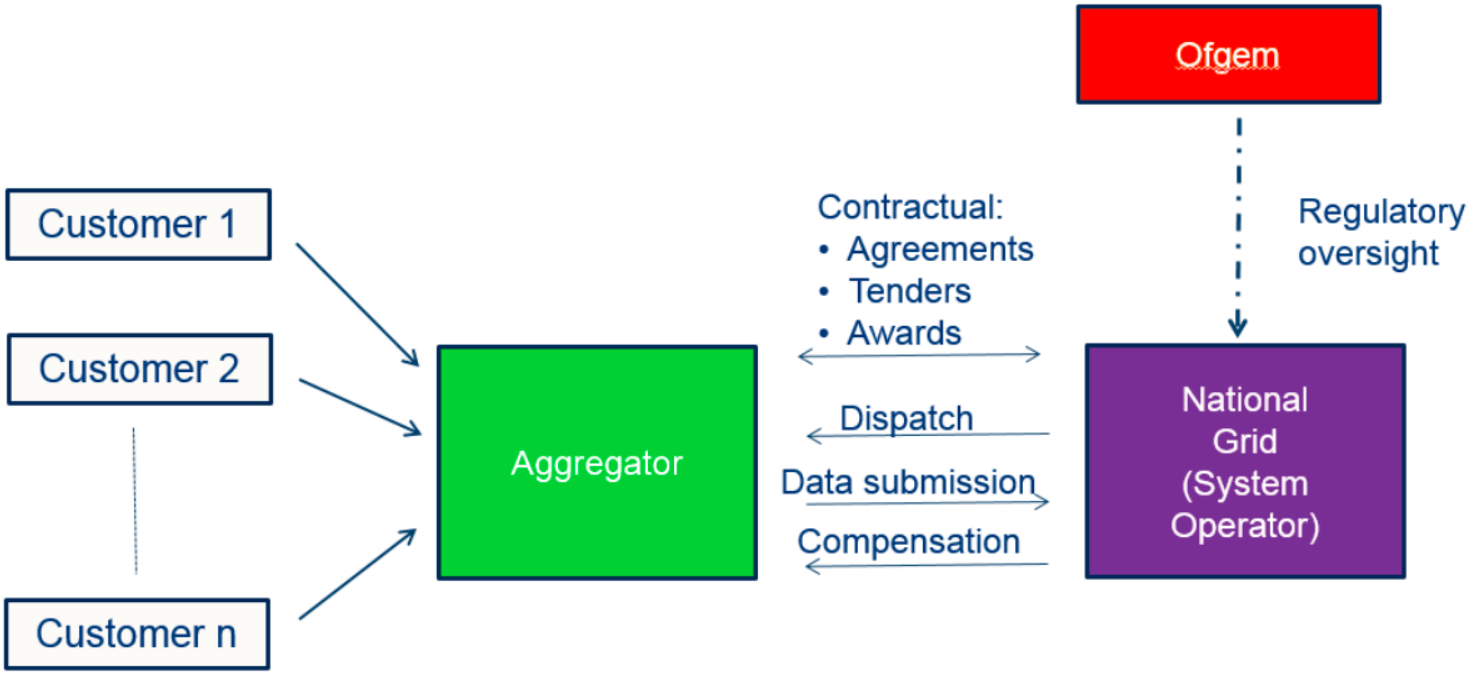
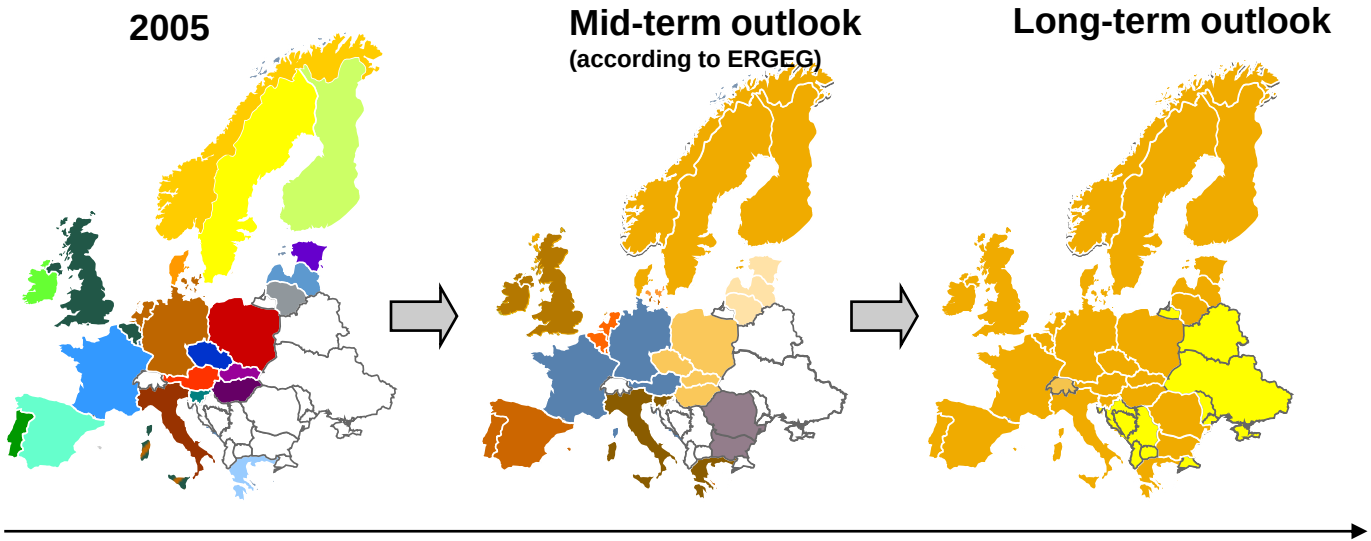
Demand Response in today's market design? Example UK (source Enernoc)



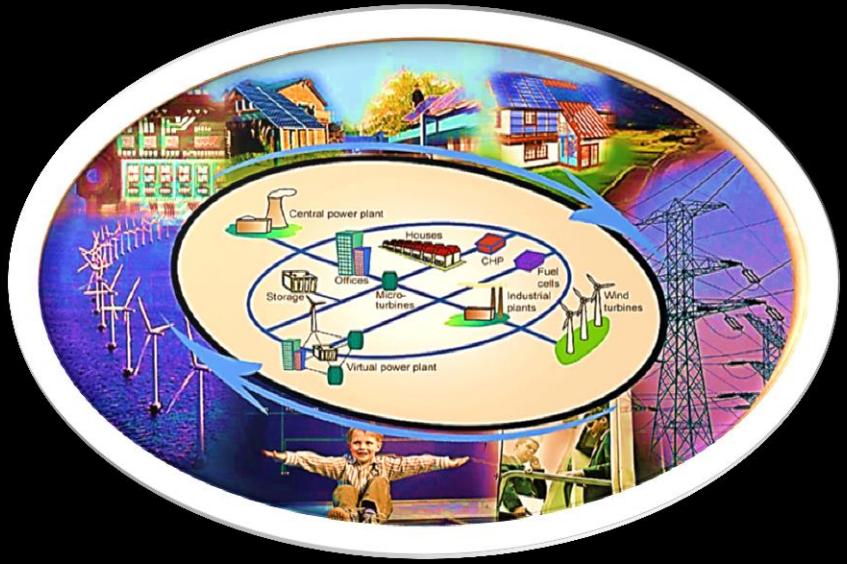
European influence on Energy solutions: Expectations on the Harmonization roadmap



ERGEG's 8 Regional Markets (currently only Electricity)

- Northern
- Baltic
- Central East
- Central South
- South West
- UK & Ireland
- Central West
- Liberalization Hub (Connecting markets)

Climate and Energy regulations change faster than traditional business models and business operations can adjust...



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5 Technology Trends that are changing the world of Customers by 2020-25. Kicking off already now

- **Moving into a connected world, machine to machine and human to business networks**
- **Enabling Cloud Platforms, IOT sensing devises and control against Cyber-Security attacks**

Hyper-Connectivity

Manage the energy service from any device, anywhere. Creates new channels from users to service providers. Enabling communities in creating new energy services

Super-Computation

Inferring relations between user-generated and other Information, beyond the capabilities today, as to improve existing or creating new energy services

Cloud

Computation and data storage resources offered by Parties as enabling platform for energy services

IoT

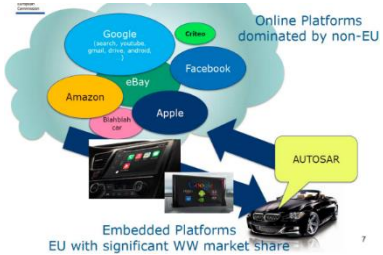
Pervasive access to a variety of sensing and control devices

Cyber-security

Privacy, 3rd party access to user data only by consent Protects energy system against failure from cyber attacks

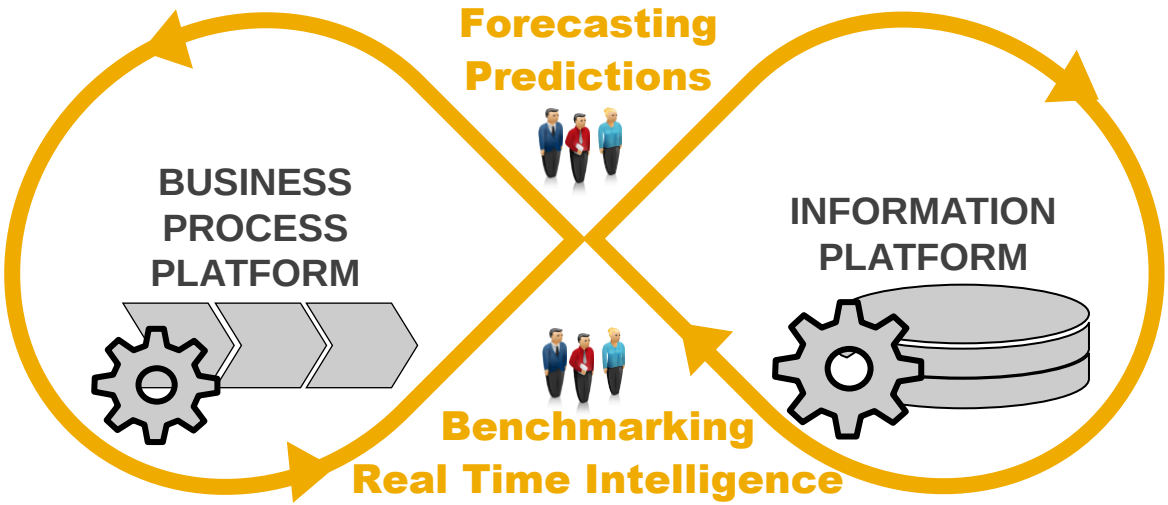
Meaningful (simple) Digtial Services to Customers anytime anywhere by 2020-25 How their day will look like ?

Technology is available. But needed Open Platforms & eMarketplaces for Energy to be massively adopted as the eCommerce Internet Services were



By 2020-25 Customer Data available 100% for SMEs and Corporates to innovate in Energy Efficiency Services (100s to 1000s available)

By 2020-25, Customer Data needs to be 100% available that SMEs & Corp. can innovate in EE services. Being simple & adapted to their Profile, energy self control will become part of their daily « casual » tasks as Smart phones are



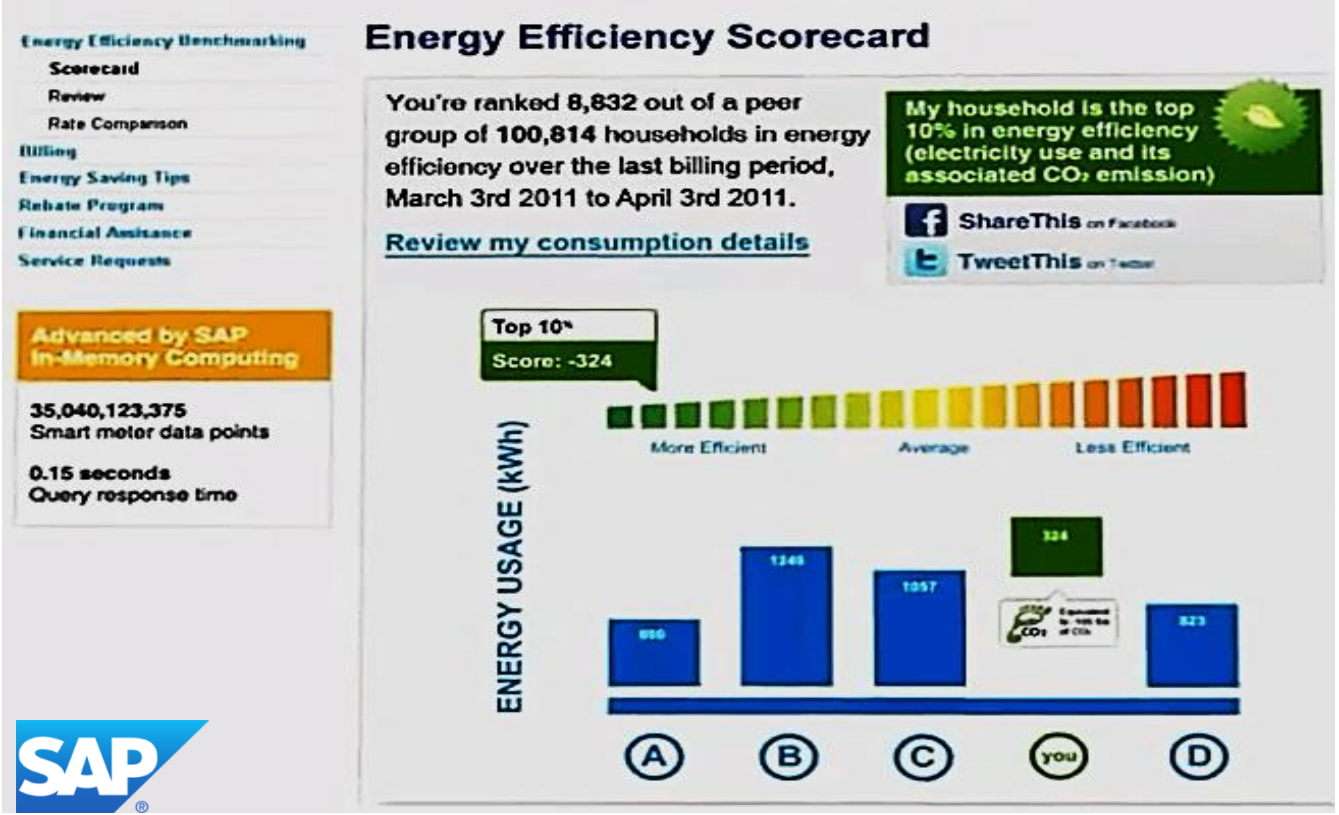
Powered by Digital (Big Data – e.g. SAP HANA)

Now Technology can Benchmark the Energy Efficiency of Residential Customers anytime

Customer Intelligence

Ranking of Residential customers in Energy Efficiency over the last billing period :

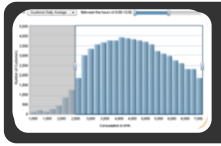
Example of a Household ranked 8,832 out of a peer group of 100,814 households



[NEW] Real Time Energy Analysis on the Cloud

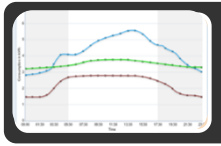
Leveraring the Cloud, IOT & Big Data (SAP HANA)

Customer Intelligence



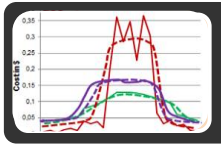
Aggregation

- *Instantly aggregate and analyze customers' energy*



Consumption Pattern Determination

- *Categorize customers that share consumption behavior*

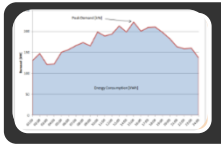


Peak Load Determination

- *Display peak demands, peak time periods, peak customers, etc*

Comparison/Benchmarking

- *Compare customer consumption with benchmarking, patterns, etc*



Forecasting

- *Forecast consumption trends, peak demands, peak time periods*

H2020 project «FLEXICIENCY» : SAP, ENEL, EDF, Vattenfal, Verbund, EDSO, …18 Partners

FLEXICIENCY

Energy Cloud Platform

H2020 project led by ENEL
18 Companies contributing

ENR HCP “FLEXICIENCY “ Electricity pan-European Marketplace for Distribution & Retail :

Kind of “Apple Store” for Energy Demand Services running on HANA Cloud Platform (SAP)

Potential of 10 000 Utilities on the same Public Marketplace

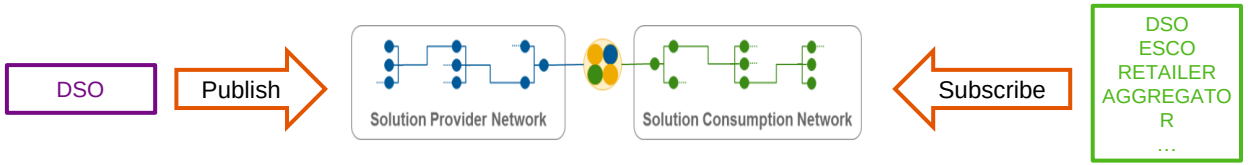
«FLEXICIENCY» is a new Dynamic Energy Marketplace based on SAP HCP

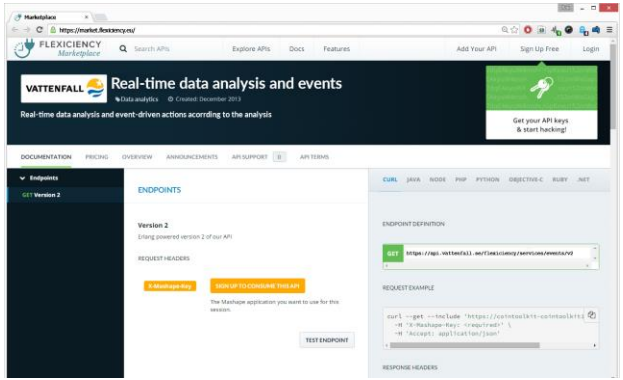
FLEXICIENCY

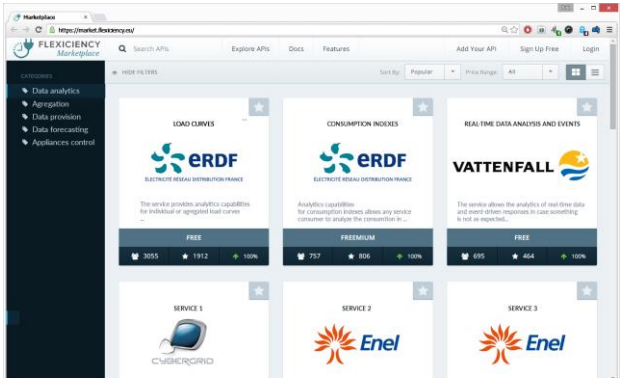
Energy Cloud Platform

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 646482

A virtual ICT environment, the Market Place, will be developed in order to catalyse the interactions between all the relevant stakeholders in an open and standardized way and to encourage a cross-country and cross-player access to innovative energy services. This will foster the birth and growth of new electricity retail economic models throughout EU28, which will in turn increase in the future the overall electricity system flexibility, while maximizing energy efficiency across Europe.







Example of UI design for the project

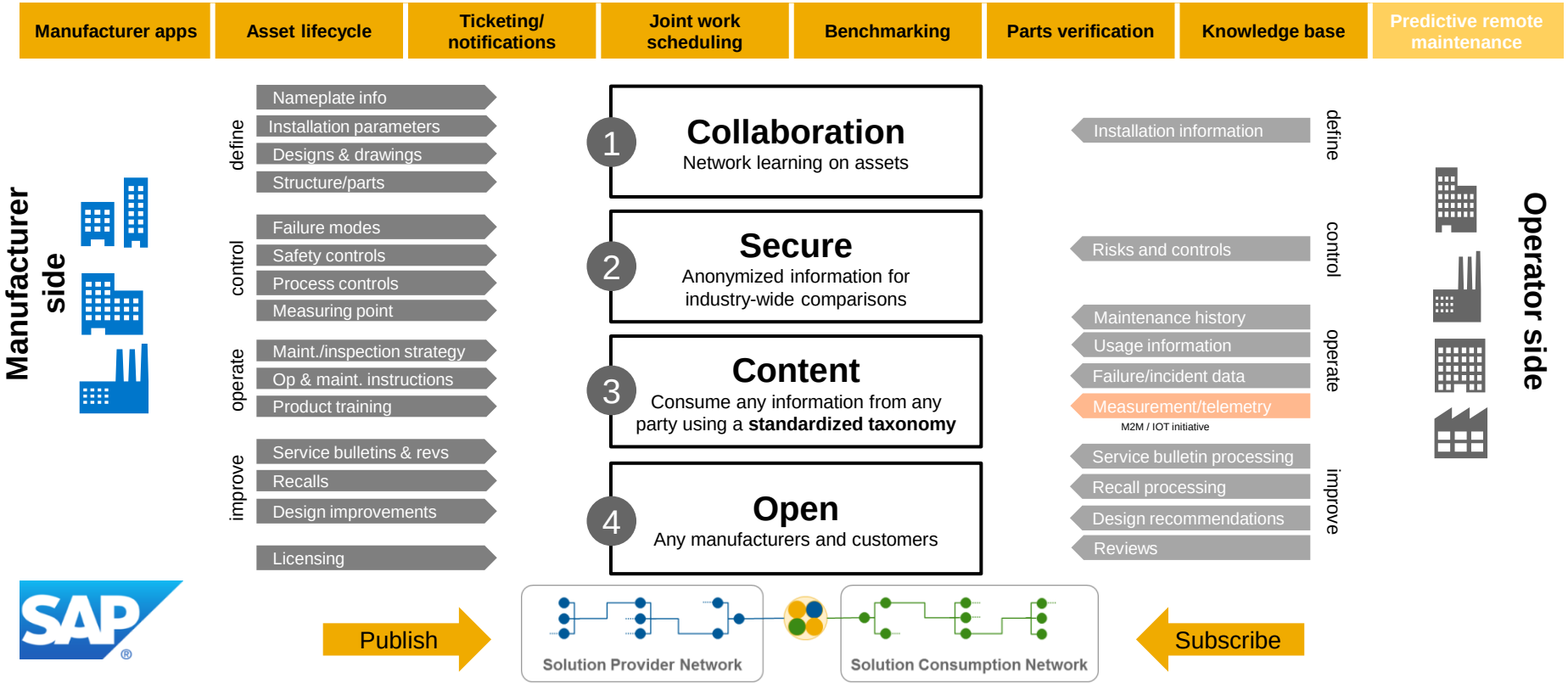
H2020 «FLEXICIENCY» use cases

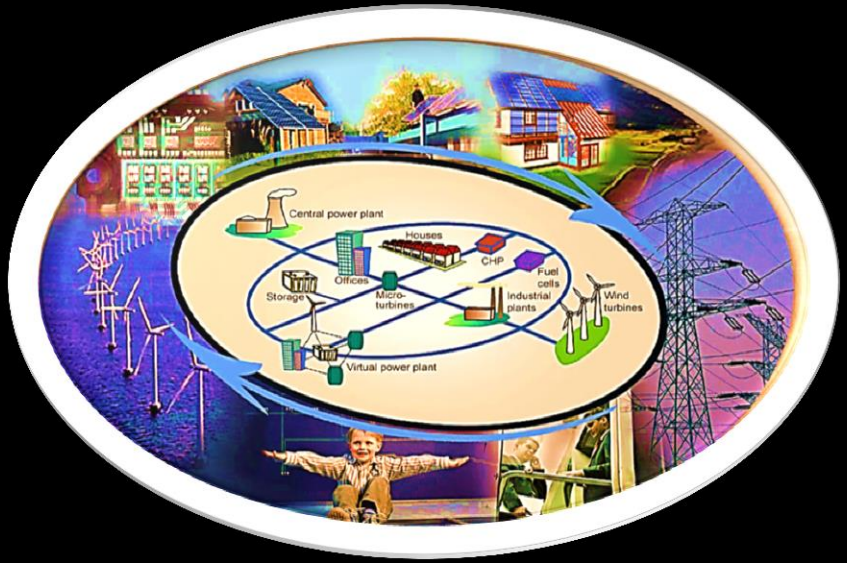
FLEXICIENCY

Energy Cloud Platform

Description of use-case and associated services	B2B/B2C	Countries involved	Lead partner	Market Place function
Customer support				
New customer with new contract (existing POD) Customer changes retailer Customer buys HAN/IHC service	B2C	Sweden	Vattenfall	Service request Market data, service request Service request
Billing and administrating (energy consumptions, specific tariffs for DR)	B2C	Spain	ENDESA	Service request
Negotiating and updating consumers' contracts				Market data, service request
Advanced monitoring				
Data analytics: load curves	B2B/B2C	France Spain	ERDF ENDESA	Service request
Customer sends specific information related to their contracts when participating in DR: energy consumption profile, critical loads, billing,..	B2C	Spain	ENDESA	Service request
Real-time or given frequency data processing	B2B	Italy	ENEL	Service request
Energy monitoring (history, forecast, alerts, support) for customers	B2C	Austria Italy	Verbund ENEL	Market data, service request
Customer subscribes to outage information in real-time (e.g. power failures in secondary homes)	B2C	Sweden	Vattenfall	Service request
Local energy control				
Local energy optimization by customer with packaged consumption data; supervision of heating equipment by customer	B2C	Sweden	Vattenfall	Market data, service request
Local energy optimization at customer installation (demand/generation)	B2C	Italy/Austria Italy	Verbund ENEL	Service request EU wide
Executing demand response (simulated)	B2B	France, UK, Holland	ERDF	Service request
Flexibility (service at aggregated customers level)				
Demand response at aggregated level for a city	B2C	Spain	ENDESA	service request
Investigation of flexibility service by using VPP (e.g. voltage control, balancing and/or congestion management)	B2C/B2B	≥2	CyberGrid	Service request

[NEW] Asset Intelligence Network high-level architecture





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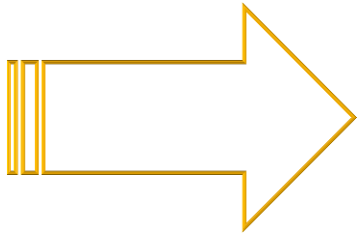
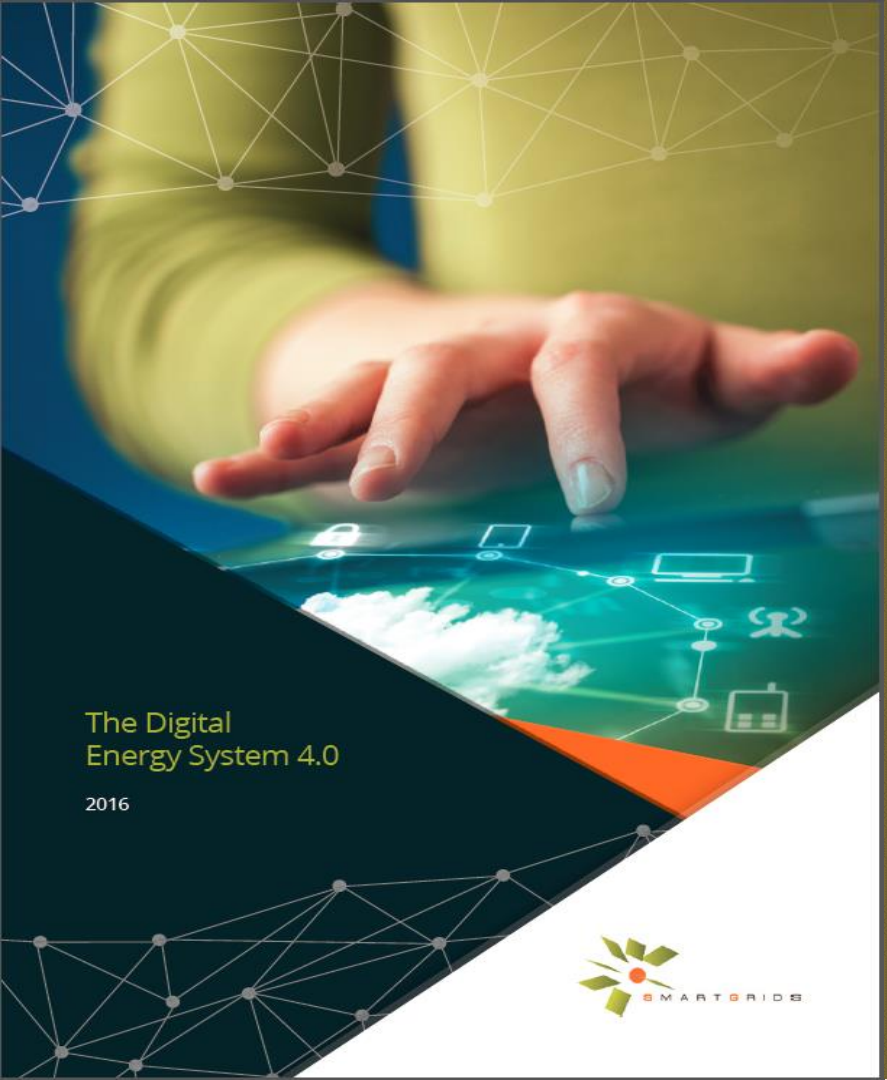
At Europa Forum in Lech (Austria) on 14/04/2016, we suggested 5 Strategic Energy Projects to get the best of Digital in Europe …

- Fostering Digital skills will help fill some 900.000 vacancies coming in the future
- The potential contribution to European GDP from achieving a Digital Single Market is estimated 415 B€
- Europe Single Digital Market will spend 50 b€ on Digital according to Commissioner Oettinger.

BUILD ENERGY UNION OF RESOURCES	CROSS-BORDER ENERGY MANAGEMENT
GARANTY OF ENERGY INDEPENDENCE	EU ENERGY SIMULATOR COCKPIT
MAKE ENERGY SIMPLE TO CONSUMERS	PLUG & PLAY ENERGY TO CONSUMERS
FASTER DISSEMINATION ACROSS EUROPE	ENERGY EXCHANGE PLATFORMS
CREATE JOBS & GDP GROWTH	VENTURING & STARTUPS HUB





Conclusions

This report discussed use cases and opportunities of digitalization of the energy system. We conclude the following:

DIGITALIZATION WILL BE HAPPENING

Several use cases are presented and the benefits are discussed. For some use cases, the cost-benefit analysis is not yet positive, however the costs are rapidly decreasing and with increasing distributed generation and introduction of appropriate market models (e.g. including demand response and dynamic pricing), the digitalization of the entire energy system is definitely happening in the coming years.

ACTORS NEED TO ADJUST THEIR STRATEGY

The actors that have been involved in the energy system for many years are challenged to adapt their way of operating and incorporate new technologies that are adopted from other sectors such as the mobile communication sector. In general, the actors in the energy system will have the opportunity to interact much more through dedicated platforms and data exchanges. It is essential that different actors in the energy system, like aggregators, network operators and retailers prepare to adjust their internal operational and business strategy accordingly.

REGULATION PLAYS AN IMPORTANT ROLE

Despite the fact that regulation is not the main focus of this report, it is clear that regulators play an important role providing the correct incentives to develop the required technologies. Examples of this are smart metering functionalities integration of flexible demand and dynamic pricing.

FUNDING RESEARCH AGENCIES WILL BE NECESSARY

Funding agencies are recommended to keep investing in research, as large challenges continue to exist even with the current available technologies and decreasing cost of communication.

In conclusion, in this report we discussed an opportunity, increased connectivity and digital evolution, to tackle a major challenge in sustainable energy i.e. the increased penetration of distributed and intermittent generation. A variety of use cases is being demonstrated in innovation projects. A lot of these demonstrators exploit the increased possibilities for interaction between stakeholders, allowing for a more efficient operation of the system as a whole. The digitalization of the energy system will have a profound impact on all stakeholders and the companies that are prepared for these changes will lead the road to the digital energy system of 2020 and beyond.

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