



#RepowerEU



REPOWERING EUROPE
Photovoltaics: centre-stage in the power system

Brussels, Belgium, 18 May 2016

• European Commission, Madou Plaza Tower, Place Madou, 1, 1210 - Saint-Josse-Ten-Noode •

Market Access

MAHER CHEBBO, PhD Energy

General Manager Energy

European, Middle East and Africa

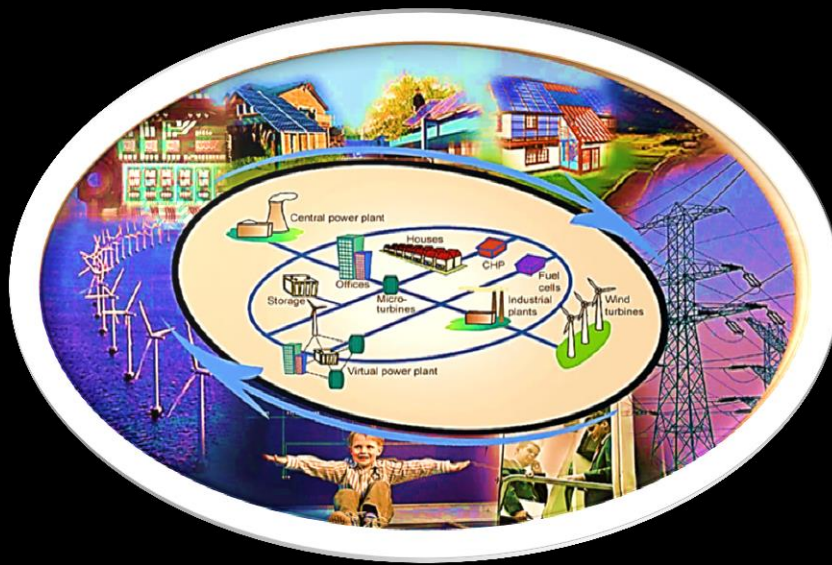
SAP

Maher.chebbo@sap.com

Chairman ETP SmartGrids Demand & Digital group

President of ESMIG (European Smart Energy Association)





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



- Security of Supply
- Internal Markets
- Environment

20/20/20
1995 Energy Policy Framework

2030 framework for climate and energy policies
European Council October 2014

- **GHG - 40%**
- **Renewables +27%**
- **Energy Efficiency +27%**

- Strategic Framework for the Energy Union
- Communication on the Road to Paris COP21

Energy Union
2015 New Commission Program

5 active end-users trends within SmartGrids



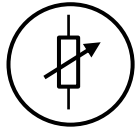
Self-generation

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.

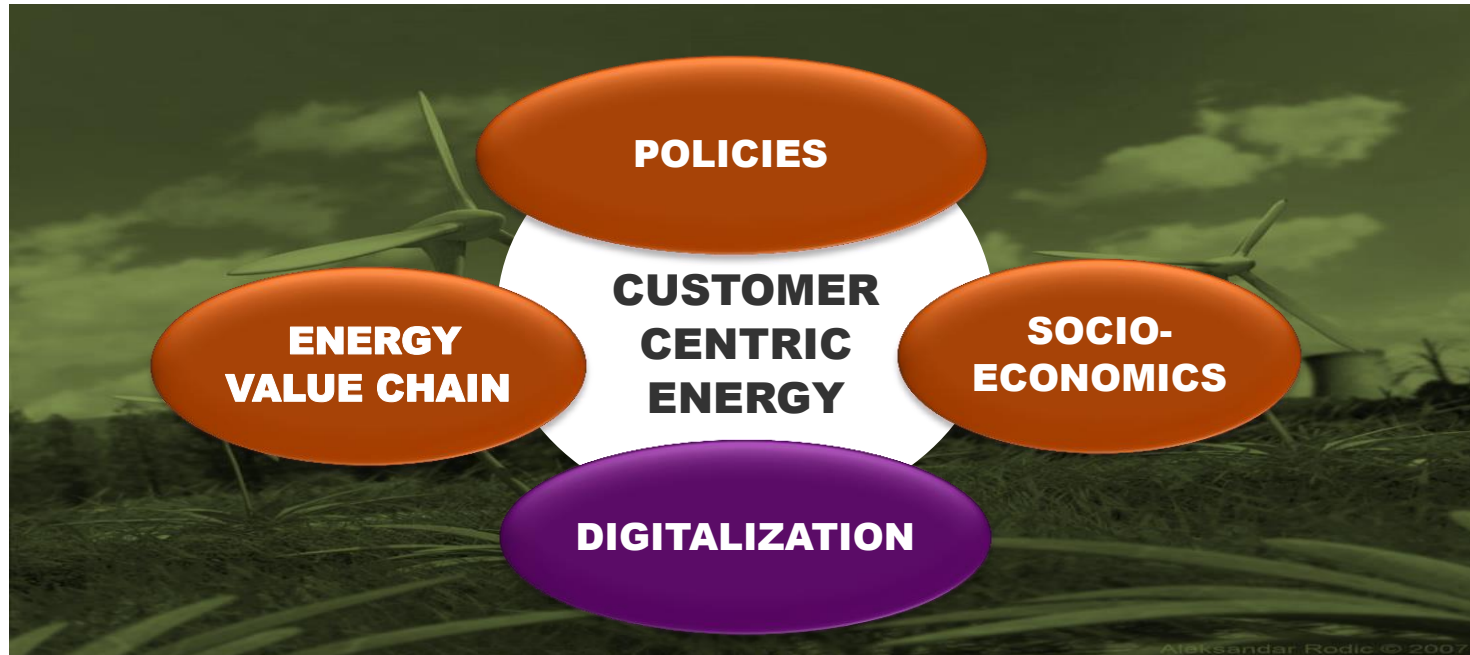


Grid divorce

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

Customer Centric Smart Energy : A challenging Equation

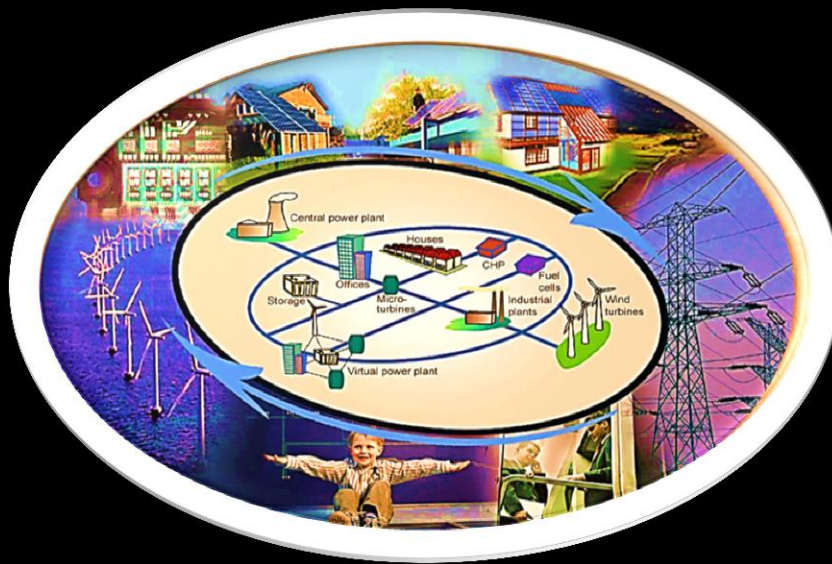
These factors have been considered but not as ONE Equation or ONE Model.
2016 ... 2020 SET Plan should put it all together in ONE integrated Strategic Energy Technology Plan



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.





1

**Market
Trends**

2

**Market
Structure**

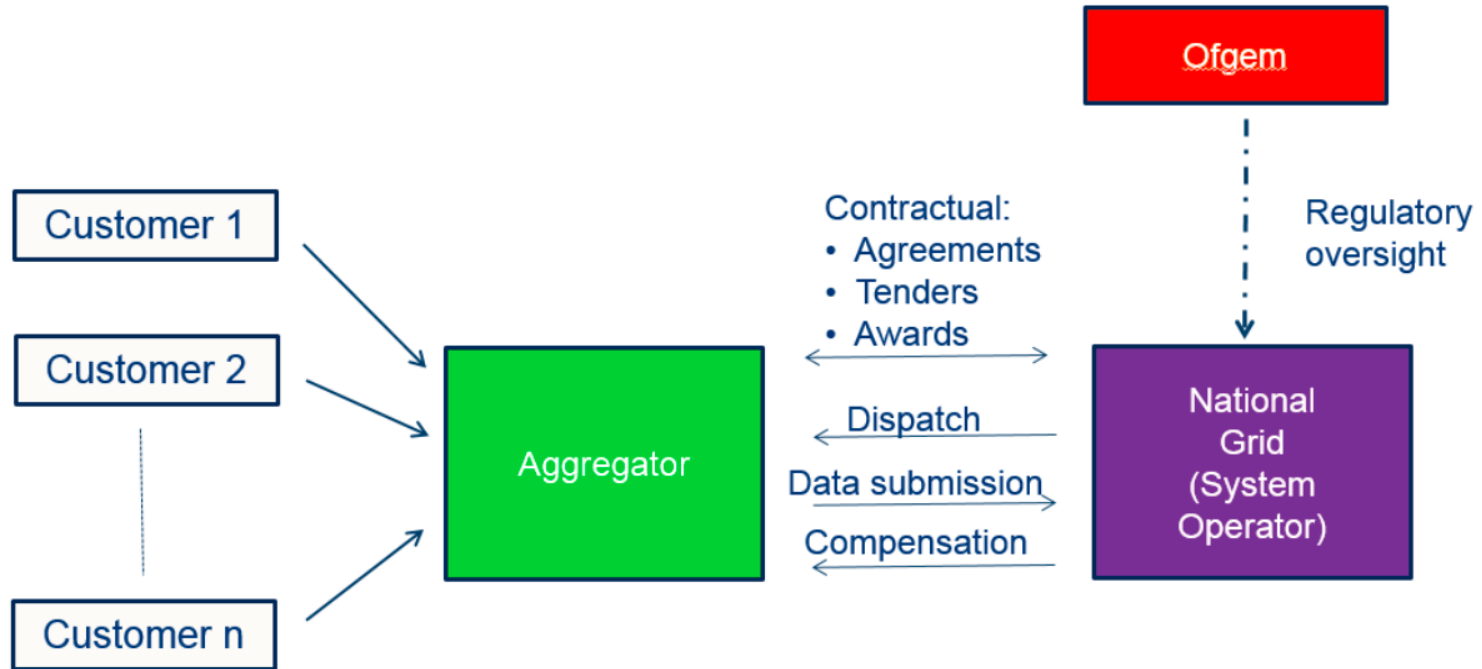
3

**Exchange
Platforms**

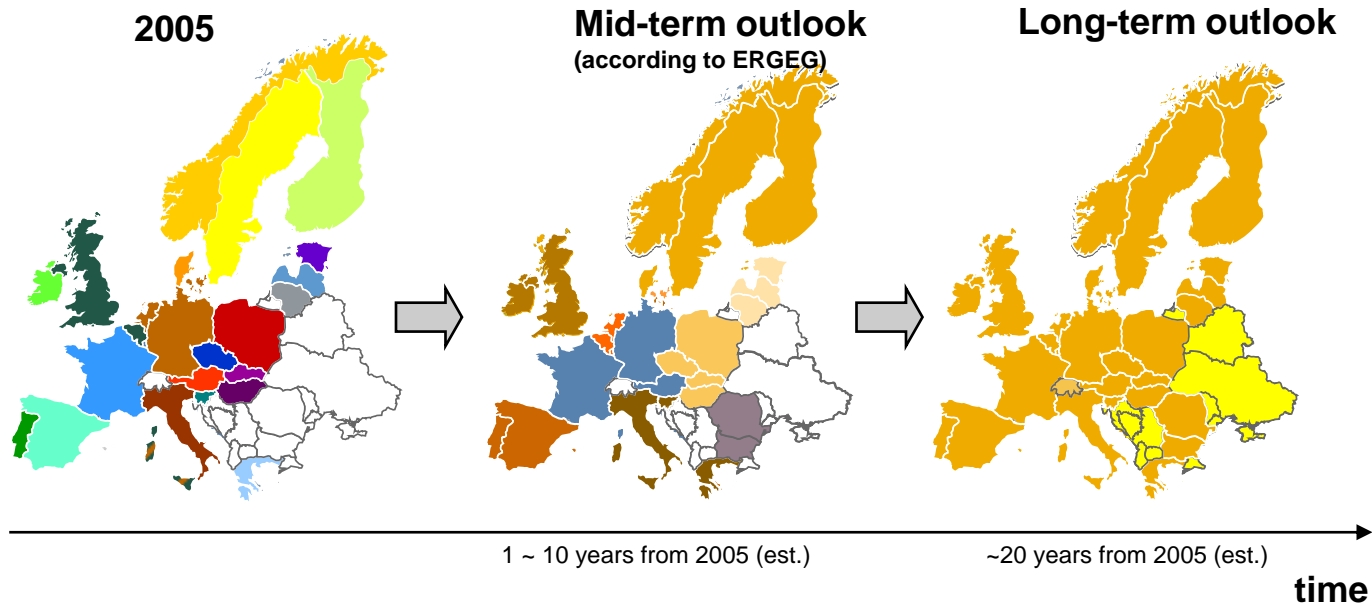
4

**Way
forward**

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



European influence on Energy solutions: Expectations on the Harmonization roadmap

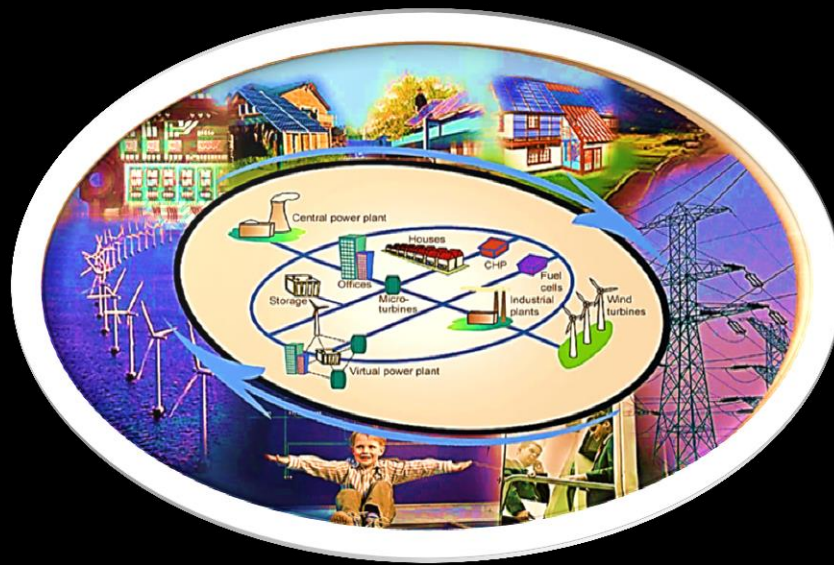


ERGEG's 8 Regional Markets (currently only Electricity)

- 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...



1

**Market
Trends**

2

**Market
Structure**

3

**Exchange
Platforms**

4

**Way
forward**

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 devices 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

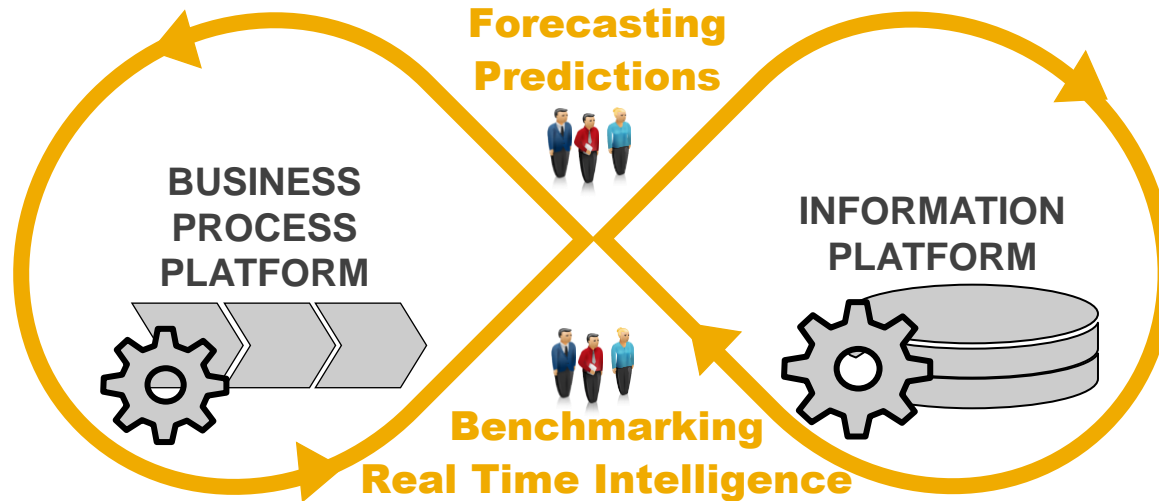


Cyber-security

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

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

Energy Efficiency Benchmarking

- Scorecard
- Review
- Rate Comparison
- Billing
- Energy Saving Tips
- R rebate Program
- Financial Assistance
- Service Requests

Advanced by SAP In-Memory Computing

35,040,123,375 Smart meter data points

0.15 seconds Query response time

Energy Efficiency Scorecard

You're ranked 8,832 out of a peer group of 100,814 households in energy efficiency over the last billing period, March 3rd 2011 to April 3rd 2011.

[Review my consumption details](#)

My household is the top 10% in energy efficiency (electricity use and its associated CO₂ emission)

ShareThis on Facebook

TweetThis on Twitter

Top 10ⁿ
Score: -324

More Efficient | Average | Less Efficient

ENERGY USAGE (kWh)

Category	Energy Usage (kWh)
A	896
B	1348
C	1057
you	324
D	823

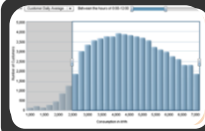
CO₂ Equivalent to 100 lbs of CO₂

SAP

[NEW] Real Time Energy Analysis on the Cloud

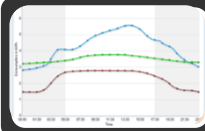
Leveraging the Cloud, IOT & Big Data (SAP HANA)

Customer
Intelligence



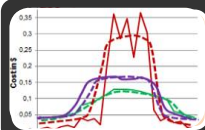
Aggregation

- Instantly aggregate and analyze customers' energy



Consumption Pattern Determination

- Categorize customers that share consumption behavior



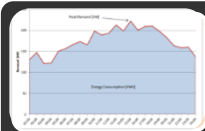
Peak Load Determination

- 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



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

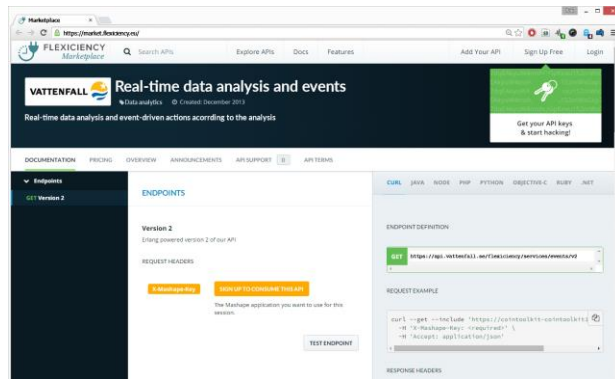
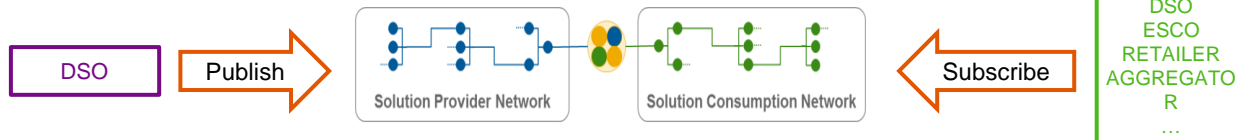
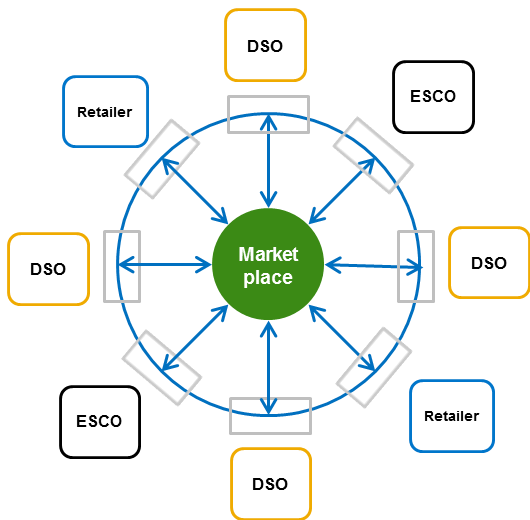


Energy Cloud Platform

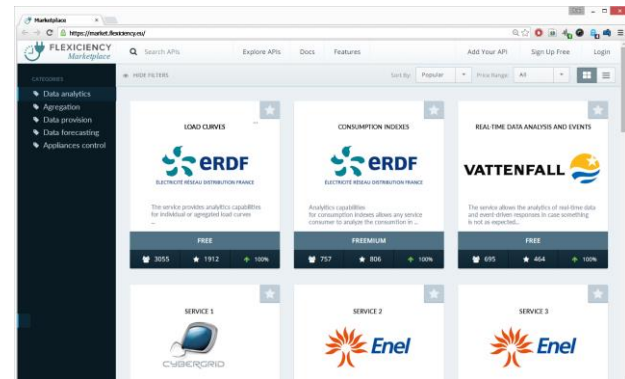


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 545482

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



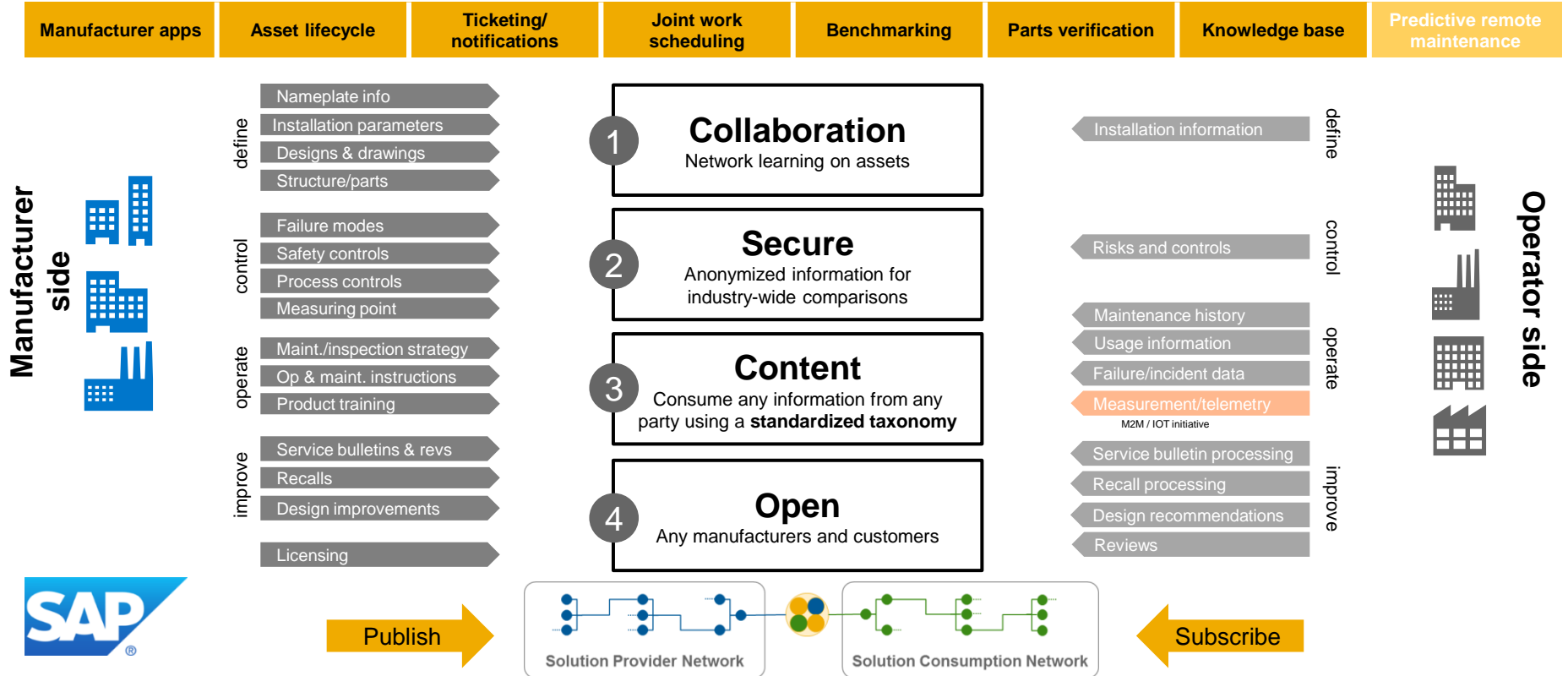
H2020 «FLEXICIENCY» use cases

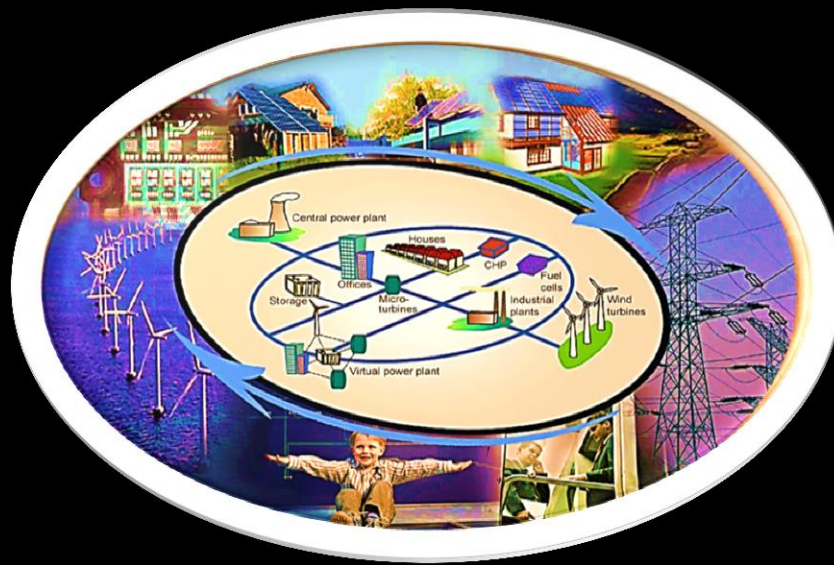


**Energy Cloud
Platform**

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)				Service request
Customer changes retailer	B2C	Sweden	Vattenfall	Market data, service request
Customer buys HAN/IHC service				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





1

**Market
Trends**

2

**Market
Structure**

3

**Exchange
Platforms**

4

**Way
forward**

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

GARANTY OF ENERGY INDEPENDENCE

MAKE ENERGY SIMPLE TO CONSUMERS

FASTER DISSEMINATION ACROSS EUROPE

CREATE JOBS & GDP GROWTH

CROSS-BORDER ENERGY MANAGEMENT

EU ENERGY SIMULATOR COCKPIT

PLUG & PLAY ENERGY TO CONSUMERS

ENERGY EXCHANGE PLATFORMS

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.

The Digital
Energy System 4.0

2016



© 2015 SAP SE or an SAP affiliate company. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. Please see <http://global12.sap.com/corporate-en/legal/copyright/index.epx> for additional trademark information and notices.

Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors.

National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP SE or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP SE or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

In particular, SAP SE or its affiliated companies have no obligation to pursue any course of business outlined in this document or any related presentation, or to develop or release any functionality mentioned therein. This document, or any related presentation, and SAP SE's or its affiliated companies' strategy and possible future developments, products, and/or platform directions and functionality are all subject to change and may be changed by SAP SE or its affiliated companies at any time for any reason without notice. The information in this document is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.