SMART GRID
&
AUTOMATIC METER MANAGEMENT

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Definition of " Smart Grid"

- Smart grid refers to a communicating electrical network that includes ICT (Information and Communication Technology) to control and manage all parts of the electrical grid (production, transmission, distribution) in a more efficient manner in order to balance between the supply and the demand.

→ *upgrading the grid*

« Smart Grid » necessity

This grid upgrading is imposed by :

- The rising demand of electricity
- The development of distributed energy production especially with the emergence of renewable energies
- The need to guarantee a certain service quality

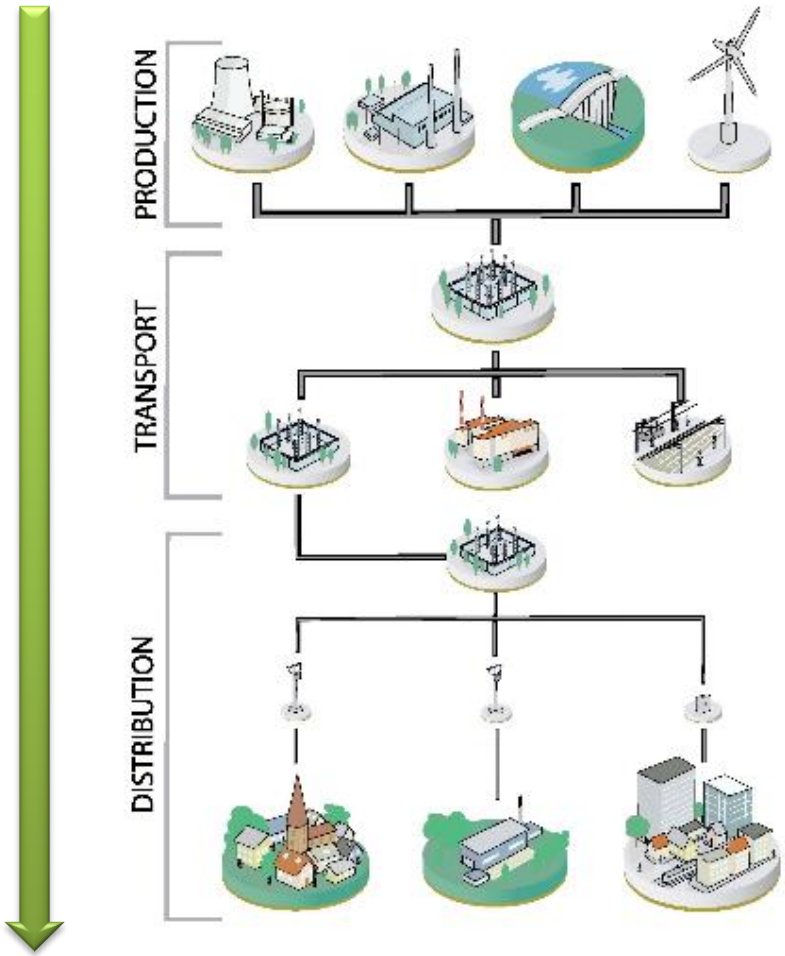
→ The deployment of smart metering or AMM is the first step towards a smart grid.

Smart Grid necessity

• Currently, electricity is provided in a unidirectional sense : from the power production plants to the customers
• With the introduction of renewable energies, the electricity production has become decentralized.
•The customer has become both producer and consumer
•Renewable energies are intermittent
•The difficulty of balancing between the supply and the demand

The need to change the existing power grid to a controllable one

Smart Grid



Smart grid challanges

- Master the consumption peaks
- Offer a better quality service
- Optimize the grid maintenance
- Ensure a better management of the distributed power production (photovoltaic, wind , cogeneration)
- Apply information technology to distribution grids
- Identify and prepare future management tools and monitoring of the distribution grids

I - Towards future grids

- STEG must engage in an upgrading of its processes and its information systems to strengthen its ability to adapt to all these changes , investing in information systems and smart grids guarantee a good quality of supply electricity .

II – STEG challenges

- **An increased effort in energy efficiency and the introduction of renewable energies :**
  - **management of increasingly decentralized production (solar roofs , wind ...)**
  - **A demand's management and grid access**

- **The development of prepayment**
- **improvement of the grid performances indicators**
- **the reduction of commercial and technical losses**
- **the provision of information to the customer in terms of mastery and use of energy**
- **A technology watch (economy with high technological content, environment-friendly , energy efficient and innovative)**

III – Conducted actions

For some years, STEG has already started some targeted actions to improve performance , manage the grid complexity and optimize its operation for :

- Monitoring and grid telecontrol
- Smart Meter (AMI project)
- Managing the renewable energies

III.1 Monitoring and grid telecontrol

- Acquisition and deployment ,in 2008, of 7 Centralized Driving Offices (SCADA)
- Use of the adapted driving equipments for telecontrol (Recloser , IAT , Power ASEM ..)
- CNC Control Introduction at the sub stations HV / MV
- Introduction of a new generation of ILD ,
- Last Telecom level (fiber optic project on MV networks)

III. 2 Strategic development of renewable energy

Contribution to the development of renewable energy (photovoltaic , wind, ...)

- Implementation of the regulatory framework for the connection of renewable energy and cogeneration facilities
- Introducing the Prosol program dedicated to solar roofs for the residential sector and the tertiary sector
- Establishing some acceptance criteria for inverters of different brands and power to be connected to the grid distribution

III.2 The smart metering

The deployment of smart metering (or smart metring) is the first step towards a smart grid

It consists on equipping the electric distribution grid with telecontrollable devices to remotely manage customer consumption

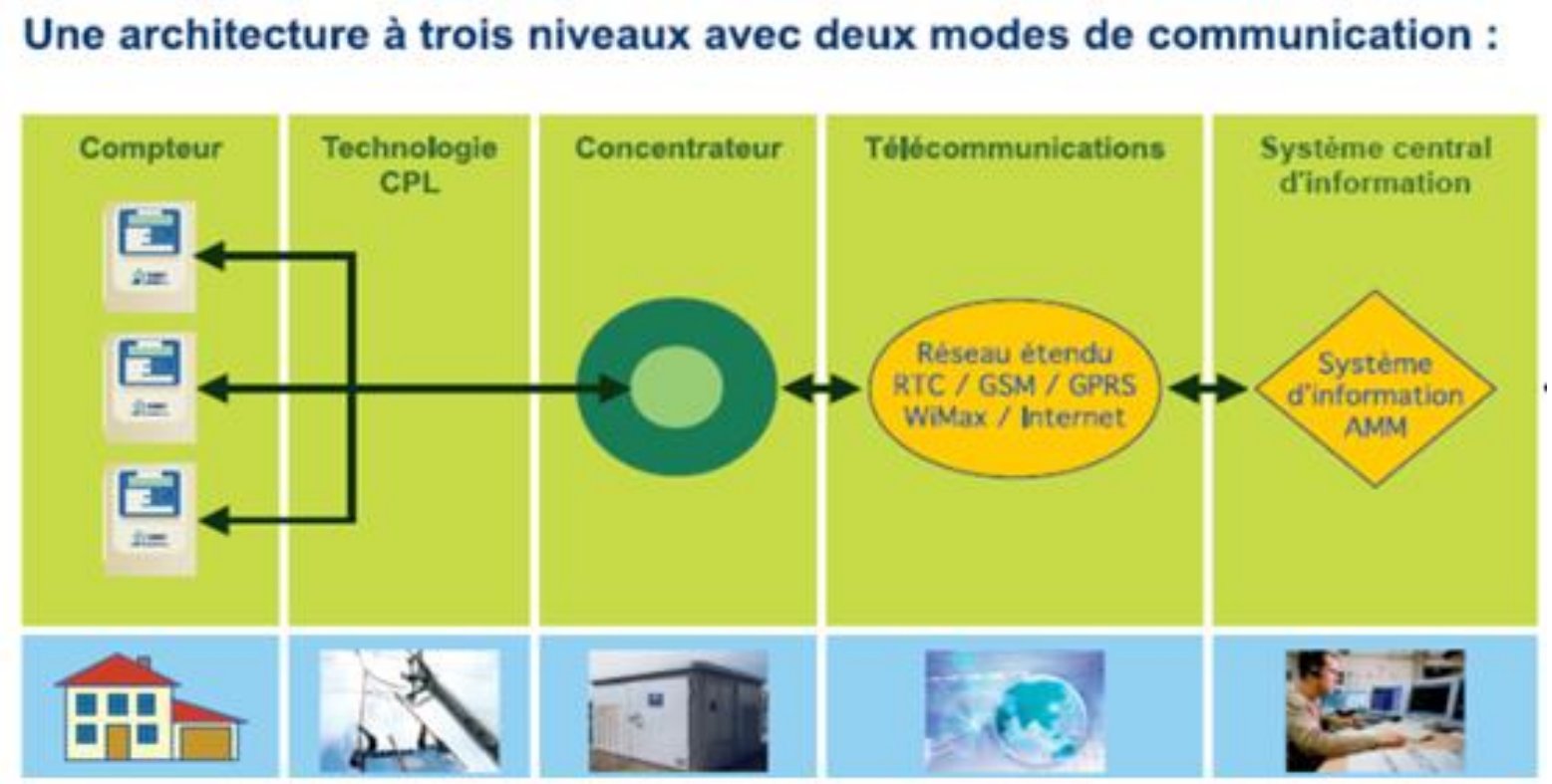
a) Interest of smart metering

- Billing based on actual consumption
- Breakdown and / or fraud teledetection
- The remote intervention of the grid manager (commissioning, termination, power increase ...)
- Load curves visualization for each subscriber
- Provision of new services to customers (ability to control its consumption through the visualization of load curve)

⟹ Better service quality

b) Smart metering system AMM

- **AMM** (Automatic Meter Management) : is the automatic meter management . The exchange of information is bidirectional between the meter and the information system at which the data collected will be processed



c) Advantages of smart metering

- Reducing technical and commercial losses
- Billing based on actual consumption
- Control of consumption peaks
- The remote intervention of the grid manager (commissioning, termination, power increase ...)

IV. STEG experiences :
Pilote sites of smart meters

Installation of smart metering pilot sites in order to:

- Become familiar with these new concepts
- Test different communication technologies
- Test the adaptability of the electrical grid with this type of equipment
- Develop a certain expertise

IV.1 STEG approach for the pilot project " smart metering " (1/2)

- Implementing smart metering systems (DC + meters) offered by different vendors in different sites
- Testing the CPL grid performances under different operating conditions:
  - Selected areas types : urban areas (popular neighborhood , residences), semi rural area
  - Grid Type: twisted aerial , underground
  - Consumers: residential, commercial , administrative
  - Distances between the station and the different installed meters vary from site to site

IV.2 STEG approach for the pilot project " smart metering " (2/2)

- Evaluate the features of different counting systems in place :
  - Modulation techniques : S-FSK, OFDM (PRIME), DCSK, DMT
  - Communication protocols : SML, DLMS/COSEM
  - The features offered by data processing software

V. Establishment conditions for a smart metering system

- The DC (data concentrator) is installed between the secondary transformer and the switchboard
- Around 200 meters can communicate with the DC
- The distances to be maintained between CPL equipments (meters and concentrators) must not exceed 100 m
- The maximum range (distance between the hub and the last meter installed) must not exceed 1 Km theoretically .

VI. Evaluation of the experience

- Evaluate the functionality of data processing software
- Study the operation of new marketing authorization architectures (eg GPRS direct link between the meter and the SI)
- Take action to have the data collection servers
- Compare technologies and adaptation of those metering systems to the power grid STEG
- Compare the different proposed counting systems

VII.Questions(1/2)

- System Interoperability (meter, concentrator , RTU , protection relays, ...)!
- Compatibility with the functional requirements of STEG ?
- Data transport bearer (GPRS, RTC, WIMAX, …) !?
- A non-proprietary system based on international standards ?
- What type of meter : communicating , evolved , intelligent, ...? For which services ? and at what price?
- Who will pay for the meter , what consequences on fares ?
- To which standards are we evolving?
- How to interpret the results of the experiment ? A generalization to come ? Which supplementary services ?

VII.Questions(2/2)

- The actions to optimize consumption and sustain them
- What new equipment will be ensure the communicate with the power grid ? The electronics and home automation at the service of the " Smart Home" .
- Integration of decentralized and intermittent renewable energy through smart grids
- The energy storage , an alternative? How to choose the most appropriate way to the needs : batteries, thermal storage , mechanical, ...?

Conclusion

Goal of this phase : a potential deploiement

- Evaluating the performance of these metering systems
- Evaluation of the adaptation of the STEG grid with this type of equipment

  - Identify the technological choices
  - Anticipating the malfunctions
  - Consider a possible deployment

Thanks for your attention