ifri Centre Énergie

Governance and Competitiveness in an Age of Innovation

Managing the energy transition

in an age of innovation

Paris, September 12, 2017

Managing the energy transition

Managing the energy transition comes to reconciling a series of objectives:

1 - Promotion of:

- **Low carbon emitting energy sources**
- **Improved energy efficiency**

2 - Preservation of:

- **Security of supply**
- **Competitiveness (affordable energy prices, strong manufacturing industry, new services)**
- **Social cohesion (access to jobs, regional development, equality among citizens)**

Managing the energy transition means intervening with:

- **Accelerator: Unleash market forces, stimulate innovation**
- **Brake: Uphold legal barriers, avoid shocks**

Electricity Market

In Europe we see low progress regarding carbon capture and storage, together with opposition to nuclear and few suitable sites for hydroelectricity. Renewable sources hence consist mainly in wind, solar and to a certain extent bioenergy.

In order to boost competitiveness, the rule for all generation is the direct sale into the market, combined with financial support:

- **either with a system of green certificates,**
- **or with supplementary income determined through tenders.**

All market participants are responsible for imbalances.

Wind and solar suffer from low predictability, but thanks to digital technologies:

- **Marketplaces may be open towards aggregators, managing power generation from different sources.**
- **Marketplaces allow players to participate very shortly before actual delivery (intraday or balancing markets) and provide trading time intervals of 15 minutes by 2025.**

Power Capacity by 2030

According to simulations, RES capacity will increase by 80%; wind capacity will double while solar capacity will be multiplied by a factor 2.4.

	2015	2030	*Change*
	GW		*%*
Nuclear	121	110	*-9*
Thermal	450	305	*-32*
Wind	142	285	*101*
Solar	97	237	*143*
Bioenergy	28	54	*92*

Challenges:

1. **Security of supply through capacity remuneration mechanisms**
2. **Redeployment & vocational retraining for workers**
3. **Access to market by local manufacturing industry**
4. **Compensation for regional inequality**
5. **Consequences on power price & affordability**

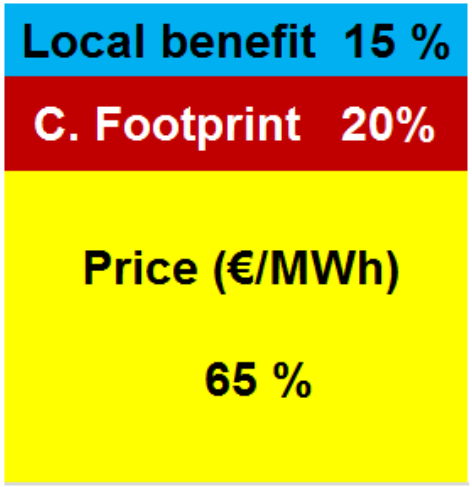
Industrial challenges

Tenders for PV generation may include a single criterion: the output price. In this case, European manufacturers of panels cannot compete with Asian manufacturers, who benefit from larger production capacity ("size effect").

Other criteria may give a chance to all manufacturers, such as:

- **Innovativeness (trackers, concentrated PV, remote control, etc.)**
- **Carbon footprint (kg eqCO2/kWp certified by an independent body)**

Criteria in French tenders Specification 2017:



In current tenders, the carbon footprint represents 20% of the total score. It should reach 30% to give a chance to French manufacturers.

Example of competition for PV panels:

- **Jinko Solar (production capacity 6500 MW): 0,37 €/Wp (including EU taxes)**
- **Voltec Solar (production capacity 50 MW): 0,46 €/Wp**

Inequality

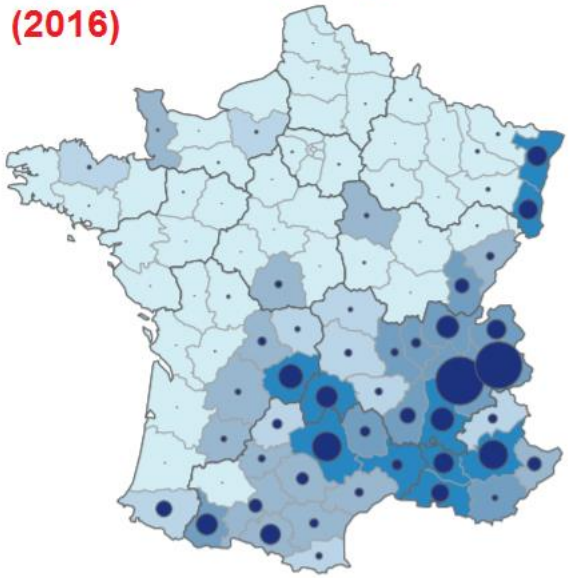
RES development for the whole of the EU masks deep inequalities.

- **Inequality among Member States, due to discrepancy in access to capital**
  > European guarantee could be granted to investors

- **Inequality among regions, due to discrepancy in natural resources**
  > Reinforcing the network allows for a single wholesale market

Forecast Total RES Capacity (GW)			
2015		2030	
Germany	88,2	Germay	157,8
Italy	32,7	Spain	68,5
Spain	31,3	Italy	57,9
Romania	4,9	Romania	10,1
Czech Rep.	2,8	Bulgaria	6,1
Bulgaria	1,8	Czech Rep.	5,7

Hydropower Capacity in France (2016)



Networks charges

Even with the cheapest possible RES generation, total cost will increase due to network reinforcement. Challenges to be addressed:

1 - Connection charges & locational signal: size of the zone, voltage level, duration of the charge

2 - Use of networks:

- **injection charge,**
- **fixed charge (€/period),**
- **capacity charge (€/kW),**
- **volumetric charge (€/kWh),**
- **tariff for self-consumers.**

3 - System operation: RES to provide energy services such as primary or secondary reserves, not yet fit for frequency and voltage control, main parameters for the quality of electricity.

Self-Consumption

Consumers are encouraged to generate electricity from renewable sources either individually or through an energy community.

In the absence of specific provisions, self-consumers may not pay their share of network charges as well as levies aimed at supporting RES.

Self-consumption will remain unaffordable for large sections of the population, due to insufficient saving capacity or inadequate housing.

Network tariffs, taxes and levies shall be carefully designed to avoid any increase of their bill linked with self-consumption. Financial support related to heat & energy efficiency may be introduced.

Heat & Bioenergy

Bioenergy faces several difficulties which could hinder their development:

1. **Sustainability criteria are likely to affect these resources.**

2. **The full use of calories generated by combustion facilities depends often on the existence of a heat network ("district heating"). Yet the profitability of such installations could fall under the impact of energy efficiency measures.**

3. **Forests are "carbon sinks". Increasing the use of wood to provide heat is equivalent to "destocking", which then needs to be compensated by larger cuts in emissions in other sectors. This might lead the EU to import more biomass from third countries, in order to achieve its 2030 targets.**

Heat pumps seem to be in a better competitive position. Heat pumps are also a privileged instrument for exploiting residential heat in all areas of dense housing where self-generated electricity from solar panels or windmills is often difficult.

Transport & Biofuels

In the EU, the transport sector represents 32% of final energy demand and 29% of energy related CO2 emissions. However legislation in force has largely spared this sector which consumes only 6% of renewable energy in 2015 compared to 16.4% for all sectors.

The main efforts so far concern so-called first-generation biofuels, mainly based on plants used for food. The incorporation of these conventional biofuels remains limited to a ceiling set to fall from 7% (2020) to 3,8% (2030).

In 2014, about 10% of bio-ethanol and 26% of bio-diesel consumed in the EU came from third countries. In the same year, imported raw materials made up 40% of the inputs for bio-diesel produced in Europe.

EU directives impose severe sustainability criteria, but in spite efforts to ensure accurate traceability, verification proves difficult.

Transport & Electricity

Progress with batteries & clean mobility policies accelerate the spread of electric vehicles (EVs). Uncoordinated charging could result in excessive peaks:

- **Slow charging (8 hours for 24 kWh) - 1 Million EVs > 3 GW**
- **Fast charging (1/2 hour for 24 kWh) - 1 Million EVs > 48 GW**

Digital technology allow for smart charging, driven by both price signals (flexible EV loads respond to time-of-use price) & control signals (according to grid and market situations).

When car fleets are not in use, batteries represent a storage capacity that can be used to provide services to grids (V2G).

Achievement however depends on the remote control of all vehicles and regulations adapted for this new function.

Conclusion

As illustrated by the previous examples, managing the energy transition translates into permanent trade-offs between the various objectives.

How can legislation marry stability, as visibility is requested by investors, with flexibility, in order to adapt to unexpected events? It is suggested to:

- **Avoid rigid targets, prefer corridors**
- **Organise frequent reviews with all stakeholders**
- **Provide for scheduled "windows" for modifying the settings**
- **Leave room for "hand made" solutions for specific circumstances, e.g. through the power granted to the Regulatory Authority**

Exchange of experience is paramount. Beside international organisations, dedicated bodies such as the French-German Office for the Energy Transition play a useful role.

Comments & Questions are welcome

michel.cruciani@dauphine.fr

Sources

Slide 4:
PRIMES, *Technical report on Member State results of the EUCO policy scenarios*, By E3MLab & IIASA, December 2016, pages 70-71.

Slide 5:
- French Energy Regulatory Commission (CRE), *Specification for the tender on ground PV farms of a capacity between 500 kWp & 17 MWp*, 2016, page 17.
- EurObserv'ER, *Photovoltaic Barometer*, April 2016, page 13.

Slide 6:
- Idem slide 4, pages 74 to 127.
- French Ministry of Environment, *Datalab - Chiffres clés des énergies renouvelables*, 2017, page 29.

Slide 10:
European Commission, *Renewable Energy Progress Report*, COM (2017)-57, pages 9, 16, 17.

Slide 11:
Eurelectric, *Smart charging: steering the charge, driving the change*, 2015, page 16.