



# **Long term scenarios and short term action the Deep Decarbonization Pathways approach**

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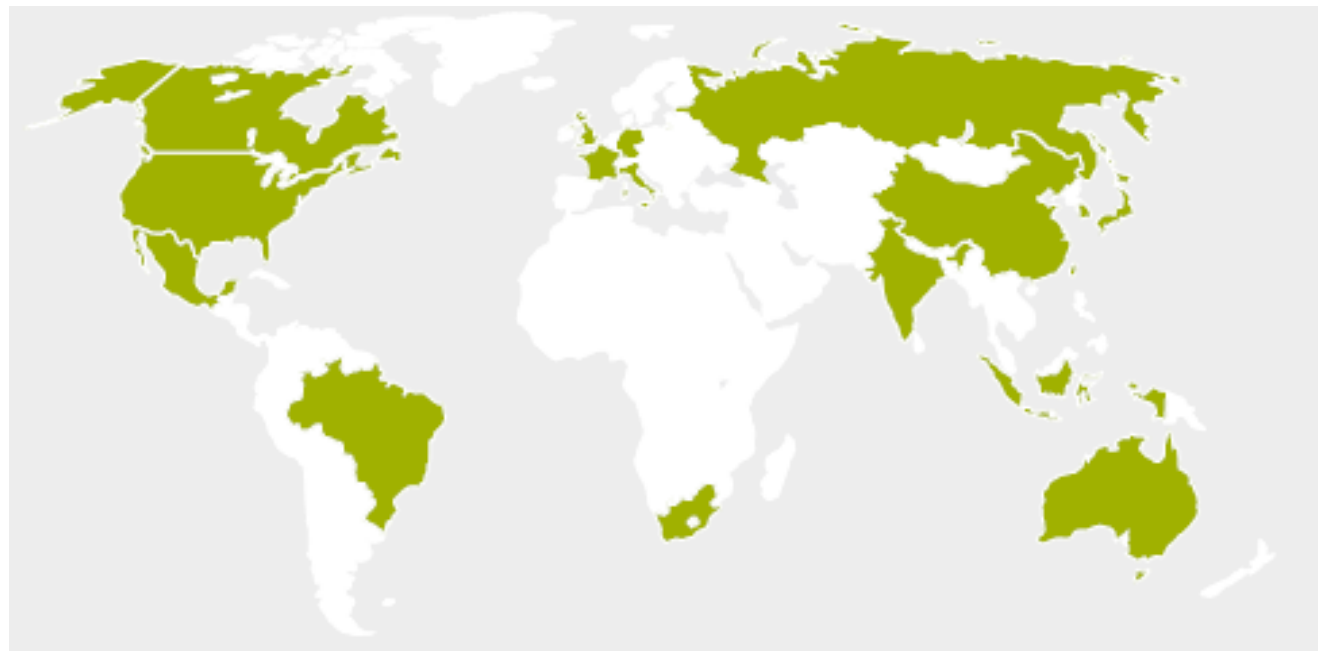
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# On the road to Paris

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**Depart from the burden sharing approach and size the real challenge in front of (all of) us : decarbonization**

**What does it take to decarbonize economies in 50 years time?**



# The need for national, ambitious narratives

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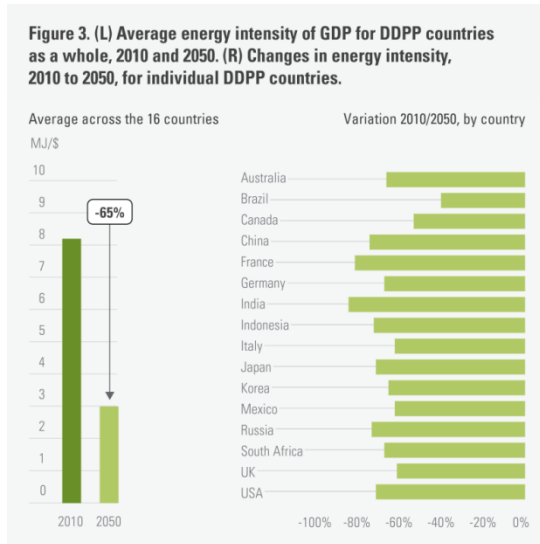
- **Global scenarios, with regional breakdown**
  - No political traction at national level
- **National short term, climate economy focussed (MAC curves) approaches**
  - Climate as a burden / risk of lock in?
- **National short term, « no regret » (stakeholder compromise) policy approaches**
  - Consensus, but adequacy?

# The DDPP complementary approach

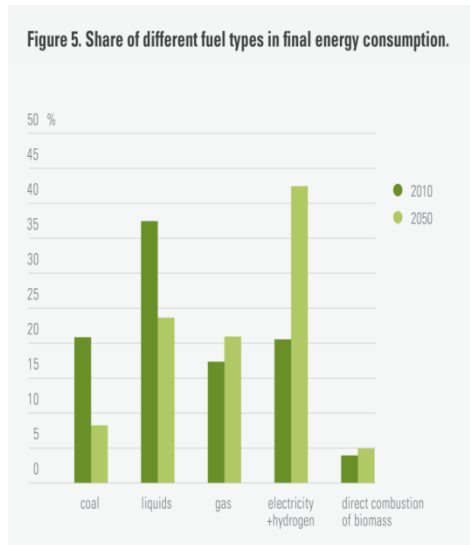
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1. No short term C budget, just a long term normative « attractor »
2. National teams
3. Strategy to be compatible with socio economic objectives
4. Never say « impossible », explore! Enabling conditions?
5. STRATEGY MATRIX : report and quantify sectoral narratives of change
6. DASHBOARD : snapshot of key economic et energy indicators
7. Academics but also « experts », political judgement
8. Modelling?

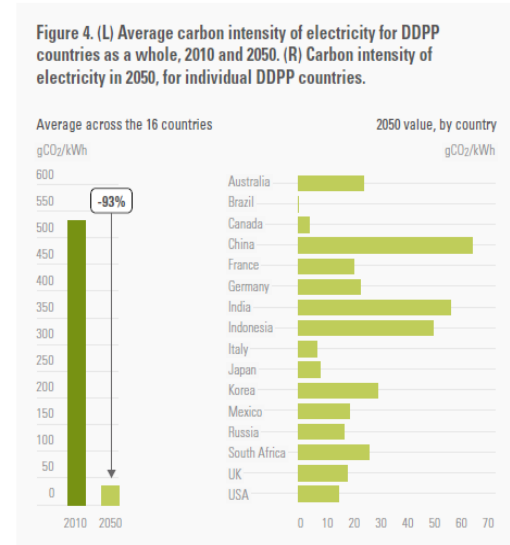
# 3 pillars for the transition, demand side action is key



1. Energy efficiency / sufficiency

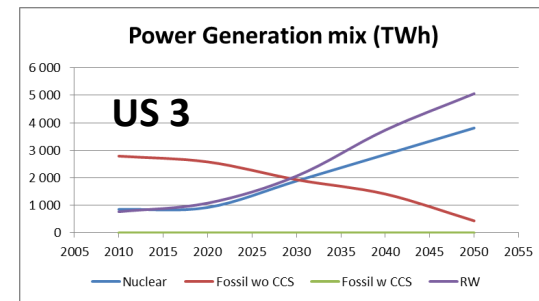
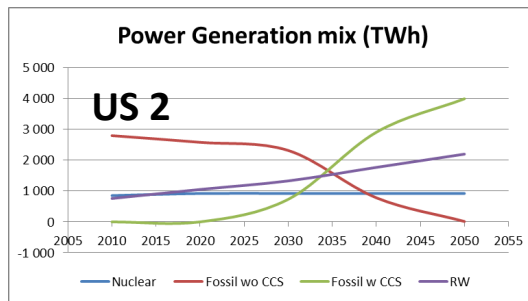
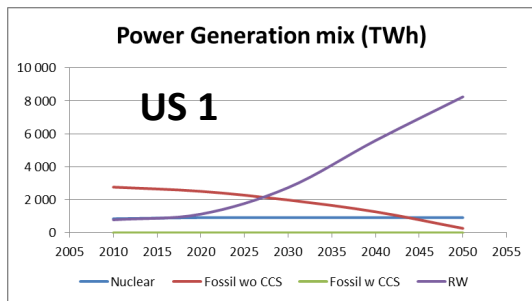
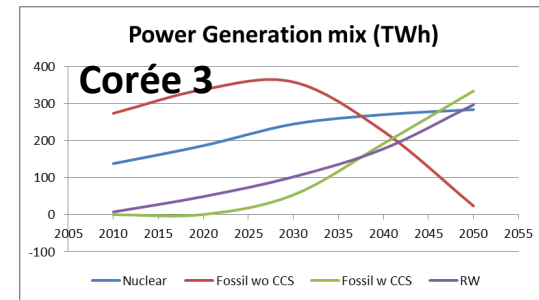
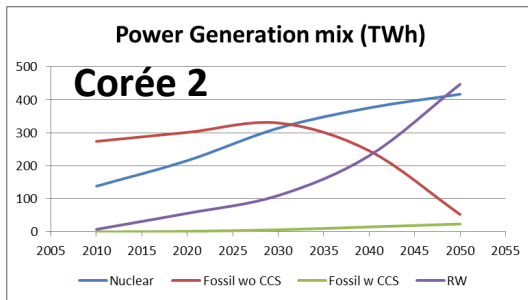
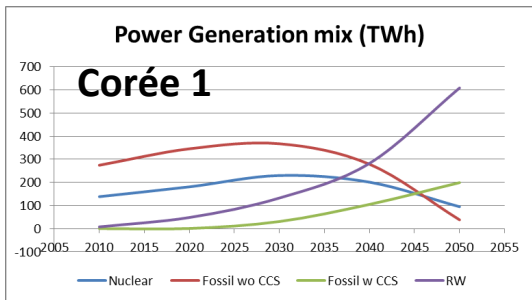
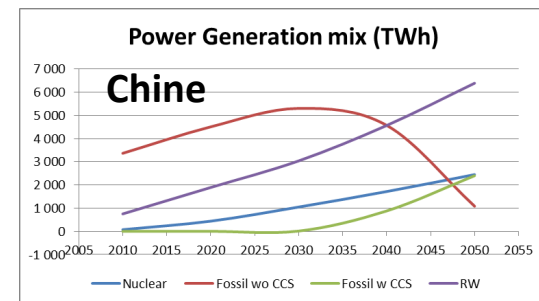
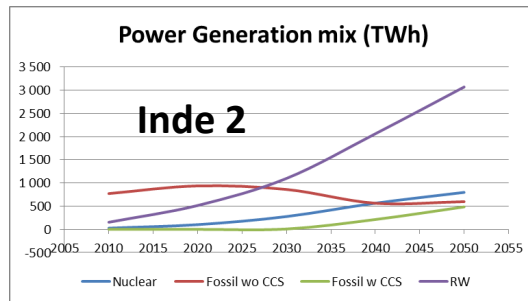
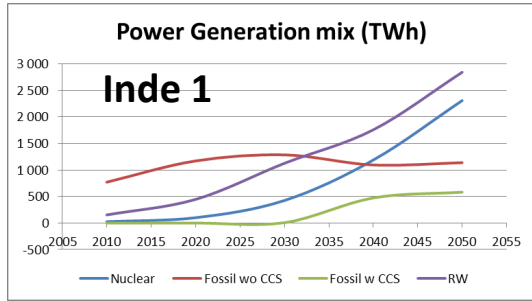


2. Fuel switching in end uses  
Development of decarbonized energy carriers  
(power, gas, water..)



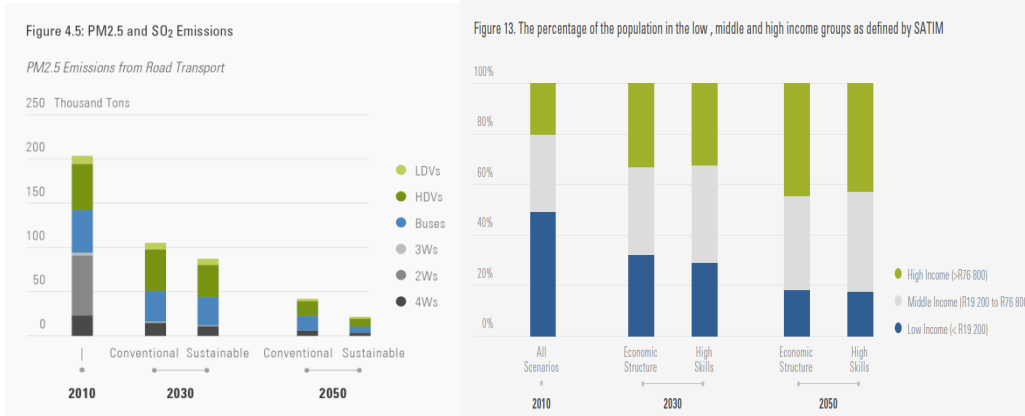
3. Decarbonization of Supply  
(from primary to final energy)

# Leading to country specific, alternative options



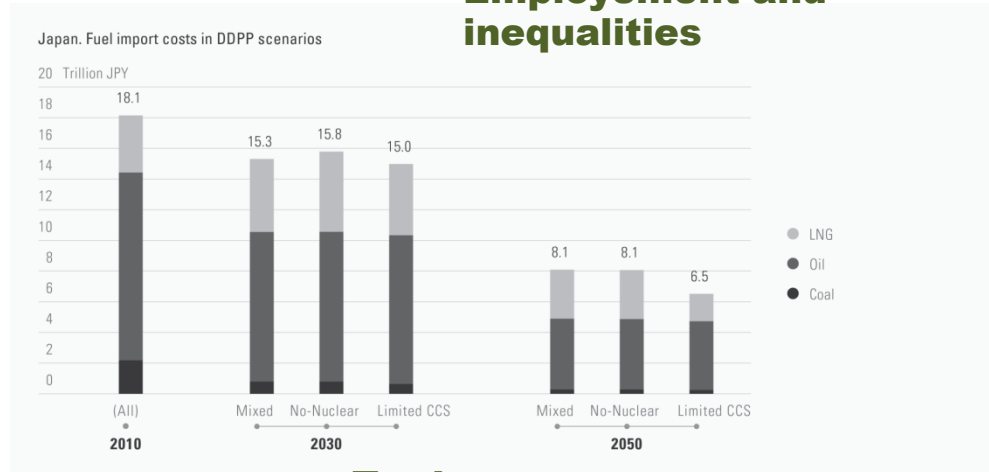
Waisman, DDPP/Iddri

# 16 socio economic context / expectations

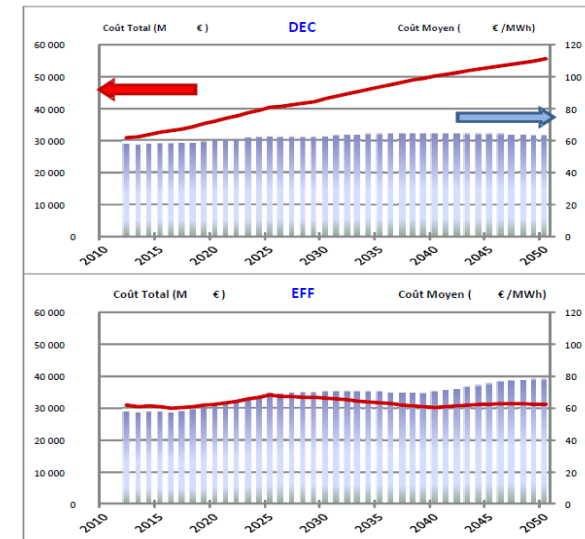


## Air pollution

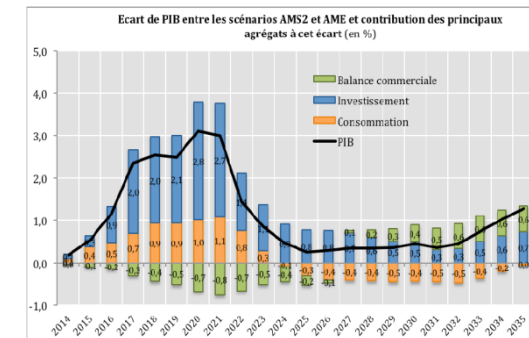
## Employment and inequalities



## DDPP participants



## Energy bill



## Growth and job creation

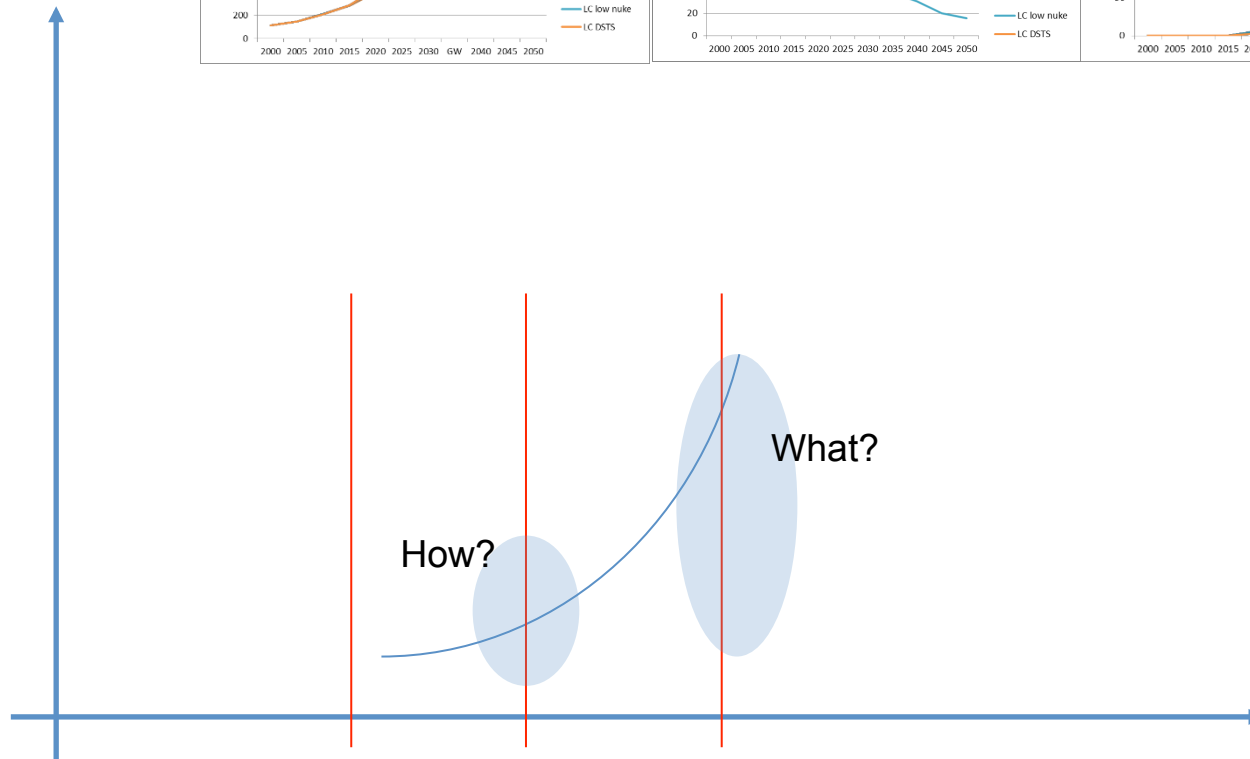
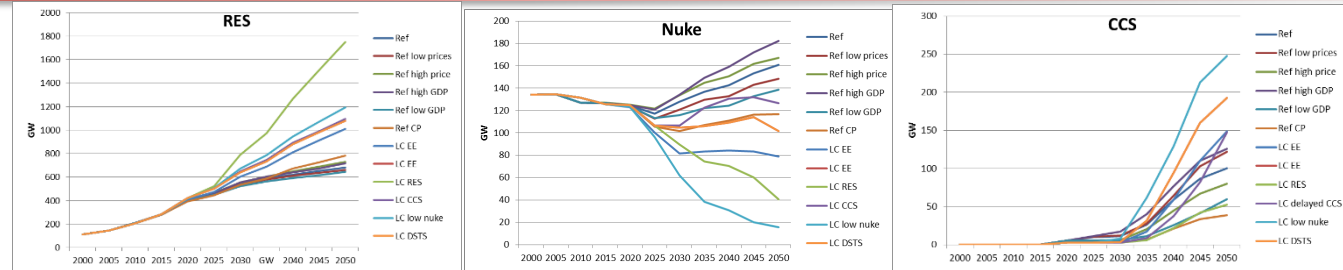
# The DDPP in 2018

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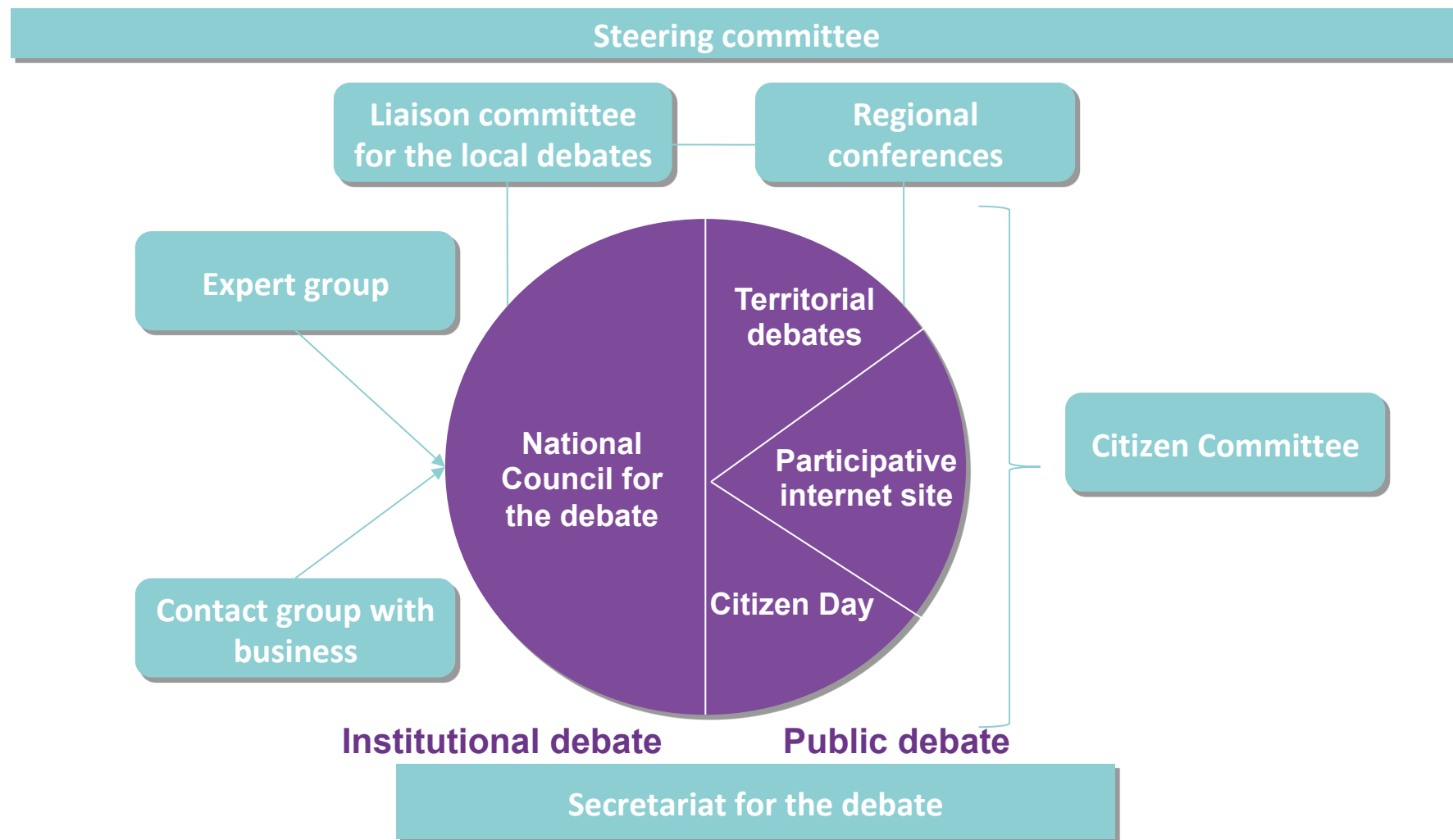
1. Expanding to new countries
2. Going deep, better responding to specific NON ENERGY sectoral challenges
3. Building ambition
4. Providing relevant tools
  - » A guide to public action (roadmap)
  - » A reference for private decision making



# “ Future is less to be discovered than to be invented” - Gaston Berger



# The french energy debate 2012-2013

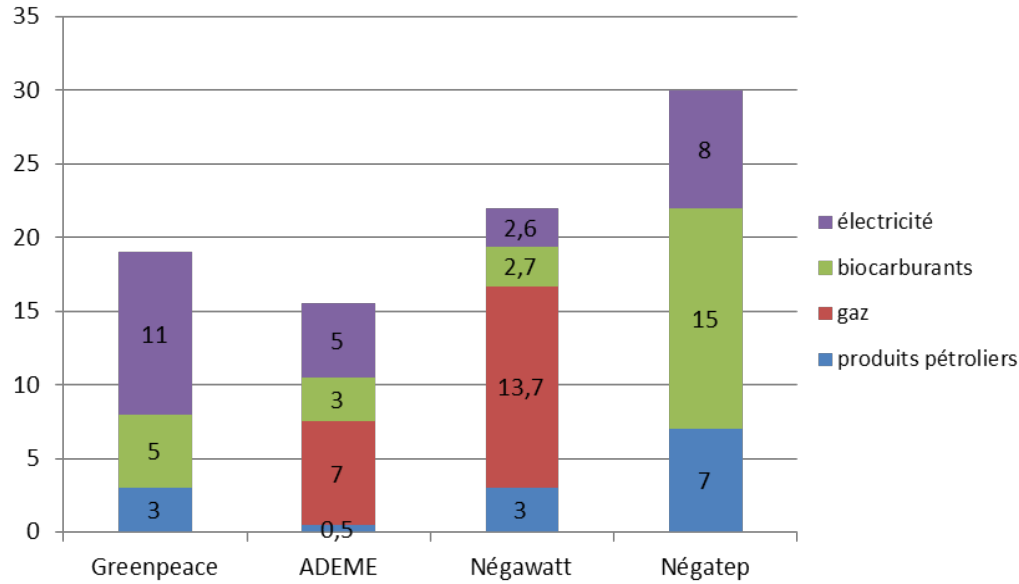


## Conflicting views

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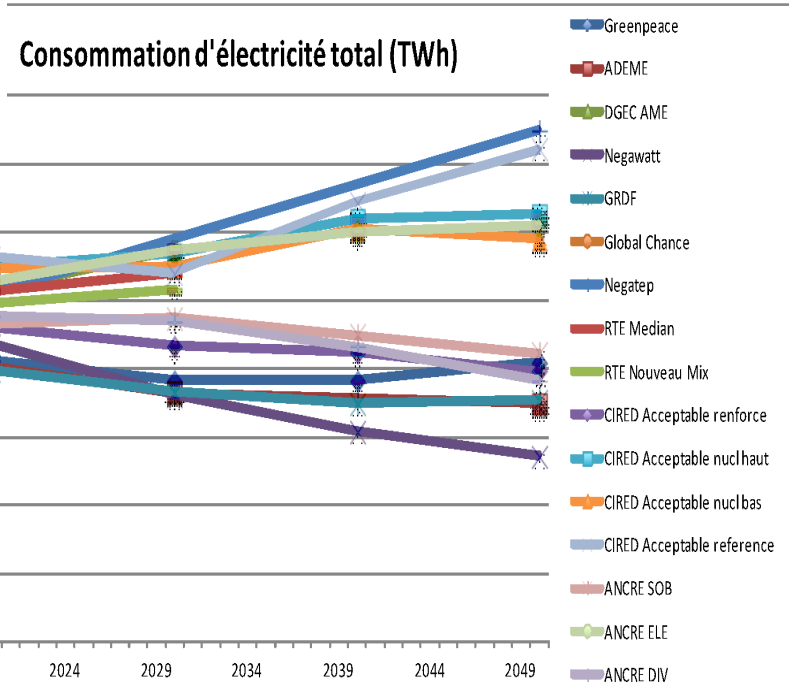
- a) Sufficiency : emerging behaviours or de-growth?
- b) Efficiency : cost efficient or too expansive?
- c) Electricity demand (sharp increase vs shrinking demand)
- d) Role of nuclear
- e) The need for shale gas

# FR diversity of scenarios / stakeholders



← Transport Fuel supply

Power demand →



# 4 Visions for the Energy Transition in France

## Objectives:

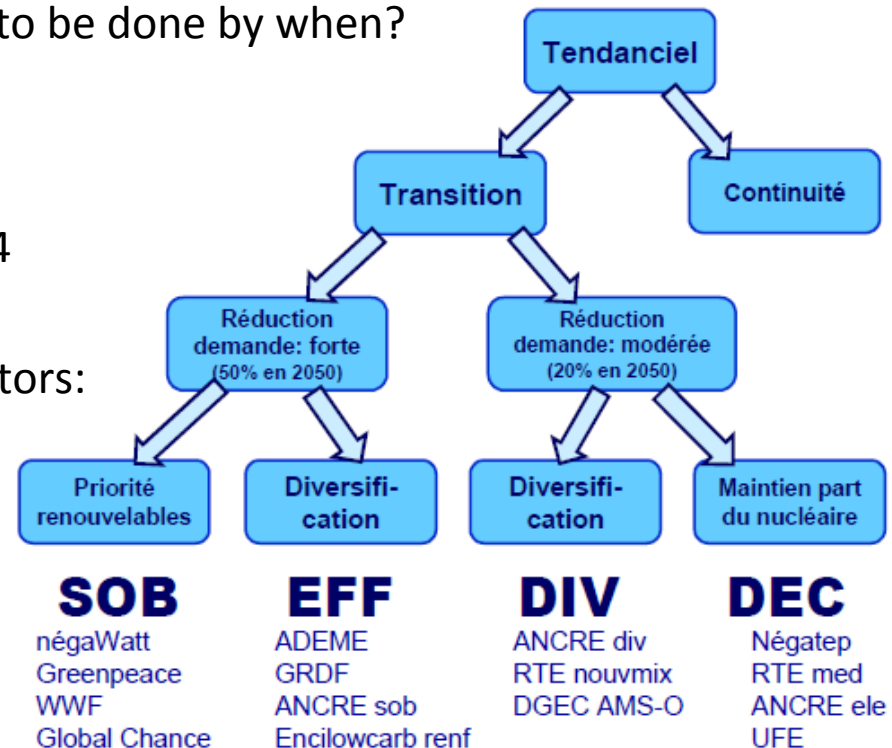
- clarify conditions of feasibility, uncertainties and impacts of different policy options and trajectories
- Dynamic visions and time horizons: what has to be done by when?

## Methodology:

Focus on existing energy scenarios distilled into 4 trajectories

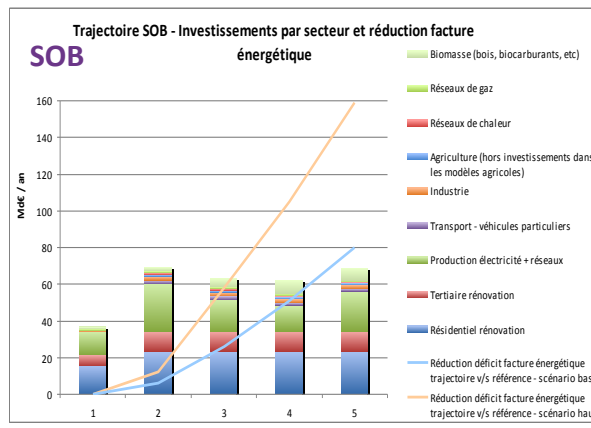
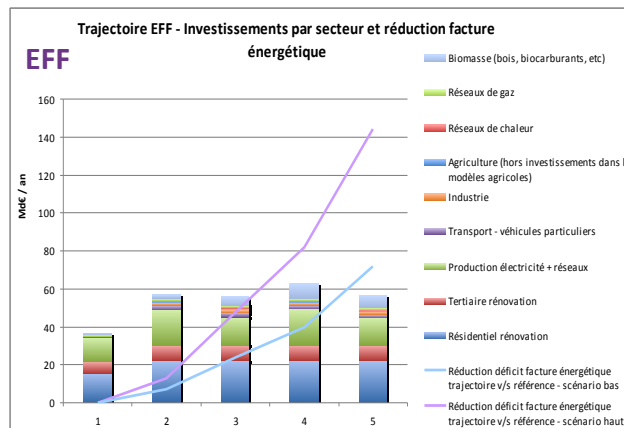
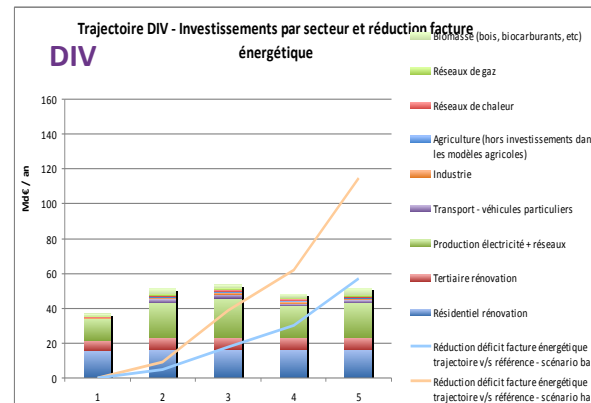
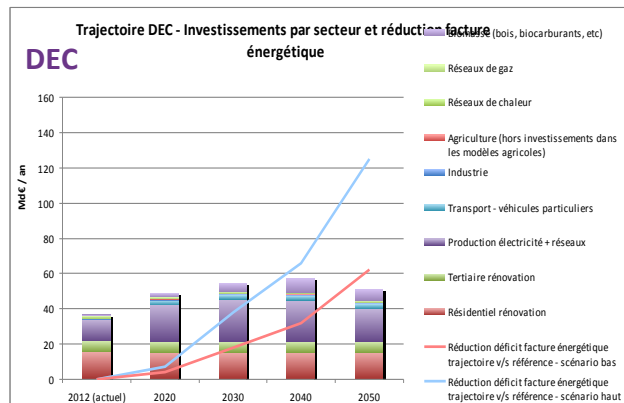
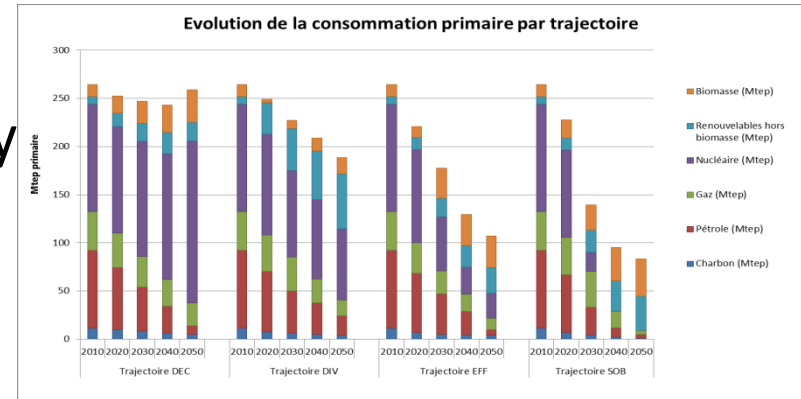
Development of a common template with indicators:

- General vision, modeling tools and method
- Energy supply & demand indicators
- Demographic and economic evolution
- **Socio-economic indicators**



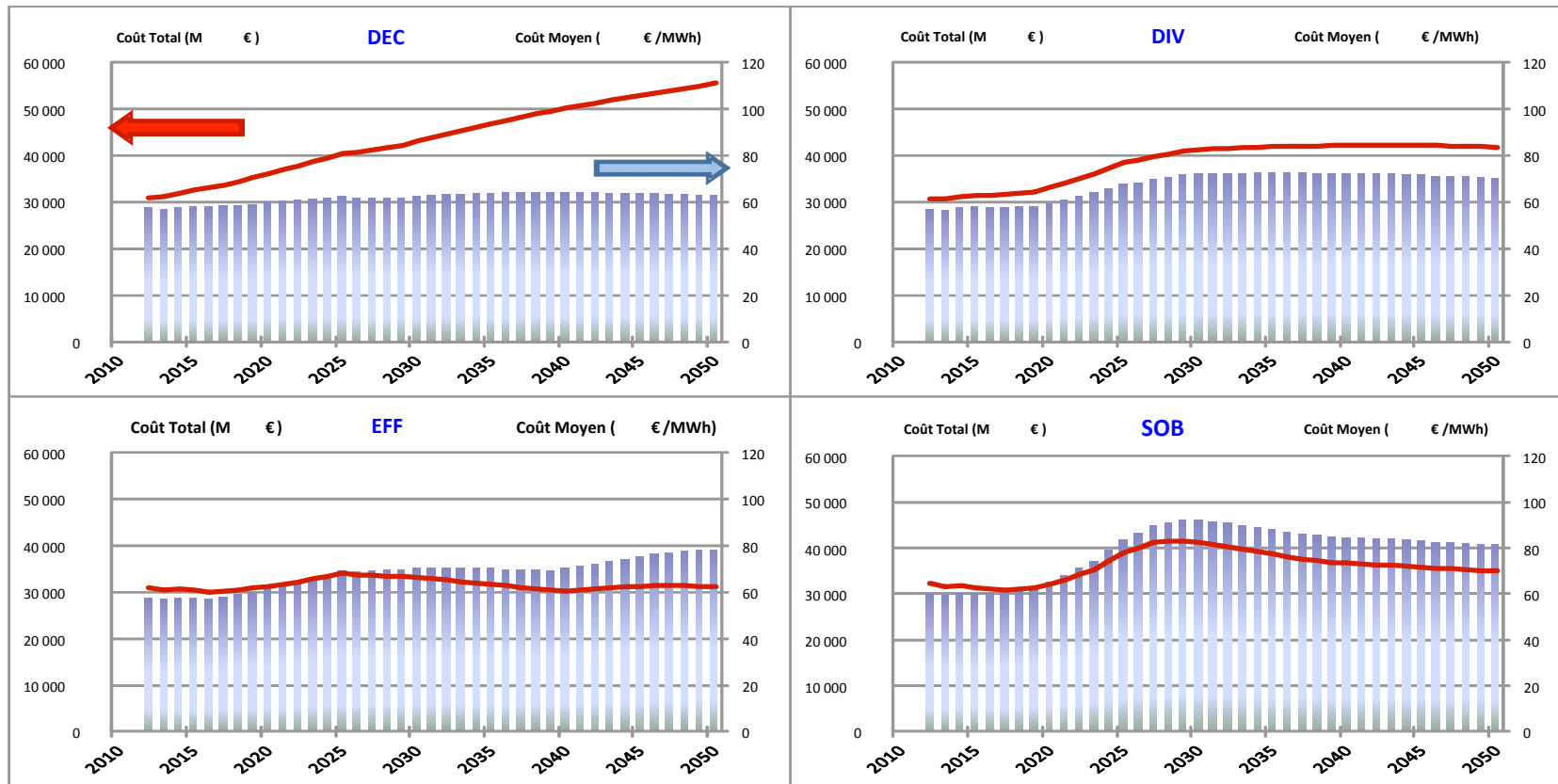
Harmonized impact analysis (GHG, economic impacts)

# Investment needs and change in energy dependency



Recommandations du GT financement au Conseil national du débat – 23 mai 2013

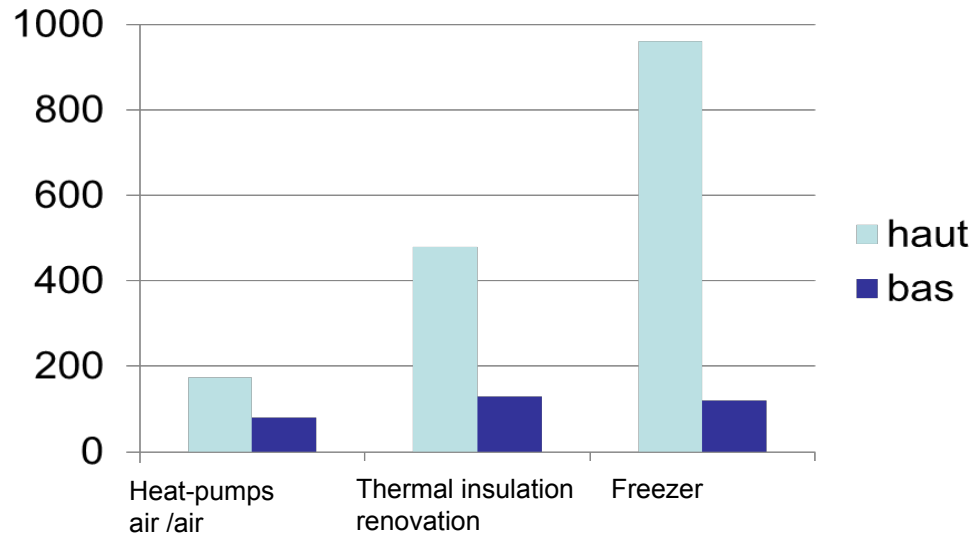
# Electricity price versus cost of the power system



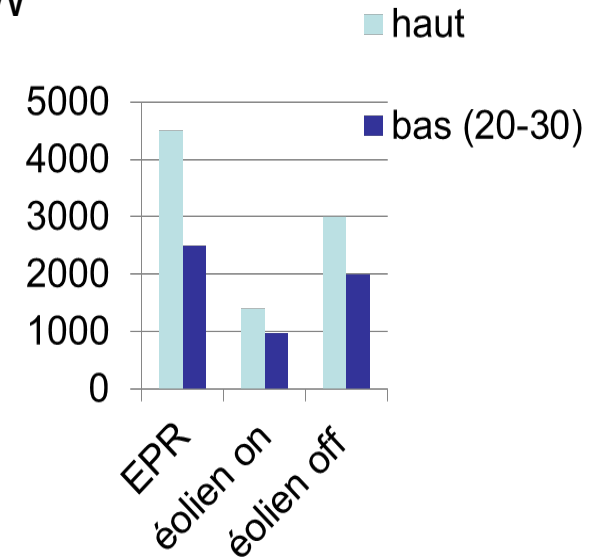
Source ELECsim

# Interests, uncertainties, controversies

€/MWh cumac



€/MW

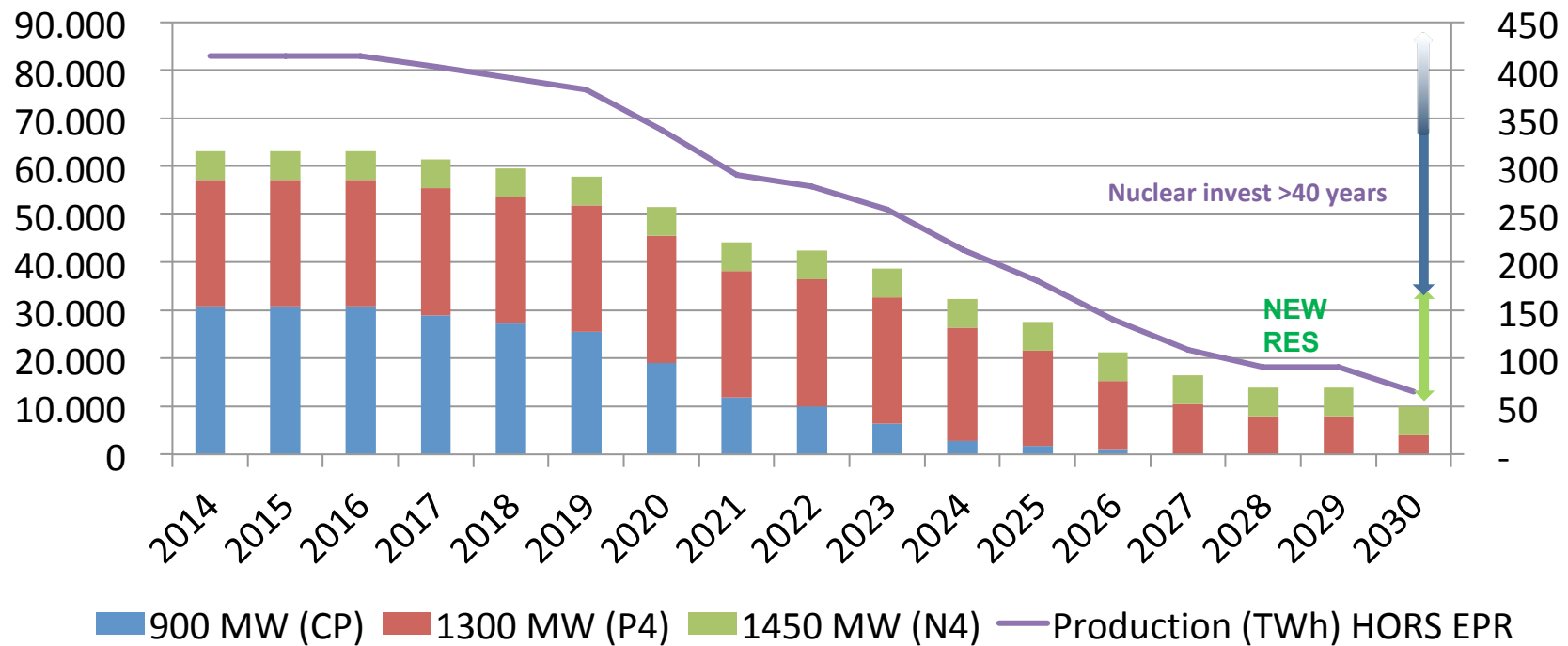


- Comes from :
  - Different hypothesis on learning effects
  - Methodology : marginal/total costs
- Methodological differences correspond to alternative public policy designs
- Yet uncertainty on policy impact!



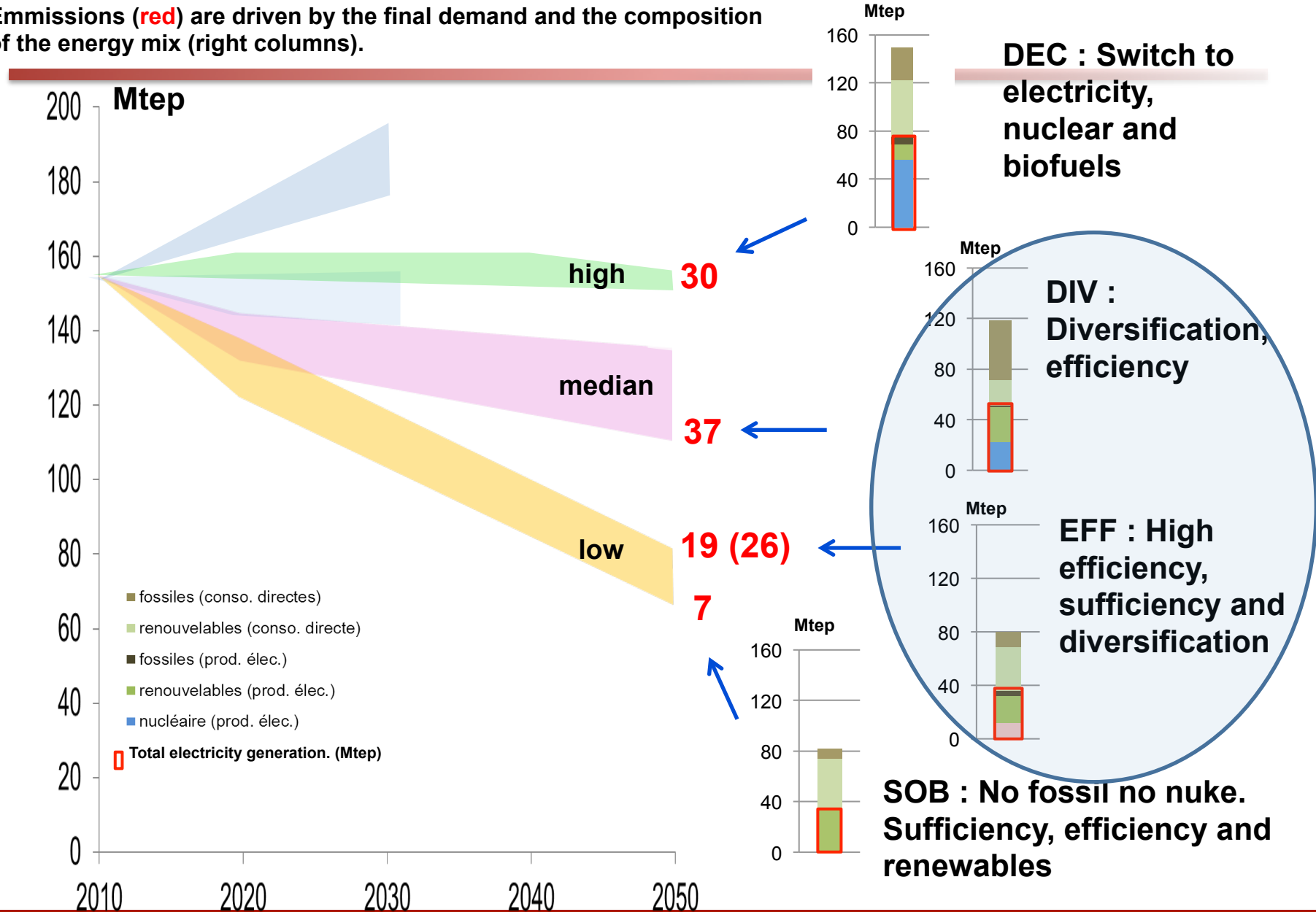
# Power generation from existing NPP before their 4th decadal inspection (40 years)

- 1) A 40% renewable objective by 2030
- 2) A stable electricity demand (ambitious electrification in industry, buildings and electric vehicles, but also energy efficiency / new technologies)
- 3) Need for an investment strategy in the nuclear fleet to expand lifetime
- 4) Adjustment : exports?



# 2050 pathways for France Base year 1990 (Index 100)

Emmissions (red) are driven by the final demand and the composition of the energy mix (right columns).



# Convergence, controversies, uncertainty

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## 1. Controversies

- a) Sufficiency / emerging behaviours
- b) Electricity demand (increase versus stable)
- c) Role of nuclear/strategy (reduced capacity?)
- d) The need for shale gas

## 2. Progressive convergence on key pillars of the transition

- a) Increasing overall efficiency (industry, building transport)
- b) Changing the structure of final energy (energy carriers)
- c) An increasing role for renewables, no energy CCS (but industrial CCS)
- d) The need for a diversified policy approach (price, regulation, incentives, etc)

## 3. Uncertainties, unsolved controversies : The need for a dynamic approach: periodic revision of medium term objectives, based on learning process (monitoring/evaluation)

- a) Conflicting interests
- b) Boundary conditions (international prices, technologies...)
- c) Successes / failure of policies

# Energy Transition Law and implementation

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1. **Energy Transition Law** (July 2015)
  - a) Long term and medium term objectives on emissions, total energy consumption, respective shares of renewables, fossil and nuclear
  - b) A set of sectoral framework and institution
  
2. **National « Low Carbon » Strategy** (sept 2015)
  - a) 15 year horizon, revised every 5 year
  - b) Global Carbon budget, indicative sector /gas allocation
  - c) Sectoral strategies (industry, buildings, transport, agriculture)
  
3. **Pluriannual Energy Plan** (currently under public consultation, tbp nov 2016)
  - a) 5+5 year horizon, revised every 5 year
  - b) Quantitative Energy sectoral/technology objectives
  - c) Government mandatory framework, alignment of private decision making

# Economic analysis of the transition

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Elements for the debate

If you have further questions : [michel.colombier@iddri.org](mailto:michel.colombier@iddri.org)

# The 3 pillars of the energy transition (-75% of GHG by 2050)

## Energy efficiency :

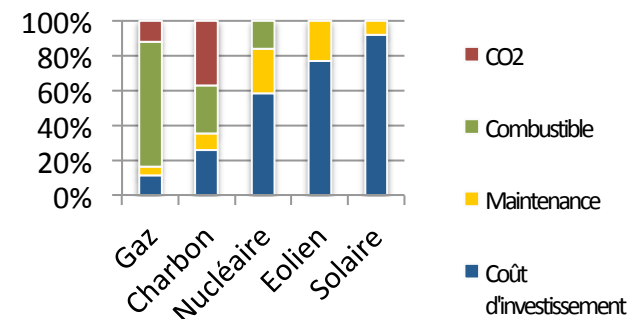
- Additional investment on end use equipments
- A strong reduction of the final demand of energy (-50% by 2050)

## Switch towards decarbonised energy carriers :

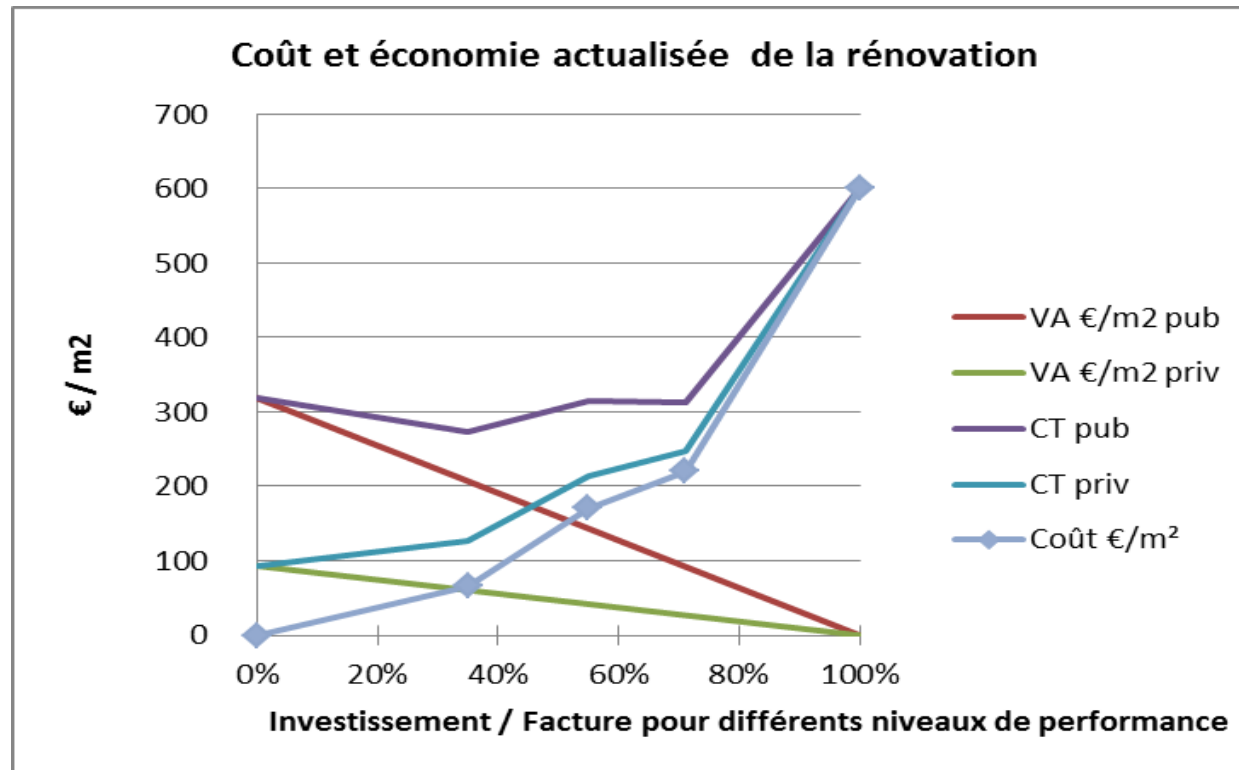
- Additional investment in transport and distribution infrastructures
- Increased share of electricity (from 24% to 40-45% of final demand), heat and decarbonised gas and fuels
- Energy security, “smart” demand side management, better integration of variable renewable energy sources => improved economic efficiency of the energy system

## Development of decarbonised supply:

- From OPEX to CAPEX, a mix of additional investment and substitution to BAU investment
- A strong reduction of fossil fuel consumption (and imports) : -30% by 2030



## Providing appropriate finance solutions is key to harvest the macro economic effects



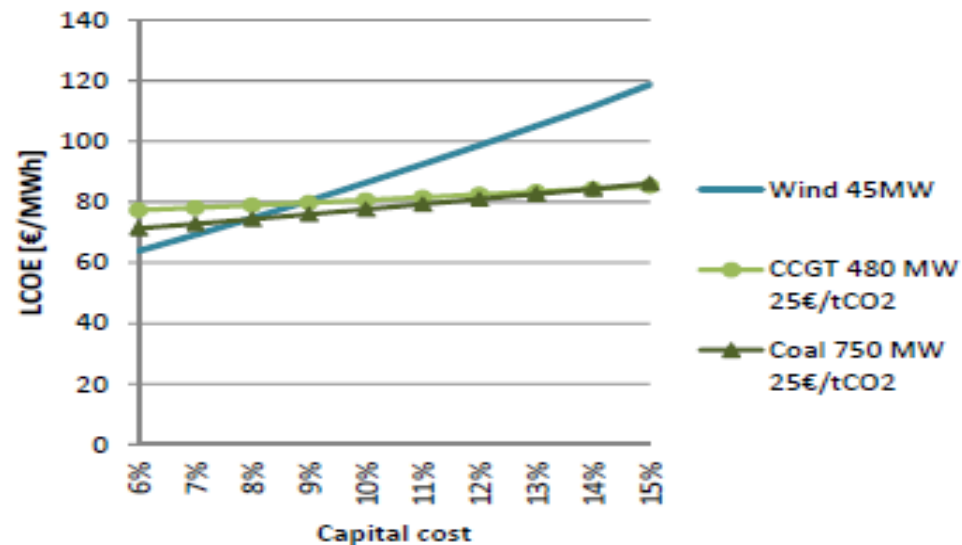
With short term, « consumption type » loans, energy savings will never pay back EE investment

With long term, « real estate type » loans, up to 75% savings are economically viable

# Actual investment cost also depends on the regulatory environment

When the transition from « feed in tariffs » to a more market-oriented Renewable Support Scheme was announced, capital cost immediatly increased by 1 to 2 points

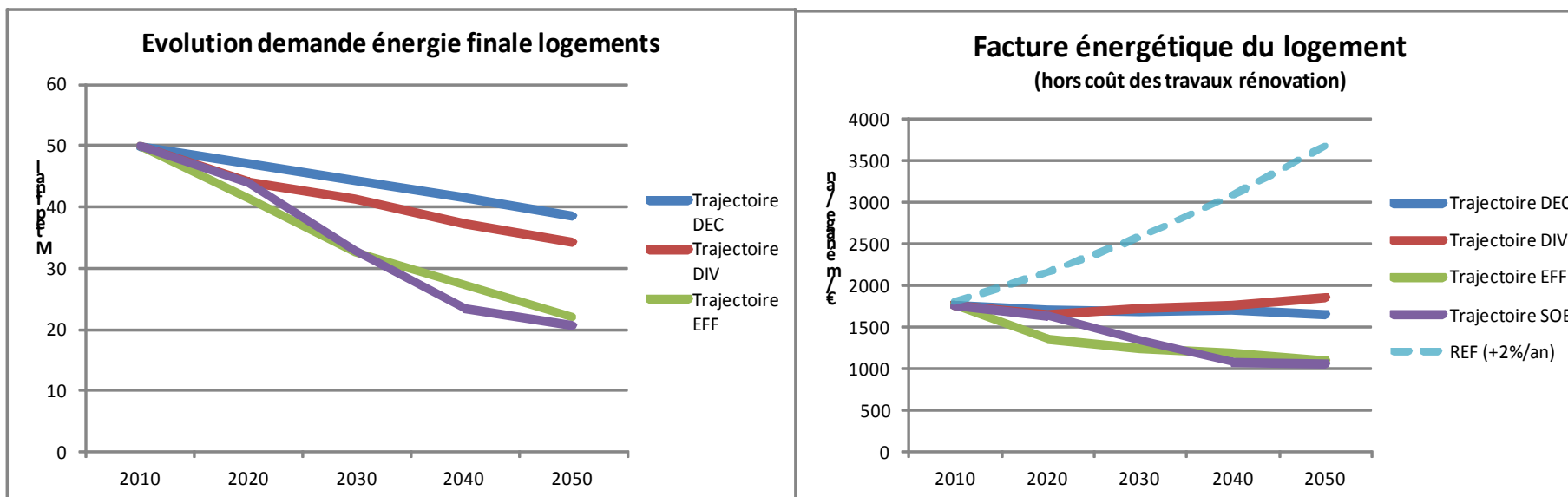
Figure 5. Levelised cost of wind vs CCGT and hard coal under different capital cost assumptions



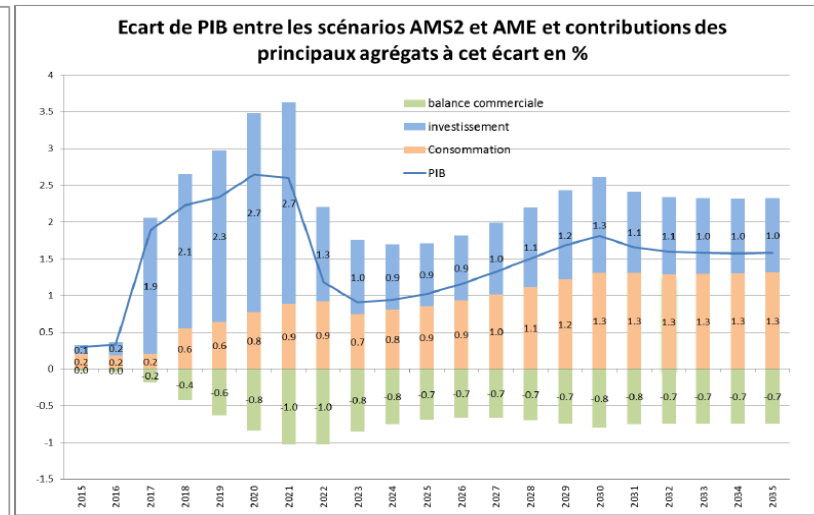
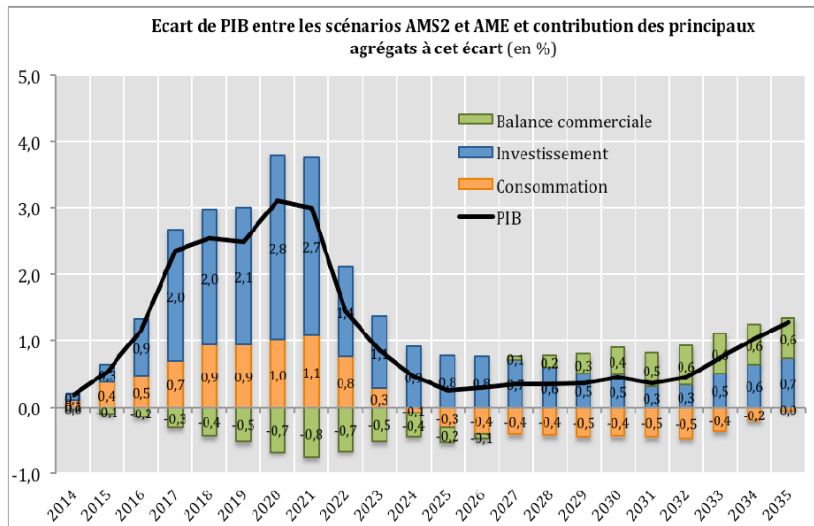
- Need to rapidly respond to investor's concern with clear perspectives in the new market design, to avoid long term impact on RES cost.



# Impact on domestic energy bill



# Macro economic impact of the transition



The Energy transition provides short term, but also long term, sustainable benefits on growth and employment – but under different conditions (see next slide)

- + 3 to 4 % GDP on the short term, + 1 to 1.5% on the long run
- + 100 000 to 300 000 net jobs

# **Mechanisms (and unabling conditions) matters (not figures)**

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- 1. Short term macro-economic benefits mostly come from the investment dynamic (and the creation of debt)**
- 2. Long term positive impacts on growth and employment depend on the level of consumption (and therefore on the respective levels of debt service and energy bill reduction) and trade (depending on consumption but also on labour productivity)**
- 3. Economic and regulatoy environment will play a key role in the success of the transition**

# Beyond aggregated results, the challenges of the transition

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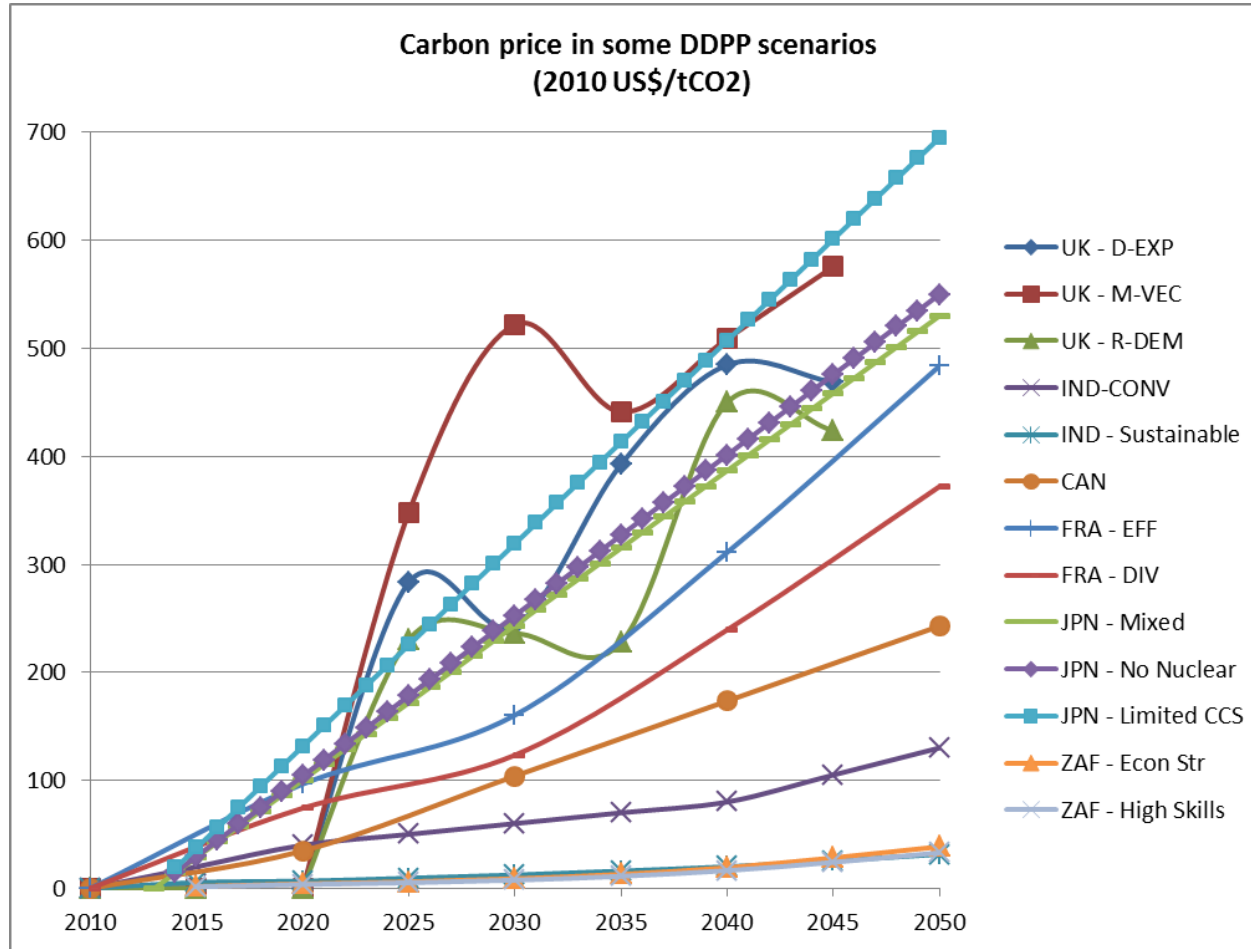
- 1. Behind the reorganisation of the Energy Systems and the adoption of new technologies**, a reorganisation of the economic structures with new functions and new agents (independent producers, system developers, service providers)
  - **Need to give clear perspectives to the private sector (this is also the role of the National Low Carbon Strategy, and the Pluriannual Energy Planning procedures)**
  - **Need to revisit regulations and rules, market structures, and to provide economic space and opportunities for innovative outsiders**
- 2. The transition can harm the incumbent energy industry**, but they are also well positioned, if strategic, to adapt their business model and play a key role in the new energy system
- 3. A net, positive impact on employment?** Yes, but jobs will be destroyed, with social and regional consequences in the absence of proper policy intervention. At the same time, the transition requires new qualification in all sectors (industry, building, services)
  - **Need for capacity development, training, support policies**

# Beyond aggregated results, the challenges of the transition

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- 1. At State/EU Level, much can be done to drive the transition (framework legislation, sectoral regulations, fiscal reform, etc. but most of the transition potentials can be harvested at local level by local authorities (LA), who need specific incentives, tools and support**
  - **LA in charge of local planning (urban development, transport) and infrastructures**
  - **LA better positioned to identify opportunities, mobilize decentralized economic agents**
- 2. A positive impact on consumers (and SMEs and services) energy bills? Yes, families facing energy poverty, and fragile firms may not be able to seize the investment opportunities and may be negatively impacted by the evolution of energy prices, in the absence of focussed policies**
  - **Need for specific, tailored accompaniment of the most vulnerables (rebates, compensations, support for EE investment)**
  - **Finance solutions are more effective than subsidies (and less expensive for the public budget!)**

# Carbon prices in Deep Decarb. Pathways



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SciencesPo.

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