

The Nuclear Option Against Climate Change

Associated Risks, Limitations and Barrier to Alternatives

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Presentation of the report:

L'option nucléaire contre le changement climatique
Risques associés, limites et frein aux alternatives

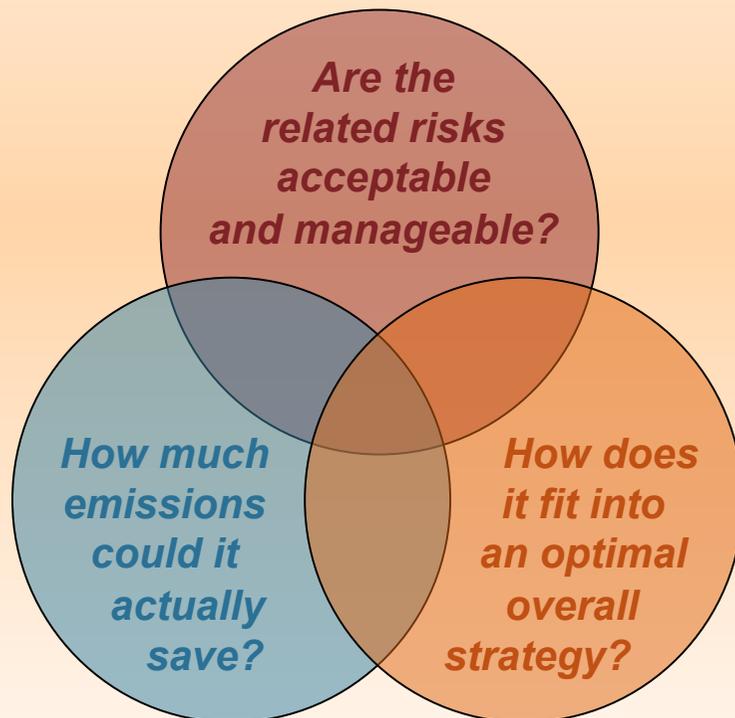
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Objectives and contents

*In front of the climate urgency,
an overall view
of nuclear power
as an option to reduce
greenhouse gas emissions*



Three related areas of analysis

Risks

Specific related risks

- Nuclear proliferation
 - Safety and security
 - Radioactive waste
-

Efficiency

Limits of production substitution

- Emissions content
 - “Avoided” emissions
 - Range of action on emissions
-

Consistency

Nuclear and alternatives

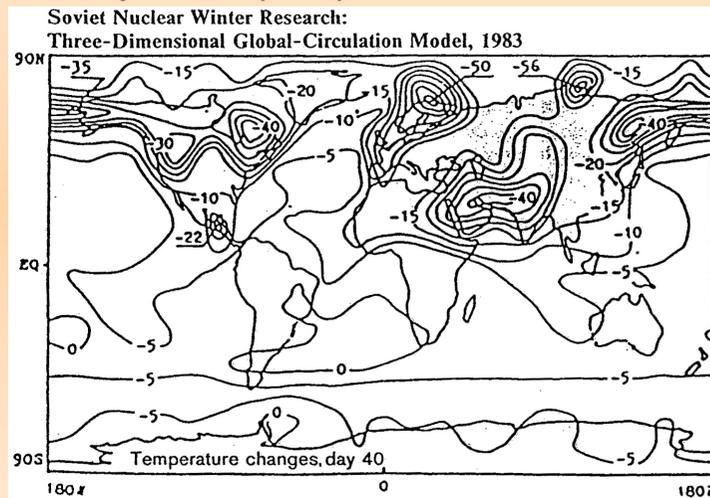
- Potential of action
 - Comparison with other options
 - Role in energy transition
-

- The use of nuclear power leads to specific risks

→ Nuclear proliferation:

- easiness of civilian/military transfer
- nuclear winter scenario

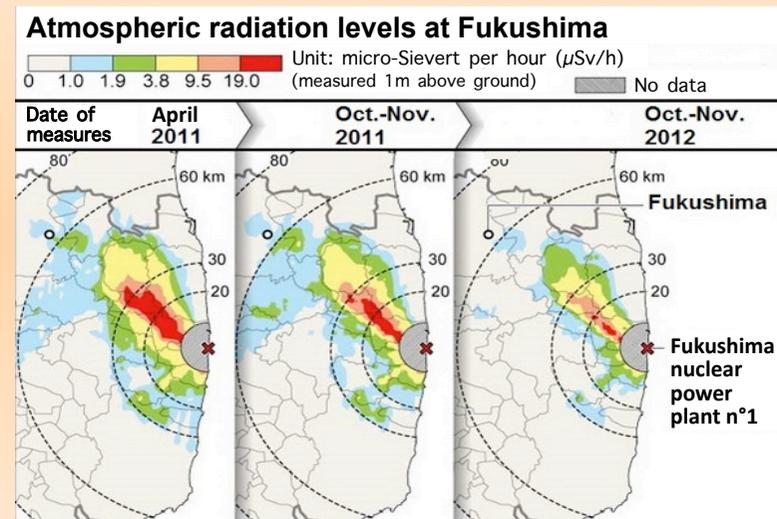
Impact on temperatures on Earth surface after explosions (in °C)



Source: Unclassified Soviet research, 1984

→ Major accident:

- frequency > 100 more than theory
- deastrous consequences
- aggravation factors at play



Source: based on Japanese Ministry of Sciences, 2013

→ Radwaste, discharges, contaminations: accumulation partly without solution

- These risks have grown with the development of nuclear power until now
- They are bound to increase in case of further development

- No direct CO₂ emissions, but non negligible “life cycle” emissions
- Emissions “avoided” by nuclear power depend on what it “replaces”
 - ➔ a conservative calculation (proportionate to the electric mix of the time)

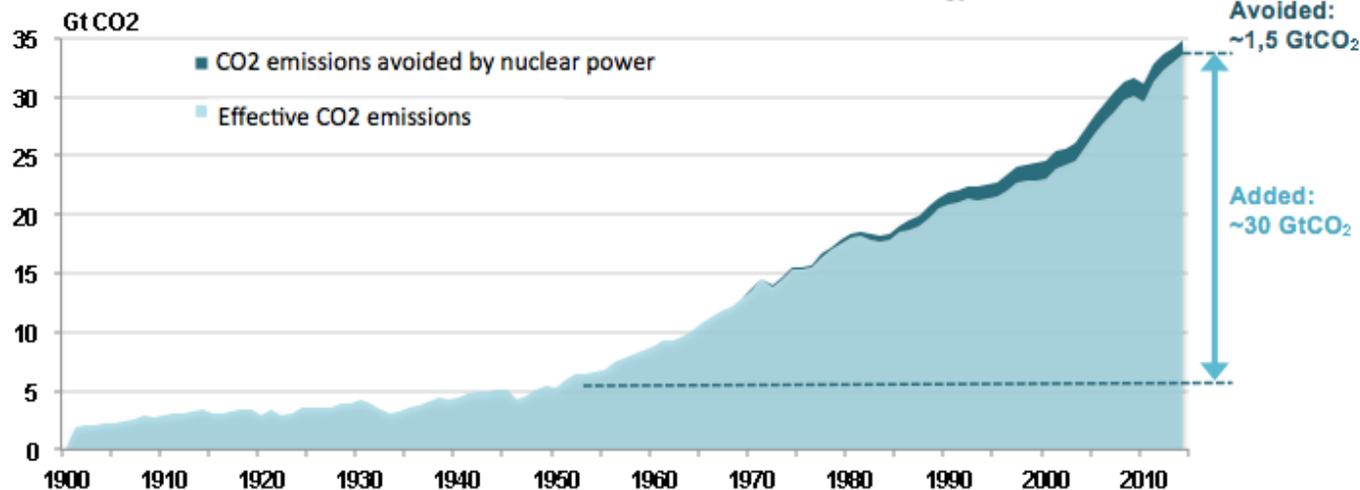
Historical balance of the contribution of nuclear power:

- a marginal impact, limited to a few percents
- an increase of emissions by 20 times more than “avoided” ones
- a component of the past system rather than an alternative

Nuclear power decline:

- nuclear contribution peaked in 2000
- down from 6% to 4%

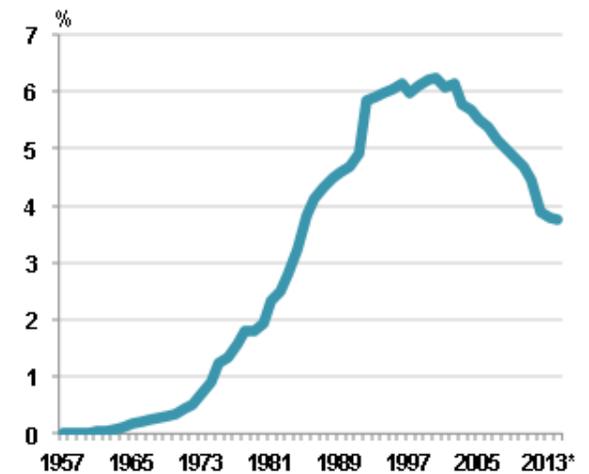
Evolution of world CO₂ emissions related to energy



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Source: based on WRI (CAIT2), JRC (EDGAR), TSP, 2015

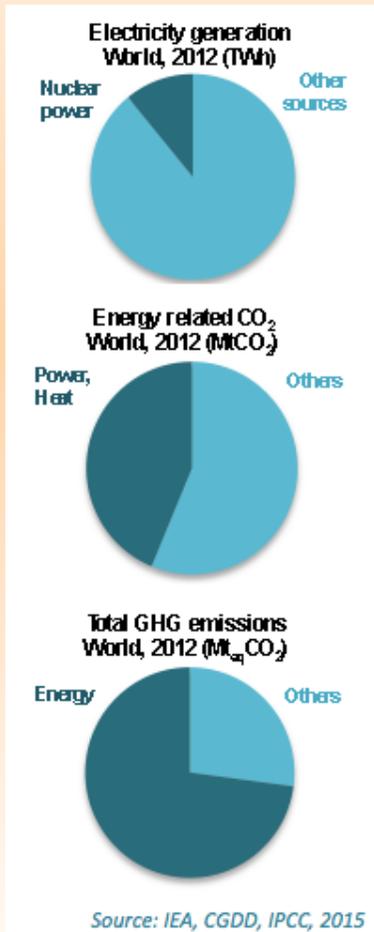
CO₂ emissions “avoided” by nuclear power



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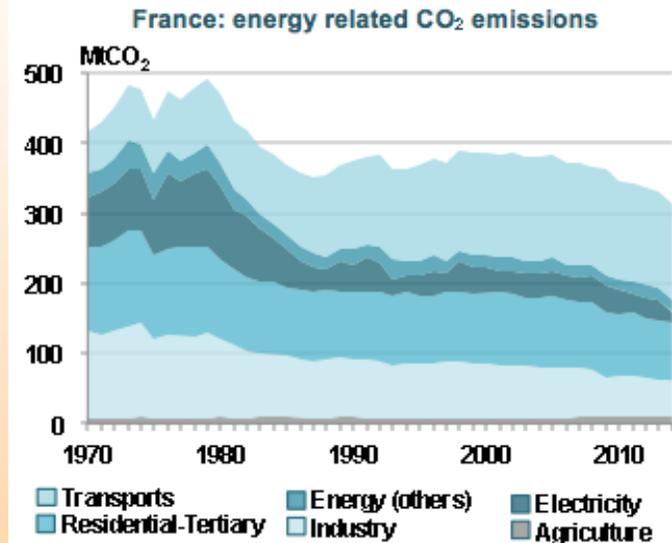
Source: WRI (CAIT2), JRC (EDGAR), TSP, 2015

- A restricted range of action: electricity related CO₂ emissions
- An action structurally insufficient

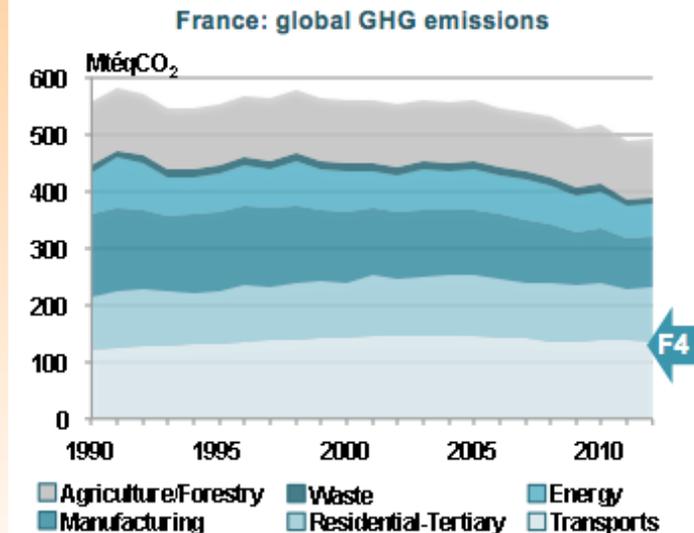


France as an example:

- Nuclear raised to its maximum (close to 80% of electricity)
- An introduction leading to 15% at most decrease of emissions (30% together with action on demand, period 1973-1980s)
- No further impact while total GHG emissions remain 4 times above a sustainable level

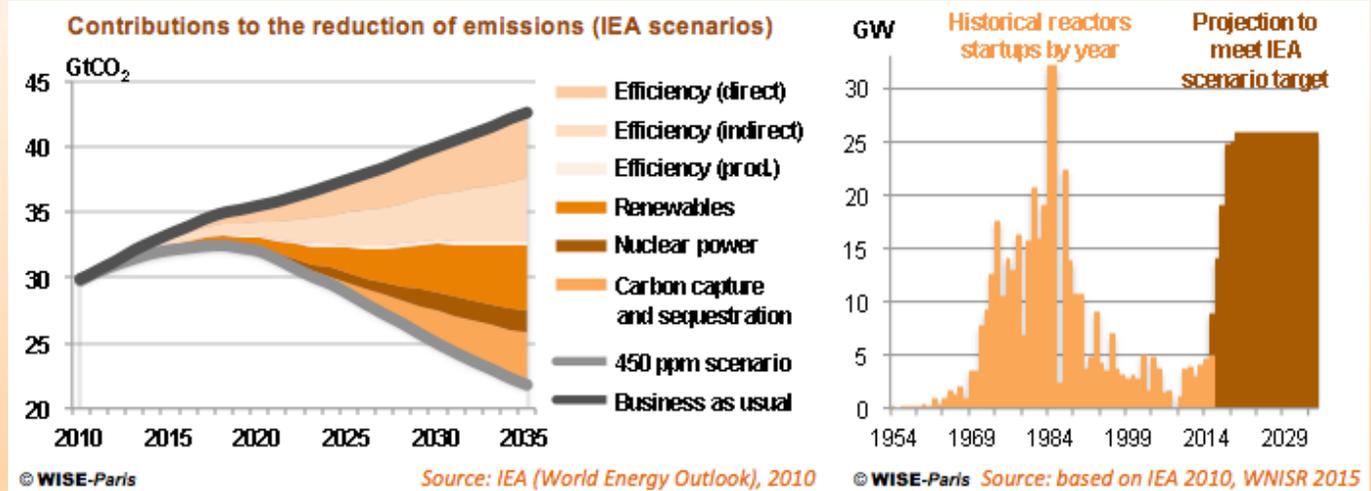


Source: CGDD, 2015

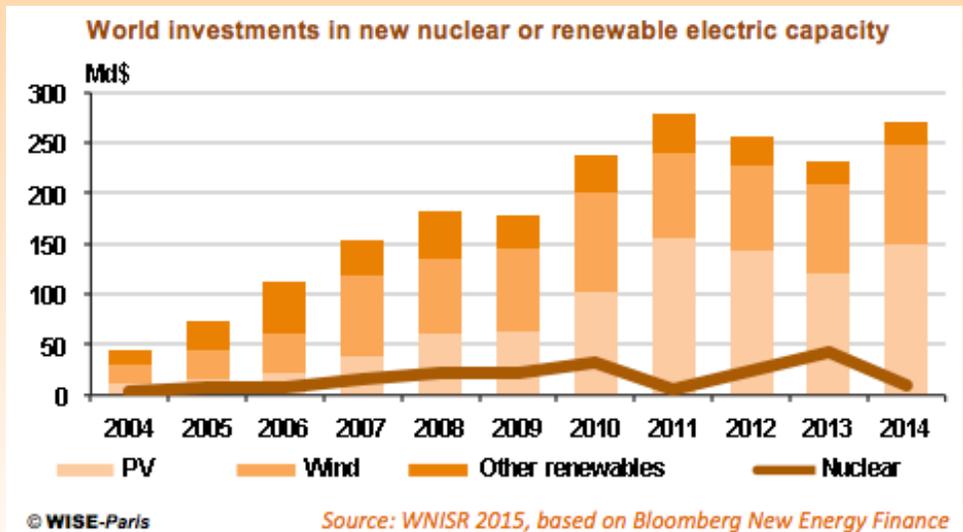


Source: CITEPA, 2015

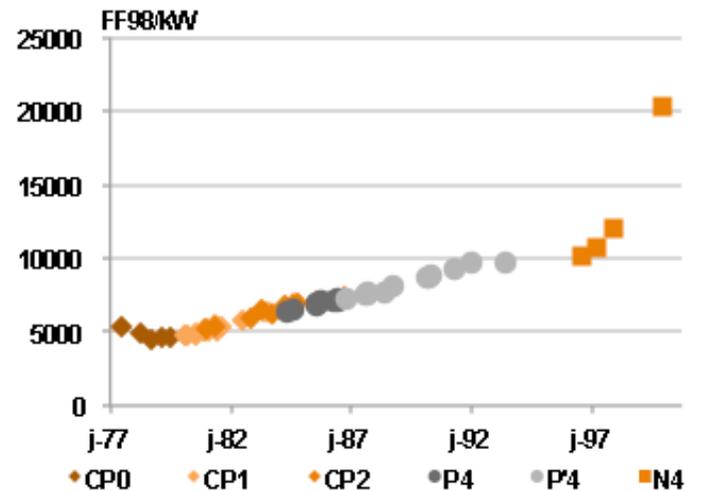
- The prospect of a major action on emissions is out of reach for nuclear power
- A minor role in voluntarist scenarios... (less than 10% of overall reductions) would require a major effort, highly unrealistic



- A respective confidence in nuclear power and renewables that is opposite their real dynamics
- Renewables / nuclear (world) :
 - 5 times more installed capacity
 - twice more electricity generated
 - 10 times more investments



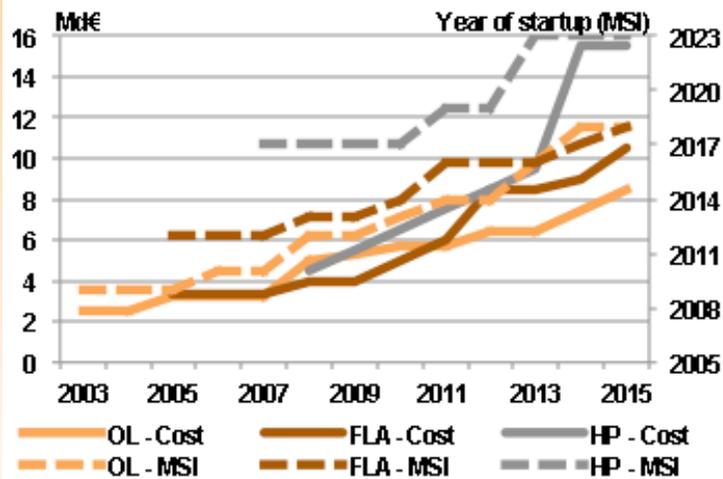
Construction cost of French nuclear reactors (per unit)



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Source: IIASA, 2007

EPR rising costs and delays (France, Finland, UK)

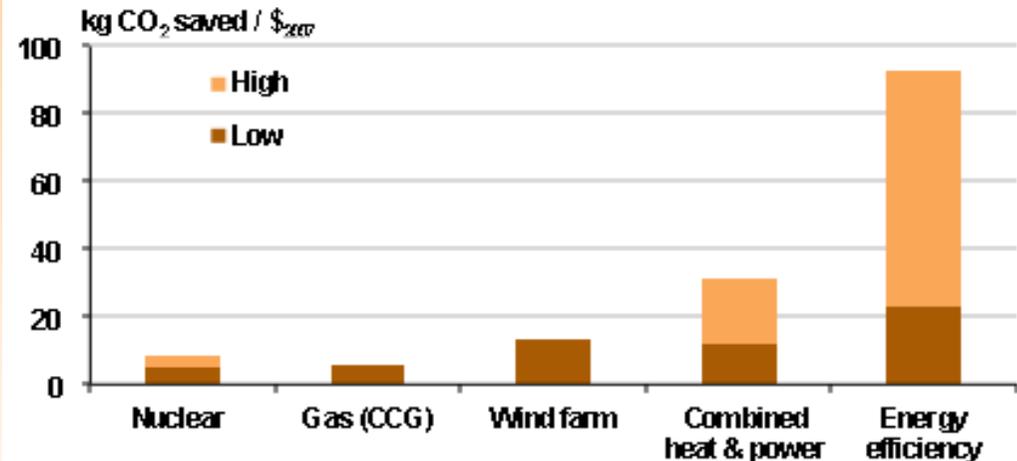


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Source: based on EDF, Areva, TVO*, 2005-2015

- Nuclear power: constantly growing costs
- New reactors: escalating costs and delays
- An option that is less and less competitive compared to renewables and efficiency
- New reactors projects always substitute to existing faster, cheaper and more effective options

CO₂ emissions saved by invested dollar



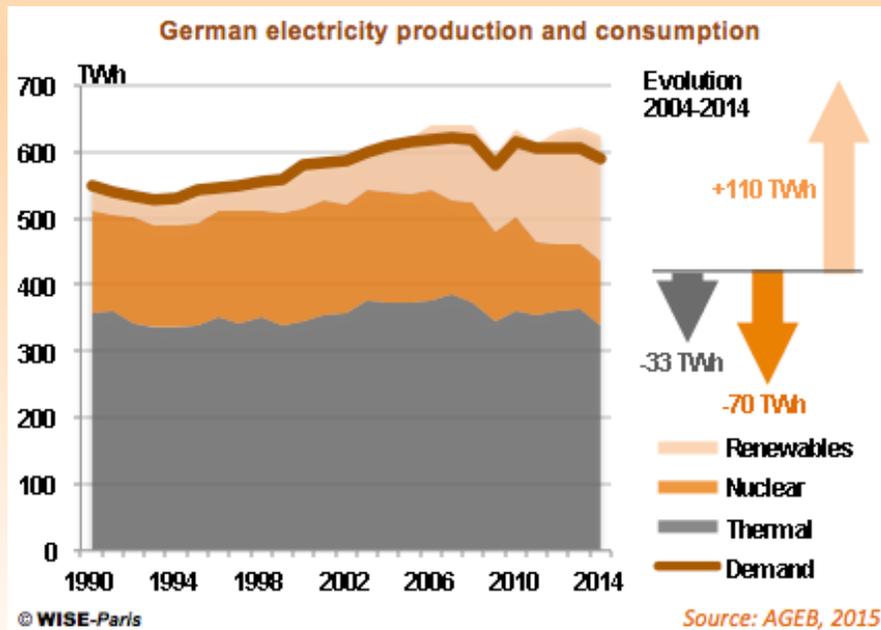
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Source: based on RMI, 2010

- Existing nuclear power in the process of energy transition

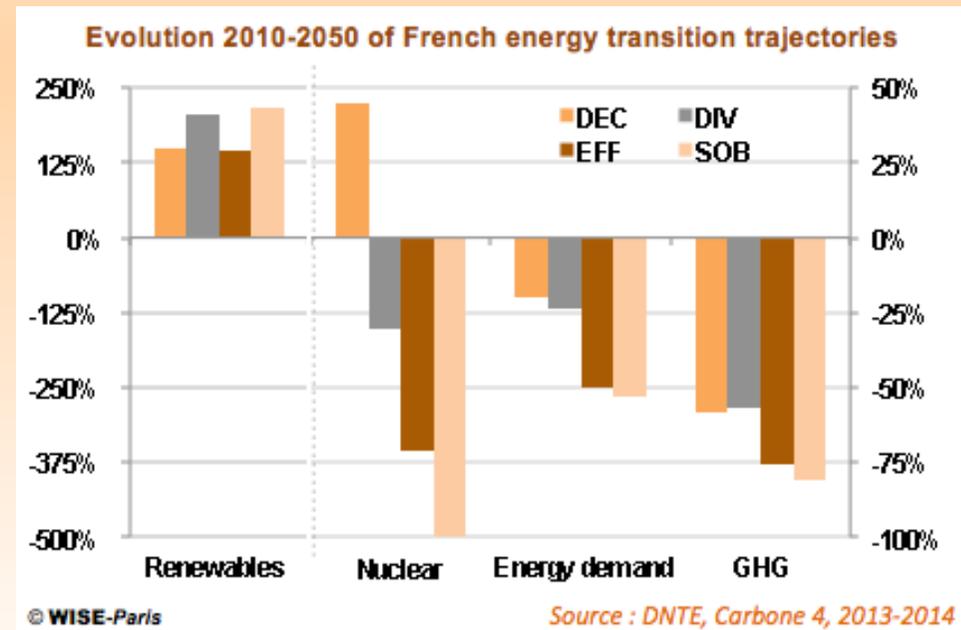
The case of Germany

- A consistent trajectory of overall GHG reduction
- A strong action delivering on renewables and electricity conservation



The case of France

- Scenarios “factor 4” (long term strategies)
- Reaching required 4-fold reduction of GHG requires strong action on demand and goes with reducing the role of nuclear power
- 100 % renewables in electricity is feasible
- This energy transition is an opportunity



Conclusions

Risks The specific risks attached to this energy have grown with the use of nuclear power. Whatever everyone's assessment of their seriousness is, these risks would certainly further increase if nuclear power is further developed and its use expands to more countries.

Efficiency Emissions “avoided” by substituting nuclear power to other energy productions have been marginal, unable to prevent the strong growth of overall emissions, and declining due to the development of other options. Limited by nature in its range of action, nuclear power could not, even raised to its maximum output, bring emissions down close to a sustainable level.

Consistency Given the urgency, the need is not to add all the options but select the most effective ones and combine them in the most consistent way. Nuclear power could only pretend to a minor role, complementary to the options that are mostly needed: action on energy demand and renewables. It turns out that new nuclear projects are always more expensive, slower to deliver and less efficient than further effort in those directions. Moreover, by slowing in-depth energy transition, existing nuclear reactors also appear as an obstacle to the the development of up-to-scale and fast enough climate change policies.

Thanks for your attention

More information :

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