

# Nuclear Power as a Solution to the Climate Problem?

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## Climate change - a lifeline for nuclear power?

- **Nuclear industry is on the decline** and « **Nuclear renaissance** » so far is a **bluff**
- **Still have time to organise for survival** because of long life cycle of its plants
- **For this, Climate Change comes as the obvious lifeline**
- **Nuclear industry thus pictures itself as « the alternative »** with some success towards policy makers and even some ecologists
- **Opponents mostly point the lack of legitimacy of the proposal** given the well-known specific risks of this industry
- **Broader analysis of its efficiency or relevance is useful too**

## GHG emissions from nuclear power

- « **A nuclear power plant does not emit CO<sub>2</sub>** »  
its fuel is fossil but not carbon
- **This is arguable...**  
depends on hypothesis for life cycle calculations  
as nuclear power consumes a lot of energy before and after it is used
- **Nuclear power emits much less than fossil fuels**  
and even less than most renewables in some calculations

## Emissions « avoided » by nuclear power

- Impossible to compare the **same system** with or without the use of nuclear power
- For who wants to demonstrate the effectiveness of nuclear option  
**Worst case hypothesis:** 300 geC/kWh (substitution to coal, etc.)
- More realistic view taking the existing mix into account  
**Realistic calculation:** e.g. 150 geC/kWh (average substitution)
- Hypothesis that the same could be obtained with e.g. windpower  
**Optimistic view:** at most a few tens geC/kWh
- Assumption that the equivalent energy could be saved

## Impact in the energy system of a country

- **Exemples provide with results, rather than such calculations**
- **The United-States:** both « champions » of nuclear power (30% of world share) and GHG emissions (about 25%)  
**No sign of an « alternative » there** - but not in the Kyoto Protocol
- **The European Union:** 30% of electricity from nuclear power but not on track to meet its objective under the Kyoto Protocol  
**No correlation** between trend in Member States and their share of nuclear power
- **The extreme of France:** 78% of electricity from nuclear power but will not meet its objective of stabilizing emissions  
**Not matching** long term objective of 4-fold reduction by 2050

## Impact in the energy system at world level

- **Nuclear power today represents the range of 300 MteC avoided**  
Equivalent to results expected from Kyoto
- **It took it 50 years to reach that point**  
(although of course not with the aim to contribute to climate change)
- Meanwhile, **CO2 emissions from fossil fuel consumption**  
have risen about **15 times more** (+ 4.700 MteC)
- **Nuclear power** represents **17%** of world electricity  
**Carbon emissions** from this sector account for **15-20%**  
of all anthropogenic GHG emissions
- Sets the **level « needed »** for nuclear power to solve  
climate change alone to a rough **10-fold increase**

## The real alternatives

- **Nuclear option a practical solution to global warming?**  
**Not consistent** with the gap between actual development of nuclear and levels of reduction to address
- **Other advocated tools are energy efficiency and renewables**  
Clearly have **as much potential** as nuclear today (3% of final energy consumption worldwide)
- The issue: **choose between these options** in a policy that is **a breaking policy in any case**

## Lessons from prospective scenarios

- **World IIASA scenarios cross hypothesis on renewables and nuclear share with hypothesis on energy demand**

Moderate consumptions scenarios generally show emissions levels in 2050 two to three times lower than high consumption scenarios

Scenario with 6-fold increase of nuclear power and renewables and high demand (A3): 15.1 GteC in 2050 (compared to 6.0 in 1990)

Scenario with nuclear stable, development of renewables and low demand (C1): 5.4 GteC in 2050

**Demand side is the key, not nuclear supply**

Scenario with 3.5 nuclear increase, same renewables and low demand (C2): only 2% savings more in cumulated emissions

**Low additional value of nuclear power**

## Is nuclear option legitimate?

- **In the perspective of:**
  - **the problems facing nuclear power today**  
(accident, proliferation, waste, terrorism...)
  - **the « need » for a steadily and massive development**
- **Promises of « sustainable nuclear energy » with Generation IV**
  - **implicitly acknowledges current technology is not**
  - **but it is current technology that would be used**
- **Strong doubts on the capacity to meet Generation IV objectives**  
after 50 years of efforts already
- **Needs more precise and sound answers**

## Is the nuclear option effective

- **Based on a logic of substitution that is intrinsically limited**
  - **in scope and pace:**  
not suitable everywhere (and excluded of flexibility mechanisms),  
not for all energy uses (and not at any level),  
subject to geophysical limitations  
and eventual scarcity of resources
  - **in effect:** it cuts some emissions down but does not reverse  
an overall rising trend
  - **in principle:** as the potential of alternatives increases (technical  
progress, etc.), the effectiveness of nuclear substitution decreases

## Is nuclear option (still) relevant?

- **Not the alternative** but still could represent a contribution limited in time (transition) or to some countries
- Question of the **systemic impact** of nuclear power
- **Experience:** nuclear power has so far everywhere been an obstacle to the development of ambitious demand side policies and renewable programmes  
**Might be a part of the problem rather than of the solution?**
- **Example from the comparison between Germany and France,** e.g. the development of wind power or the renovation of households to reach a standard of 50 kWh/m<sup>2</sup>

## Conclusion

- **Nuclear industry stance as a solution to climate change is driven by an attempt to survive on promises**
- **But nuclear industry:**
  - is not in a legitimate position to guarantee its sustainability
  - has not demonstrated decisive effectiveness in cutting emissions
  - is very likely to maintain or create systemic obstacles to much more legitimate and effective solutions
- **It is somehow used as a « conservative illusion » to resist realistic changes for those who don't want them**
- **From that perspective, it is rather the nuclear problem that appears as an obstacle to the solution to climate change**