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# Nuclear Energy and Climate Change.

**HBS/NIRS/Sierra Club of Canada COP-11 Side Event**

**„Nuclear energy – no solution to climate change“**

**Montreal, 7 December 2005**


## Dr. Felix Chr. Matthes

# The project

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- **Nuclear Issues Paper Series**
  - **Nuclear Power: Myth and Reality. A Political Summary. By G. Rosenkranz (forthcoming)**
  - **Nuclear Reactor Hazards. By A. Froggatt**
  - **The Nuclear Fuel Cycle. By J. Kreusch, W. Neumann, D. Appel, P. Diehl**
  - **Nuclear Energy and Proliferation. By O. Nassauer**
  - **The Economics of Nuclear Power. By S. Thomas**
  - **Nuclear Energy and Climate Change. By F. Ch. Matthes**
- **www.boell.de/nuclear**

# The climate challenge: filling a gap of 25 … 40 Gt $CO_2$ by 2050

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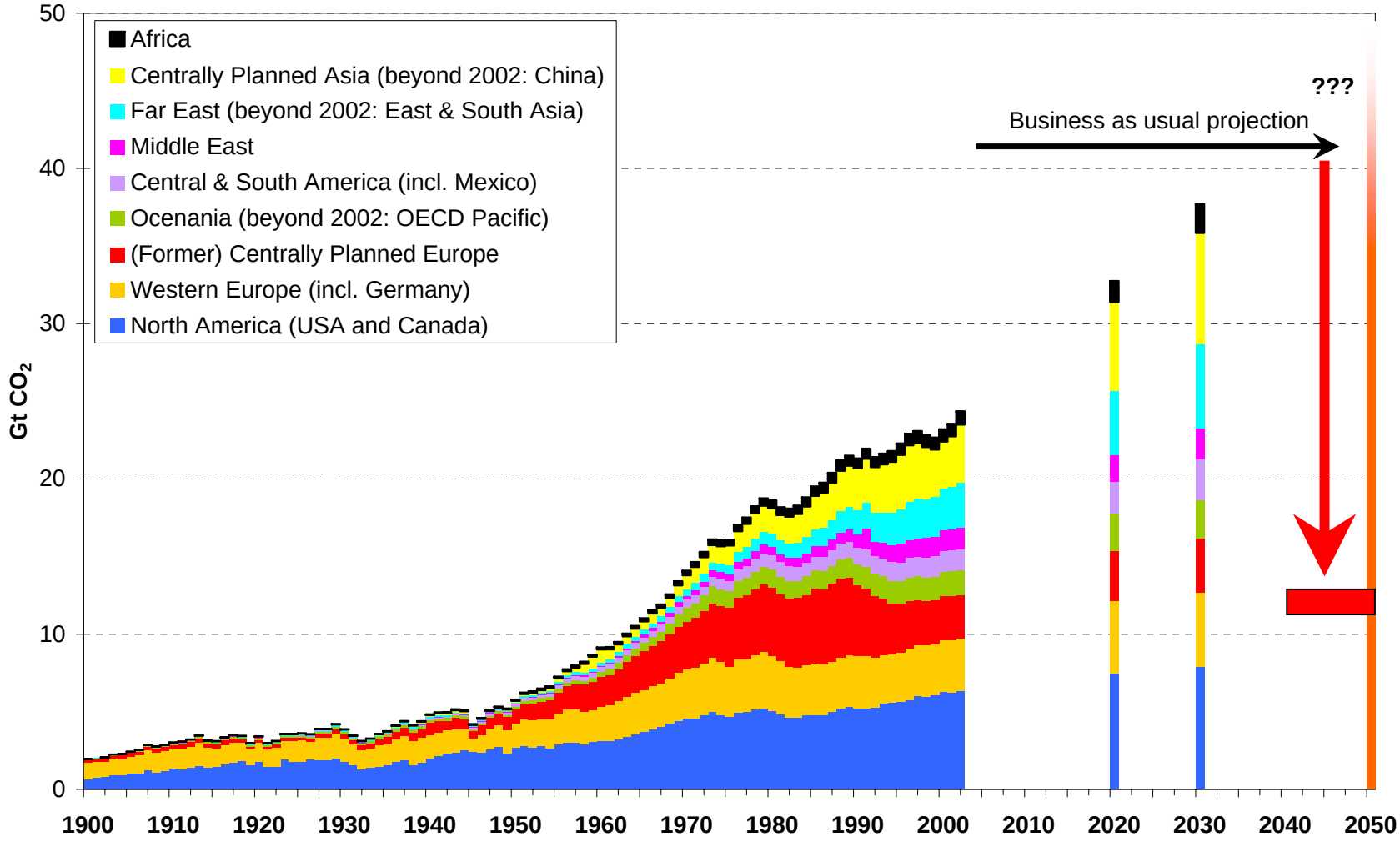


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# The business as usual case
# Electricity generation

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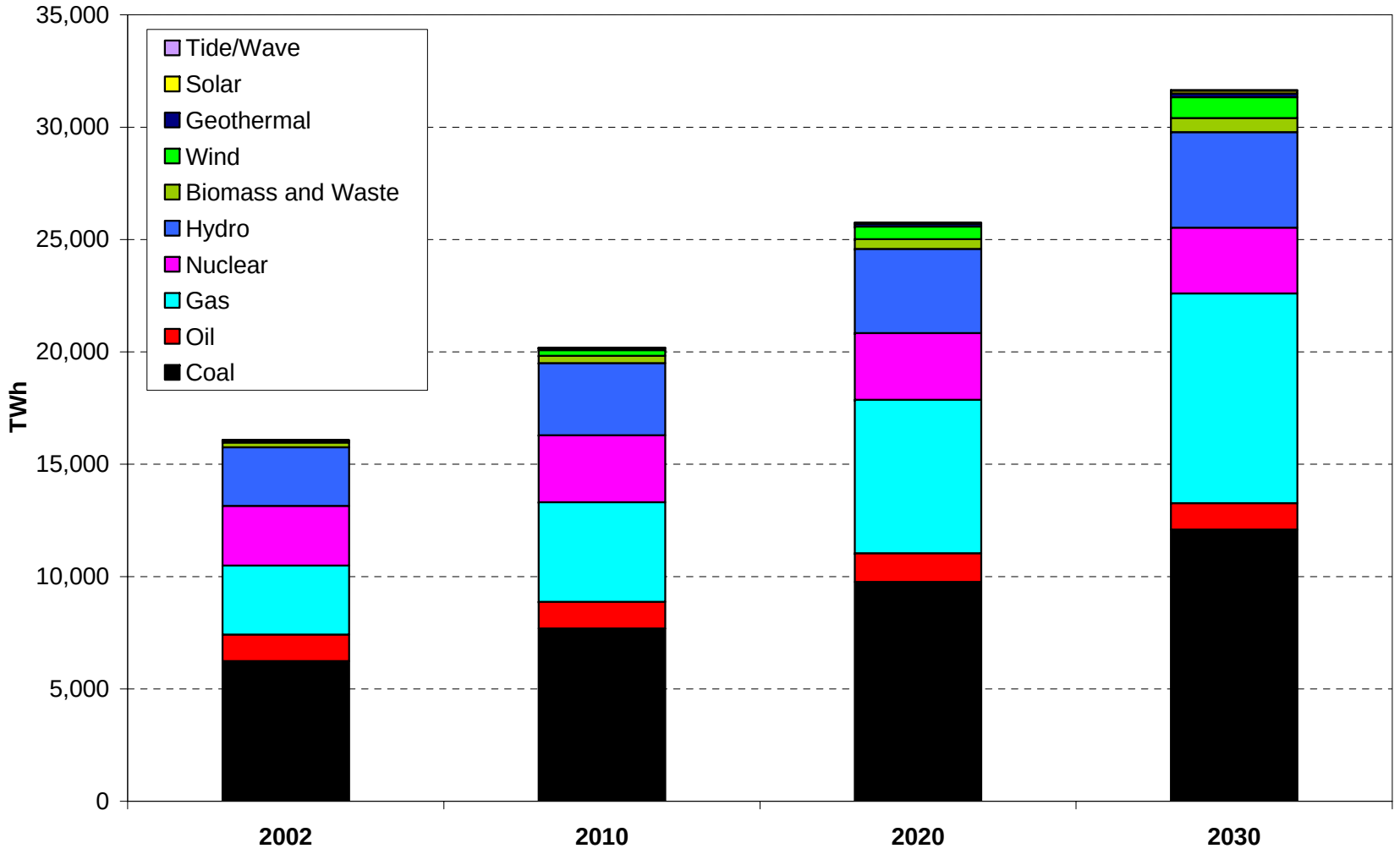


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# Strategies to combat Climate change
# All options needed?

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- Really <u>all</u> options?
- Other risks, e.g. of nuclear
  - total costs of a major nuclear accident
    - 2,000 to 5,000 bn €/accident in Germany
    - 5…7% and 20% of state budget of Ukraine and Belarus in the mid-1990ies
  - the waste problem
  - the problems of terrorism & proliferation
- Other aspects
  - costs (incl./excl. externalities & subsidies)
  - resource limits, their implications and other constraints

# A closer look on risk structures

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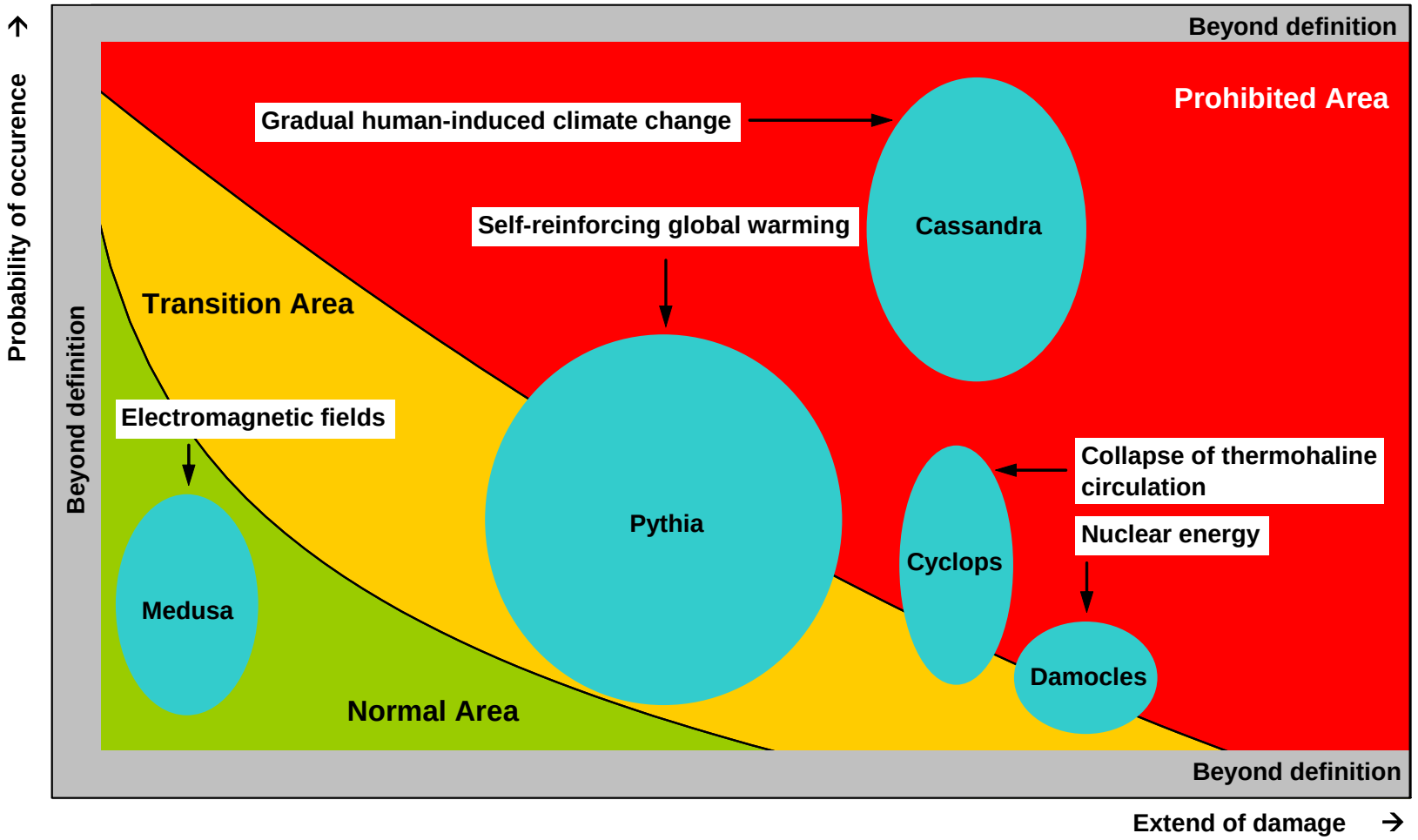


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# Manifold mitigation options exit

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**For the time horizon of 2050**

- **about 5 Gt $CO_2$ from an expansion of nuclear power generation to the threefold of current capacities;**
- **about 4 Gt $CO_2$ from enhanced energy efficiency for buildings;**
- **about 5 Gt $CO_2$ from enhanced energy and material efficiency in industry sectors;**
- **about 7 Gt $CO_2$ from enhanced energy efficiency in the transport sector;**
- **about 2 Gt $CO_2$ from enhanced energy efficiency in the energy sector (apart from fuel switching);**
- **about 3.6 Gt $CO_2$ from fuel switch (coal to gas) in the electricity sector;**
- **about 15 Gt $CO_2$ (or more) from renewable energies (in both the electricity and the heat sector);**
- **between 4 and 10 Gt $CO_2$ from carbon capture and sequestration.**

# Nuclear power
# in an (ambitious) climate strategy

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- **Implications of a 5 Gt $CO_2$ contribution for the time horizon of 2050**
  - **annual commissioning of 25 GW (including replacement)**
  - **annual Plutionium production 560 t (proliferation)**
  - **supply of nuclear fuel would have to rely on speculative (undiscovered) resources -> re-entry of breeder technology and reprocessing (~ 50 new reprocessing plants worldwide)**
  - **equivalent of 14 Yucca Mountain projects**
  - **heavy investments in the total technological chain**
  - **promises of new technologies?**
  - **cost reductions?**

# Alternatives
# in an (ambitious) climate strategy (1)

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- **Renewable energies and CCS require a fundamental transition of the electricity system (new base technologies, significantly changed geographical structure, grid integration, etc.)**
- **The requirements resulting from a significant share of renewable energies and CCS in power supply for the electricity system (increased flexibility, integration of decentralisation and centralisation, handling of intermitting power production, enhancement of infrastructure for electricity and $CO_2$) could come into conflict with the requirements from enhanced nuclear power (large units, centralised grid structures, low flexibility)**
- **The only abatement option which has similar ties to the existing electricity supply system is fuel switch and the enhanced efficiency in the power sector (including CHP). These two options could play a key role in the start of the transition of the electricity system.**

# Alternatives
# in an (ambitious) climate strategy (2)

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- **The most efficient abatement potentials from the economic point of view (various ways to enhance energy efficiency) require comprehensive political interventions because of the manifold obstacles for the implementation of energy efficiency measures.**
- **A sufficient level of $CO_2$ prices (and an appropriate design of the emissions trading scheme, etc.) will help to initiate the necessary measures.**
- **Key abatement options in the medium term (some renewable energies, CCS) are not competitive with nuclear power in the short term if the externalities of nuclear power are not reflected appropriately (liability and insurance, decommissioning funds, etc.) or other distortions exist (direct or indirect subsidies).**
- **However, a huge learning potential exists for many non-nuclear options.**

# Alternatives
# in an (ambitious) climate strategy (3)

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- **No other technology in the emission abatement portfolio shows a comparable mobilization potential. If one or more disastrous accidents in nuclear facilities (including enrichment, reprocessing and disposal facilities) were to occur, the acceptance for the nuclear track would be lost within a very short space of time. This could be disastrous for climate policy if it was intended that nuclear power deliver a significant contribution to emission reduction.**

# Conclusions

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- **Nuclear power is not indispensible for (ambitious) climate strategies.**
- **A significant contribution of nuclear power to ambitious emission reduction targets would raise new risks in new dimensions. The nuclear track could create an obstructive potential (infrastructures, flexibility of the scheme, etc.).**
- **The key question on nuclear is on the alternative options. A sufficient potential exists. An overall risk-minimization strategy is possible.**
- **Major learning effects and cost reduction potentials for many alternatives to nuclear power, opposite to nuclear.**
- **Huge potential of fuel switching and energy efficiency in short term.**
- **Ambitious emission reduction targets could be achieved with and without nuclear power for costs which do not exceed the capabilities of modern societies.**
- **In the framework of the necessary and fundamental transformation of the global energy system, a climate strategy without nuclear power makes for a probably more innovative and more robust strategy.**

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# Thank you very much

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