

ENTRIA

DISPOSAL OPTIONS FOR RADIOACTIVE RESIDUES:
INTERDISCIPLINARY ANALYSES AND
DEVELOPMENT OF EVALUATION PRINCIPLES

Nuclear Power and Nuclear Waste Governance - a wicked problem -

Zukunft der Umweltpolitik – Umweltpolitik der Zukunft
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Agenda

- 1. The bigger picture**
- 2. The decline of the nuclear industrial complex**
- 3. Crisis of nuclear waste governance**
- 4. Nuclear waste - a wicked problem**
- 5. New modes of governance**

The bigger picture

The one side of the coin ...

- **industry and state** formed the nuclear industrial complex
- close connection of **civilian and military** applications
- **high profits** for big utilities and the nuclear industry
- long time **downplaying** of radiation risks by the nuclear lobby

... and the other

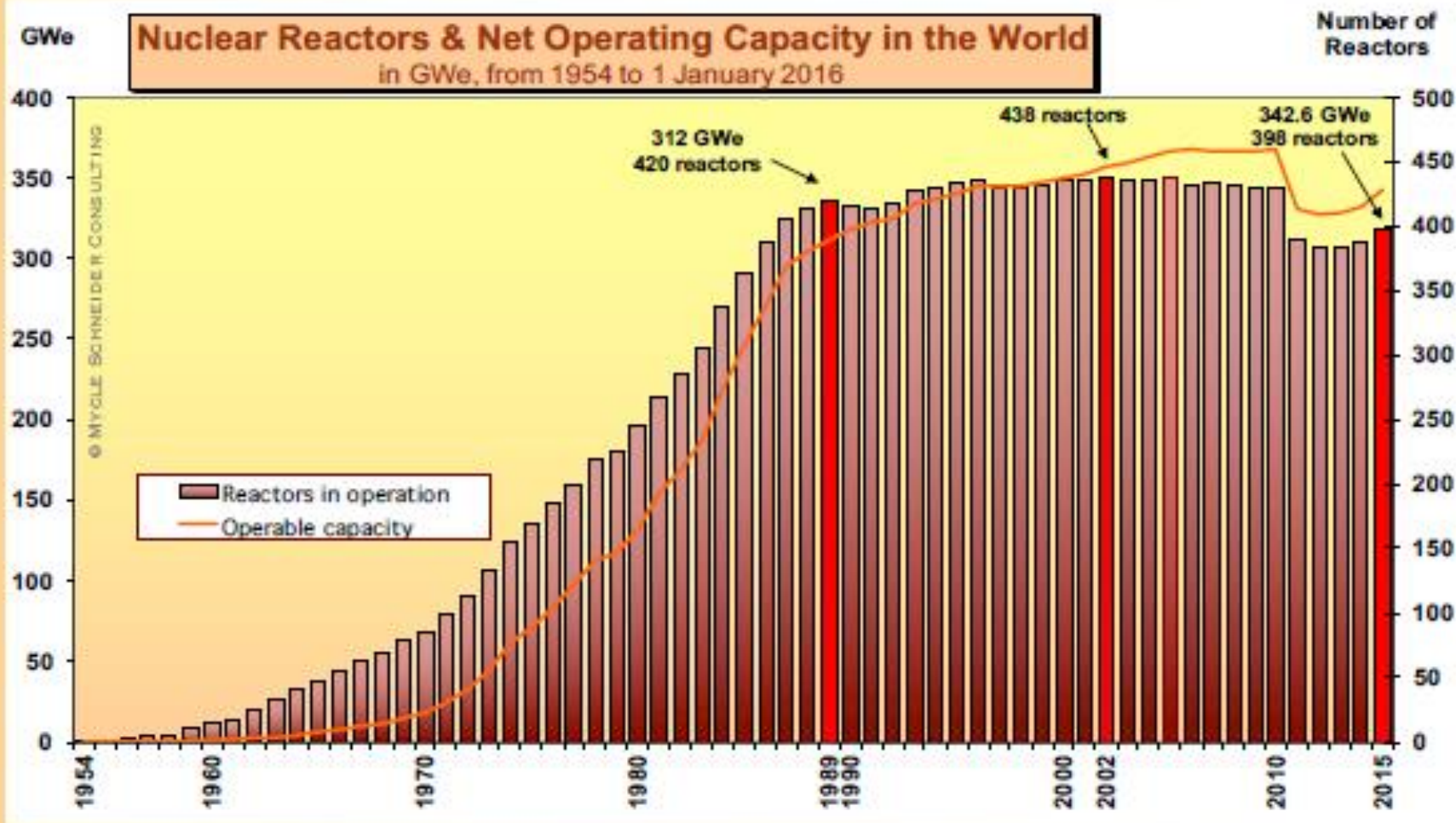
- long history of **contestation** of nuclear politics and technology
- **accidents and disasters** - Chernobyl (1986) / Fukushima (2011)
- high amounts of radioactive **waste**
- **No final waste disposal** – independently from the political system: China, Russia, USA, Europe

Decline of the nuclear industrial complex

- **398** operational commercial NPPs (1/2016)
- **64** NPPs under construction
- **157** shut-down NPPs + **38** long-term outage NPPs in Japan
- nuclear electricity production **dropped** to 2,410 TWh (2014) – 10.8%
- nuclear industry / electricity companies in (deep) **financial trouble**

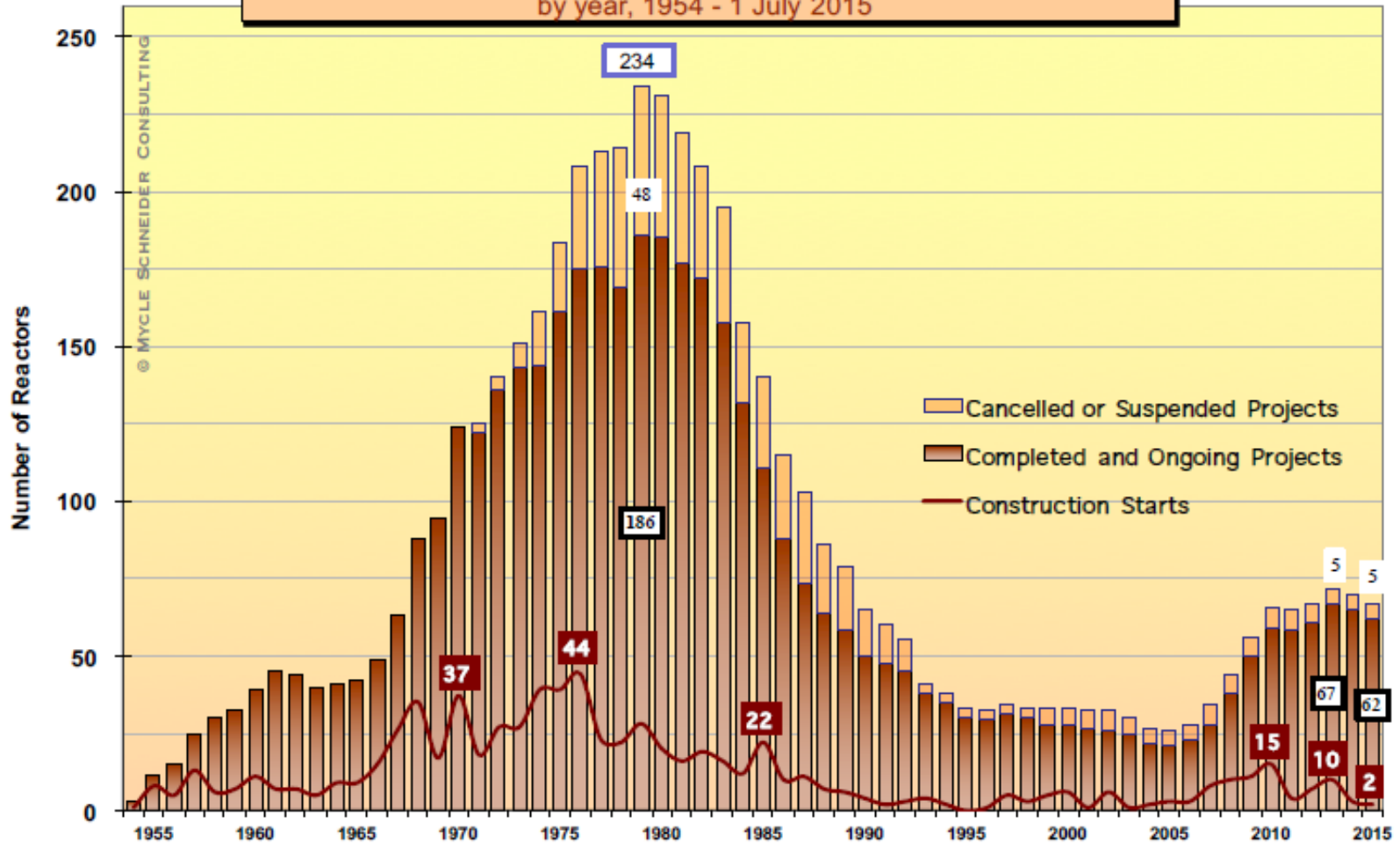
Increase of Nuclear Waste

- **270,000 tons** of used fuel in temporary storage worldwide
- Increase of **12,000 tons** per year worldwide
- **50** countries with SF
- stored in pools at reactor sites or in central **interim sites**
- awaiting reprocessing or disposal



Source: IAEA-PRIS, MSC, 2016

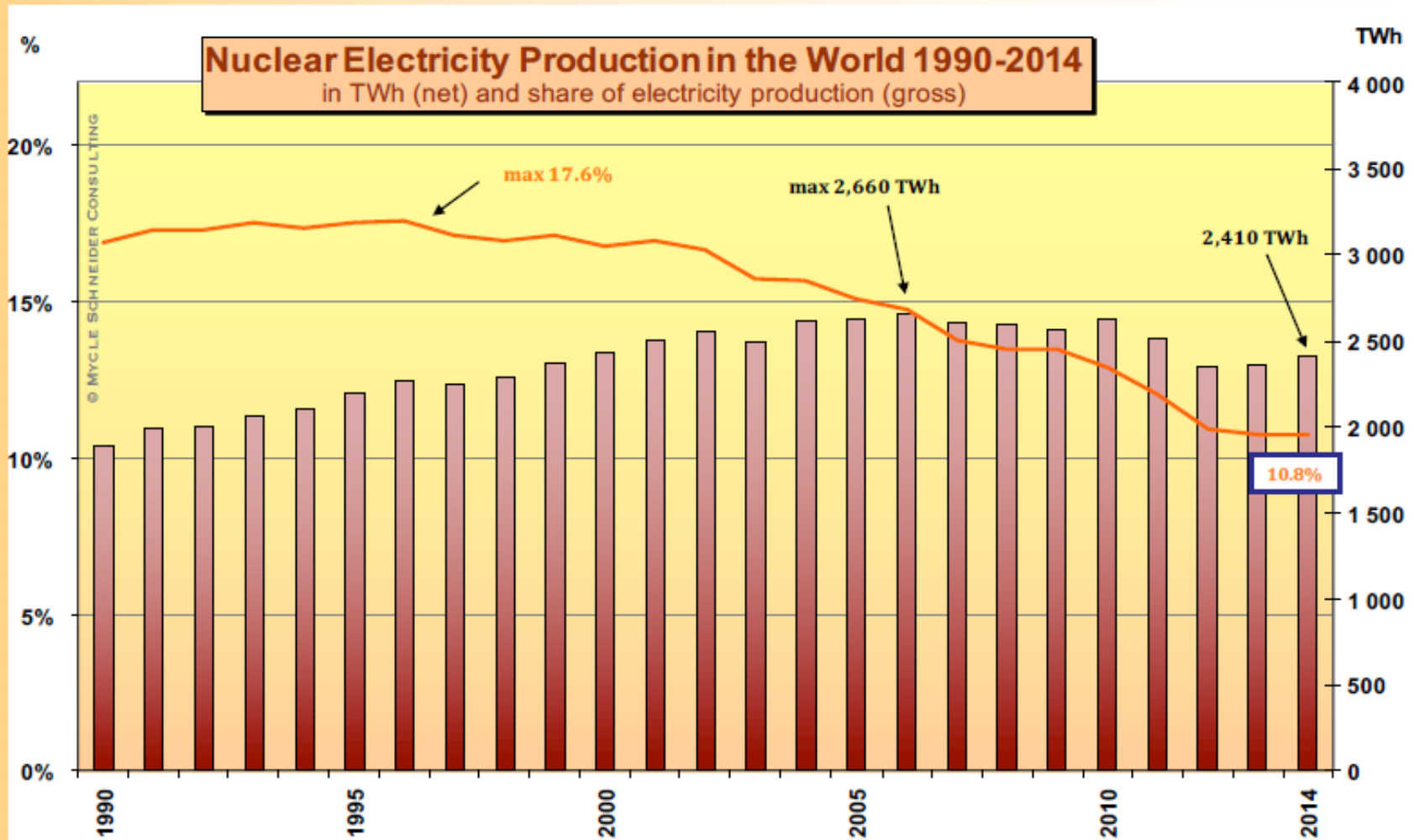
Number of Nuclear Reactors Listed as "Under Construction" by year, 1954 - 1 July 2015



Source: IAEA-PRIS, MSC, 2014

MYCLE SCHNEIDER CONSULTING

Berlin, 16. März 2016



Source: IAEA-PRIS, MSC, 2015

The nuclear industrial complex in financial trouble

- Share value of the largest nuclear operator in the world, the French Électricité de France (EDF), dropped December 2015 to its historic low
- Since 2007 the EDF share value fell with 89%
- 2015 €75 bn sales, debts €37.4 bn
- AREVA technical bankrupt. Losings €10 bn in five years. Debt burden €6.3 bn by €4.2 bn sales. Share value fell with 95% since 2007
- Standard and Poor's rated AREVA in November 2014 BB+ („junk“) and downgraded the long-term rating in March 2015 to BB-
- RWE €48.6 bn sales and debts €35.2 bn
- Profit €5 mio, no dividend for common shares, €0.13 per preferred share
- S&P rating BBB (8/2015) – before A+ (2/2008)
- E.ON €116.2 bn sales and debts €27.7 bn – €3.6 mio deficit and €0.50 dividend per share
- S&P rating BBB+

Crisis in Nuclear Waste Governance

- **ignoring back end NF-cycle, proliferation, geopolitical power**
- **downplaying safety / security issues**
- **leaving the problem to future generations**
- **top-down process** / marginalising citizens concerns and anti-nuclear movements
- financial calculations that **underestimate actual costs – polluter pay principle** or **private goods – public bads**
- decline of nuclear companies and industry / **who pays the bill?**

Pressure to act?

- impacts of **Chernobyl** and **Fukushima**
- **aging** NPPs
- concerns with **interim storage**
- **anti-nuclear-movements**
- **regulatory requirements** (EU-Directive)
- New **actors** and **institutions**
- **ethical** concerns (future generations will bear the consequences)
- **energy transition**



good enough reasons?

Nuclear Waste – a wicked problem?

- **no clear definition** of the problem: dependent on political, economic, technical or societal perspectives
- **high uncertainties** due to long time horizon: construction of a repository site in 2050, 2070 or after 2100?
- **no test under laboratory conditions**: reaching the highest possible level of safety for a period of one million years
- **learning by trial and error**: no well-described set of political instruments to organize the siting process
- **many players with different interests on different levels**: industry, state, regions, civil society, local communities, science ...



The problem is not understood until after the formulation of a solution

New forms of Governance - lessons learnt

- **citizens want to influence** political decisions
- **inclusive participation**, right to veto and re-start possibilities at all steps and levels of decision making
- key conditions: **access** to information, early **involvement** of the affected population, **openness** for unforeseen results and transparent **compensation mechanisms**
- provision of **resources** to enhance public engagement (capacity building), improve decision-making and increase public confidence.
- learn to **frame uncertainties** (e.g. re. costs, safety, public response ...)



from representative to **deliberative** forms of democracy?

Thank you for your attention!

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