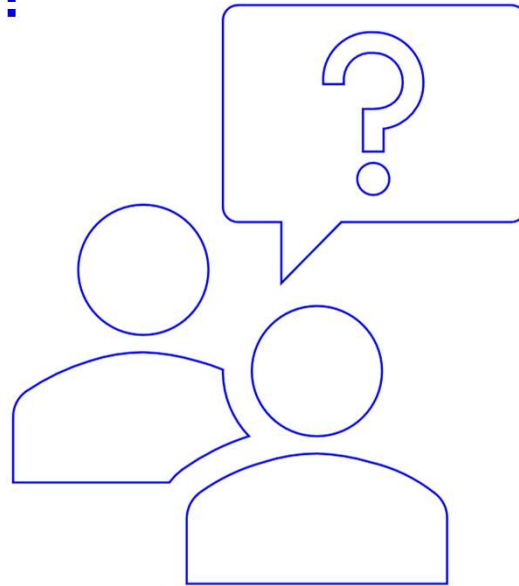


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Nuclear Power Plant Financing

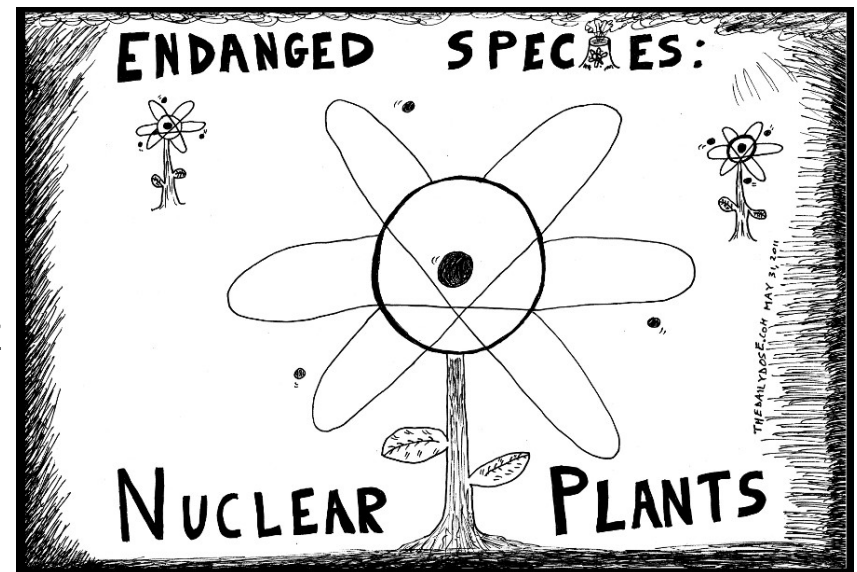
Mgr. Tereza Stašáková
427280@mail.muni.cz

Discussion: What do you know about the current state of the new nuclear project in the Czech Republic?



Lecture outline

- Why should we talk about NPP financing?
- What is so demanding on large-scale projects?
- Theoretical approaches
- Financing – basic concepts
- Examples of financial and business models
 - Financial, contractual, and ownership arrangements
 - Investment and financial arrangements of the NPP in the CZ
- Price and construction time around the world and in the EU
- Factors influencing the final price
- Risk reduction measures
- Application



Source: www.funnyjokesandlaughs.wordpress.com/tag/nuclear-power/

Why should we talk about NPP financing?

- **High capital cost**– 60-85 %
 - Low operation cost– 10-25 %
 - Fuel cost – 7-15 %
- A long time before the project starts to generate profit– around 8-10 years
 - Very demanding for an investor, not attractive for private investors → state support is often needed
- **Long payback period** – more than a decade
- Complicated investment environment
- Risky business
 - Technical complexity, political and regulatory risks, complicated financing, liabilities (waste, decommissioning)

What is so demanding on large-scale projects?

- In general, high demands on:
 - **Project management**
 - Preparation of the project (communication with authorities, law on public procurement, construction permits, EIA)
 - **Supply chain**
- In the case of nuclear power plant
 - **More demanding preparation of the project** (might be more controversial, negotiation on the national and European level)
 - **Complexity of technologies**
 - **Safety elements** (pressure to increase safety elements also during construction - EU)
- Many examples of bad practice
 - **Price increase** of the project during construction
 - **Extension of construction time**

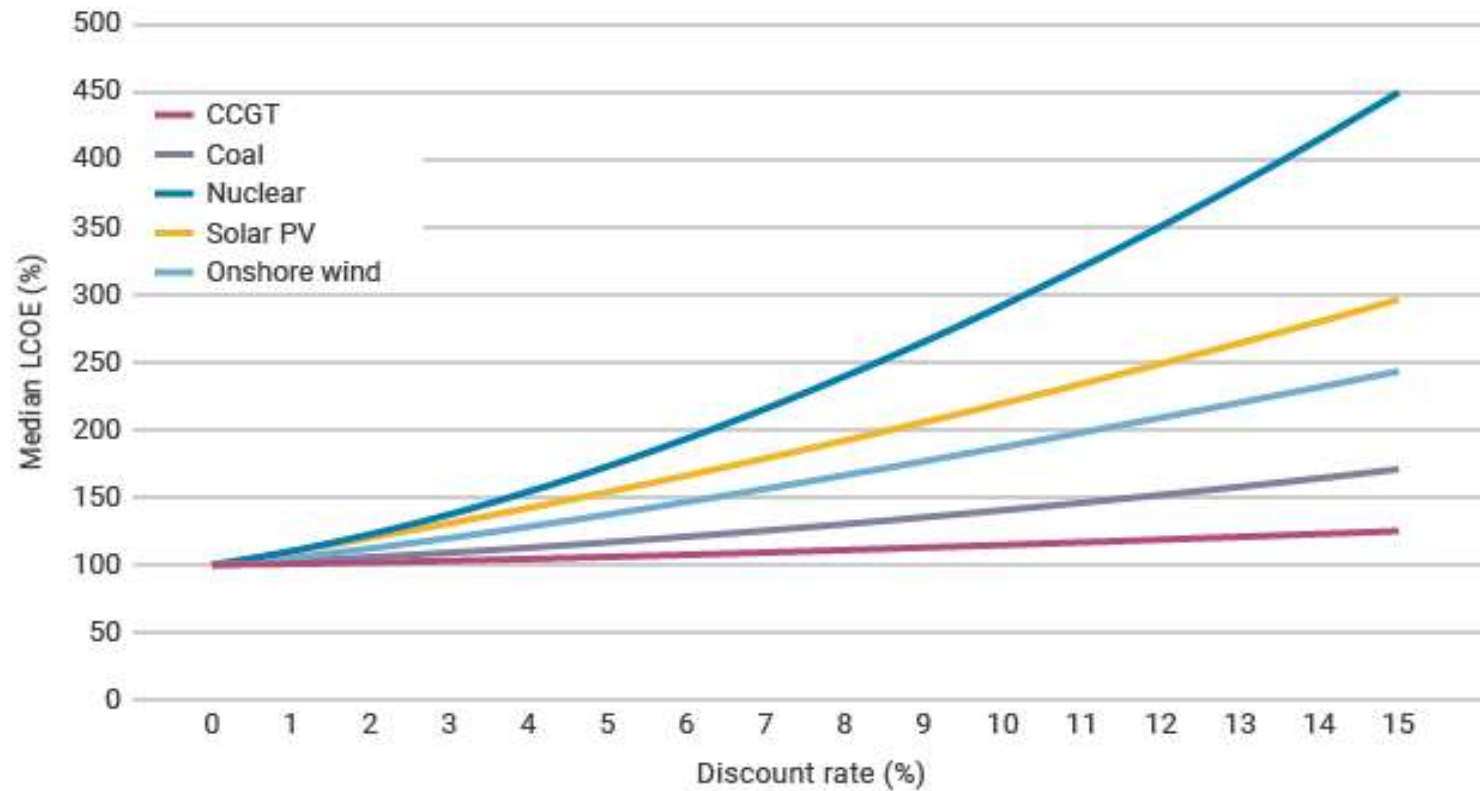
Theoretical approaches

- **Market vs. Strategic**
- Nuclear energy as a **strategic sector**
- **Important role of the state**
- Nuclear energy does not fit into the liberalized energy market

Financing – basic concepts

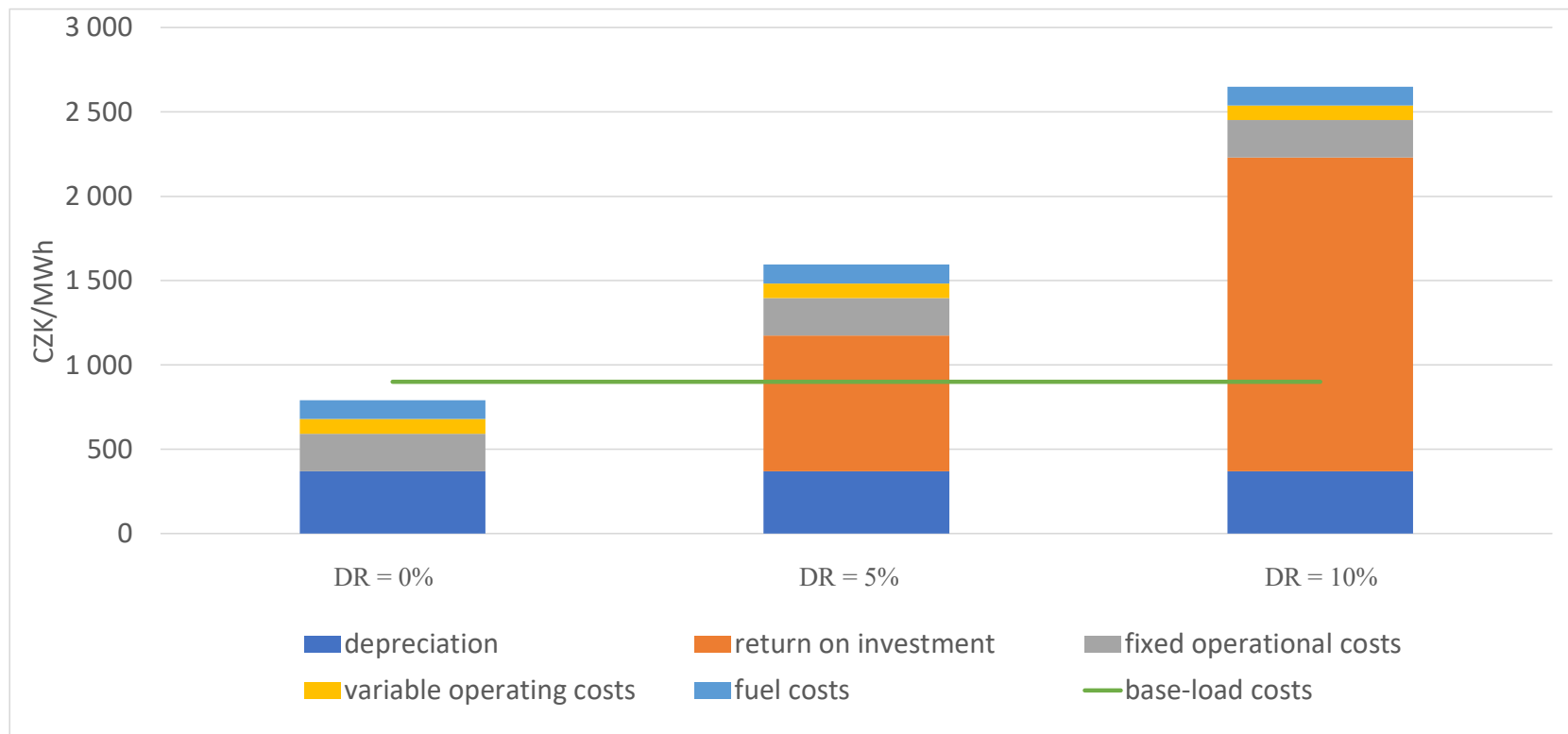
- Direct x debt financing
- State x private financing
- Investor x financial x business/ ownership arrangements of a project
- Discount Rate
- LCOE – Levelized cost of energy

The effect of the discount rate on the median LCOE for different technologies



Source: OECD Nuclear Energy Agency

The effect of the discount rate on the LCOE of nuclear power plants

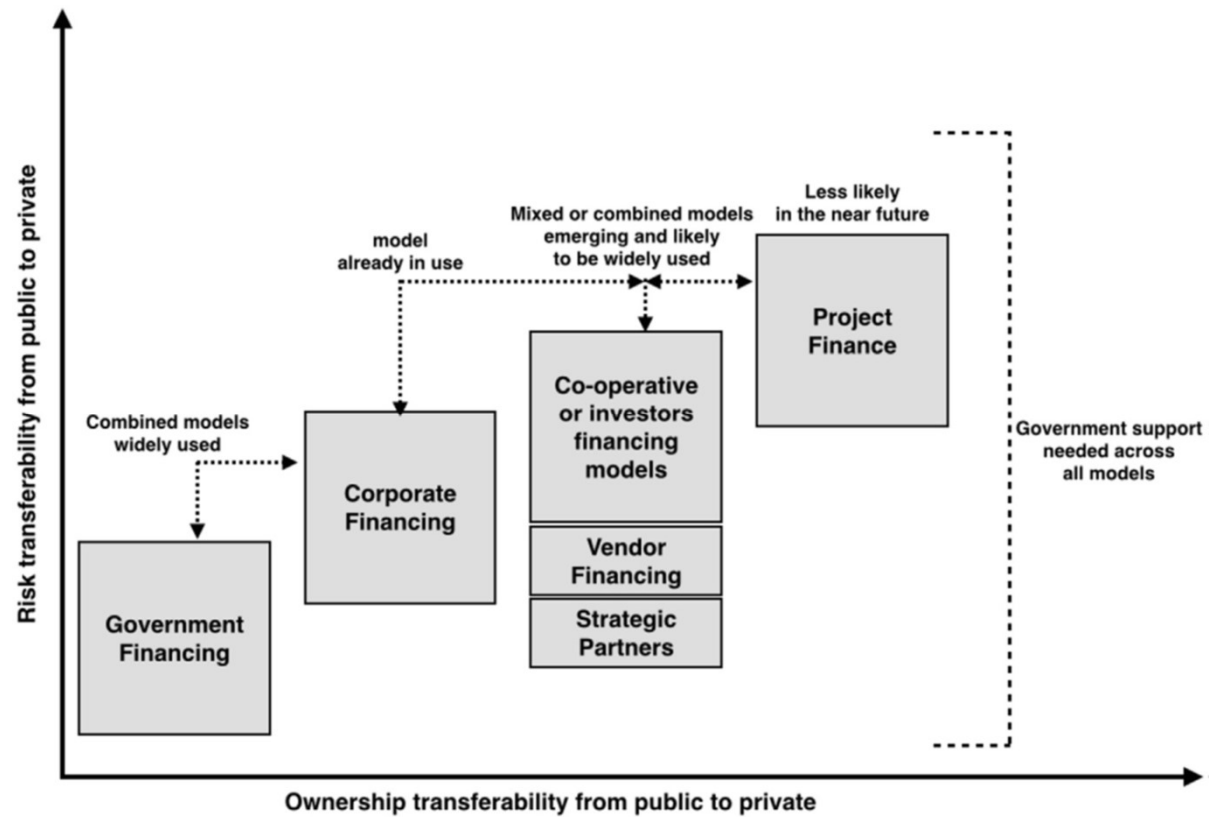


Source: Vlastní propočty, EGÚ Brno

Financial, contractual and ownership arrangements

- Financial arrangements
 - **Government financing**
 - **Direct financing**
 - State incentives for the private sector** – loan guarantee, guaranteed long term contract, feed-in tariffs, CfD, ECA
 - State to state** – intergovernmental agreement
 - **Private financing**
 - Mankala; Corporate financing; Vendor financing; Raising finance through capital markets**
- Contractual and ownership arrangements
 - **Turnkey contract** – risks taken by the supplier
 - Different degrees of involvement of the supplier - according to his experience
 - Public Private Partnership
 - **Alternative Contracting and ownership practices:** Build-Operate-Transfer, Build-Own-Operate, and their variations, also an example of feed-in tariffs and CfD

Emerging trends of nuclear financing models



Examples of financial and business models

- **Contract for Difference** (Hinkley Point C)
 - Guaranteed purchase price by the state
- **Mankala** (Hanhikivi)
 - A consortium of investors who are interested in NJZ - profit, electricity supply at a stable price
- **Vendor financing** (Paks II)
 - Supplier financing
 - From the supplier's point of view: "assistance" to other states, in order to secure the contract, continuity of production, geopolitical interests
- **Build-Operate-Transfer** (Sinop)
 - PPP, concessions for co-financing, construction and operation, guarantee of price, transfer to public administration
- **Build-Own-Operat** (Akkuyu)
 - PPP, same as BOT, but no transfer

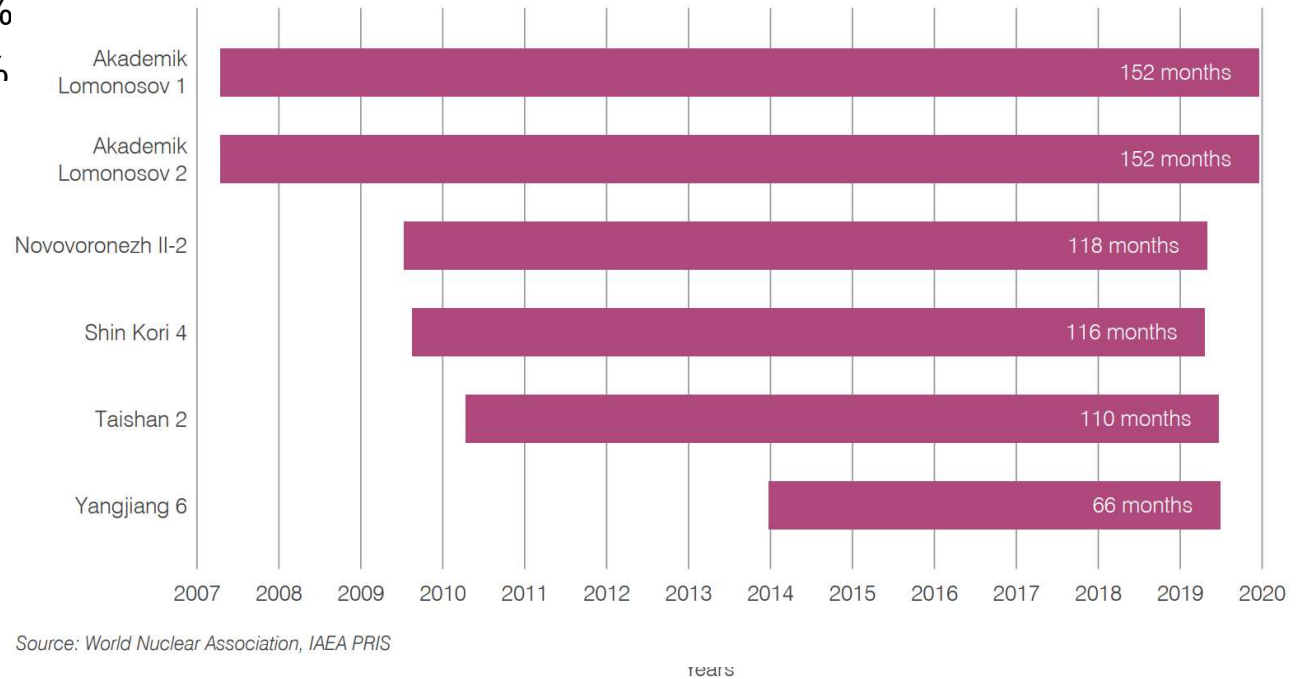
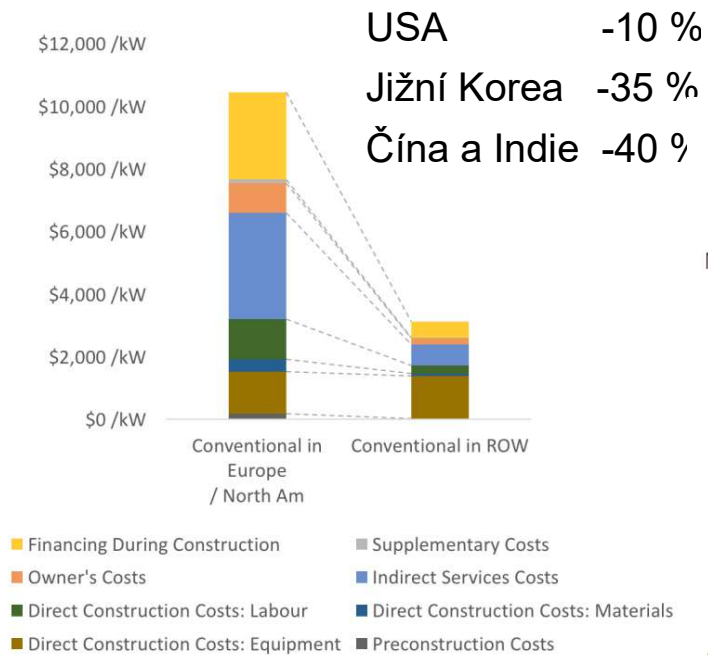
Financial arrangements of the new NPP in the CZ

- NAP considers three models:
 - 1) investment through the existing owner and operator of Czech NPPs, ČEZ, or its 100% owned subsidiary;
 - 2) investment through a private investment consortium;
 - 3) or direct construction by the state through a newly established state-owned enterprise.
- Final model?

Price and construction time around the world and in the EU

Price comparison to the EU

Median of unit construction time since 1981



Source: CleanTech Catalyst Ltd 2018

Source: World Nuclear Association, IAEA PRIS

Factors influencing the final price

- Supply Chain
- Cost of labor
- Project management
- Political and regulatory context
- Construction time
- Project design
- Reactor size
- The nature of the investor
- Unclear financial framework

Risk reduction measures

- Selection of finalised design and proven technology with a stable supply chain
 - Security demonstration
- Involvement of experienced project management
- Involvement of a project supplier who has the experience and at the same time also has another ongoing nuclear build
- Close cooperation with the government
 - Continuous and systematic support of the government
 - Government support for project financing
- Close cooperation and coordination with the national regulator
- Consideration of cultural aspects - working habits, language, way of communication

What are the implications for the construction of new NPP in the CZ?

What are we good at?

- Public support
- General support of the project through all the political parties (political consensus)

What are the mistakes?

- Long decision making
 - Delay
- Problem of taking responsibility
 - Lack of political consensus on the individual steps
 - Critique of the chosen investor model
- Disagreements regarding the choice of supplier

List of companies approved and contacted by the government and milestones

Supplier	State	Type	Power	Information
Westinghouse	USA	AP 1000	1200 MW	ano
Rosatom	Rusko	MIR TOI	1200 MW 1250 MW	ano
Kepeco /KHNP	Korea	APR 1400 APR 1000+	1400 MW 1100 MW	ano
Areva	Francie	EPR 1700	1700 MW	ano
Mitsubishi	Japonsko	APWR 1700	1700 MW	ne
Atmea	Francie / Japonsko	Atmea 1100	1100 MW	ano
CGN	Čína	HPR 1000	1150 MW	ano
CNNC	Čína	ACP 1000 (HPR 1000)	1150 MW	ne
SNPTC	Čína	CAP 1400	1400 MW	ne

Milestone	Beginning	End
Initial documents approved by government	06/2015 06/2015	02/2018 02/2018
EIA → 2019	01/2015 01/2015	11/2018 12/2018
Selection of supplier → 2024	03/2018 03/2018	09/2023 06/2022
Placement permit	01/2017 01/2017	12/2021 12/2021
Zoning permit	02/2024 02/2020	08/2027 08/2023
Authorisation for the construction	09/2023 09/2022	11/2029 11/2026
Construction permit	01/2025 08/2026	09/2031 02/2028
Transportation route ready	09/2016 09/2016	02/2033 11/2029
The first concreting of a nuclear island	09/2031 06/2028	02/2033 11/2029
Ready for connection		09/2037 09/2033
Construction and commissioning of the first unit → 3036	03/2030 08/2026	09/2039 09/2035

How to minimise the risks for the new NPP in the Czech Republic?

Discussion – What would you suggest to the Czech government and the ministries?

- Government has to be consistent (strategic x market)
- Sound, efficient and stable investment environment
- Successful negotiations with the EU
- The investor must have realistic expectations when planning and managing the project
- All key aspects must be taken into account when choosing a supplier

Question time



**BY THE TIME WE'D LOBBIED THE GOVERNMENT, GOT
PLANNING PERMISSION, RAISED CAPITAL, PUT THE JOB OUT TO
TENDER AND BUILT IT WE DIDN'T NEED IT ANY MORE!**

Source: www.cartoonstock.com/directory/n/nuclear_energy.asp

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**Thank you
for your attention!**

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