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Finnish Exceptionalism: Drivers of nuclear new build

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Sociology



Outline for my lecture

1. Introduction
2. Energy policy in Finland
3. An exception – In what sense?
4. Drivers of nuclear new build
5. One special background factor facilitating nuclear new build
6. Conclusion

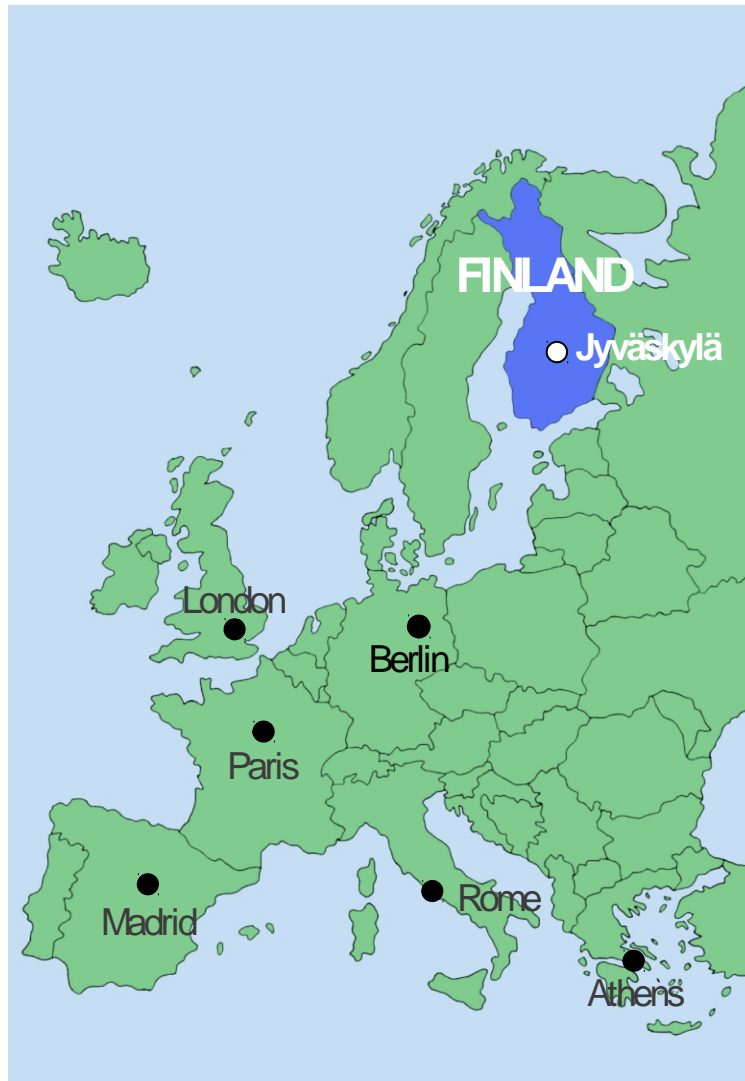


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University of Jyväskylä



1863 Jyväskylä Teacher Seminary

1934 Jyväskylä College of Education

One of the largest universities in Finland

Rector Matti Manninen

7 faculties

15,000 students

Staff 2,600



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Why I became interested in nuclear technology?

- In 1960s and 1970s hardly anyone was able to close their ears on nuclear arms race, peace movements and environmental movement
- During my studies I was inspired by sociology of science and technology, but also on social movement research
- Nuclear power companies suggested nuclear waste repository to my home municipality in 1987
- I started to study local anti-nuclear groups in 1988
- Here I am, still studying nuclear technology








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Why a sociologist is interested in nuclear power?

-  Instability in nuclear power's societal status created by
-  The ambiguous nature of the technology itself
-  Changing public opinion
-  The fluidity of political judgements
-  The flow of cultural meanings attaching to nuclear power
-  The unpredictability of media processing






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Note: Importance of cultural factors

-  The early history of nuclear power begins in 1896, with the discovery of radioactivity. *“Then Marie Curie discovered the new metal radium, whose rays, compared with the whisper from uranium, were like a piercing shout.”*
-  Century the imagery of nuclear energy has consisted not only of positive and optimistic symbols and meanings but also of dark, pessimistic and fearful images
-  Apocalyptic visions of doomsday created by mad scientists are images as permanent as those of a peaceful and prosperous Golden Age or new Eden of humankind



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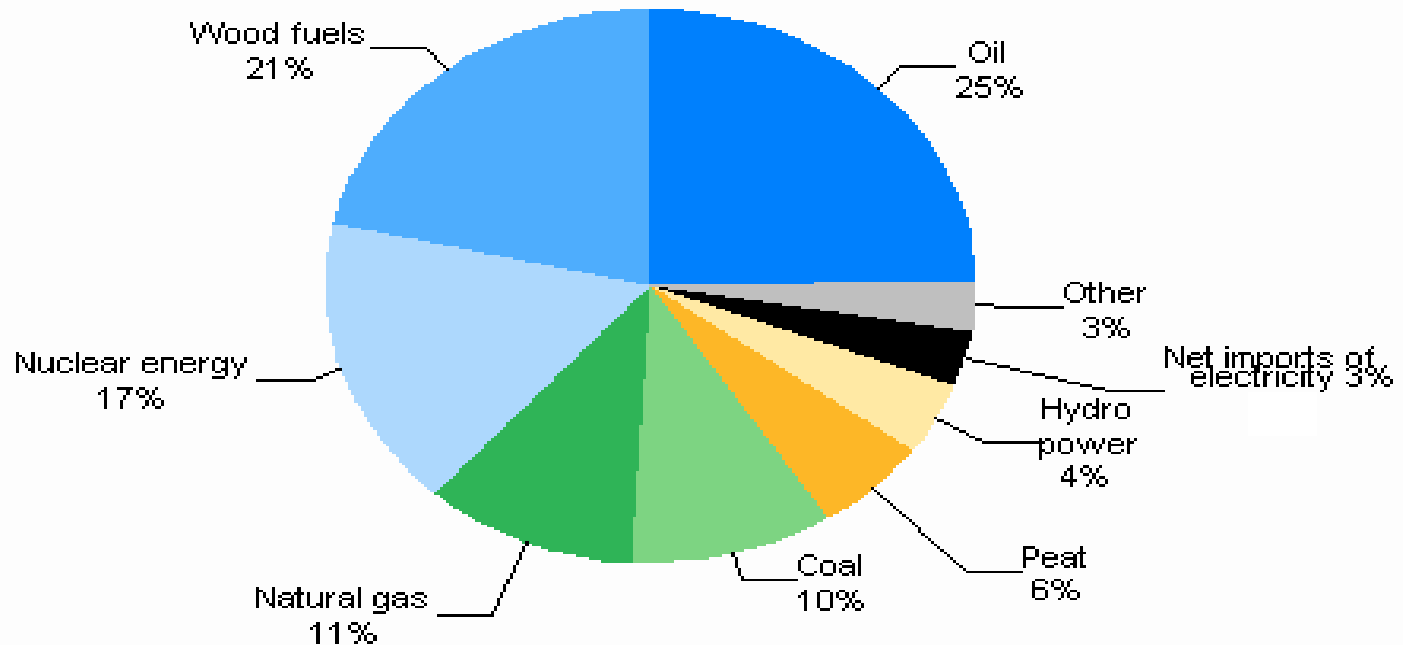


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Energy policy in Finland

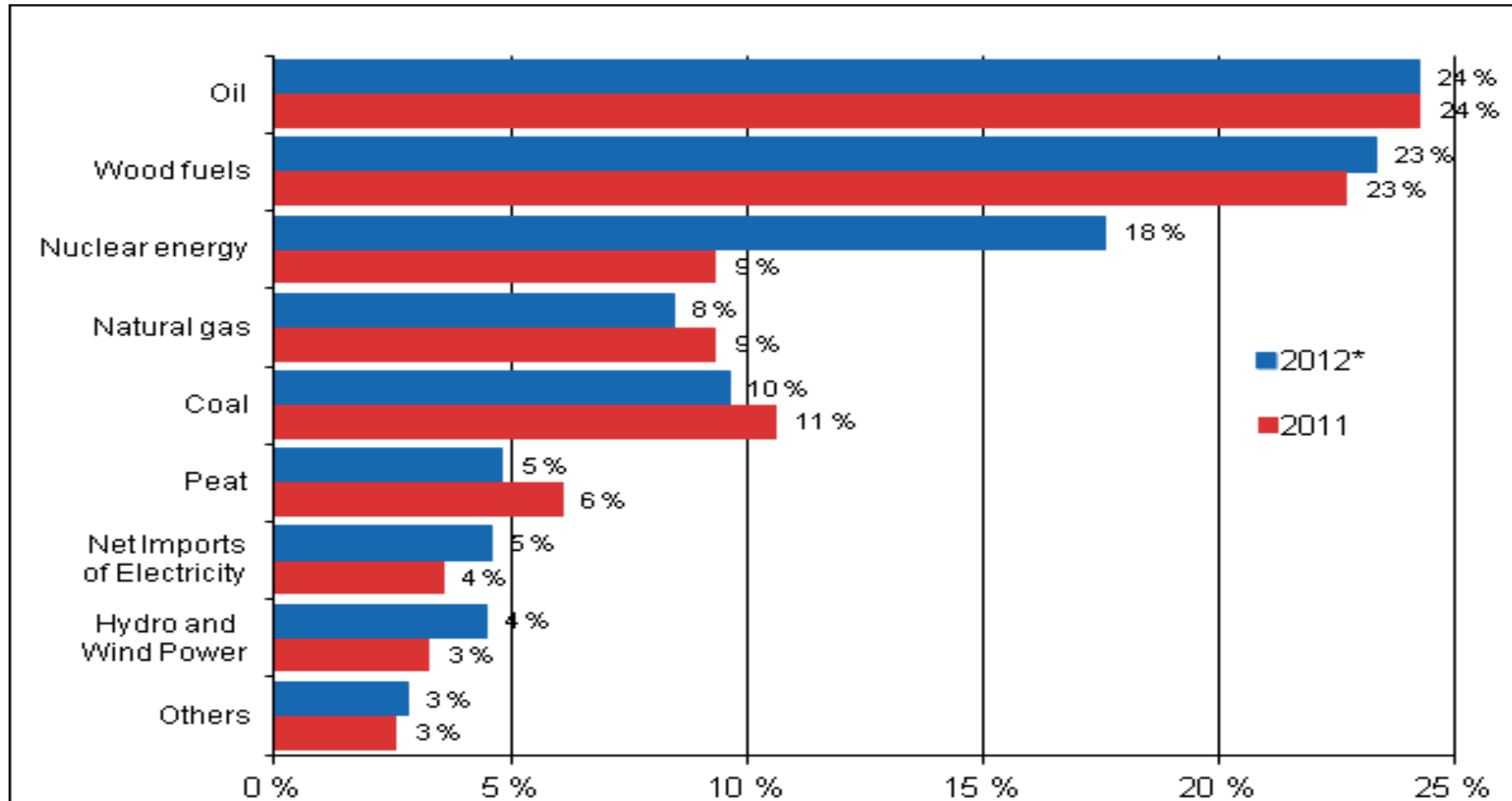
Decentralised and diversified energy system

Total energy consumption in Finland 2008



Source: Yearbook of Energy Statistics 2009. Statistics Finland

Total Energy Consumption 2012



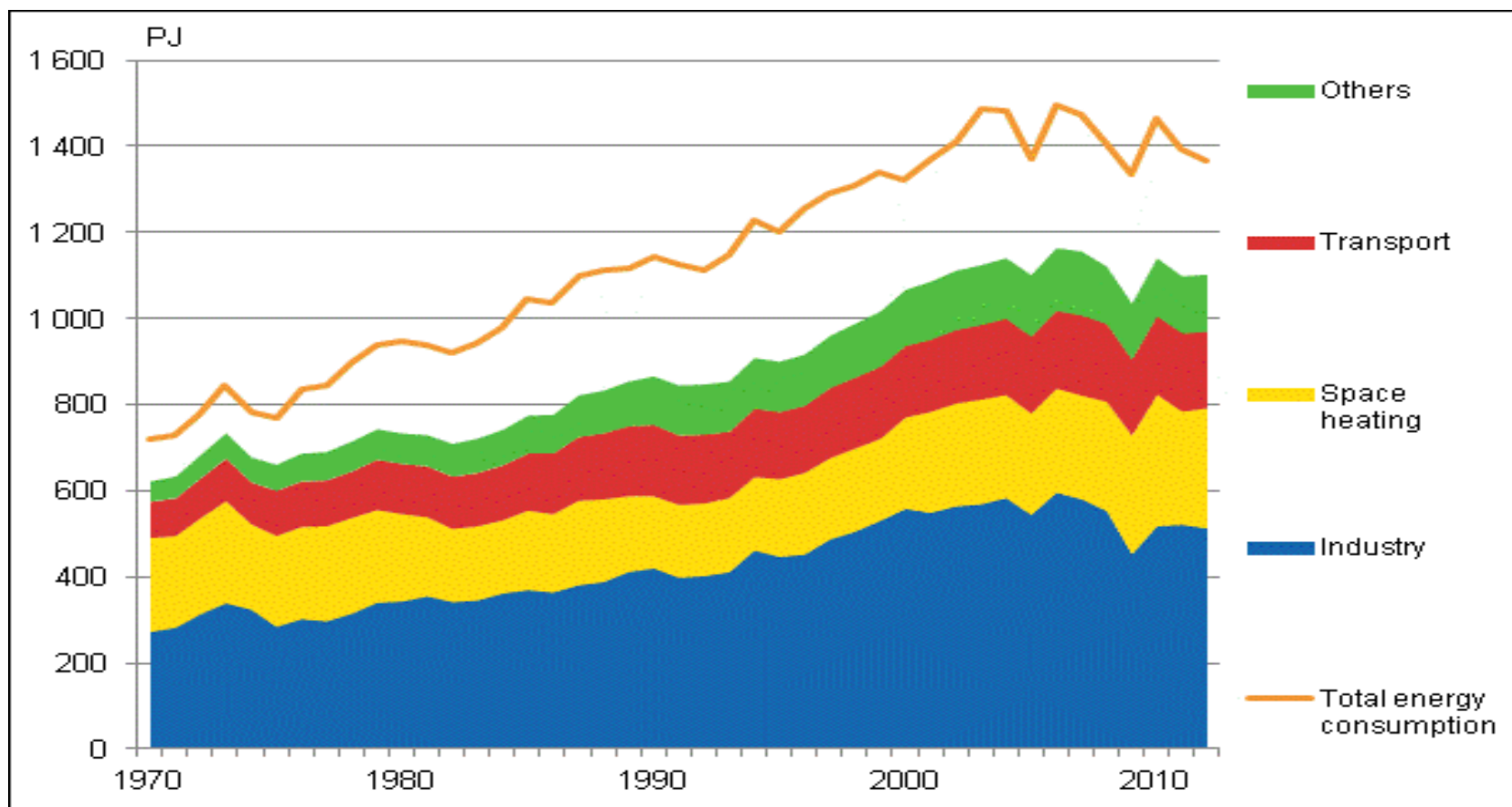
Official Statistics of Finland (OSF): Energy supply and consumption [e-publication].

ISSN=1799-7976. 4th quarter 2012, Appendix figure 7. Total Energy Consumption 2012* . Helsinki: Statistics

Finland [referred: 31.7.2013].

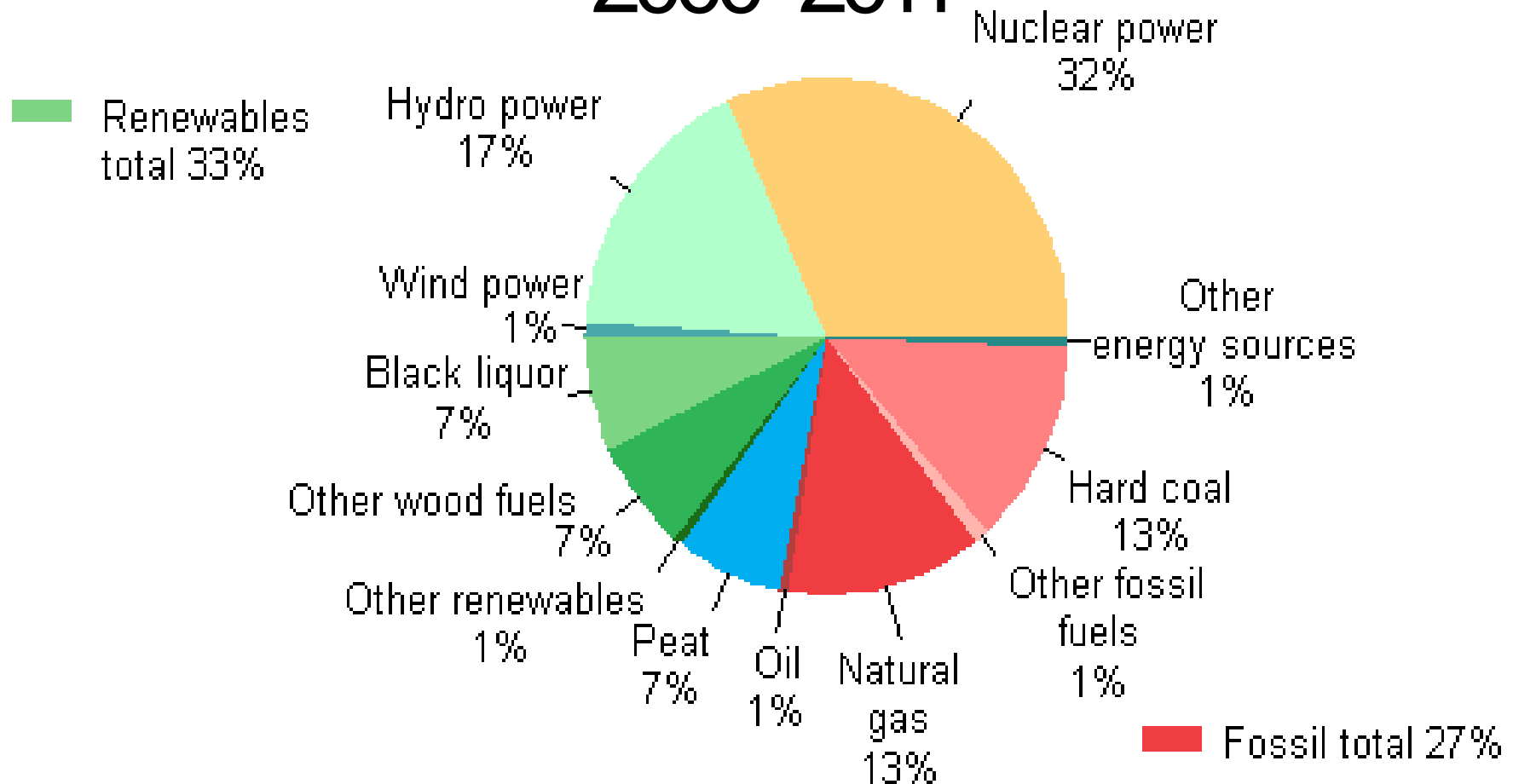
http://tilastokeskus.fi/til/ehk/2012/04/ehk_2012_04_2013-03-22_kuv_007_en.html.

Total energy consumption 1970-2012



Official Statistics of Finland (OSF): Energy supply and consumption [e-publication].
ISSN=1799-7976. 4th quarter 2012, Appendix figure 16. Total energy consumption and
final energy consumption 1970–2012* . Helsinki: Statistics Finland [referred: 31.7.2013].
http://tilastokeskus.fi/til/ehk/2012/04/ehk_2012_04_2013-03-22_kuv_016_en.html.

Electricity production by energy source 2000–2011



Electricity production 70,4 TWh

Official Statistics of Finland (OSF): Production of electricity and heat [e-publication].

ISSN=1798-5099. 2011, Electricity and heat production and fuels 2011 . Helsinki: Statistics Finland [referred:

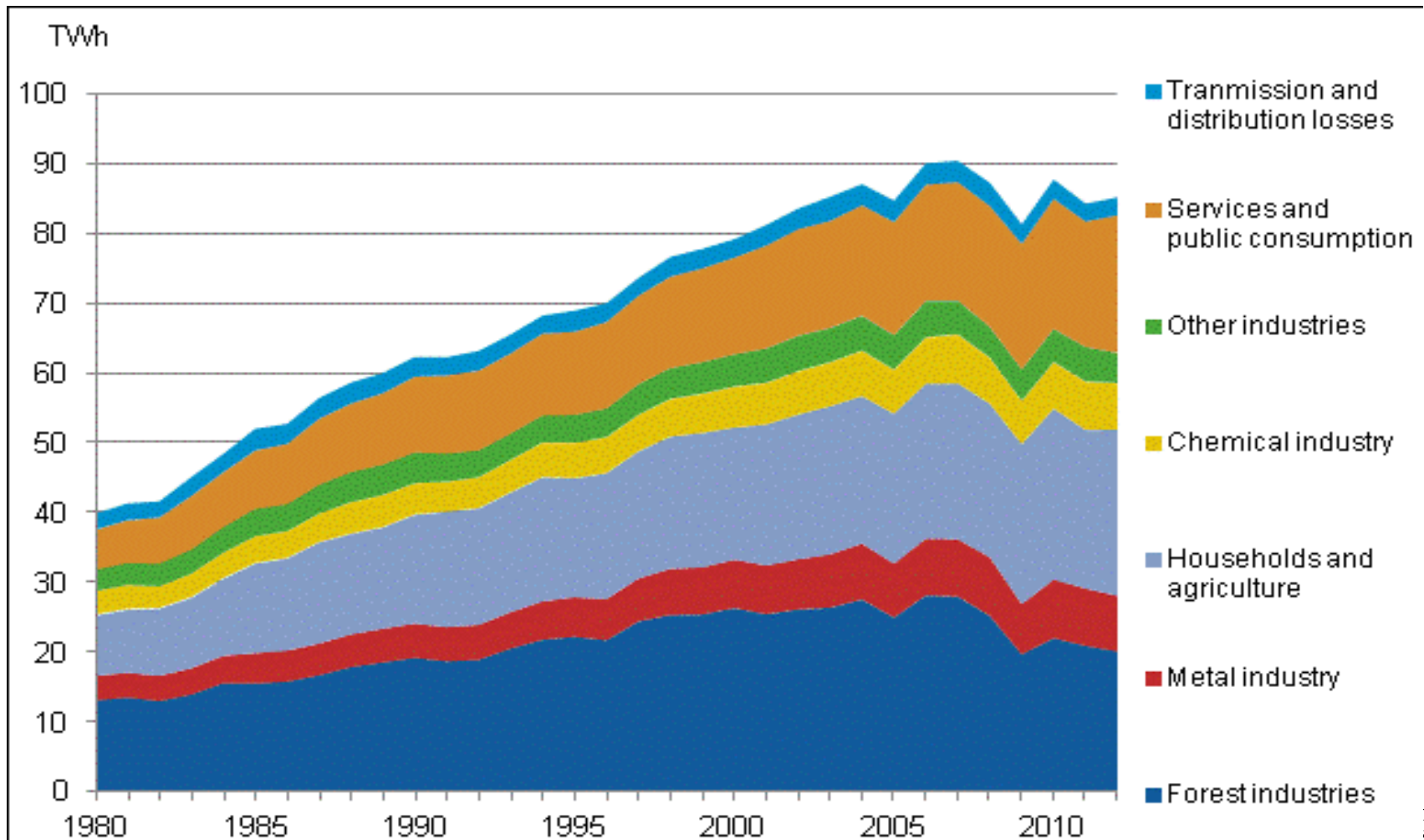
31.7.2013].

Access method: http://www.stat.fi/til/salatuo/2011/salatuo_2011_2012-10-16_kat_001_en.html.

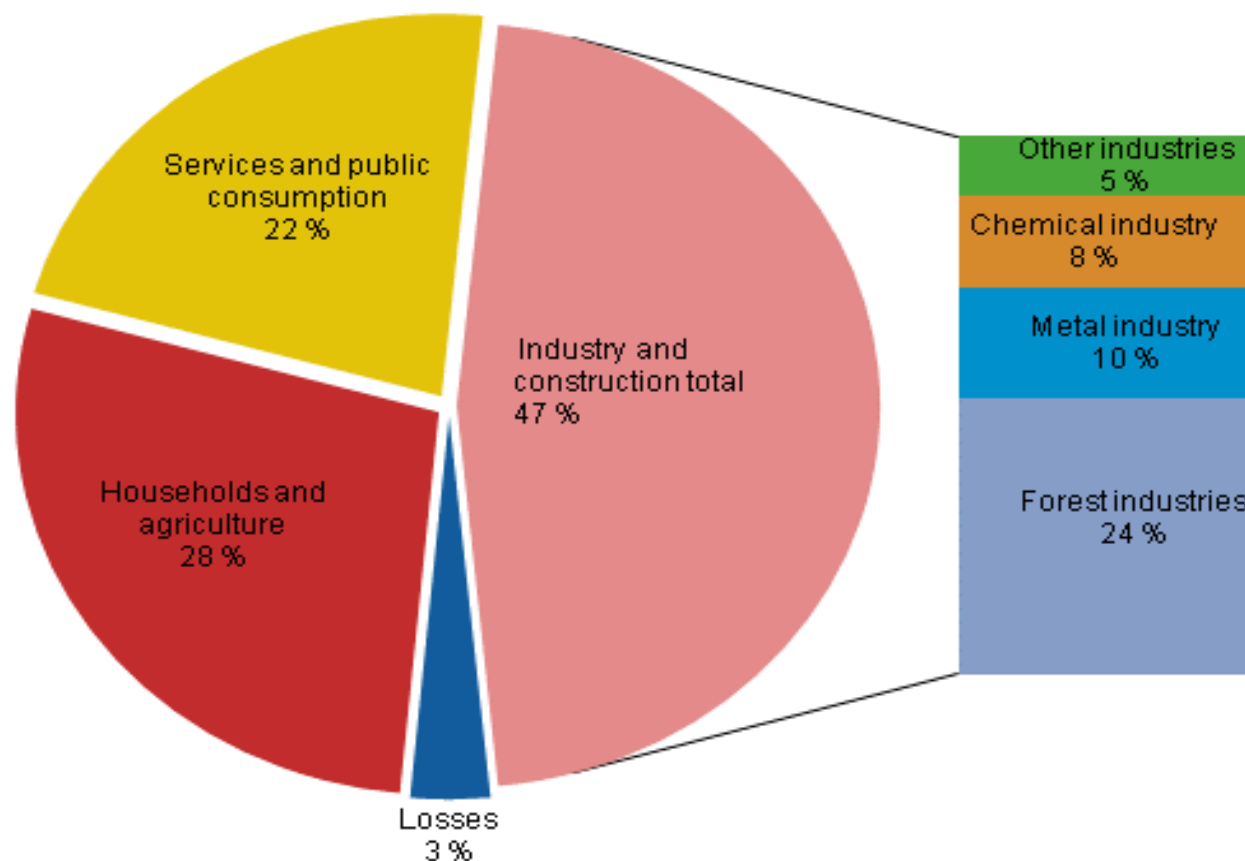


Electricity consumption by sector 1970–2012

Source: Statistics Finland, Energy supply and consumption
https://tilastokeskus.fi/til/ehk/2012/04/ehk_2012_04_2013-03-22_kuv_020_en.html



Electricity consumption by sector 2012



Official Statistics of Finland (OSF): Energy supply and consumption [e-publication].
ISSN=1799-7976. 4th quarter 2012, Appendix figure 22. Electricity consumption by sector 2012*
Helsinki: Statistics Finland [referred: 31.7.2013].
Access method: http://tilastokeskus.fi/til/ehk/2012/04/ehk_2012_04_2013-03-22_kuv_022_en.html.



Renewable Energy Sources Policy

 One of the world leaders in utilising bioenergy

RES TARGETS

- Mandatory targets set by EU's Directive on the Promotion of the use of energy from renewable sources

 38% share of RES on the final consumption of energy in 2020

 At least 10% share of renewable energy in final consumption of energy in transport by 2020



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Poor performance in reducing CO₂ emissions

N. Valkila, A. Saari / Renewable and Sustainable Energy Reviews 17 (2013) 283–290

-  Finland's per capita emissions of carbon dioxide are fairly high
-  In 2003–2005 the average annual emissions were 12.7 t of CO₂ per capita
 - as against the 9.0 t of CO₂ per capita for all the EU-25 countries
-  Poor performance is explained by
-  Geography: a northern European climate
-  Population density: sparsely populated (17 inhabitants per sq. km)
-  Structure of industry: energy intensive



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An exception



In what sense?

Overall picture in Finland

- Finland has four nuclear reactors providing nearly 30% of its electricity
- A fifth reactor is now under construction
- Two more are planned
- Provisions for radioactive waste disposal are advanced



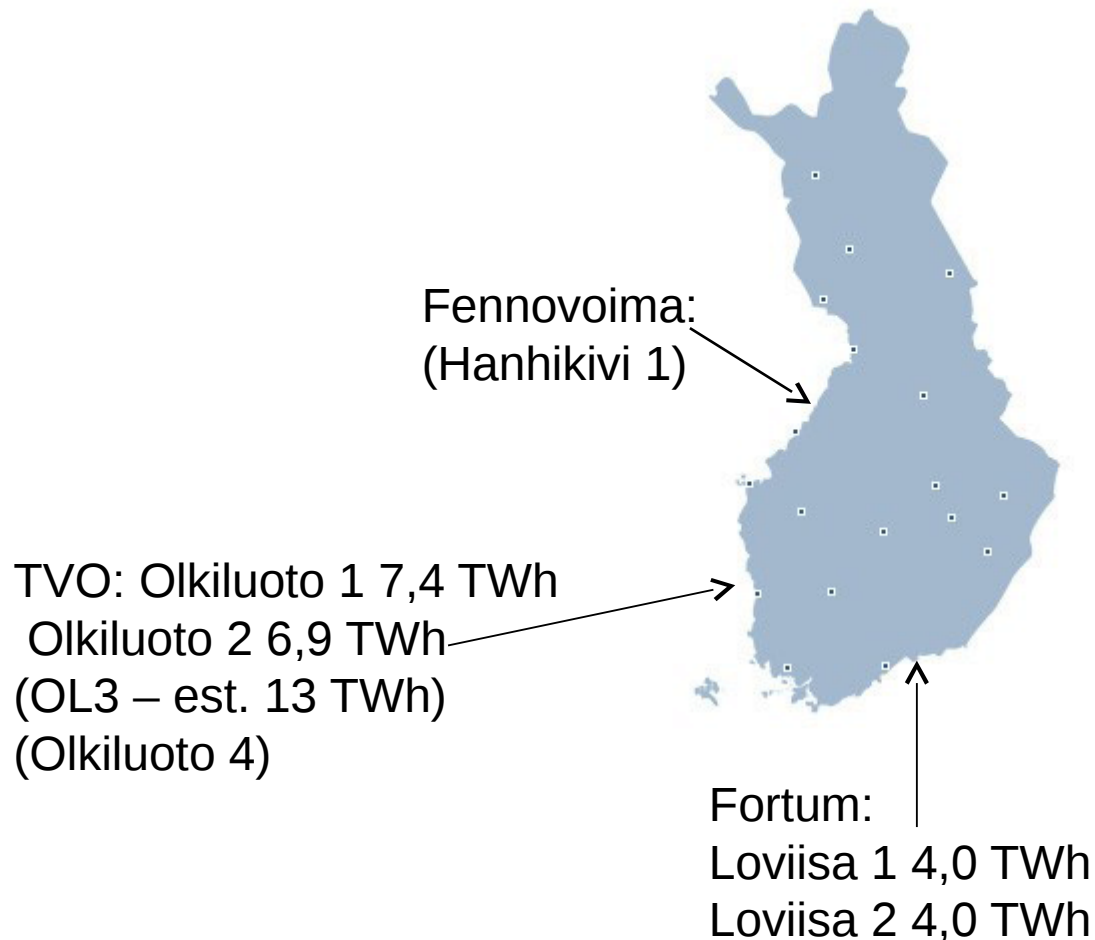
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Nuclear power plants in Finland

Total electricity supply 84,7 TWh in 2011



Fuel: no front-end facilities, potential uranium extracting (Talvivaara Sotkamo Oy) from 2012

No reprocessing of spent fuel – ban to import/export nuclear waste (since 1994)



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Finland and selected other European countries' nuclear power reactors, plans and uranium requirements (adopted and modified from VNA 2012).

Country	Nuclear Electricity Generation 2011		Reactors Operable October 2012		Reactors Under Construction October 2012		Reactors Planned Oct. 2012		Reactors Proposed October 2012		Uranium required 2012
	Billi on kWh	% electric ity	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross	Tonnes U
Finland	22.3	31.6	4	2,741	1	1,700	0	0	2	3,000	471
France	423.5	77.7	58	63,130	1	1,720	1	1,720	1	1,000	9,254
Sweden	58.1	39.6	10	9,399	0	0	0	0	0	0	1,394
Germany	102.3	17.8	9	12,003	0	0	0	0	0	0	1,934
UK	62.7	17.8	16	10,038	0	0	4	6680	9	12000	2,096



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Globally nuclear reactors "under construction" (as of 1 July 2013)

World Nuclear Industry Status Report, 19


Country	Units	MWe	Construction start	Grid Connection
China	28	27,79	2008-2013	2013-2017
Russia	9	7,273	1983-2019	2014-2019
India	7	4,824	2002-2011	2013-2016
South Korea	5	6,32	2008-2013	2013-2017
USA	3	3,399	1972-2013	2015-2017
Pakistan	2	630	2011	2016-2017
Slovakia	2	880	1985	2014-2015
Taiwan	2	2,6	1999	2014-2015
UAE	2	2,69	2012-2013	2017-2018
Ukraine	2	1,9	1986-1987	2015-2016
Argentina	1	692	1981	2013
Brazil	1	1,245	2010	2016
Finland	1	1,6	2005	2016
France	1	1,6	2007	2016
Total	66	63,443	1972-2013	2013-2019

The World Nuclear Industry Status Report 2013

 66 reactors are under construction, **BUT**

- 9 have been under construction over 20 years and 4 over 10 years
- 45 do not have an official planned start-up date
- At least 23 have encountered construction serious delays, from other 43 reactor units it is difficult to assess whether they are on schedule or not

 Two-thirds (44) of the units under construction: China, India and Russia.

 The average construction time of the 34 units that started up in the world between 2003 and July 2013 was 9.4 years.



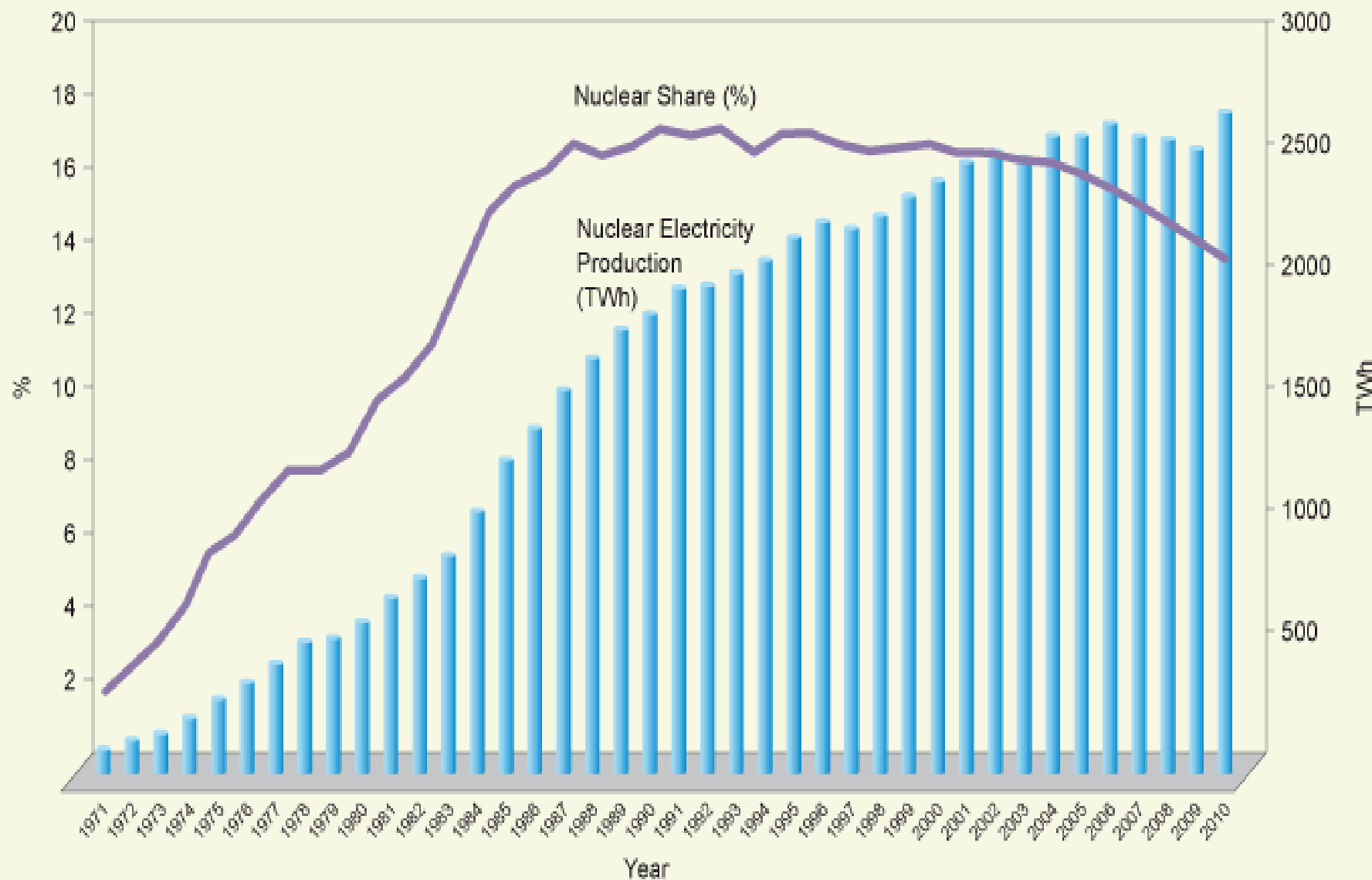
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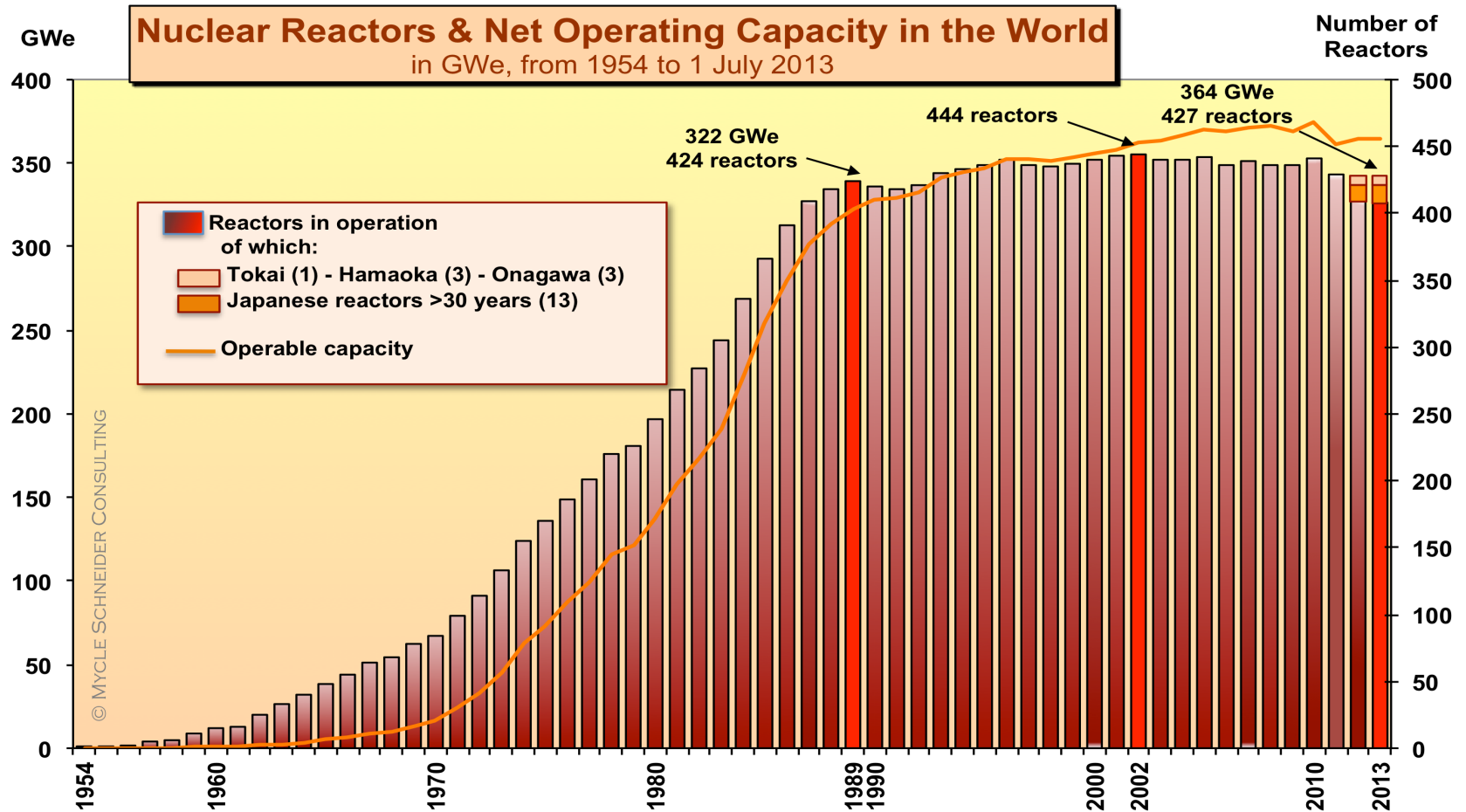


Nuclear Electricity Production and Share of Total Electricity Production

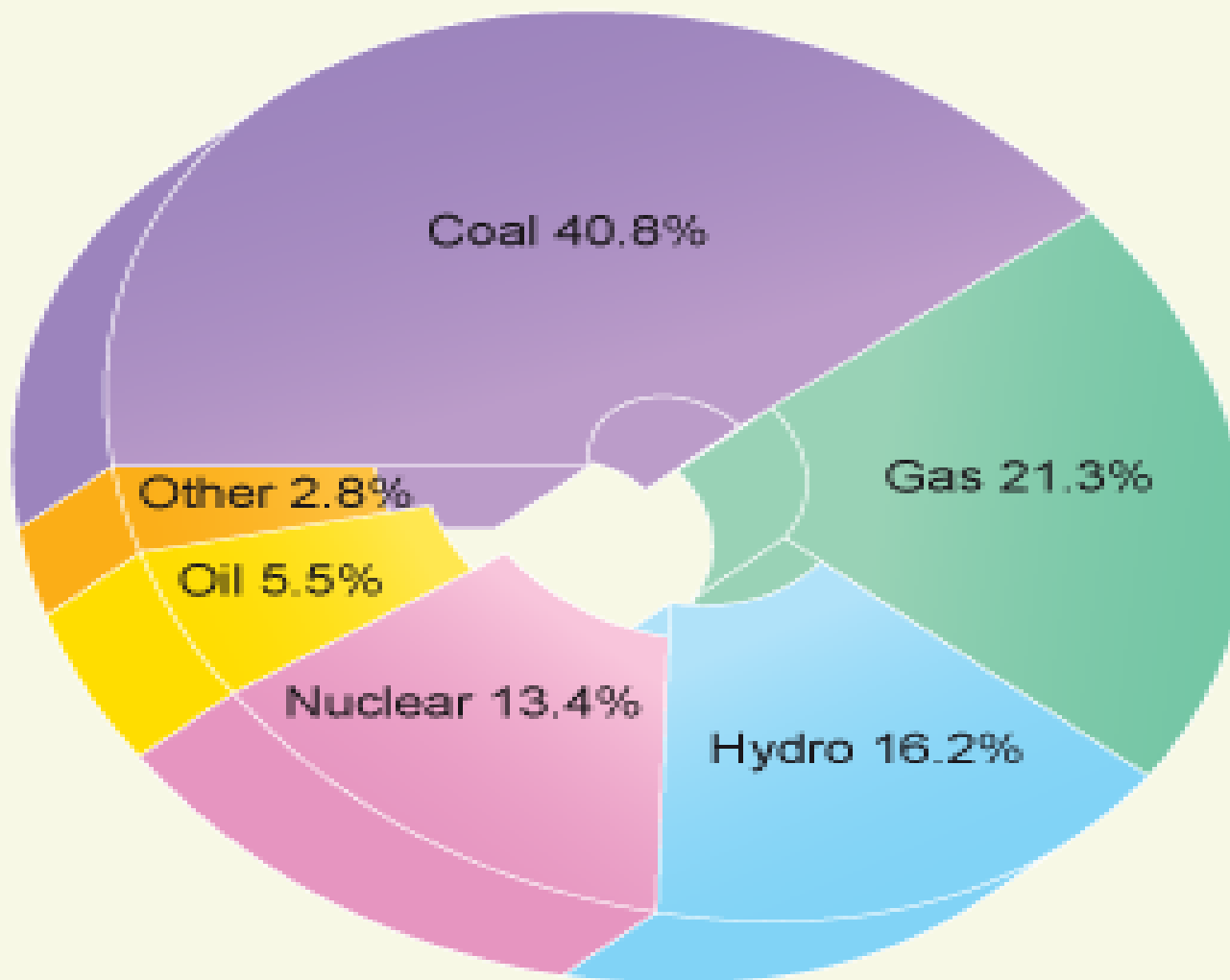


Nuclear reactors and operating capacity

(The world nuclear industry status report 2013)



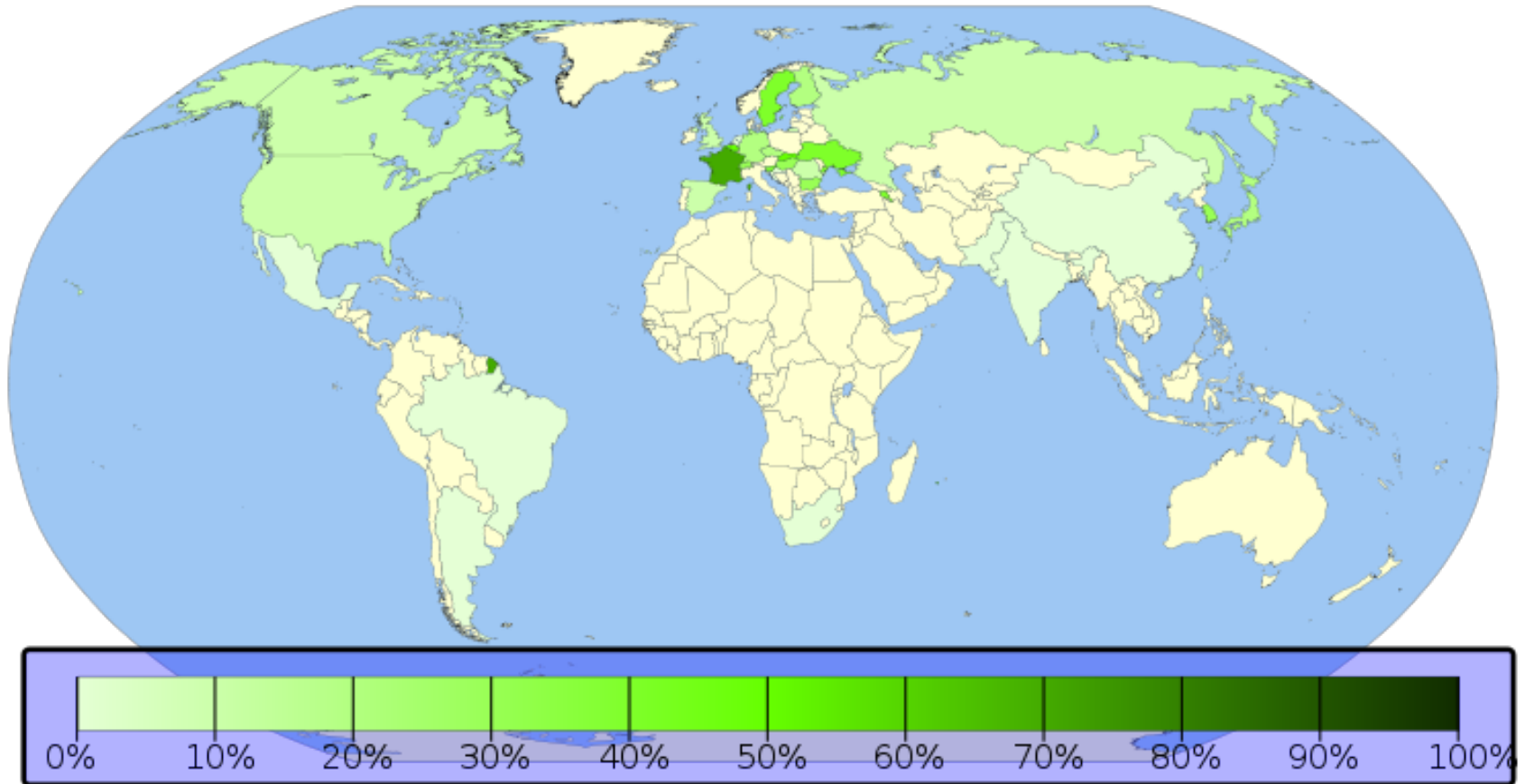
World Electricity Production 2008



Total: 20,269 TWh

Source: IEA Electricity Information 2010

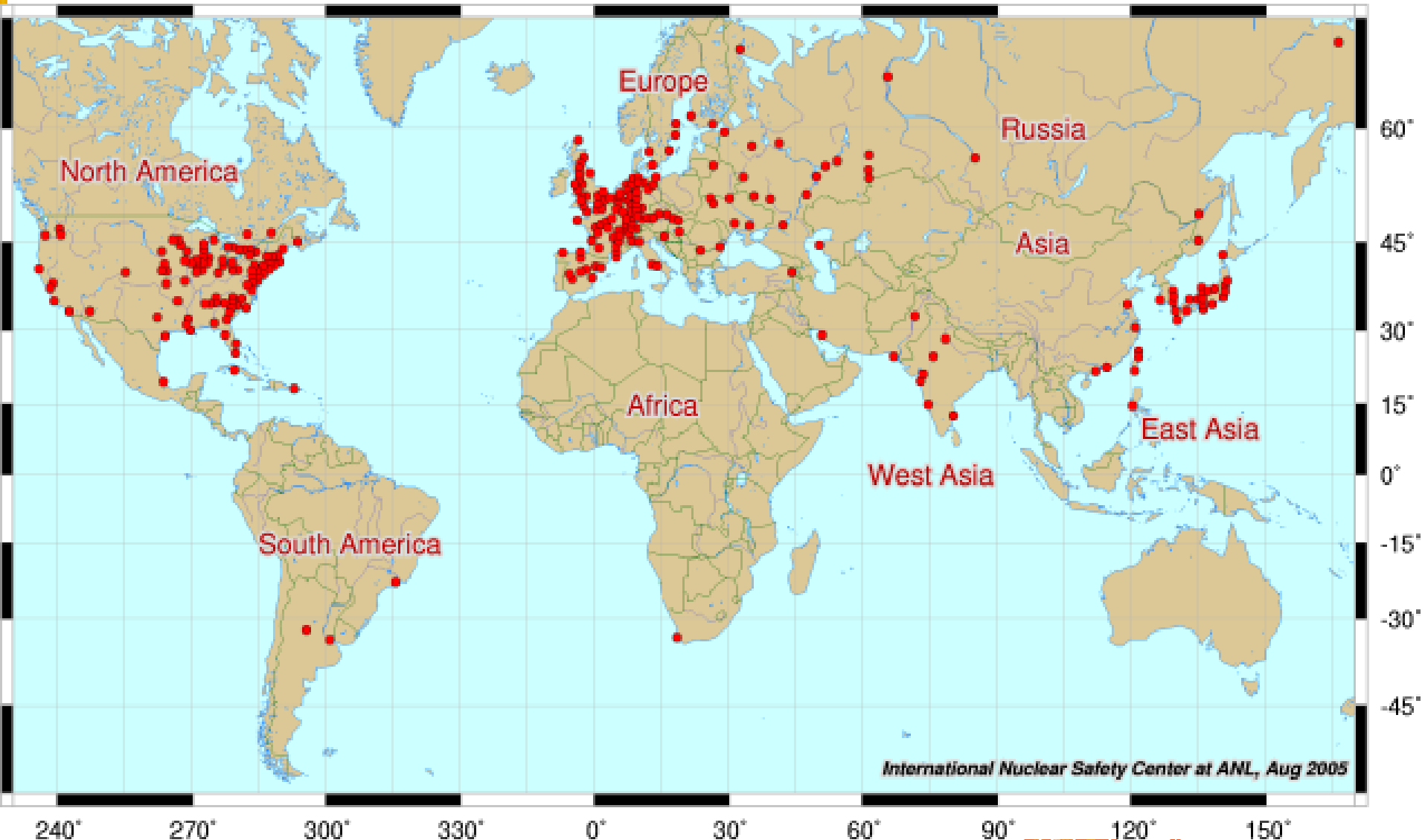
Share of electricity produced by NPPs



http://en.wikipedia.org/wiki/File:Nuclear_power_percentage.svg -- 9.2.2013

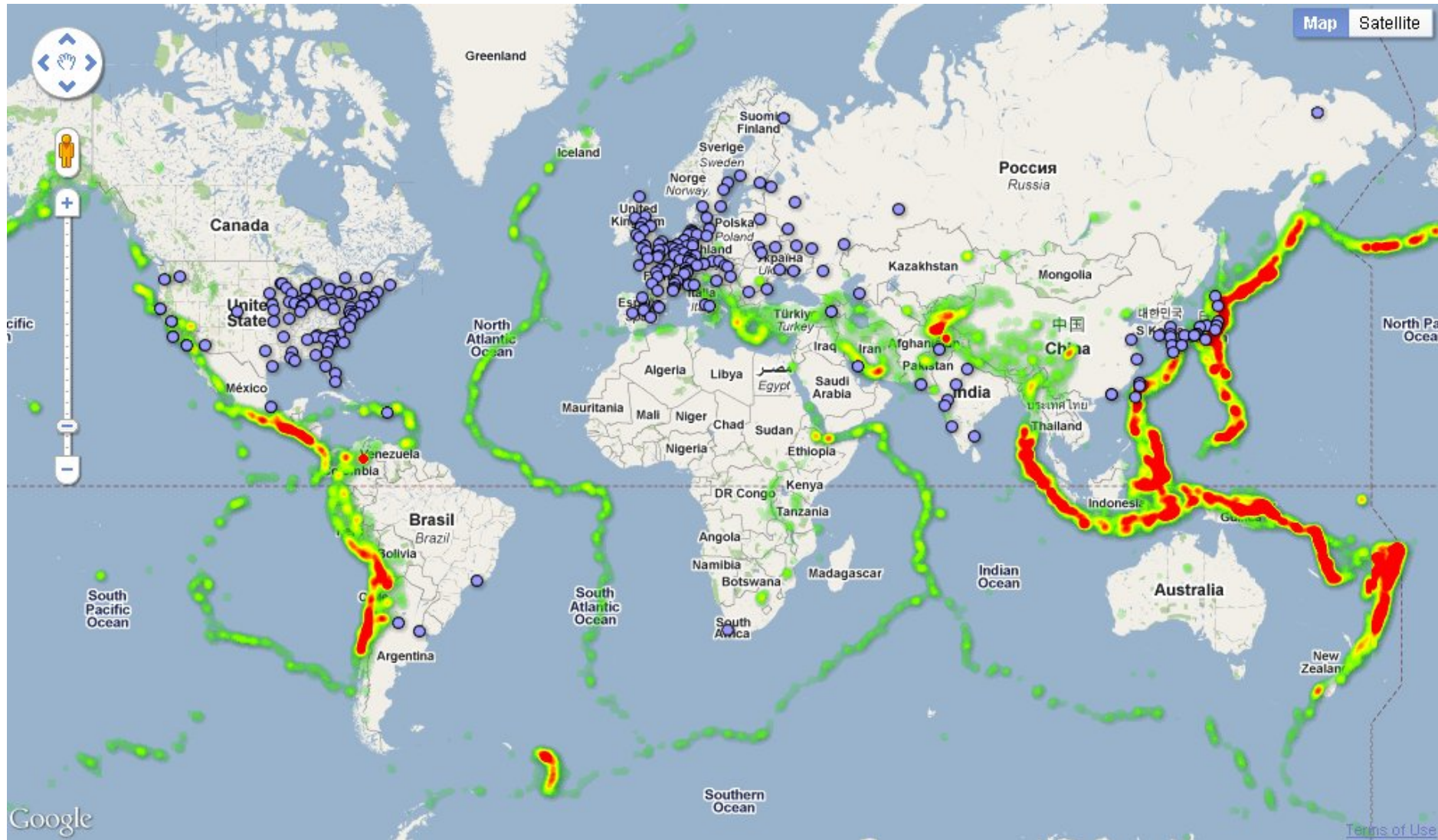


World's current NPPs



zones

United States Geological Survey & IAEA



NPPs in Europe










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Drivers of nuclear new build

Recent nuclear power policy-making

(Litmanen & Kojo 2011)

-  We have distinguished three different policy arrangement periods
-  1) rejection 1986–1993
-  2) revival 1994–2002
-  3) renewal 2003–2010
-  Before recent favourable nuclear decisions in 2002 and 2010, nuclear power was rejected by the Parliament in 1993



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Decades of determined pro nuclear lobbying

The rejection period, 1986-1993:

- characterized by opposition to nuclear power

The revival period, 1994-2002:

- a slight increase in public support for nuclear power
- presumably because the nuclear industry lobbied for its new NPP application and the anti-nuclear power movement lost strength

The renewal period, 2003-2010:

- the support for the expansionist decision has increased
- around 40% of Finns agreed with the policy and opposition dropped to under 30% in 2003



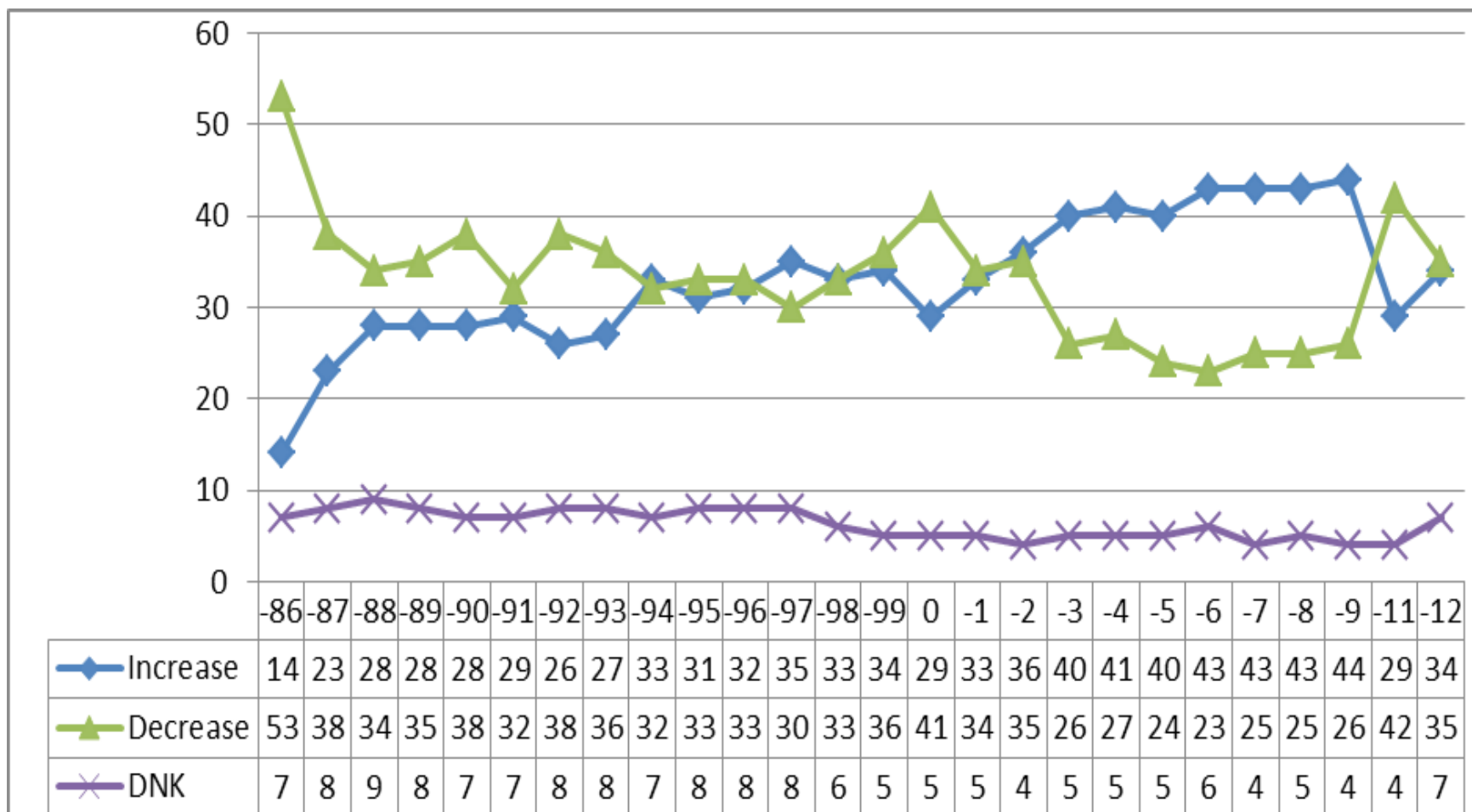
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How Finns view nuclear power should be developed in Finland?



Source: Ylönen, Litmanen, Kojo & Lindell 2013

Strong pro nuclear coalition

- Relatively close relationships between the state and the nuclear industry
 - but also between the state, export industry and labour unions
 - The National Coalition Party, the Social Democratic Party, the power companies, labour unions and business organisations (+ ministry of employment and economy)
- The energy-intensive pulp and paper industry (UPM Kymmene and Stora Enso)



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Follow the money!

The current owners of TVO

- EPV Energia (6,5%), Oy, **Fortum Oyj (26%)**, Karhu Voima Oy (0,1%), Kemira Oyj (1%), Oy Mankala Ab (8%), and **Pohjolan Voima Oy (58%)**

Fortum owns nearly 26% of TVO;

- thus, the interests of the state of Finland are also indirectly represented in TVO, as the state owns just over 50% of Fortum Consortium

Owners of PVO

- 21 shareholders, which include paper makers UPM-Kymmene Oyj (42% of shares) and Stora Enso Oyj (15,6%) as well as locally owned energy companies




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Effective change of pro-nuclear discourse

-  The pro-nuclear coalition reconsidered their message after their defeat in 1993
- Coalition ended up emphasising softer values such as
 - the importance of the defense of the welfare state
 - combating climate change with nuclear power and
 - the safety of nuclear power



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Anti-nuclear coalition was powerful in the 1980s

 The 'shock event' of Chernobyl mixed up the policy arrangement of the 1980s

- For example, the supporting coalition was temporarily paralysed,
- the political effectiveness of discourses changed
- the anti-nuclear coalition found new resources



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Liberalisation of electricity markets

- From the mid-1990s, liberalisation and deregulation of electricity markets altered the rules of the game
- The latest period from 2003 onwards
 - political interests aimed at further increasing nuclear power production capacity
 - debate over liberalisation of the licensing process






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Rationale for Nuclear Power Expansion in Finland

Arguments stated by the Government for the positive DIPs (July 2010)

-  Reaching the climate and energy strategy targets
 - including electricity supply and environmental effects
-  Self-sufficiency as a goal
 - electricity import from Russia and other neighboring countries
-  Reduce green house gas emissions



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Rationale for Nuclear Power Expansion

Arguments stated by the Government for the positive DIPs

-  The seven units might cover almost 60 % of Finnish power demand in 2020's
-  Increase competitiveness of Finnish industry
 - which is very energy intensive
-  Both companies produce electricity at cost to their owners



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Political power: geopolitics

- National security: Fuel for the economic engine!
- To ensure energy security countries tend to use energy diplomacy
- Or more rude geopolitical actions, e.g., military presence and/or domination
- How geopolitics affects in Finnish energy policy?



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The Scope of the Issue: Gas

David Dusseault's pp-slides

Russia: Main Natural Gas Export Pipelines



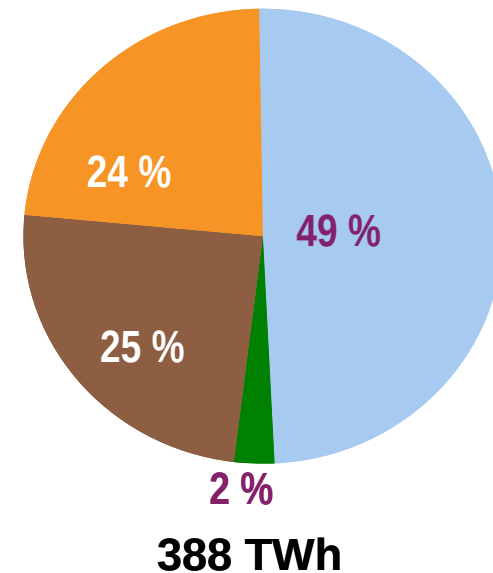
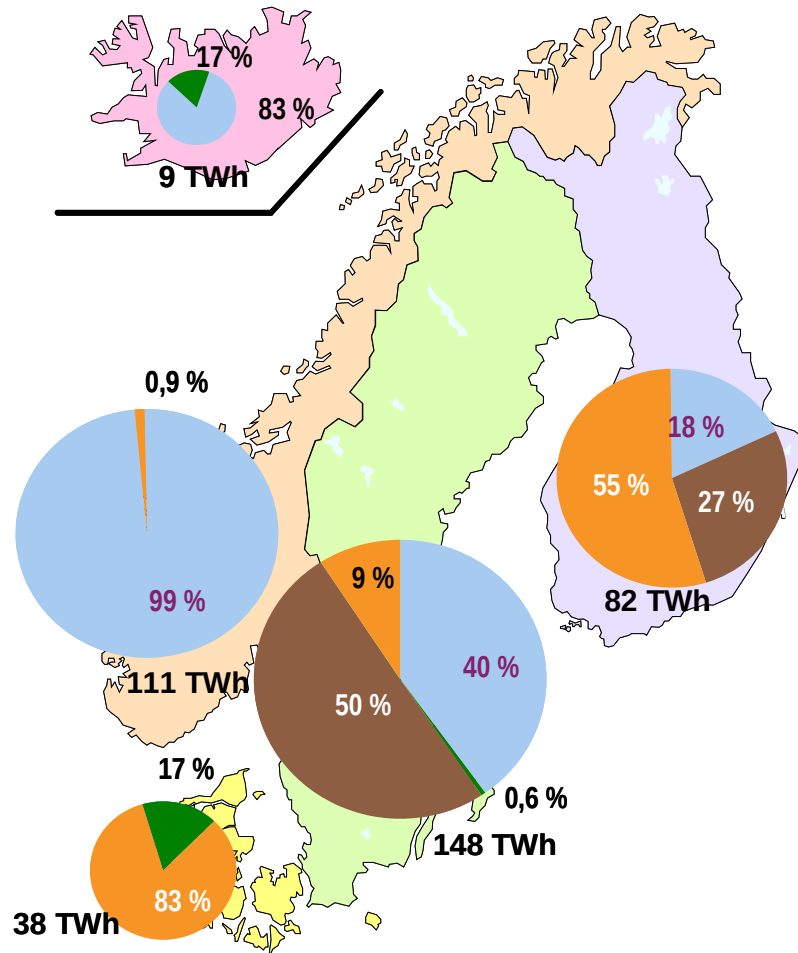
The Scope of the Issue: Oil

David Dusseault's pp-slide

Russia: Main Oil Export Pipelines



Electricity generation in the Nordic Countries 2004 (Source: Nordel)



- Hydro power
- Wind and geothermal power
- Nuclear power
- Thermal power



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Planned Fennovoima NPP at Pyhäjoki



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One special background factor facilitating nuclear new build



An ambiguous reputation as a pioneer of nuclear waste management

-  Posiva, nuclear waste company, suggested Olkiluoto to be a final disposal site
 - In May 1999
-  The municipal council of Eurajoki made a positive statement on the decision in principle
 - in January 2000
-  The Government made the decision in principle
 - on the 21st of December 2000
-  The Parliament ratified the decision
 - on the 18th of May 2001



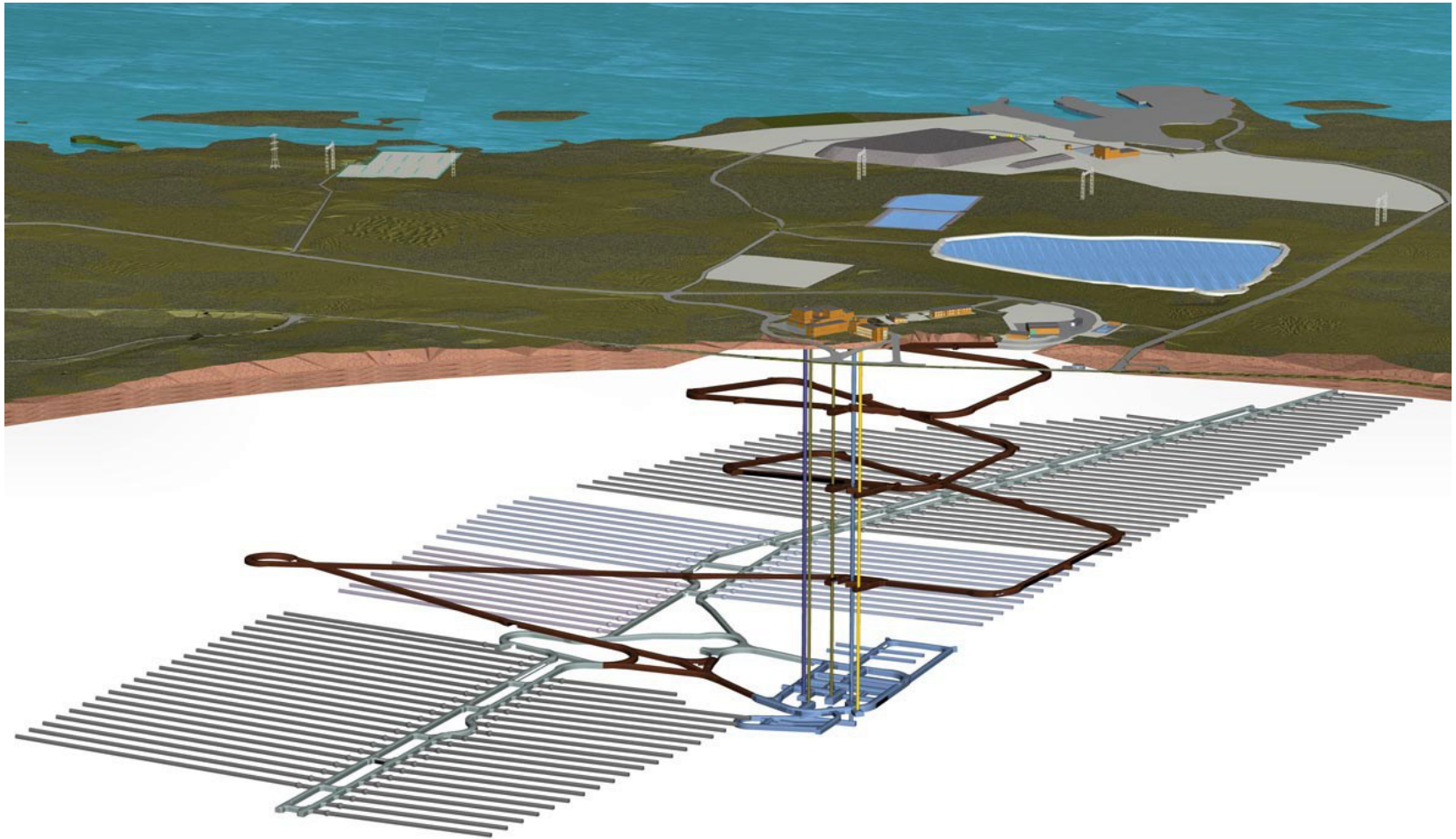
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Underground repository for the spent nuclear fuel



The nuclear waste management system

-  Spent nuclear fuel is managed by Posiva Oy
 - set up in 1995 as a joint venture company – 60% TVO and 40% Fortum
-  Deep geological repository for encapsulated used fuel at the Olkiluoto island in Eurajoki
 - some 400 metres down in 2 billion-year-old igneous rock
-  Plans do not include accommodation for used fuel from Fennovoima's new plant
 - But the government can use its legal authority to ensure that Fennovoima fuel would be included



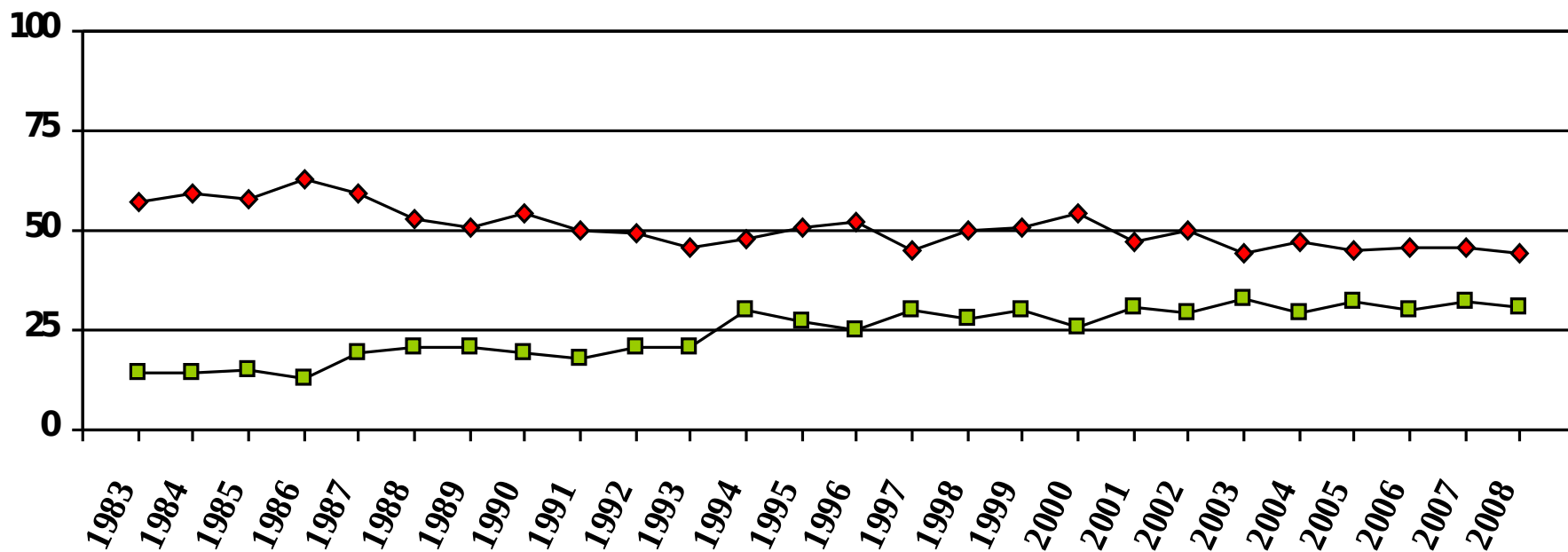
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Source: Statistics Finland, Food usage, 2008 (table 100)

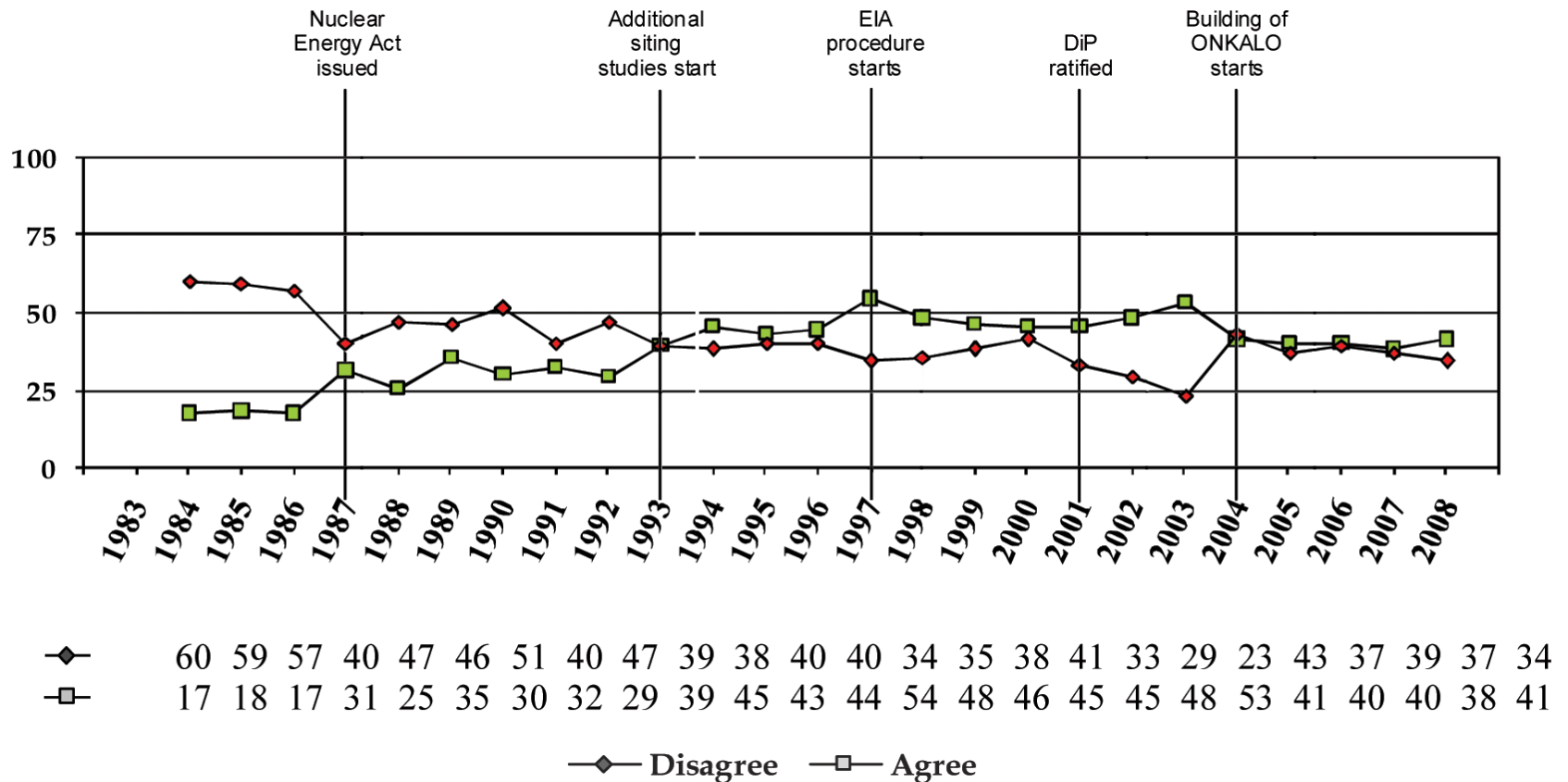


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Factors affecting on local risk perception



Residents of Eurajoki disagreeing and agreeing with the view that final disposal in the Finnish bedrock is safe (%).

Based on data from the annual Energy Attitudes of the Finns (1983) study (Kari et al. 2010, p.9)



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Risk perception in Eurajoki and its neighbouring municipalities

Perception of the threat posed by the nuclear waste disposal facility, felt at least explicitly (%) (M. Kojo et al. / Progress in Nuclear Energy 52 (2010) 168–176)

Dimension of risk perception	%
General safety	34
Own or family's safety	32
Safety of future generations	55
General health	45
Own or family's health	42
Health of future generations	56
General well-being	39
Own or family's wellbeing	37
Well-being of future generations	52





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Conclusions



Finnish exceptionalism

-  *"In Finland we have the most stable bedrock in the world and we can produce nuclear energy safer than the others. We have plenty of cold cooling water which promotes maximum production of energy and we have skillful engineers, not to mention the widely acknowledged high level of technology. Radiation and nuclear safety authority's control ensures that industry does not build seconds."* (Anonymous writer, HS, 14 March 2011).
-  *"All the recognizable threats have been analysed and they can be controlled."* (Himanen, Nuclear Safety manager of Olkiluoto, HS 26 March 2011).



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Many factors behind nuclear new build

-  Strong pro nuclear coalition
-  Effective pro-nuclear discourse
-  Industrial structure of Finland
-  State's and local municipalities' ownership in energy companies
-  National energy and climate policy strategy
-  Liberalised electricity markets
-  Geopolitical realism
-  Solutions for the problem of nuclear waste: final disposal








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Some new publications

-  Litmanen, Tapio & Kojo, Matti. *Not excluding nuclear power: the dynamics and stability of nuclear power policy arrangements in Finland*. Journal of Integrative Environmental Sciences 8 (3), 2011, 171-194.
-  Litmanen, Tapio. *Nuclear power in societal flux. The renewal of nuclear power in Finland in the context of global concern over energy security*. Nuclear Safety and Simulation, 1 (4), 2010, 280-290.
-  Kojo, Matti & Litmanen, Tapio, *The Renewal of Nuclear Power in Finland*. Palgrave Macmillan, Hampshire, 2009.
-  Ylönen, Marja, Litmanen, Tapio, Kojo, Matti & Lindell, Piritta. *(De)politicization Of Nuclear Power – The Case Of Finland After The Fukushima Disaster*. Public Understanding of Science (2013, Under a review)
-  Litmanen, Tapio, Solomon, Barry & Kari, Mika. *The Utmost Ends of the Nuclear Fuel Cycle: Finnish perceptions of the risks of uranium mining and nuclear waste management*. Journal of Risk Research (2013, Accepted manuscript)



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Thank you for your attention!

Questions, comments?





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