

A photograph of a nuclear power plant at dusk. The sky is a deep blue, and the plant's structures, including tall chimneys and a large white cylindrical tank, are illuminated with warm yellow lights. The foreground shows a dark, grassy field.

Framing of nuclear megaproject pathologies by the OECD-NEA

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Outline

My project on nuclear megaproject pathologies, controversies, and appraisal

What is NEA?

My initial findings and observations: NEA explanations for megaproject pathologies

Conclusions, insights – and a call for feedback...

My project: TENUMECA (The technopolitics of nuclear megaproject pathologies, economic controversies and varieties of socioeconomic appraisal)

Controversies over nuclear-sector megaproject “pathologies”

The “iron triangle” of project performance criteria: cost, timetable, predefined project specifications

Appraisal and economics – (positive?) role of controversies?

under which preconditions could economic controversies play a constructive role and help address megaproject pathologies in socioeconomic appraisal

Finland, France, UK, Spain, NEA

Megaprojects and their “pathologies”

The iron triangle vs. more complex explanations

Transport projects, other types of large projects, mega-events

Some work in the nuclear sector (Locatelli, in particular)

- *“Megaprojects’ in all industries are subject to similar challenges, although the past record of the nuclear industry remains slightly below that of its peers in other sectors of the energy industry in terms of building to time and budget, but this could well be a function of project size and complexity.”* (NEA 2015, 12)
- “the global nuclear industry will rise or fall based on its overall ability to deliver reactors ready for grid connection **on budget and on time.**” (NEA 2015, 231)

What is NEA?

Today

33 nuclear and non-nuclear countries from Europe, North America, and the Asia-Pacific

82% of world's nuclear capacity

European Nuclear Energy Agency, ENEA (1958)
Originally 17 European countries (US & CAN as observers)

Promotes international cooperation and capacity-building in

- nuclear energy development
- safety and regulation
- radioactive waste management and decommissioning
- radiological protection and public health
- law and liability
- science
- information and communication

NEA mission

*"To assist its member countries in maintaining and further developing, through international co-operation, **the scientific, technological and legal bases required** for a safe, environmentally sound and economical use of **nuclear energy for peaceful purposes**.*

*It strives to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the **sustainable development of low-carbon** economies."*

NEA members

Cooperation
agreements with
China

-  Argentina (2017)
-  Australia (1973)
-  Austria (1958)
-  Belgium (1958)
-  Canada (1975)
-  Czech Republic (1996)
-  Denmark (1958)
-  Finland (1976)
-  France (1958)
-  Germany (1958)
-  Greece (1958)
-  Hungary (1996)
-  Iceland (1958)
-  Ireland (1958)
-  Italy (1958)
-  Japan (1972)
-  Korea (1993)
-  Luxembourg (1958)
-  Mexico (1994)
-  Netherlands (1958)
-  Norway (1958)
-  Poland (2010)
-  Portugal (1958)
-  Romania (2017)
-  Russia (2013)
-  Slovak Republic (2002)
-  Slovenia (2011)
-  Spain (1959)
-  Sweden (1958)
-  Switzerland (1958)
-  Turkey (1958)
-  United Kingdom (1958)
-  United States (1976)

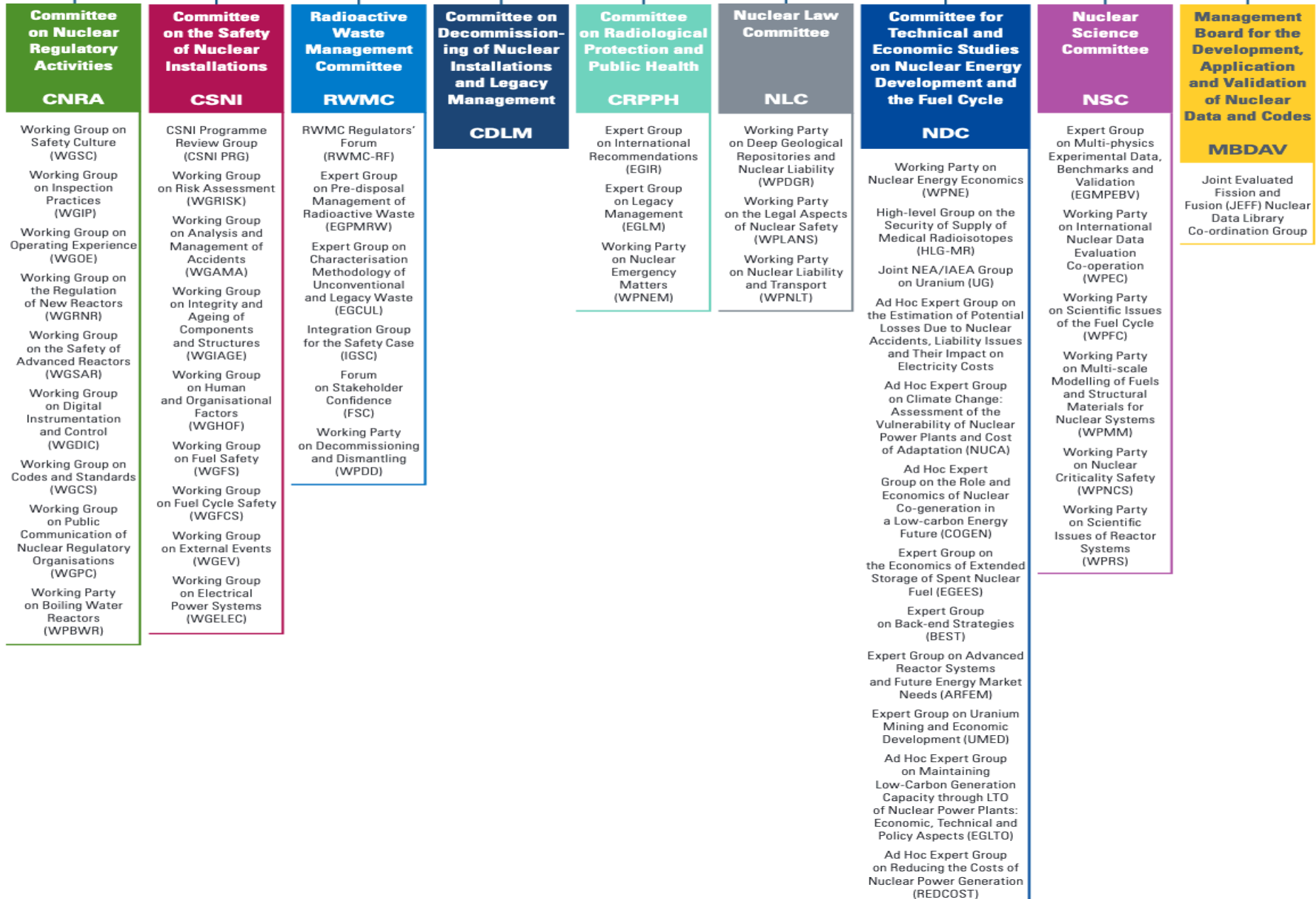
NEA/OECD working method

**No direct
regulatory
power**

Exchange of information, “best practice”, “consensus opinions”, joint projects amongst interested countries

Soft persuasion via **peer pressure**, socialisation, creation of shared identities

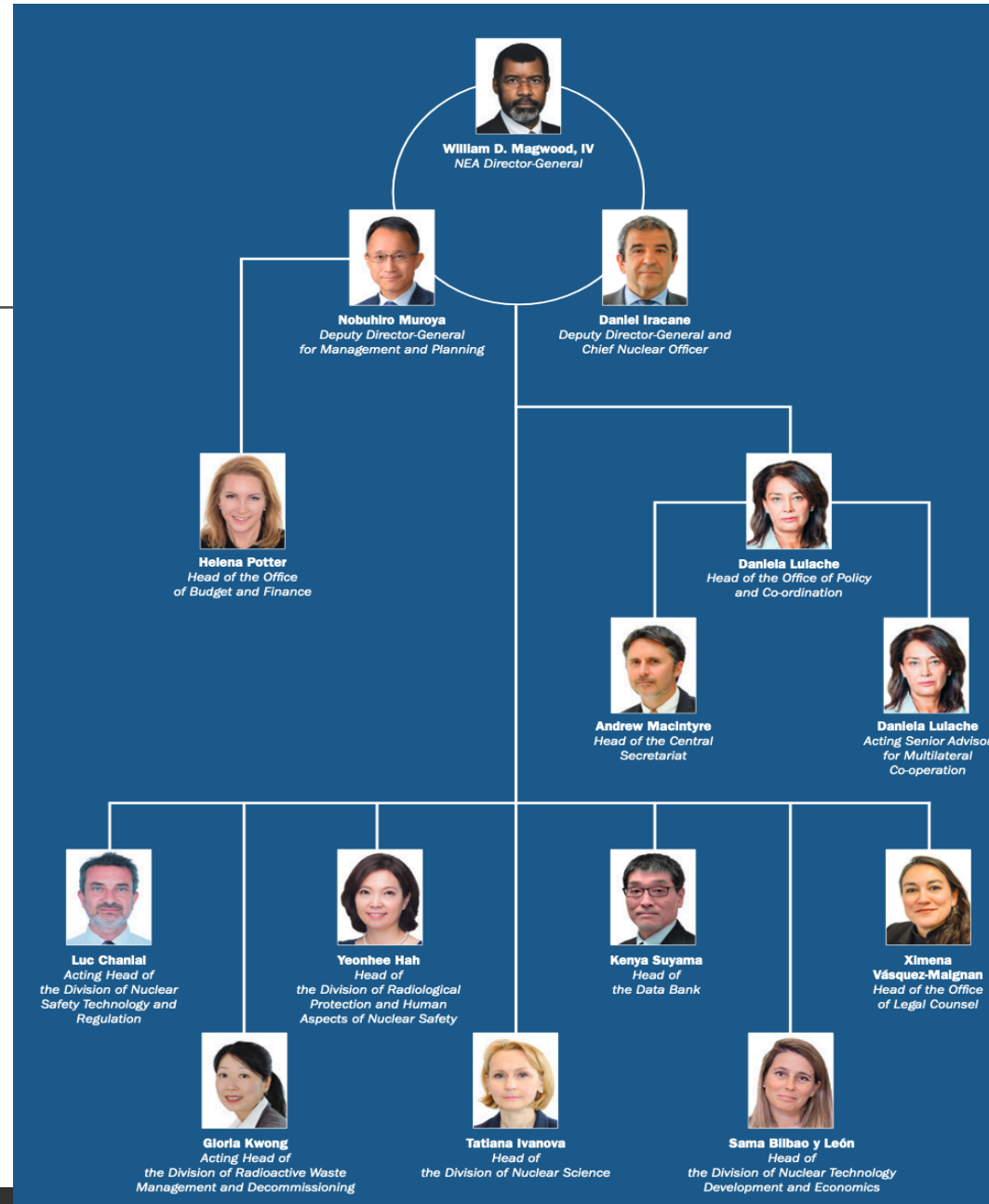
Steering Committee for Nuclear Energy





Staff of about 115 –
foreseen to decline...

- Few permanent staff
- 3-5-year contracts
- “Secondments” (staff on loan from member countries)



Me and/at the NEA

Sought to understand megaproject pathology framings

- But also NEA role in politics around those pathologies – and its role as an international organisation

19 interviews

Official NEA vs. private views

Based at the NTE Division (Nuclear Technology Development and Economics)

Frames and framing

'Frame' is a schema of interpreting reality

- Tools we use to make sense of 'raw' information regarding the situation, giving them meaning and coherence (Kendall)

'Framing' stresses agency

- Active construction and articulation of frames

Frame/framing functions

- "frames [...] provide thematically reinforcing clusters of facts or judgments", which have certain functions (Entman)
 - Define problems
 - Diagnose causes
 - Entail moral judgement (of actors, situations)
 - Suggest remedies and ways forward

Megaprojects – what I asked from my interviewees

How do you explain the “pathologies” of nuclear-sector megaprojects?

A list: economic/financial, technical, organisational, regulatory, political, social...

Most answered by elaborating on these factors, but:

- one interviewee strongly contested the term “pathologies”, as tendentious, and argued, above all, that nuclear power plants always deliver what they promise – if they indeed are built

NEA work on nuclear-sector megaprojects and reducing costs & delays...

Reject the idea of negative learning curves

From FOAK to NOAK

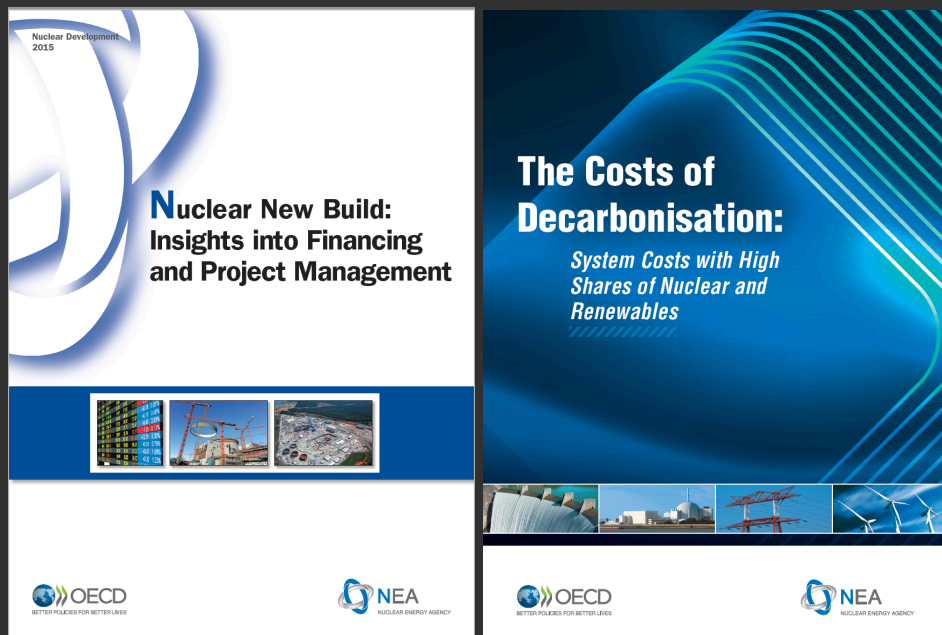
The REDCOST project

What NPP projects “should” and “could” cost

- Historical experience: interpreted optimistically...
- “Should” = NOAK, based on present knowledge and experience
- “Could” = NOAK, with improvement, optimisation...

“System costs”

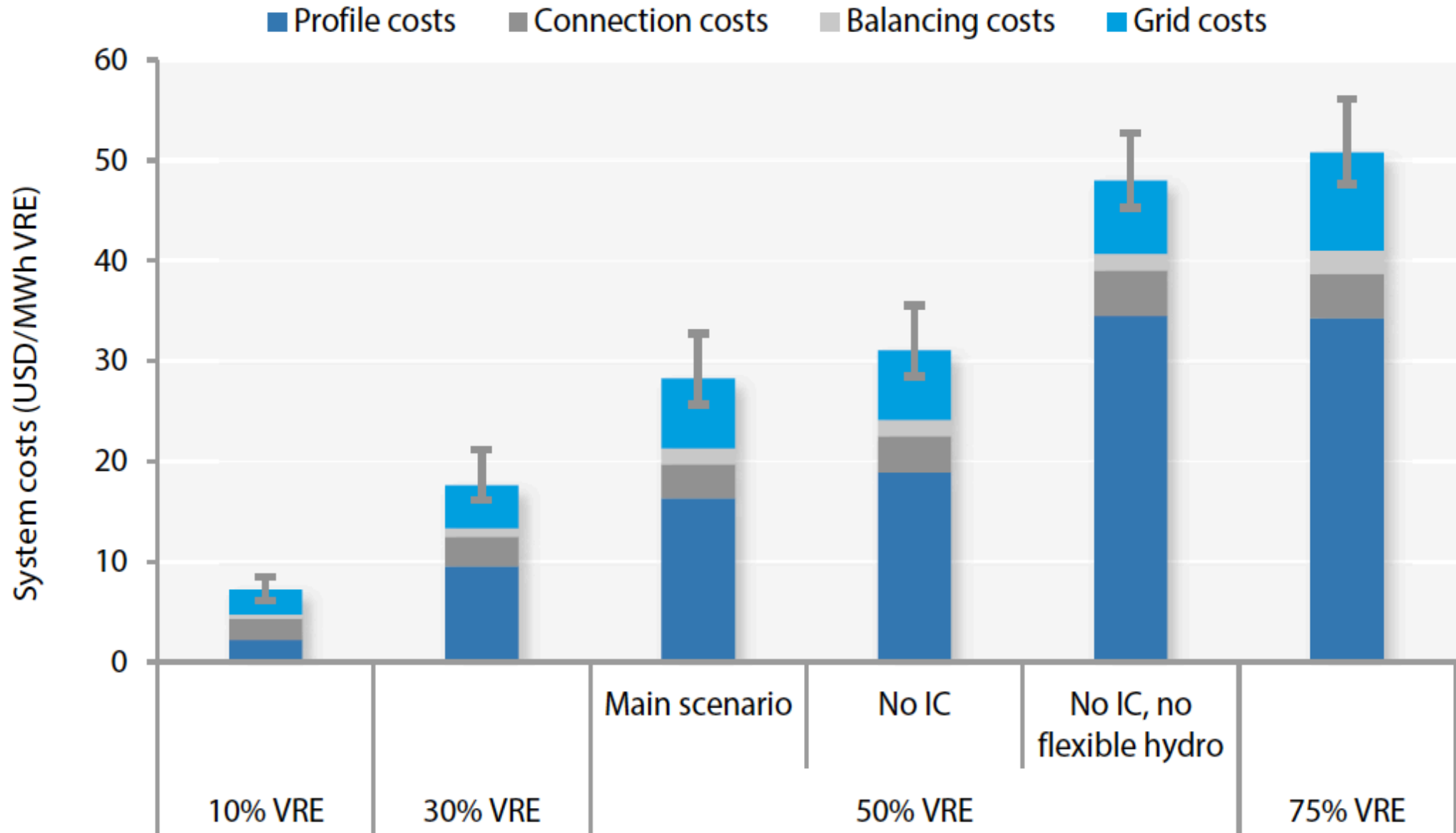
“...people – electricity market and system experts as well as politicians – have realised that renewables have costs that go beyond the LCOE. (...) But also the renewables constituency itself has become increasingly concerned about the recent development, which leads to lower electricity prices and hence lower profits for RE producers themselves.” (I-13)



Variable Renewable Energy (VRE)

- ❑ Variable
- ❑ Uncertain (unpredictability of power output)
- ❑ Location-constrained
- ❑ Non-synchronous (must be connected to the grid via power electronics and are not directly synchronised with the grid)
- ❑ Modular (smaller in size than conventional generators)
- ❑ With low variable costs

Figure ES6. **System costs per MWh of VRE**



NEA. 2019,
p. 20.

Explanations for nuclear megaproject “pathologies”

PRELIMINARY FINDINGS/OBSERVATIONS FROM THE
INTERVIEWS

Loss of skills, competences, and the supply chain

*“You ask yourself the question: how did all these very smart people spend all this money and make these mistakes, some of which were very simple? You have this idea of nuclear power as a very complex technology, which is bound to render project development difficult. But when you then look at these projects, you discover that the **problems were almost never related to the nuclear**, but it’s always about things like concrete – someone didn’t pour the **concrete** right, or that someone did not do the **welding** according to the guidelines.”*

We used to know how to do these projects, but have lost the memory and capabilities:

“Institutional memory is expensive and time-consuming“

Let’s be honest: we no longer know how to do these projects, but the Asians do – they’ve got their projects up and running, on time and within budget

Complexity, leadership and project management

*“...in the past, one person might be driving the project and take all decisions – today, you never see anything like this, because the projects are hugely complicated, there are far too many moving parts, so the person who is formally **the** project manager does not make decisions alone, as he would have done in the past.”*

*“In the past, the project leader took the **residual risk**, saying to the teams and people working under his leadership: “go and do this – the risk of something going wrong is mine”.”*

“The modern society”

We see these overruns, but they are really the tip of the iceberg – essentially, it is that we no longer know how to run and manage large projects; and the political environment is what underpins everything

*“Perfection is the enemy of the good – and **the modern society demands perfection.**”*

*“What is really driving up the cost, is the inability of our modern society and organisations to live with any amount of **residual risk**, that is, risk that cannot be diversified and hedged against.” (...) In the past, **the project leader** took the residual risk, saying to the teams and people working under his leadership: “go and do this – the risk of something going wrong is mine”. But today, this type of leadership is no longer possible, and risk is not accepted.“*

*“underlying all this overregulation and loss of experience are the **societal and political aspects** (...) politicians do what they believe the society wants them to do”*

(Over-)regulation

“This is not a politically correct opinion – and it is mine, not NEA’s – there’s overregulation on nuclear. Many regulatory requirements are excessive (...) with in my opinion zero to almost-zero benefit to safety”

“our culture of safety is not in line with a culture of effectiveness. Optimum point of safety and cost; we are over the point of optimum”

“oftentimes the regulators are not prepared. This is especially the case in countries that have not built plants for a long time”

“today we live in a very prescriptive environment, and the regulator wants to know what you are going to do, to the smallest detail”

The technology is dynamic, but regulation is static – this is why we remain with the same nuclear technologies today as those we had decades ago – compare with car industry and its high turnover!

“it is obvious that the regulatory standards for NPP projects are consistently higher than those for other industries.”

Economics and financing: who will carry the risks?

“The liberalised market that places people in competition with each other... in addition, unbundling... this dynamic weakens the large industrial players that used to be those who took the key decisions in the past... But I’m not saying that this is either good or bad.”

“The markets are extremely tight nowadays. In the olden times, we used to do more cost-plus: “you go, you build it, and whatever it costs, we’ll add 10 million dollars, and that’s your profit”. Today, we are saying this is what you have to build, and there are incentives for delivering early and disincentives for delivering late. This isn’t working, because you’ve created a system, which gives suppliers an incentive to do things when they are not really ready yet.”

Opacity of the nuclear industry seen also as an impediment to financing:

“You are providing me with a business case, and you are not willing to share info on your business”

The markets are broken – this is not a market!

*“If you look around the OECD countries, in many places you have situations in which electricity prices are routinely zero or negative – but that’s not a market! (...) Obviously, a big contributor to this are the **subsidies going to renewables** – people would say that we are not subsidising them, but well, “yes you do!” Because when you have a requirement to have 20% or 30% of RE, it is essentially a subsidy, because it creates a guaranteed demand for renewable electricity and thereby removes the risk from the companies. The risk of building these things is borne by the taxpayers and consumers, while the companies have no risk at all. If you had zero **risk** you could build anything!”*

“What we have today are not liberal markets, but markets seized by governments, willingly or unwillingly, consciously or unconsciously, that are driving nuclear and other baseload electricity out of the business. This is a system that is really not viable, it is not sustainable.”

...and the OECD and IEA increasingly agree with us

The EPR

Excessive complexity and lack of optimisation from the combination of German and French nukes technologies

The French (EDF?) did not really want an EPR – there's a fraction at the EDF that insisted on the development of a purely French reactor

Not very different from the AP1000 projects – a “Western” problem?

The Chinese... *“You should not look at Spain, but China! Analyse the Taishan projects, alongside Olkiluoto and Flamanville, and try to explain the differences”*

Flamanville and Olkiluoto = poor sites for FOAKs; too cold in Finland, too windy and too crowded in Flamanville..

Solutions



Nuclear AND renewables

GETTING THE
MESSAGE RIGHT!

Need for a strong political signal

“To reconstruct the supply chain, there’s a need for a strong political signal – once again, that’s indispensable!”

“If we are really serious about climate change...”

Carbon pricing, new financing arrangements (with state backing) and a truly level playing field

“I would refer to what Dani Rodrik once said: No nuclear power plant has ever been built on the basis of market prices”

FiT, Contracts for Difference, Power Purchase Agreements...

Integrating the system costs into the calculations & decision-making

Cooperation, creating a “common vision”

Collaboration between:

- the operator and the regulator
- regulators from different countries

“Reasonableness” in regulation: how safe is safe enough?

Work for a common cause, “common good”, electricity as a public good...

Standardisation, harmonisation...

“Key success factors are the replication of existing reactors, “a relative monoculture”, a stable environment with experienced stakeholders and a long-term view.” (NEA 2015, 187)

“closer co-operation between reactor vendors and their principal suppliers on common codes and quantity standards” (NEA 2015, 138)

“the convergence of nuclear engineering codes and quality standards remains a key step in promoting both competition and public confidence.” (NEA 2015, 13)

SMRs & other “advanced nuclear technologies”?

Mixed views – some countries/individuals highly enthusiastic, others highly sceptical

Future perspectives

Nuclear power is at risk, at an inflection point; hard to anticipate what the future will bring...

Unless we do the right thing within 5 years, we are doomed...Chinese and Koreans will take over

"In the past... whereas today..."

Climate: this is what it all hinges upon – we must get the message right!

NEA: a mixture of hope and despair, optimism and pessimism...