Second, almost all nuclear new-build projects require some mechanisms – either contractual or regulatory – to allocate market risks to the final consumers. For instance, recent projects in the United States are eligible for a nuclear production tax credit from the federal government as part of the 2005 Energy Policy Act, effectively transferring market risks to taxpayers. Flamanville 3 is the only project financed without the explicit transfer of risks to consumers or taxpayers.

Third, there is more variability in the allocation of construction risks. Utilities, developers and vendors have accepted to carry part – and sometimes all – of the construction risks for a number of projects. Only projects located in countries or states with regulated electricity markets have allocated construction risks to final consumers[64]. In addition, when construction risks have been allocated to the industry, this has been driven by a range of considerations beyond the scope of the project. Eagerness to benefit from first-mover advantages in the nuclear new-build market was a particularly important stimulus for several projects prior to the Fukushima Daiichi nuclear accident.

Table 7: **Financing structures and market and construction risk allocation for recent nuclear new-build projects**

	Status	FOAK	Structure of financing			Allocation of market risks			Allocation of construction risks			Debt guarantee
			Corporate finance	Project finance	Hybrid model	Consumers	Taxpayers	Utility	Consumers	Utility/developer	Vendor	
Olkiluoto 3	Under construction	Yes			x	O				O	C	French ECA
Flamanville 3	Under construction	Yes	x					O		O	C	None
Taishan 1&2	In operation	Yes		x		R			R*			None
Vogtle 3&4	Under construction	Yes		x		R	R		R		C	US federal guarantee
VC Summer 2&3	Cancelled during construction	Yes		x		R	R		R		C	US federal guarantee
South Texas 3&4	Cancelled before construction start	Yes		x		C				O	C	None
Hinkley Point C	Under construction	Yes		x		C				O		UK government
Wylfa Newydd	Suspended before construction start	Yes		x		C				O		Japanese ECA
Akkuyu 1&2	Under construction	No		x		C				C**		None
Shin Kori 3&4	In operation	Yes	x			R			R			None
Barakah 1-4	Under construction	No		x		C					C	Korean ECA

* Set after commissioning. ** Build-own-operate (BOO) model.

Notes: O = Ownership; C = Contract; R = Regulation; ECA = Export credit agency.

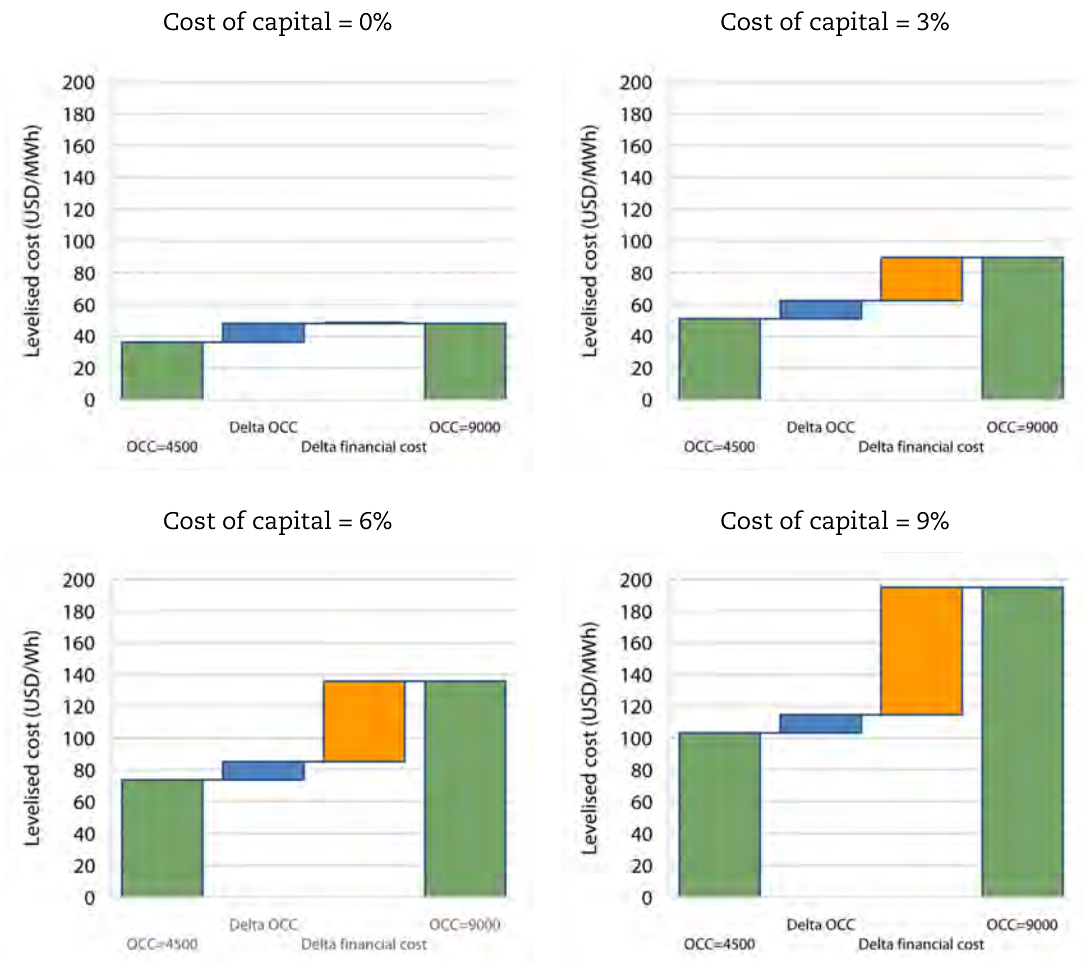
64. In practice, national or state power sector regulators may decide that some costs are not deemed reasonable and prevent the utility from passing these costs on to the final consumer. This is typically the case for US states with regulated power sectors. In addition, some residual construction risks – typically in case of bankruptcy – can also be explicitly borne by taxpayers through loan guarantee schemes. This has applied to projects in regulated markets but also in the United Kingdom.

Today, the allocation of construction risks to industry participants is at the root of the high risk premium expected by private investors, and therefore of the cost of capital. This is best illustrated by the HPC project, for which the WACC was estimated at around 9% – well above the 6% return required by the UK government for public infrastructure projects (NAO, 2018).

More generally, Figure 39 illustrates LCOE sensitivity to a doubling of overnight construction costs (OCC) for different costs of capital, from a reference point of USD 4 500/kW$_e$ to USD 9 000/kW$_e$.[65] Similar to the direct impact of the cost of capital on the LCOE (presented in detailed in Figure 37), most of the cost increase originates from the indirect rise in financial cost that – even at a relatively low 3% cost of capital – represents USD 15.6/MWh, or 57% of the cost increase. For a cost of capital of 9%, the additional financial cost rises sharply to USD 104/MWh, which represents 90% of the cost increase.

In other words, the effect of a construction cost overrun on the LCOE is dominated by an indirect impact on financial costs, especially for relatively high costs of capital. From a public policy perspective, it would be of considerable social benefit for the government to allocate part of the construction risk to other parties, in particular consumers and/or taxpayers.

Figure 39: **LCOE sensitivity to the cost of capital and overnight construction costs**



65. An OCC of USD 9 000/kW$_e$ is in line with the highest ex-post OCC for recent FOAK projects in OECD countries (see Table 1).

6.3.3 *Government financial support*

From the outset, government commitment and political consensus to incorporate nuclear in a long-term energy strategy is a prerequisite for any nuclear new-build project. Government involvement will also be central to establish an effective regulatory framework for licensing of the reactor, and to secure social licence to operate from the society.

A core goal of government support is therefore to create conditions conducive to successful industry performance. This builds on the standard principles of sound public governance for public-private partnerships to establish a framework that continues to incentivise cost reductions and limits the risk of cost overruns.[66]

In addition, considering the various ownership structures, a government can support financing directly or indirectly. Government support is primarily motivated by positive nuclear power externalities and electricity market failures, as well as broader macroeconomic considerations.

First, the positive externalities of nuclear energy require that government intervention be adequately valued[67]. For the energy sector, this includes the contribution of nuclear power to energy security (NEA, 2011), energy diversification, and climate change mitigation (IEA, 2016). Furthermore, nuclear programmes can create macroeconomic benefits for the economy as a whole (NEA, 2018), particularly in terms of industrial development, research and development (R&D) spillovers, and the high level of training and expertise of its workforce. Given the nature and diversity of these positive externalities, the government is often best placed to properly value and internalise these benefits.

Second, the willingness of OECD countries to liberalise electricity markets during the 1990s represented a shift from the normal regulated environment, in which tariffs are calculated such that investors and utilities recover their costs, including financing. Nuclear energy, along with other low-carbon energies such as hydropower, wind and solar photovoltaic, is a technology whose cost structure is dominated by investments during construction. In the absence of specific incentive policies, these energy production methods are especially exposed to market risks, which raises the cost of financing because private investors require higher risk premiums (Rothwell, 2006). The strong correlation among electricity, gas and CO_2 prices further implies that, compared with combined-cycle gas turbines (CCGTs), NPPs may retain limited option value in private investors' portfolio strategies (Roques et al., 2006).

Third, electricity markets can be subject to specific market failures that hinder investments in long-lived assets such as NPPs. Current electricity market structures in OECD countries in particular have often been initially designed to organise competition among existing assets, rather than to support long-term investments in new capacities (IEA, 2016). Markets may therefore fail to deliver the long-term price signals needed to match the lifetime of nuclear reactors.

Fourth, the current macroeconomic environment, with interest rates persistently low in many OECD countries, is dramatically changing the impact government support schemes can have on the cost of capital. The volume of global private equity has been increasing rapidly in the past decade, exceeding private investment and resulting in a lower cost of equity. However, despite the overall excess of private equity, investors continue to require relatively high risk premiums for investments in infrastructure with time horizons beyond 10-15 years (Newbery

66. See the OECD's *Principles for Public Governance of Public-Private Partnerships*: www.oecd.org/gov/budgeting/oecd-principles-for-public-governance-of-public-private-partnerships.htm.

67. From a more theoretical perspective, the environmental cost-benefit literature examines the normative social discount rate (also referred to as social time preference rate) to assign value to climate change mitigation action. While estimates of the social discount rate continue to be debated, the typical range is 1.4% (Stern Review) to 3/3.5% (W. Nordhaus). For instance, the UK *Green Book* recommends a social discount rate of 1.5-3.5% in real terms (for risk-to-life values) when appraising infrastructure projects. This is consistent with the 6% nominal discount rate used in the UK National Audit Office (NAO, 2018 review of Hinkley Point C, assuming 2.5% inflation: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf.

et al., 2019). As part of post-COVID-19 economic recovery policies, there is therefore strong macroeconomic rationale for government policy intervention to steer private capital towards infrastructure assets that would contribute to long-term economic growth.

In this evolving context, governments can encourage better financing conditions through a number of policy support schemes:

- direct government financial support;
- indirect government support through long-term power purchase agreements (PPAs);
- indirect government support through regulated models (e.g. regulated asset base [RAB]).

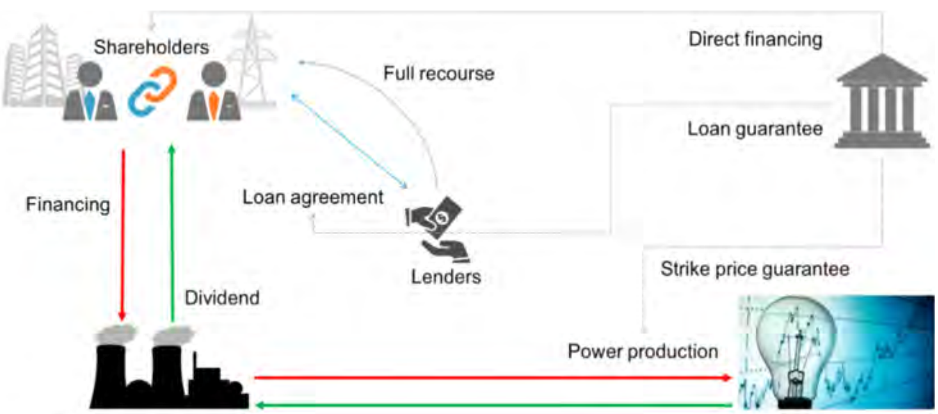
Direct and indirect financial support

Government support for financing can first be provided as part of the ownership structure through an equity stake in the project or public loans. Considering new NPPs as strategic infrastructure projects means that governments will expect a lower rate of return than the private sector, resulting in a lower cost of capital. This is especially the case in today's international financial environment, with macroeconomic shifts having led to historically low – and sometimes negative – borrowing rates for governments.

Additional support from public entities, particularly from ECAs in the vendor's country in the case of an international projects, has proven successful for several projects, including the Angra 3 plant in Brazil, Qinshan I & II in China, and Paks II in Hungary.

ECAs are traditionally national financial organisations set up to promote national exports through trade financing for domestic companies. Their core activity is therefore to provide loan guarantees and insurance, as well as direct loans for overseas projects. In effect, ECAs play a central role in covering political risks, but also contractual risks. In OECD countries, export credits follow specific guidelines (OECD, 2018) that allow ECAs to support up to 85% of the export's contract value, including third-country supply but excluding local costs, with additional specific guidelines for repayment terms and minimal applicable interest rates.

Figure 40: **Direct and indirect government support approaches**



Finally, other indirect financial support can also be envisaged to improve project profitability or reduce investors' risk exposure, such as production tax credits, risk insurance and loan guarantees. Such schemes have typically been used in recent projects such as Vogtle in the United States and HPC in the United Kingdom.

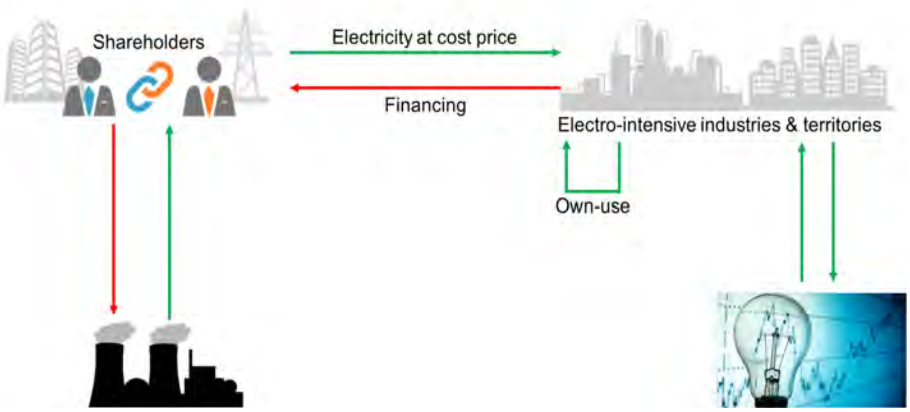
Indirect government support through long-term power purchase agreements

To mitigate market-related risks for investors and provide long-term price signals, PPAs can be established to support the revenue stream. PPAs are often part of corporate and project finance ownership structures and can be contracted with a range of public and private parties.

For instance, the Mankala model has been used for the Olkiluoto 3 project. In Finland, a Mankala company is a limited liability company that sells the produced electricity and heat to shareholders at cost, proportionate to their holdings in the company. Mankala shareholders are usually energy-intensive users (industries and municipal utilities) seeking long-term energy cost stability, and they reduce their individual risk exposure by investing in projects together.

Other corporate PPA models could also be considered, although none have been applied to recent nuclear new-build projects. For example, in France a consortium of energy-intensive users and banks formed a limited liability company (Exeltium) in the early 2000s to finance upfront investments for the long-term operation of the nuclear fleet (Pehuet Lucet, 2015).

Figure 41: **PPA under the Mankala model**



When investment opportunities for energy-intensive users are limited, the government can take action by establishing specific contracts. One option widely used now for renewable energy projects is the contract for difference (CfD). A CfD is as a swap between an agreed fixed price and the wholesale market: the difference between the agreed price in the CfD and the market reference price is paid to the project developer (if positive) or paid by the project developer back into the system (if negative). This approach has been successfully used to address market risks for the HPC project in the United Kingdom.

It is important to stress, however, that the CfD model addresses electricity market risks only, while project developers retain the construction risks. To lower this hurdle, governments can complement the CfD model with state guarantees, as has been done for HPC. Consequently, HPC's WACC is estimated at 9% – higher than the 6% return required by the UK government for public infrastructure projects (NAO, 2018). With a 9% WACC, HPC's strike price is 50% higher than it would be in a scenario with direct or indirect government financing, which would reduce the WACC to 6%.

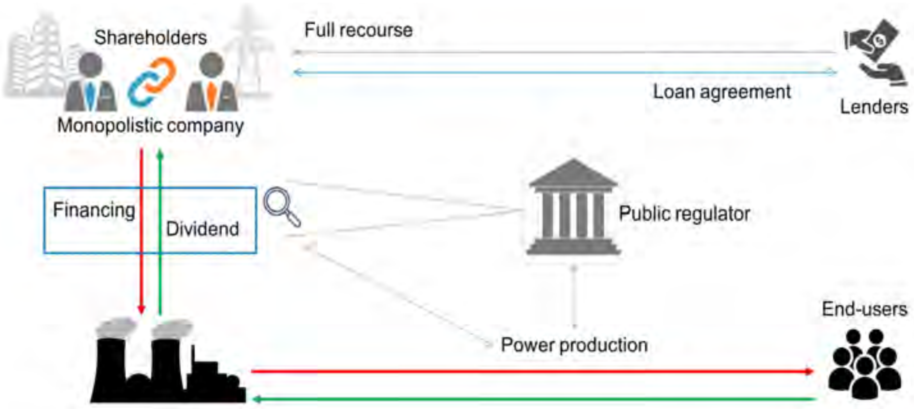
In addition, the role of electricity market reforms to support long-term price signals should not be neglected. Long-term CO_2 price trajectories can especially complement CfDs and PPAs to reduce the expected gap with the wholesale electricity price and strengthen the market framework.

Regulated asset base

The government can also mitigate both construction and market-related risks by considering a nuclear project as a regulated asset. In the United States, several states have maintained vertically integrated utilities in which the regulator can decide whether to integrate nuclear projects as part of the utility's rate base.

Among several rate-of-return regulatory approaches, the RAB model is receiving renewed scrutiny for nuclear new-build projects.[68] It has been widely used in several OECD countries – the United Kingdom in particular – to support and regulate long-lived capital-intensive investments in infrastructure assets. Under the RAB model, an economic regulator sets the end-user price. In some cases the project owner (often a utility) is allowed to adjust the end-user bill during construction to secure a reasonable rate of return. Payments can also be received upfront, reducing interest during construction (IDC).

Figure 42: **Regulated asset base model**



The RAB model can be effective in mitigating construction and market risks by ensuring a return regardless of market conditions. This approach can also designed to avoid some of the drawbacks of standard rate-of-return regulation. Periodical price reviews create an incentive for costs savings and avoid over-investments. Hence, the RAB model aims to optimise risk allocation by balancing the benefits of passing some of the risk of the cost of capital on to consumers with the need for sufficient incentives for the industry to manage and reduce these risks.

The success of this approach will depend on a strong regulatory framework and consistent political leadership to overcome challenges during construction. In particular, the (economic) regulator will need to develop sufficient understanding of the nuclear project to review allowable and disallowable costs. This will be especially important to give the stakeholders involved in project financing confidence in the regulator's decision-making process. Some historical projects in the United States, including the recently cancelled VC Summer project in South Carolina, demonstrate that other rate-of-return regulatory approaches do not always provide sufficient incentives for risk mitigation, in particular for FOAK projects.

Conversely, a key benefit of the RAB model is that transferring construction and market risks to consumers significantly reduces the risk premium expected by investors, especially infrastructure funds and potentially pension funds seeking long-lived assets. In addition, introducing a rate base from the moment a project is approved avoids interest during construction, which further raises project profitability and reduces final consumer costs.

Recent large-scale infrastructure projects illustrate how the RAB model can be successfully implemented to leverage private financing with a low WACC. For example, it is estimated that the Thames Tideway Tunnel in London resulted in a real WACC of 2.5% (Newbery et al., 2019). Important to the success of this project's financing was the provision that part of the costs overruns would be covered by ratepayers (up to 30%), significantly reducing the level of construction risk for investors while maintaining strong incentives for the project developer to mitigate those risks.

68. For instance, see the 2019 UK inquiry regarding the applicability of the RAB model for future projects: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/825119/rab-model-for-nuclear-consultation.pdf.

It is expected that applying a similar RAB arrangement to a nuclear project in the United Kingdom under a CfD approach would reduce the real WACC from 8% to as low as 3.5% (Newbery et al., 2019). Given the importance of the cost of capital on the LCOE of nuclear power, this reduction in the WACC could significantly reduce the levelised cost by about 50%.[69]

6.3.4 *Implications for future projects*

Depending on the national context and project characteristics, several financial models can be considered for future nuclear new-build projects wherein governments actively help mitigate risks and therefore support financing. This is especially possible given the historically low interest rates and relatively abundant private capital in OECD countries that create a unique opportunity to lower the cost of capital if the right policy frameworks are in place to address construction and market risks.

Governments should also consider taking a direct equity stake in new nuclear construction projects, as the public sector has the lowest cost of capital in most OECD countries. Doing so would also enable governments to be more proactively involved in project governance, including in activating its social benefits. It is particularly important for countries considering large nuclear programmes to be aware that as the risk level falls significantly after construction, additional sources of funding should become available, ultimately reducing the government's overall financial burden.

In addition, the role of government in financing is particularly important for countries restarting their nuclear programmes. Government financial support should, however, be viewed as transitional, as industrial maturity will drive down both risks and costs, reducing financial support needs in the long term (Figure 43).

Figure 43: **Positive cost-risk loop for nuclear new-build projects**

As the various policy support schemes highlighted above are not exclusive, combining them can raise the effectiveness of government action by reinforcing certainty in the government's commitment to new NPPs, further mitigating private investor risks. This is essential to attract new sources of financing as part of public-private partnerships, especially for financial institutions – such as pension funds – that may not have specific expertise in infrastructure assets and are seeking long-term investments that match the time horizons of their liabilities.

Finally, beyond measures aimed specifically at supporting financing, electricity market reforms should also not be neglected, as they can be of considerable help in providing long-term price signals, such as for CO_2 price trajectories. Similarly, policies could be designed to incentivise corporate PPAs for large energy-intensive users, as has been done in Finland with the Mankala model.

69. Reducing the real WACC from 8% to 3.5% under the general hypotheses of a GBP 5 000/kW$_e$ OCC, a 10-year construction lead time and 91% availability factor would translate into an LCOE reduction of GBP 100/MWh to GBP 53/MWh (Newbery et al., 2019).

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7. Conclusions and policy recommendations

It is time for action if countries around the world are to meet their policy goals for environmental and energy security. Building new nuclear plants alongside variable renewable energy (from wind and solar photovoltaic) is a path to decarbonisation of the power sector. As the 2019 Nuclear Energy Agency (NEA) report *The Costs of Decarbonisation* explains, nuclear power will become increasingly attractive owing to its attributes as a low-carbon, dispatchable and flexible technology.

Nevertheless, policy makers are rightly concerned about the cost of nuclear new-build projects. In many Organisation for Economic Co-operation and Development (OECD) countries, the construction delays and cost overruns experienced by first-of-a-kind (FOAK) nuclear projects are serious industrial and policy challenges that need to be addressed for subsequent installations. These delays and cost overruns resulted largely from uncertain political contexts and a lack of design maturity that is somewhat inherent to FOAK projects. Overruns consisted primarily of indirect costs, including the nonrecurrent costs associated with deploying a new generation of reactors. Nevertheless, they have undeniably undermined stakeholder and public confidence in the nuclear sector's capacity to successfully deliver new-build projects.

Against this backdrop, this study reviewed the drivers of nuclear construction costs over time and across countries. The conclusion is that the nuclear industry should be well positioned to learn lessons from the recent completion of FOAK Gen-III reactors and could deliver additional construction cost reductions in the 2020s. While these cost reduction opportunities are at the technical and organisational levels, their effectiveness requires a robust governance framework and greater government involvement.

Transitioning from FOAK to rapidly deliver more competitive Gen-III reactors

Several OECD and non-OECD countries have already progressed beyond Gen-III FOAK projects. China and Russia in particular are now both able to focus on continuously improving nuclear industry performance, in a similar manner to other industries. Historical evidence from France, Japan and Korea confirm that with serial construction and industrial standardisation, new nuclear power plants can be delivered at a competitive cost. More importantly, these countries' experiences demonstrate that FOAK project flaws can be corrected in subsequent projects. Even countries with relatively small nuclear programmes (e.g. the United Arab Emirates [UAE]) can achieve better industrial performance when a reference plant has been established and a well-integrated and qualified supply chain can be mobilised.

In this regard, the successful delivery of the next new nuclear construction projects in western OECD countries will be critical to rebuilding public confidence in those countries. At the policy level, design maturity and regulatory stability should be prioritised to support near-term cost reductions.

In the near term (early 2020s), the most effective way to achieve construction cost reductions in countries with a significant need for fleet renewal is to develop a nuclear programme that implements serial construction with multi-unit projects on the same site, and/or serial construction of the same reactor design on several sites. Costs would be reduced significantly through:

- Reducing indirect construction costs related to design documentation, safety approvals associated with the design, and supplier qualification. For multi-unit projects on the same site, additional cost reductions would result from several units sharing nonrecurring, site-specific, regulatory, planning, and supporting infrastructure costs.

- Mobilising the nuclear supply chain as experience is transferred from one project to another, particularly for construction methods that can be easily repeated once validated. As construction durations shorten, financial costs (i.e. interest during construction) also fall.

Key policy recommendations

1. Capitalise on lessons learnt from recent Gen-III construction projects. With the construction of several FOAK Gen-III nuclear reactors completed, the nuclear industry and its supply chain have in large part redeveloped their capabilities in several OECD countries. By building on these reactor designs, governments have a window of opportunity to realise cost reductions in the early 2020s through timely new-build decisions. Delaying these decisions will prevent the sustainment of capabilities and therefore raise near-term project construction costs.
2. Prioritise design maturity and regulatory stability. Designing policies to support nuclear construction is critical to ensure that new-build projects start in the right conditions. Policy support mechanisms should include requirements for design maturity and, more specifically, construction readiness, and should ensure that the regulatory framework for nuclear safety remains stable and predictable throughout construction.
3. Consider committing to a standardised nuclear programme. For countries considering multiple new-build projects, commitment to a standardised nuclear programme to capitalise on the series effect, multi-unit construction and continuous design and process optimisation is the most promising avenue to effectuate cost reductions.

Cost reduction opportunities are available at several levels

Building on lessons learnt from recent projects, a range of cost reduction opportunities for future nuclear construction (up to 2030) is emerging. In fact, a number of industry initiatives focused primarily on the interplay between incremental design optimisation of Gen-III reactors (particularly simplification and standardisation) and the integration of cross-cutting technologies and innovative enabling and construction processes (e.g. digital transformation, modular construction) are being launched. In many cases, these innovations have already been implemented successfully in other industries.

New co-operative interactions among various stakeholders, particularly regulatory bodies, are also being introduced. At the regulatory level, recent country experiences demonstrate that regulatory interactions can be enhanced without jeopardising safety objectives or regulatory independence.

Finally, the nuclear industry is also developing a number of longer-term (post-2030) opportunities that hold further cost reduction potential, including the harmonisation of licensing regimes, codes and standards; and innovative designs such as small modular reactors (SMRs) and Gen-IV reactors.

Policy makers can support these industry initiatives in a number of ways, with measures to co-ordinate energy and industry policy and to support research and development (R&D), innovation and skill development. For countries with a large enough nuclear new-build market, implementing a standardised nuclear programme is the most effective way to mobilise the various cost reduction drivers.

Key policy recommendations

4. Enable and sustain supply chain development and industrial performance. Industrial and energy strategies for new nuclear plants need to be carefully articulated. For instance, investment in supply chain capabilities requires assurance of long-term energy policy commitment to new nuclear construction to adopt the latest technical and organisational advances under the best conditions. New-build ambitions needs to be adjusted to integrate supply chain constraints and ensure continuous activity to enable and sustain development.
5. Foster innovation, talent development and collaboration at all levels. Governments can support cost reduction opportunities arising from innovative nuclear technologies (i.e. SMRs and Gen-IV reactors) by ensuring the timely development of demonstration projects and the licensing framework required to foster market deployment. Supporting talent development is also essential given the high level of technological expertise needed in nuclear power. National and international collaboration remains a key vector to achieve these objectives.

The governance framework is essential to support competitive new nuclear construction

The governance of nuclear new-build projects is critical to effectively allocate and mitigate construction and market-related risks. Nuclear projects are not different from other sectors and the standard economic principle of allocating each risk to the party most capable of managing it should be followed. In practical terms, this means that the industry (i.e. vendor, owner or supply chain as a whole) will often be best placed to manage technological and organisational risks, whereas risks related to the market and financing framework will warrant some degree of government intervention.

The impact of the cost of capital on the levelised cost of nuclear power and the positive externalities associated with nuclear power provide particularly clear rationale for direct or indirect government financial support in countries pursuing nuclear energy generation. This is especially necessary at the beginning of a nuclear programme to minimise risk perception.

Furthermore, as with other large-scale infrastructure projects, government involvement should extend well beyond specific policy support measures. Given the long-lasting and structural impacts of a nuclear programme on a country's economy and electricity system, governments must consider nuclear plants as national infrastructure projects of strategic importance. This means governments are responsible not only for project leadership but for uniting the various stakeholders, including the public at large.

Key policy recommendations

6. Support robust and predictable market and financing frameworks. Nuclear new-build projects require long-term government planning involving both specific commitments and market regulations. In addition, financial support is currently essential in western OECD countries – at least as a transitional measure – to deliver cost-competitive new nuclear construction.
7. Encourage concerted stakeholder efforts. Governments should create an environment that fosters social contract with industry and society to reduce nuclear construction costs. Recent national initiatives such as the Nuclear Sector Deal in the United Kingdom provide clear evidence of how such frameworks can be developed and implemented.
8. Tailor government involvement to programme needs. The enabling role of governments will differ depending on the nature of the programme. Whereas government financial support in countries considering a fleet programme can be expected to decrease gradually as the industry reaches maturity and the perceived risk level falls, countries restarting a nuclear programme or considering only a single-plant project are likely to require further government support.

Appendix 1: List of experts

This study was written by the NEA Secretariat, Michel Berthélemy and Antonio Vaya Soler based on evidence collected from the different references cited in the report as well as the insights and specific inputs provided the Ad Hoc Expert Group on Reducing the Cost of Nuclear Power Generation (REDCOST) and other experts. The REDCOST members, along with the Working Party on Nuclear Energy Economics (WPNE), supervised the study at all stages and recognised its results. Additionally, the NEA Secretariat conducted individual interviews with senior nuclear industry professionals to collect insights from the industry on selected topics. A list of the different experts that formally participated in the study is indicated below.

Members of the REDCOST expert group:

Country representatives

Mr Celestin Piette	Belgium
Mr Jukka Hautojärvi	Finland
Mr Olivier Bard	France
Professor Dr Thomas Schulenberg	Germany
Dr Tomoko Murakami	Japan
Dr Tae Joon Lee	Korea
Mr Adrian Gabriel Dumitriu	Romania
Mr Dmitry Andruyshin	Russia
Mr Mike Middleton	United Kingdom
Mr Bruce Hallbert	United States
Dr Francesco Ganda	United States

Representatives of international organisations

Dr Saied Dardour	IAEA

Observers

Mr Hasan Charkas	EPRI
Mr David Scott	EPRI
Mr Philippe Costes	WNA

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Unlocking Reductions in the Construction Costs of Nuclear: A Practical Guide for Stakeholders

Today, with the completion of First-of-a-Kind Gen-III nuclear reactors, the nuclear sector is at a critical juncture. These reactors have led in several parts of the world to delays and construction costs overruns that have challenged the competitiveness of nuclear power and are driving the risk perception of future projects. Against this background, a review of historical and recent lessons learnt from nuclear and non-nuclear project offers ample evidence that nuclear new build can be delivered cost and time-effectively.

This study assesses the policy and governance frameworks needed to drive positive learning and continuous industrial performance for nuclear new build. The study also explores the risk allocation and mitigation priorities needed to define adequate financing schemes for these projects. In the longer-term, it identifies cost reduction opportunities associated with the harmonisation of code and standards and licensing regimes and new innovative designs (i.e. small modular reactors and advanced reactors).

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