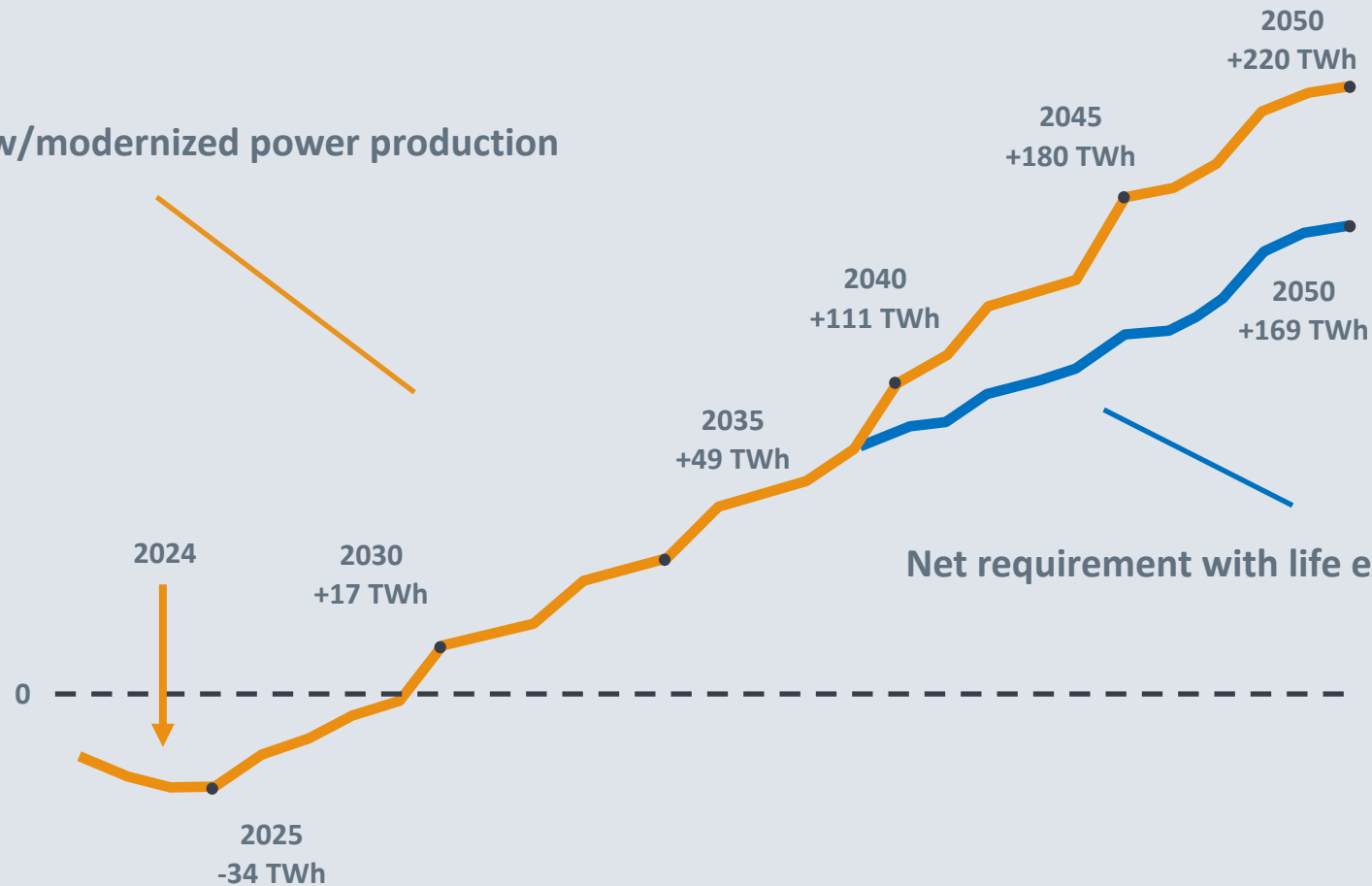


Kraftsamling elförsörjning och tillstånd



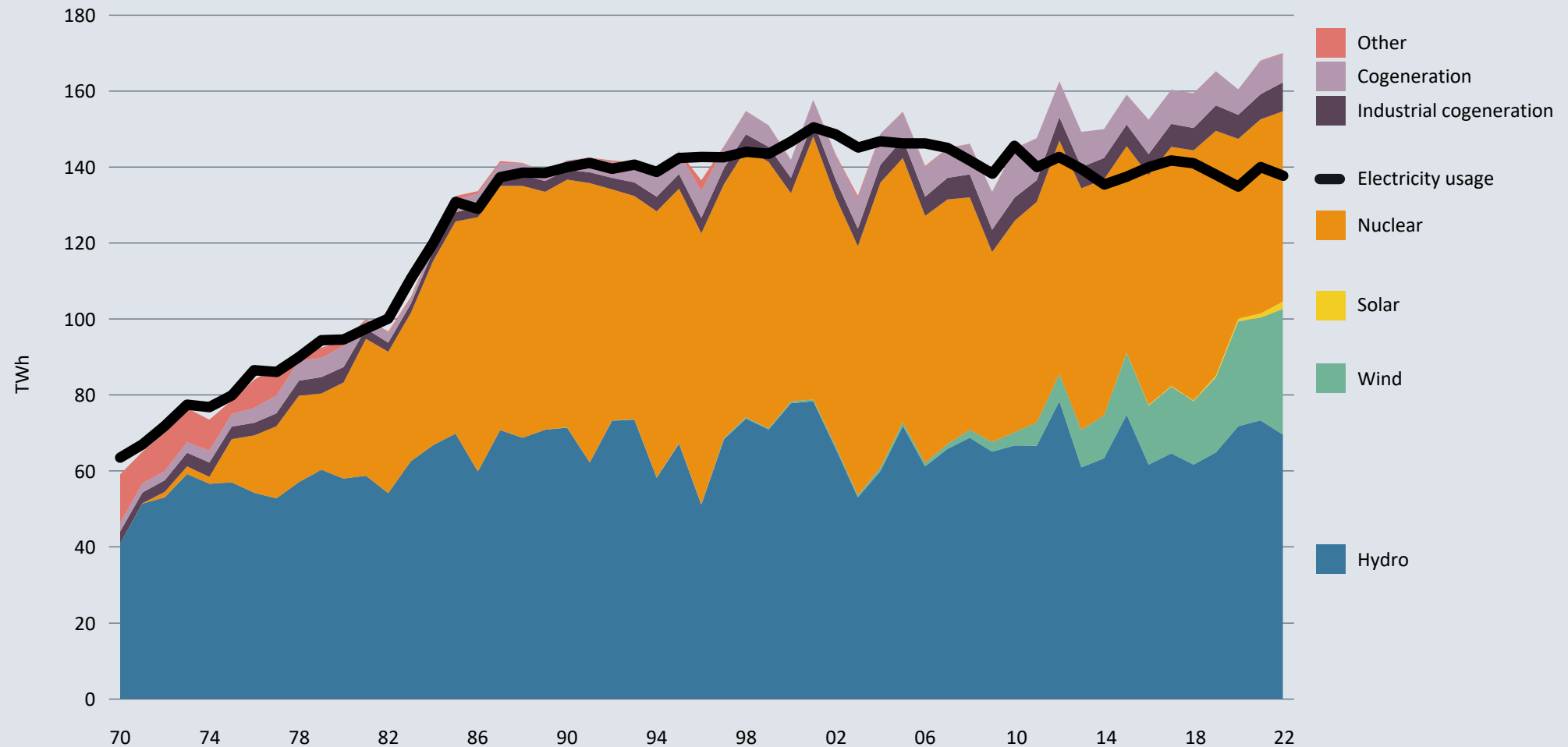
What lies ahead of us?

Net requirement of new/modernized power production

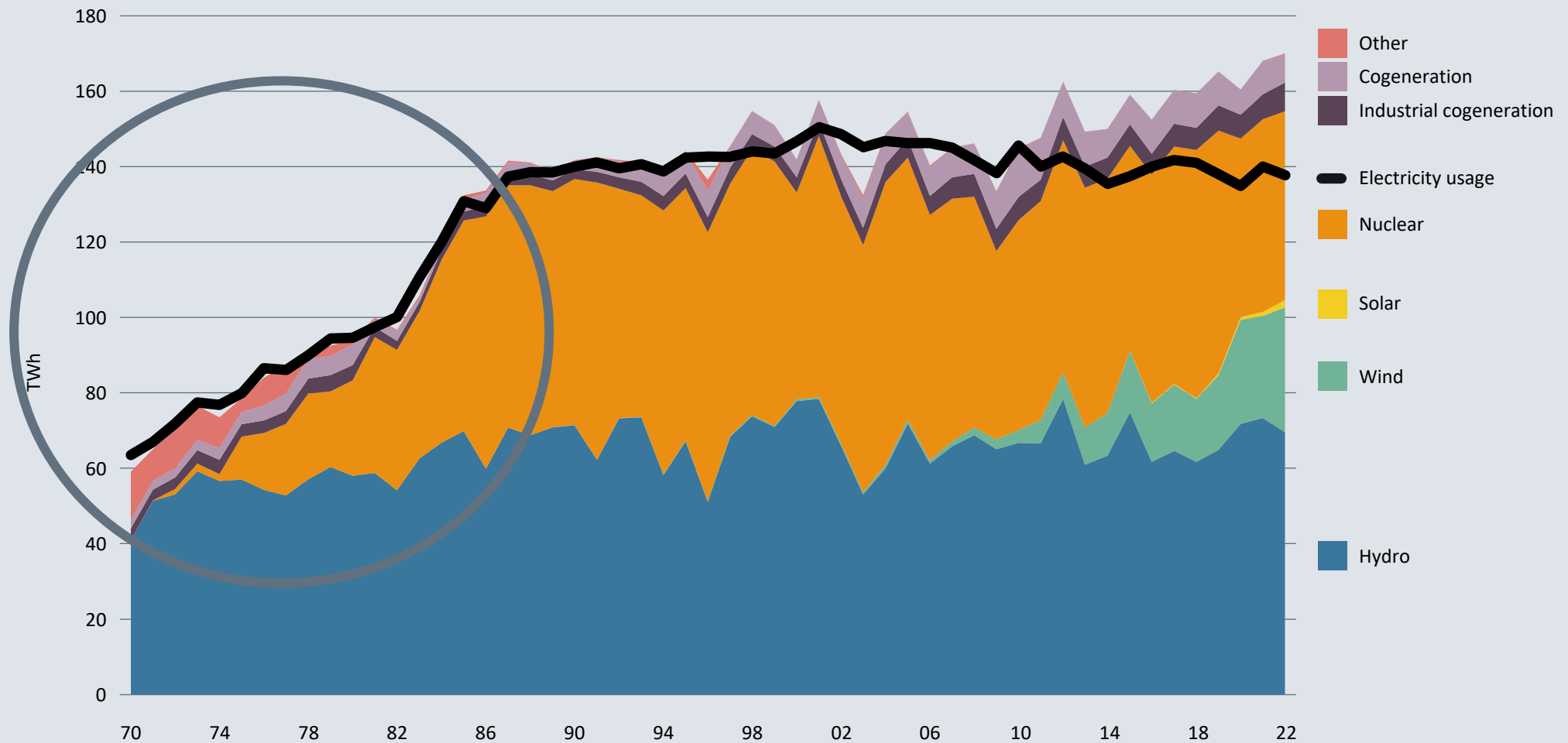


Net requirement with life extension of existing nuclear power

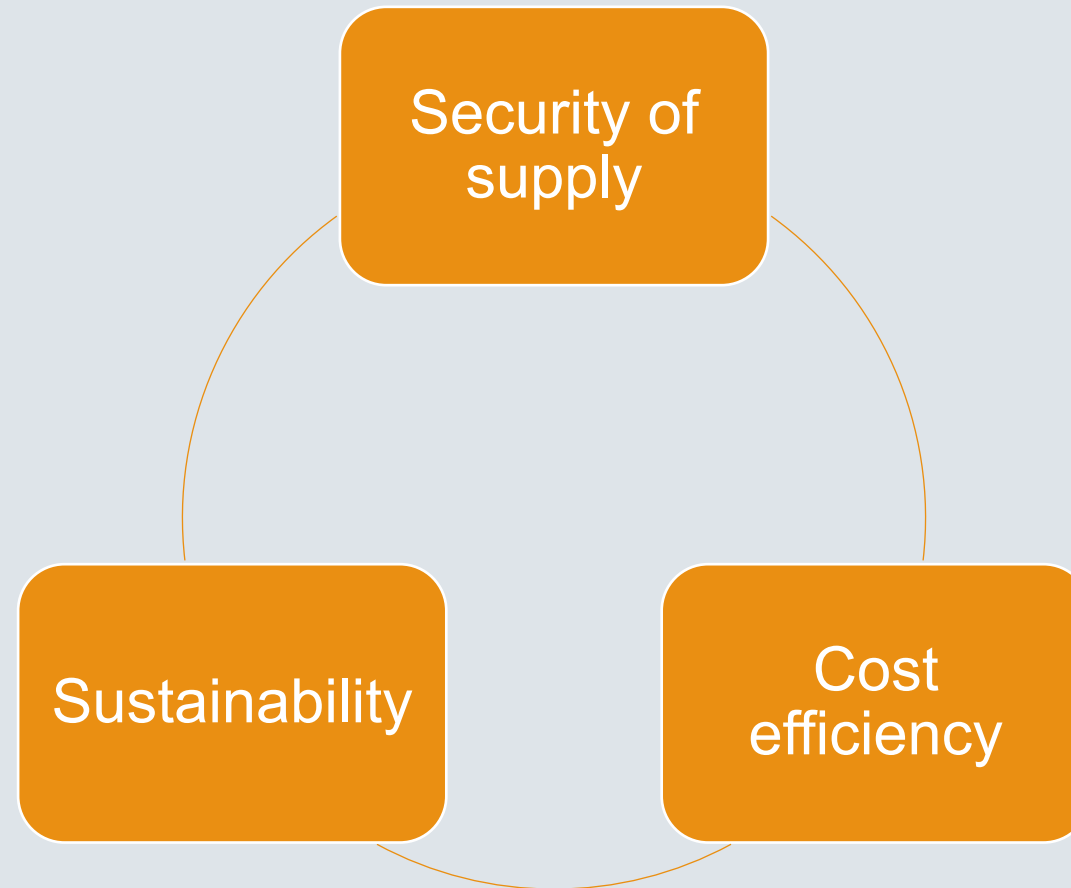
Sweden's electricity production and total electricity usage 1970-2022, TWh



How do we achieve this again?



Energy policy trilemma





Delivery Options for New Nuclear Power in Sweden

Presentation at public seminar

14 May 2024

Confederation of Swedish Enterprise



Baringa is a certified B Corp™
with high standards of social
and environmental performance,
transparency and accountability.

Introducing the team



Marcel Volkerts

- ▲ Director Networks
- ▲ Lead consultant



Alex Weir

- ▲ Director PLCS
- ▲ SME – Large infrastructure projects



Alastair Davies

- ▲ Director MAA
- ▲ SME – Energy System



Yinfan Zhang

- ▲ Director PLCS
- ▲ SME - Nordics Power Market

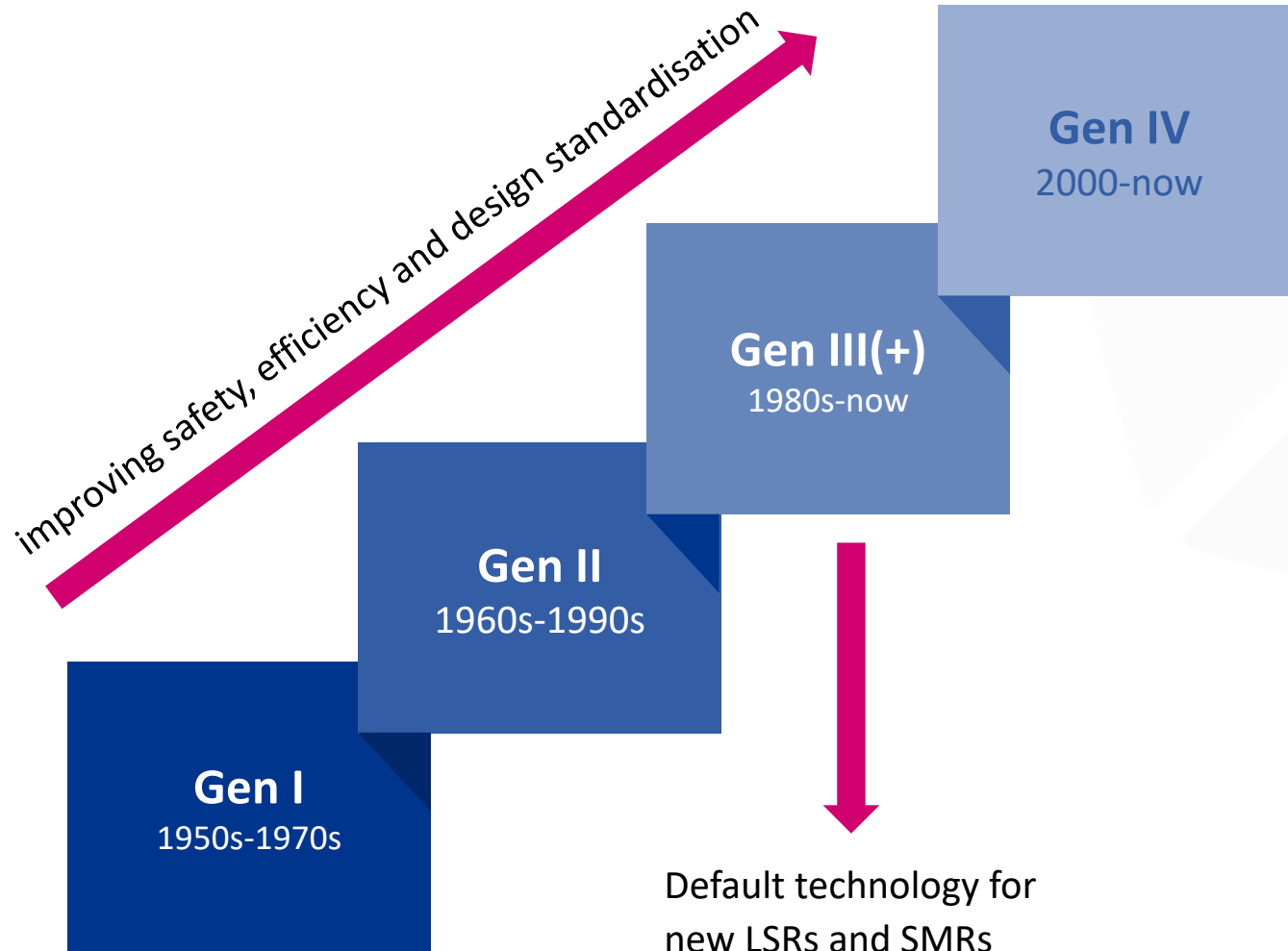


David Luu

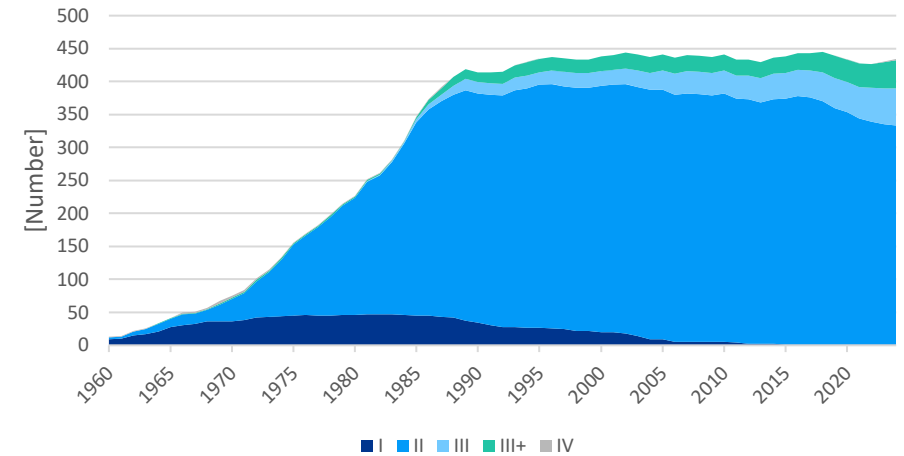
- ▲ Consultant PLCS
- ▲ SME - Nordics Power Market

Nuclear power – Safe, Reliable and Clean

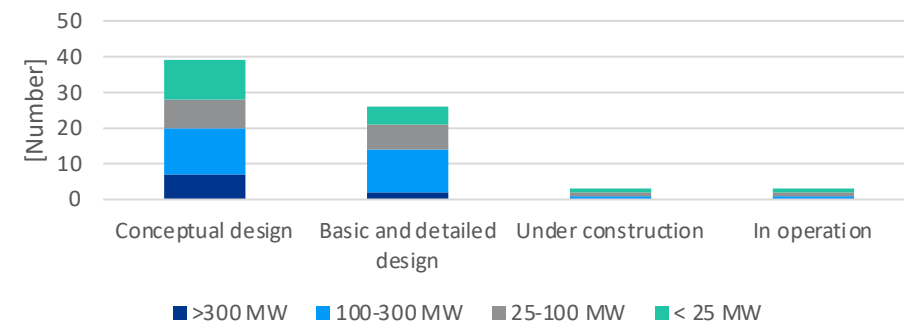
Reactor types have evolved considerably since the 1950s. More recently, Small Modular Reactors (SMRs) have emerged as an alternative to traditional Large-Scale Reactors (LSRs)



Global operable reactor count by Generation



SMR Maturity



Small Modular Reactors – Revolutionizing nuclear power?

SMRs are a promising development for mid-term new build ambitions but should not be put on the critical path for Sweden to address its power generation challenges

Advantages are easily identified...

- + Can be manufactured in a factory – reduced on-site assembly time
- + Modular streamlined manufacturing process increases quality, improves safety, and lowers overall construction costs
- + Gradual deployment of multiples at a single site can better follow the load growth, spread investment needs, bring forward revenue streams
- + Supports a range of applications, likes remote power generation, dedicated power for industrial clusters and integration in multi-commodity energy hubs
- + Candidate for in-situ replacement for coal-fired power plants, whose units are often comparable in capacity to larger SMRs

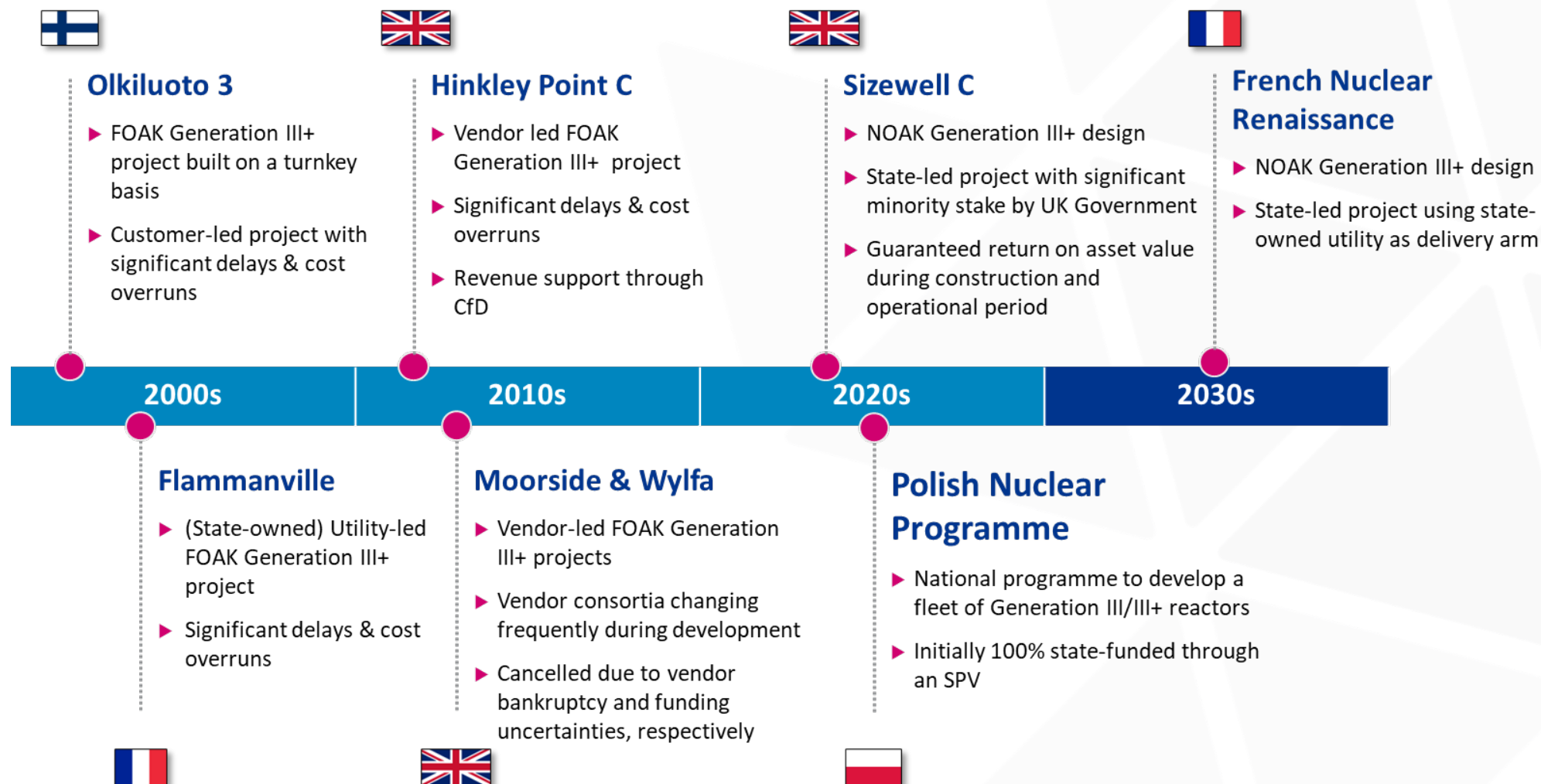


...but challenges exist

- Most designs are still at the pre-commercialisation stage
- Few designs have received regulatory approval and there are only a few under construction or operational
- No serialized production of SMRs exists to date
- Wide range of technologies are being pursued with Generation IV designs being more than a decade away from general availability
- The SMR industry recently suffered a setback when one of its lighthouse projects, the Carbon Free Power Project in Utah, was cancelled due to worsening economics

Trends in delivering large scale nuclear newbuild projects

Higher level of government shareholding appears to develop into emergence of nuclear new build programmes rather than projects, initiated and (largely) funded by the State



De-risking and risk sharing – Bringing certainty forward

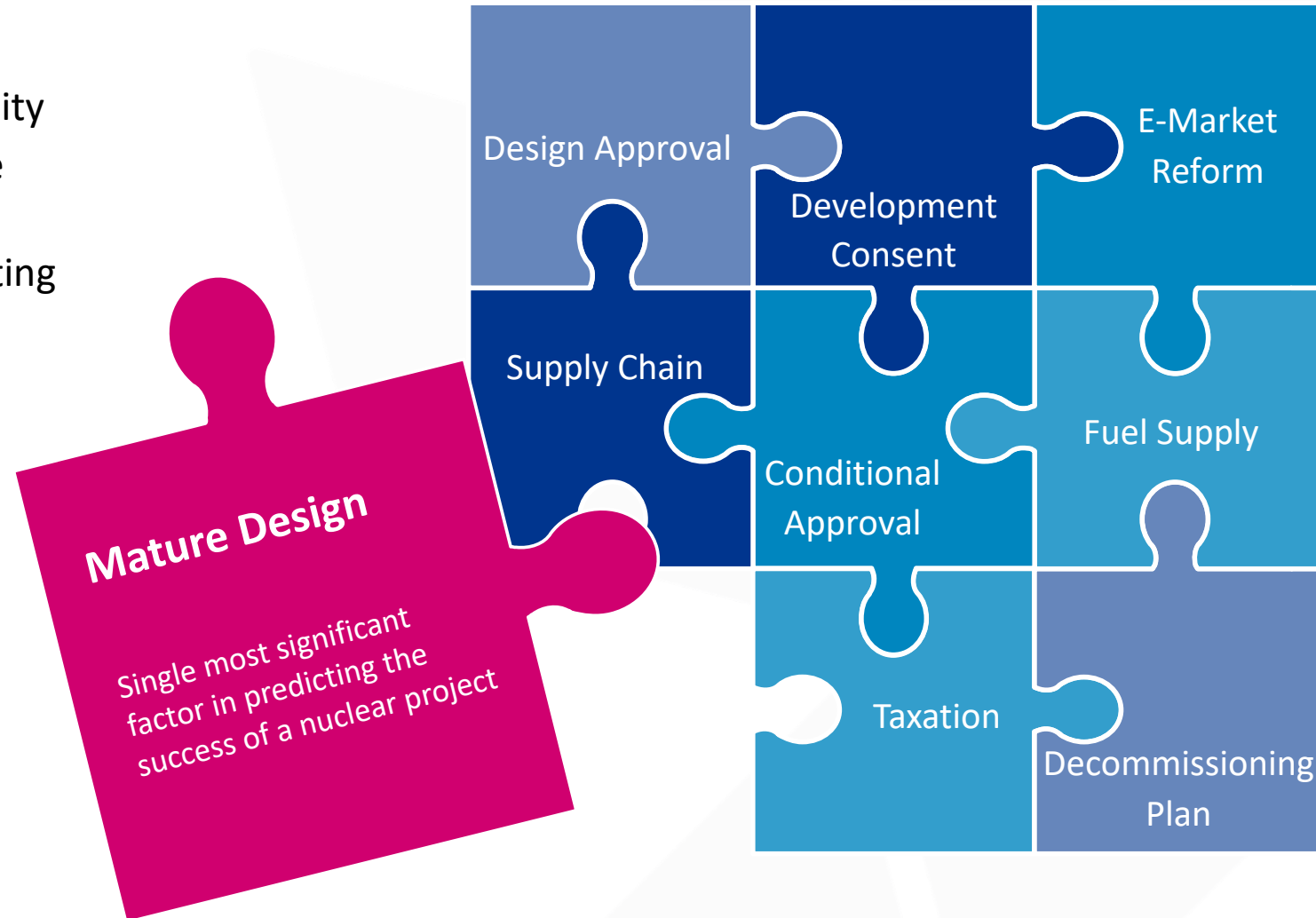
Non-financial de-risking options can contribute significantly to a positive project or programme outcome.

De-risking

- ▶ Ensuring long-term policy continuity
- ▶ Providing a stable and predictable regulatory framework
- ▶ Harmonised licensing and permitting processes

Risk sharing

- ▶ Grants for project development
- ▶ Use of a State-owned or public-private development company
- ▶ Revenue support



Three delivery models are considered to be attractive for Sweden

Either of the first two models can be combined with the third to collectively meet Sweden's nuclear ambition



Utility-led project with state backing

- ▶ Vattenfall and Fortum are utilities with significant presence in the Swedish market
- ▶ Both utilities have expressed an interest in nuclear new build and have launched feasibility studies.
- ▶ Attractive option, both for a limited number of new NPPs or as part of a larger programme



State-led programme

- ▶ Multiple reactors of the same type from the same vendor constructed under the same support scheme
- ▶ Model is pursued in Poland, France and the Netherlands
- ▶ Attractiveness largely contingent on the size of Sweden's nuclear ambition and society's support for strong Government involvement



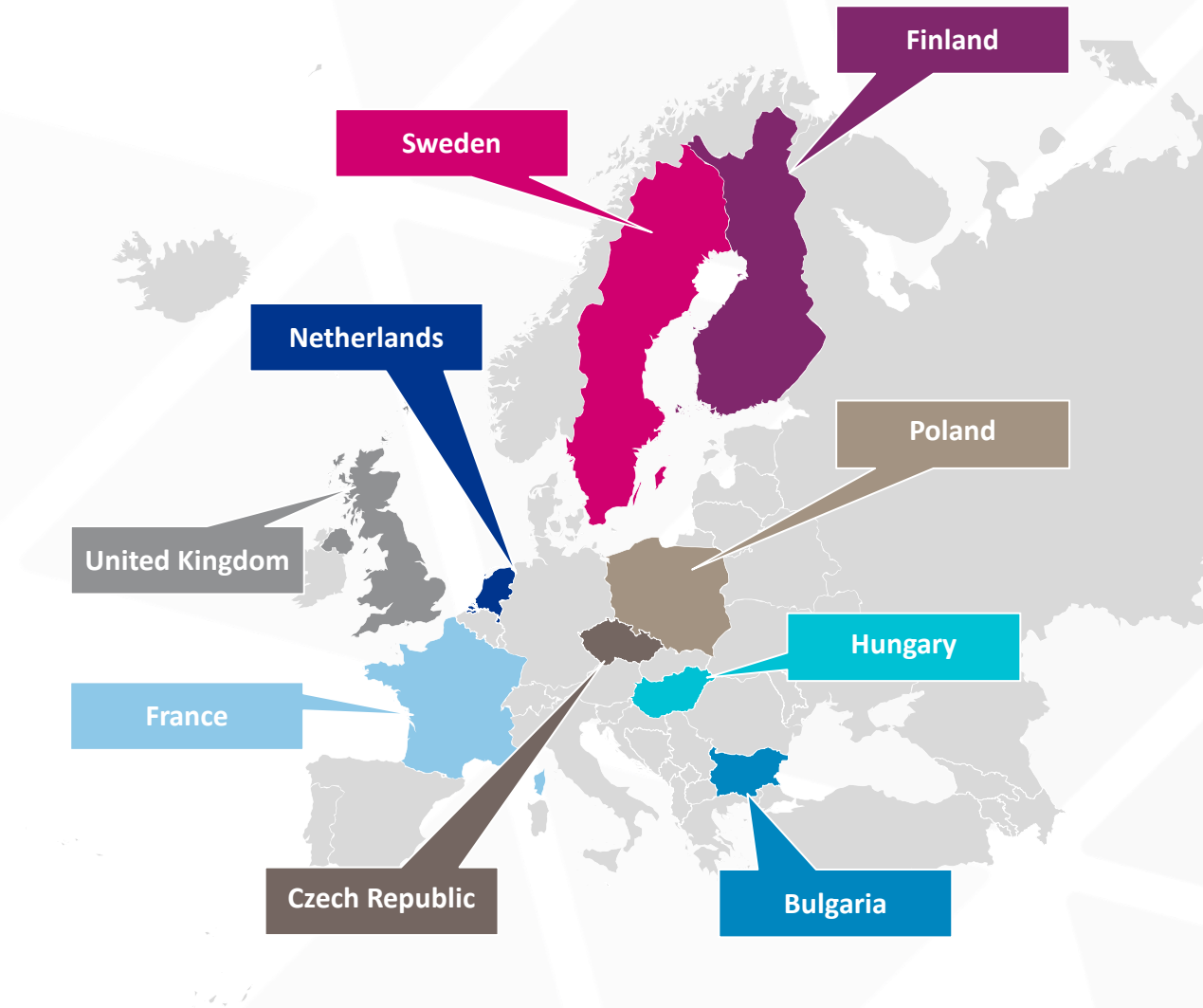
International SMR programme

- ▶ SMRs vendors expect to deliver from a number of strategically located "factories" across Europe
- ▶ Could deliver benefits from shared design and approval and unlock investment in local production capacity.
- ▶ Finland and to a lesser extent the UK, Netherlands and Central European initiatives could be partners

International perspective – Europe’s return to nuclear

Impact on Sweden’s nuclear ambitions can be both positive and negative: learning effects and international collaboration creating cost reductions, but also increased demand for scarce knowledge and resources

- ▶ European countries are (re)starting nuclear newbuild programmes that add up to 70GW of new capacity over the next couple of decades
- ▶ Europe’s return to nuclear offers great potential for learning effects and lowering risks for cost and project overruns associated with recent and current FOAK projects.
- ▶ International collaboration can help to achieve economies of scale and can be an alternative for a national-level programme
- ▶ A clearly stated nuclear ambition enables vendors and manufacturers to plan for delivery capacity
- ▶ Building the right-skilled, right-sized workforce would make Sweden an attractive partner for nuclear new build



Conclusions and recommendations

Ensuring the extension of the Swedish nuclear fleet in a timely, robust and financially sound way



Sweden should clearly articulate its vision for nuclear energy. This includes providing a clear policy trajectory, and guiding principles around deployment (including any red lines that might exist) to provide clarity and signal its commitment to the market.



Market-led projects financed solely by the private sector are not feasible in Europe and that some form of government support is needed. Sweden should therefore implement project de-risking measures as well as risk-sharing mechanisms for residuals risks.



Three potential delivery models appear to be viable for Sweden: utility-led project with state backing, state-led and programme and an international SMR programme.



A combination of a utility-led NPP or state-led programme delivering multiple LSRs in 2030 could very well be combined with an international SMR-programme delivering part of the Swedish ambition in the late 2030s/early 2040s.



Sweden should decide early on its delivery model, as this drives many key topics around de-risking, revenue support and State Aid.



Sweden should support educational institutions and industry to develop and implement curricula across a wide range of levels and topics



The risk-reduction potential of reforming Sweden's energy-only market to provide (nuclear) power providers to additional revenue streams is considered minimal, and therefore not considered critical path

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Financing New Nuclear Sweden

Release presentation

2024-05-14



SVENSKT NÄRINGSLIV



**Building a better
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Here today
from EY



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Partner
EY Energy



David Stearns
Senior Advisor
EY Global Nuclear Advisory
UK



Julien Saigault
Senior Director | France



Christian Grauers
Director | Sweden



Johan Gullman-Strand
Senior Manager | Sweden



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Manager | Sweden

Increasing Swedish electricity demand can be met with a mix of fossil-free energy sources including new nuclear

Current electricity need of **134 TWh** expected to surge to **345 TWh** by 2050

Existing power generation is **ageing**

Sweden has a target of net **zero-emissions** by **2045**

All **fossil-free energy sources** are needed

Nuclear ambitions

2.5 GW
by 2035

10 GW
by 2045

The developer view: IAEA's 19 key nuclear infrastructure pillars

Successful nuclear project development requires an enabling ecosystem



National position



Nuclear safety



Management



Legal framework



Safeguards



Funding and financing



Radiation protection



Regulatory framework



Electric grid



HR development



Stakeholder involvement



Site and supporting facilities



Environmental protection



Emergency planning



Nuclear security



Nuclear fuel cycle



Radioactive waste management

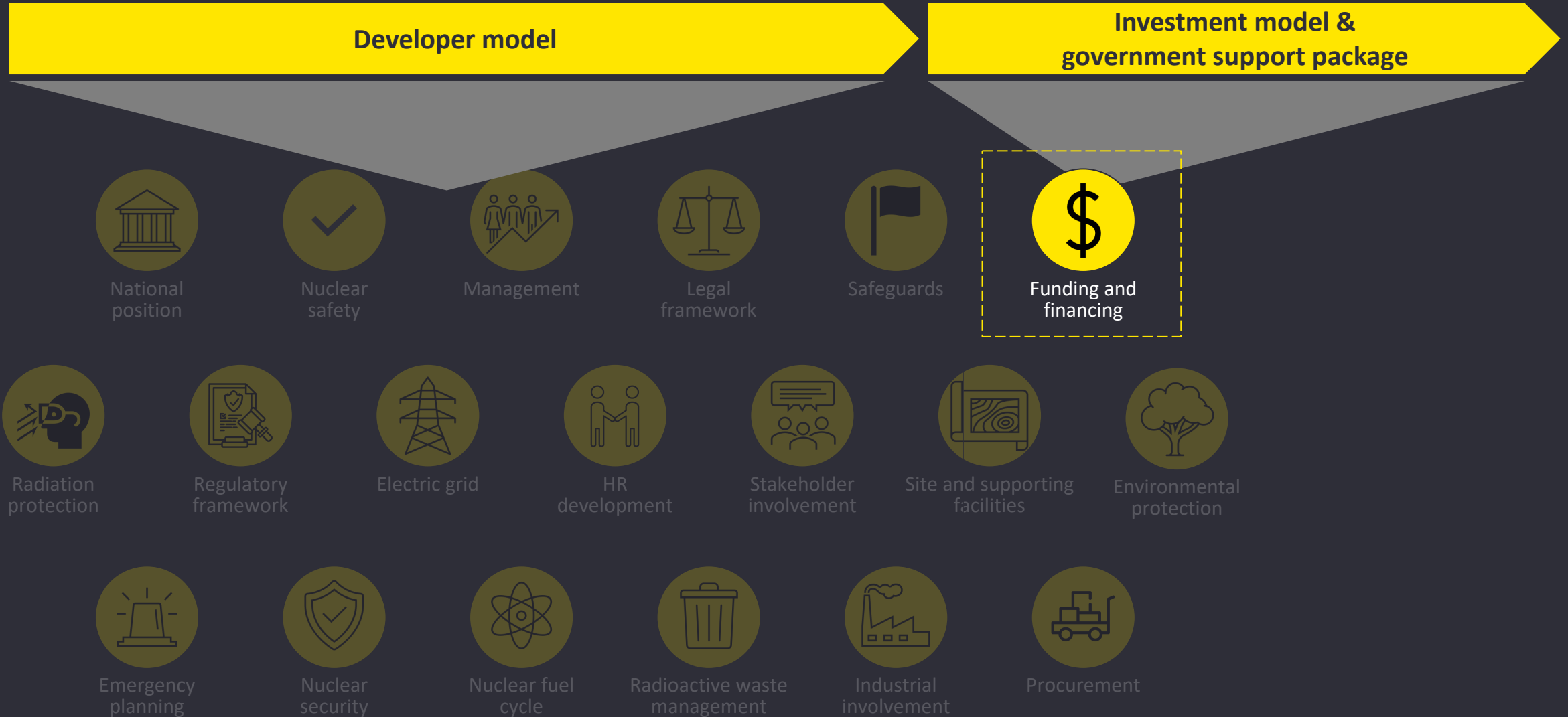


Industrial involvement



Procurement

The report focuses on funding and financing – an outcome directly derived from the strength of the nuclear ecosystem



The investor view: Key investment enablers identified



For re-deployment at scale in Sweden, the state will be expected to propose an equitable distribution of nuclear benefits, costs and risks across the market

Translating the investor view into investable projects

Developer model

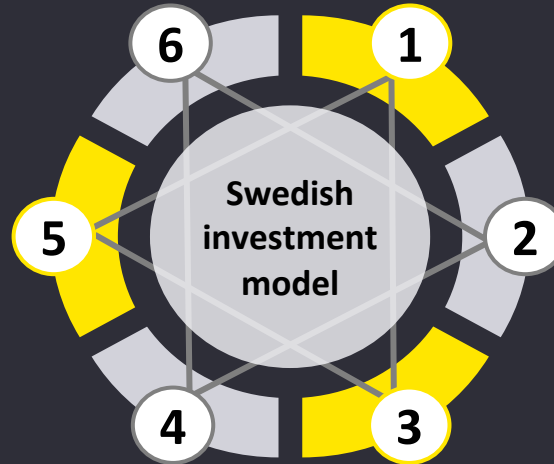


"Risks must be reduced, before they can be allocated to the market"

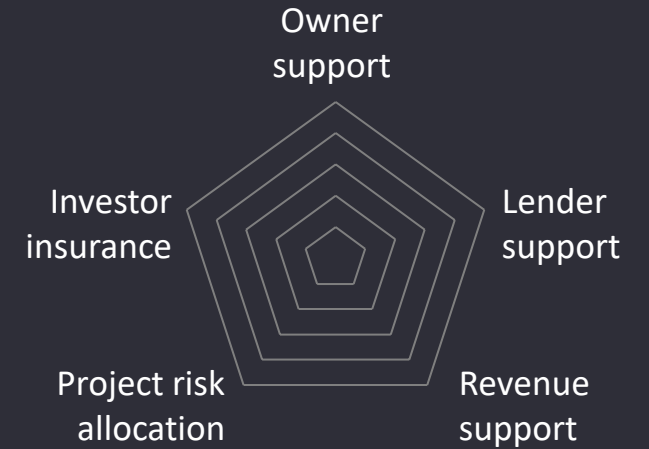
Investment model

FID

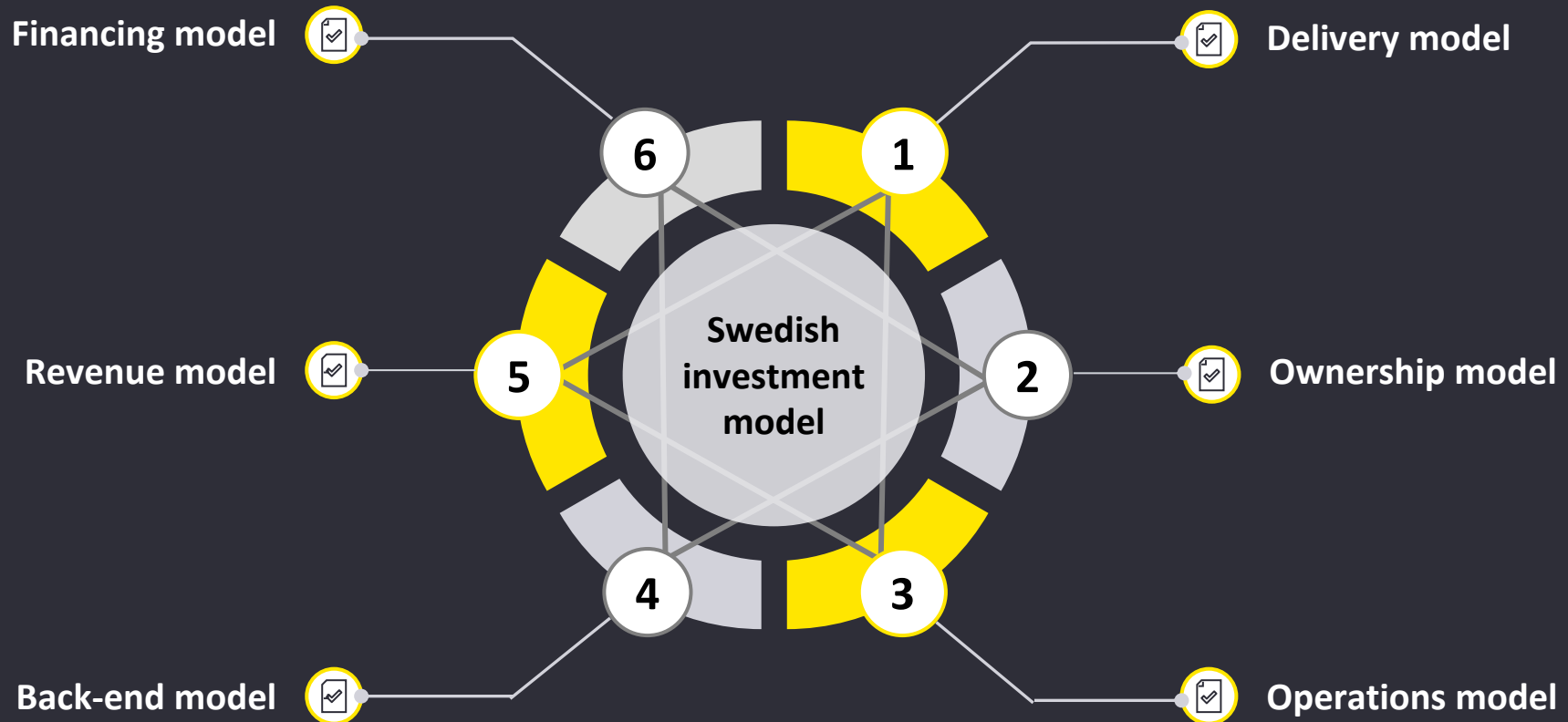
Government support package



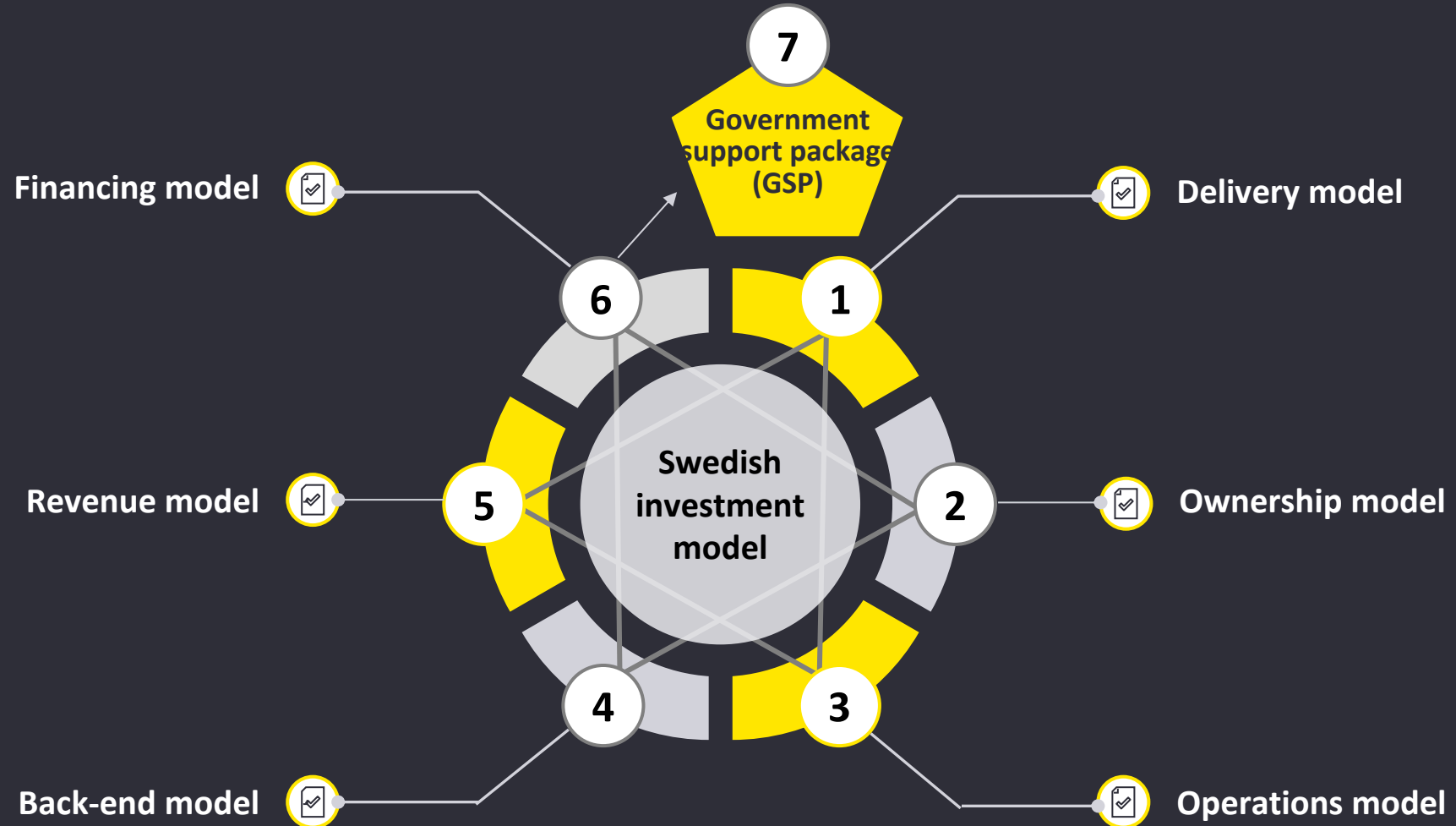
1. Delivery model
2. Ownership model
3. Operations model
4. Back-end model
5. Revenue model
6. Financing model



Updating the investment model for current market conditions



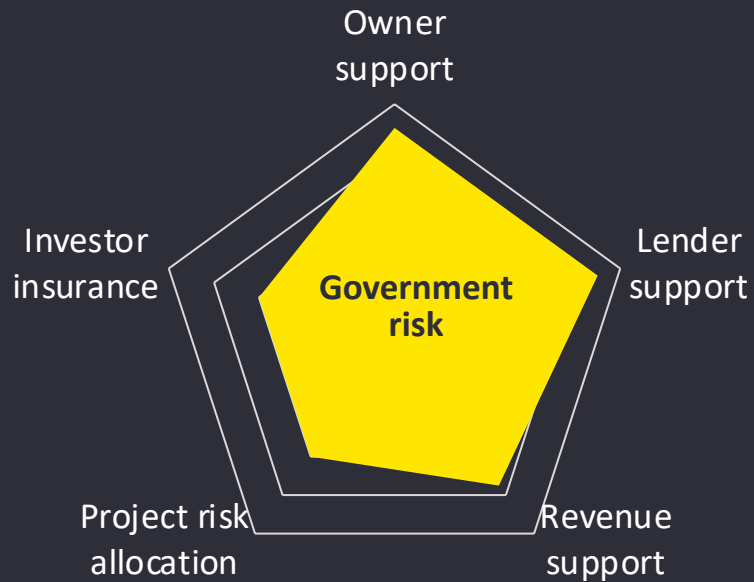
Updating the investment model for current market conditions



GSP targets market gaps across project risk spectrum and gives an indication of the needed government support for least-cost nuclear

First-of-a-series GSP

ILLUSTRATIVE



Next-of-a-series GSP

ILLUSTRATIVE



Market gap

The remainder of the pentagram is the share of risk covered by market players

- 1 Owner risks
- 2 Lender risks
- 3 Revenue risks
- 4 Project level risk allocation
- 5 Investor risks

Potential next steps for financing new nuclear in Sweden

1

Assess results and feedback on **report findings**

2

Establish a framework and a plan for the **Swedish developer model**

3

Develop the **Swedish investment model** and corresponding **government support package**

4

Assign responsibility to **relevant organization** to orchestrate the process

5

Work with developers towards **final investment decision** with specified incentives

Financing new nuclear in Sweden

14 May 2024



Thank you!



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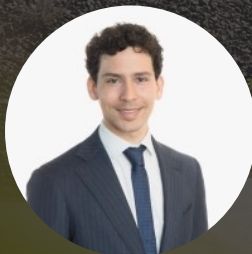
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