



Extending operating time of existing NPP's – Opportunities and challenges

+ ANItA, a new Swedish competence center focusing on SMR realization

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UNIPER Nuclear Sweden at a glance

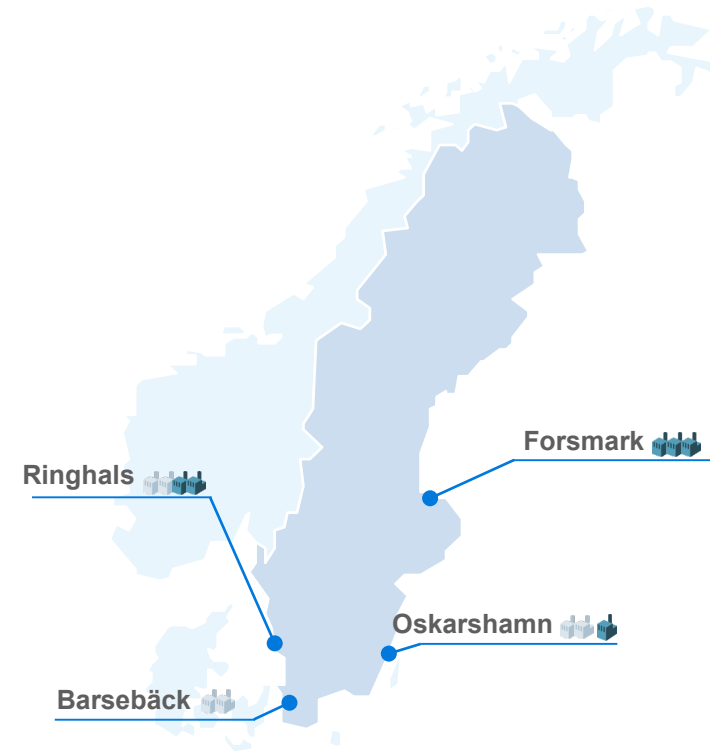
Uniper Nuclear – Focus

Operation of existing nuclear reactors

- Oskarshamn 3
- Ringhals 3-4
- Forsmark 1-3

ND&D program & Backend

- O12 + B12
- SKB



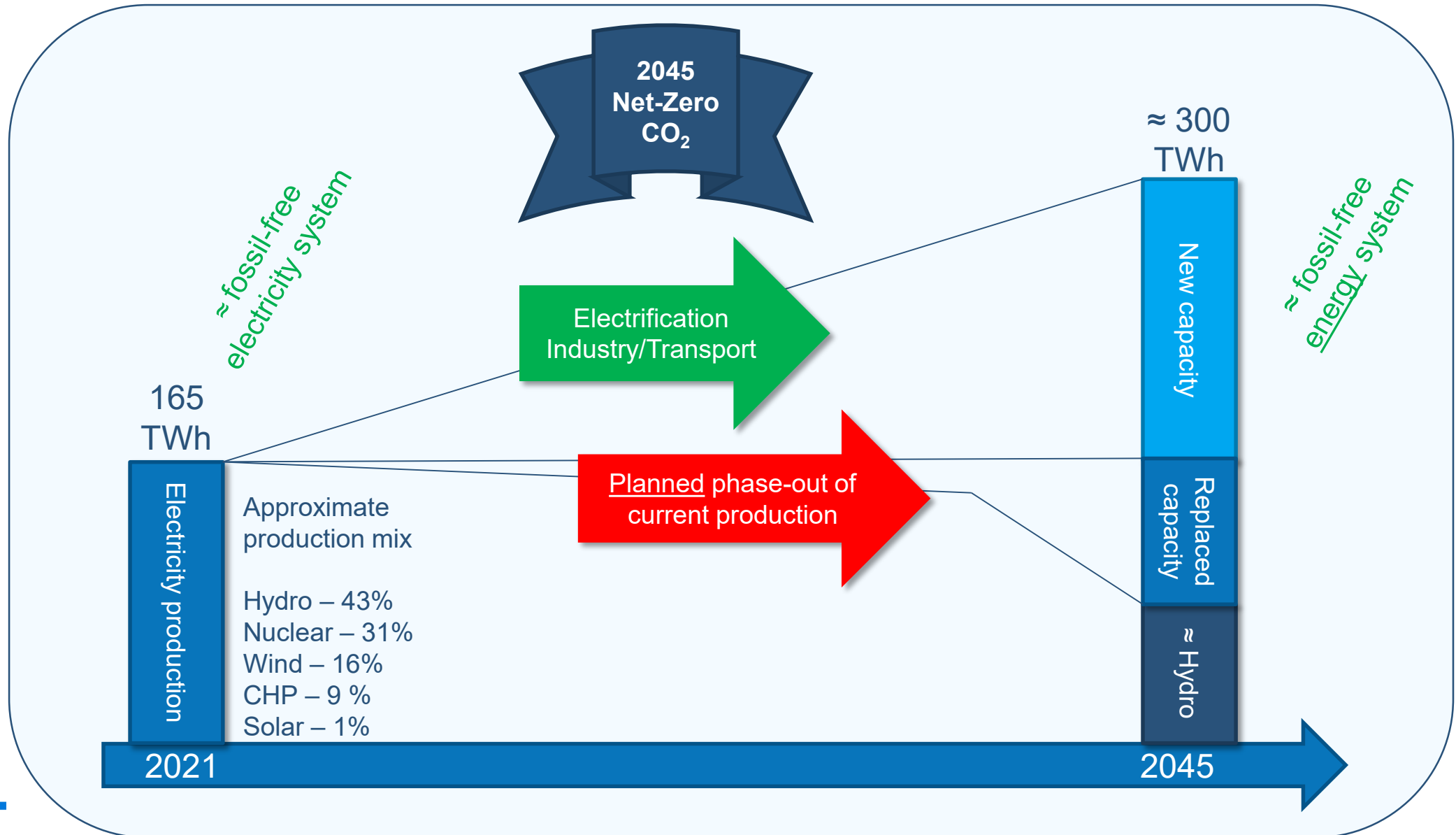
Overview of the nuclear fleet

	<p>Oskarshamn Active reactors: 1 BWR D&D reactors: 2 Power: ~1400 MW Operation plan: 2045 Majority owner: Uniper</p>		<p>Barsebäck D&D reactors: 2 EOL: 2005 Majority owner: Uniper</p>
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	<p>Forsmark Active reactors: 3 BWR Power: ~3300 MW Majority owner: Vattenfall</p>
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	<p>Ringhals Active reactors: 2 PWR D&D reactors: 2 Power: ~2200 MW Majority owner: Vattenfall</p>
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The Swedish challenge – in principle



How can nuclear power be one part of the solution?

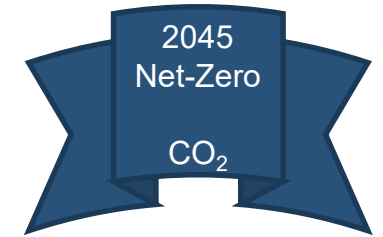
- To form a balanced electricity system together with other fossil-free production techniques

Extending operation time beyond 60 years for current reactors can reduce the needed replaced capacity by 50TWh

=> Lifetime extension for existing nuclear fleet >60 years

Build new nuclear power based on well known light water technology in the form of SMRs

=> ANItA – A competence center supporting realization of light water SMR



2045

Extend operating time - “Lifetime extension”



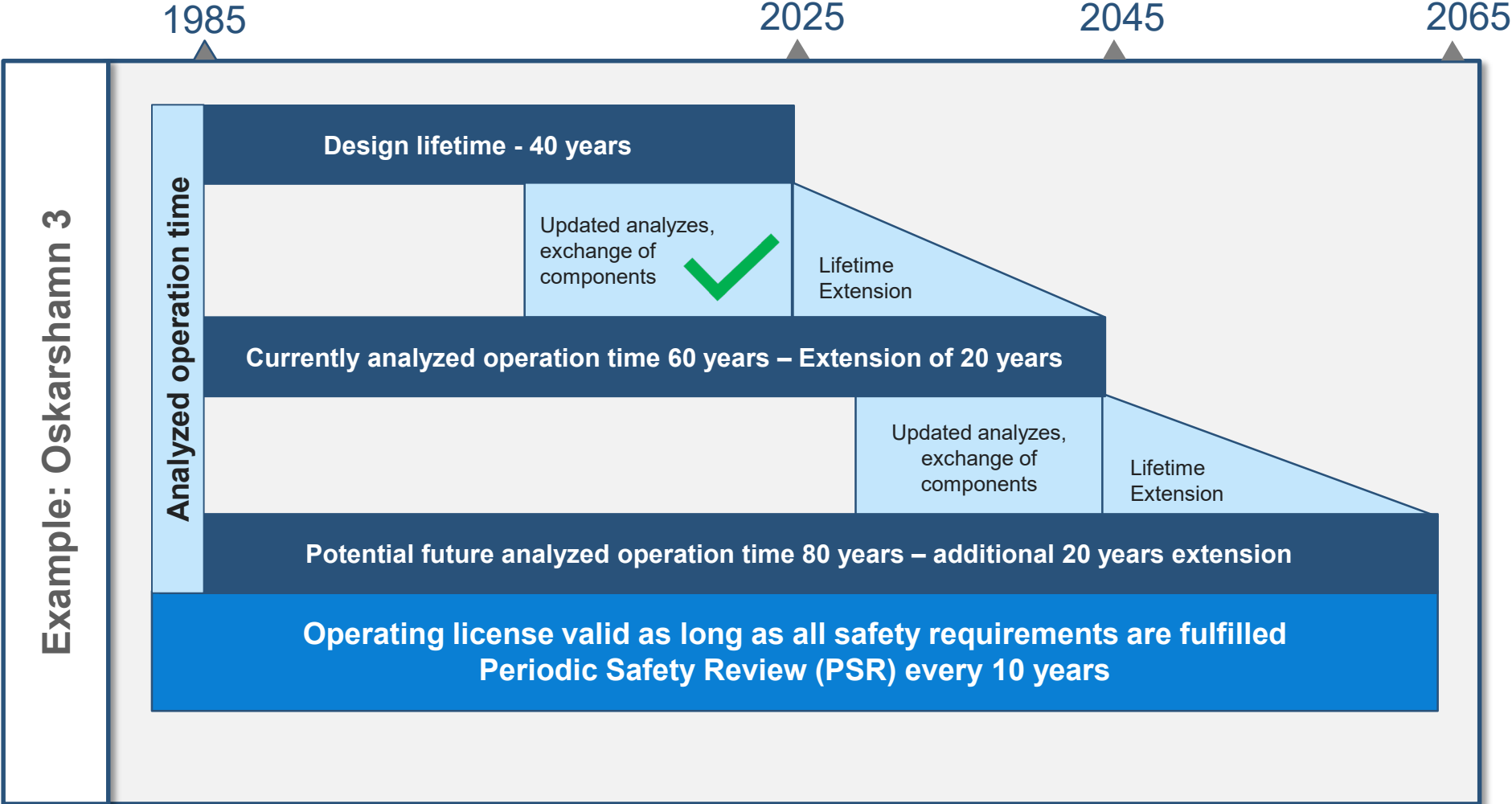
- Requires extension of analyzed operation time
 - Require exchange of componets reaching their technical, or economical, lifetime
- **Creates opportunity for continued safe and efficient production with existing assets**

Example:

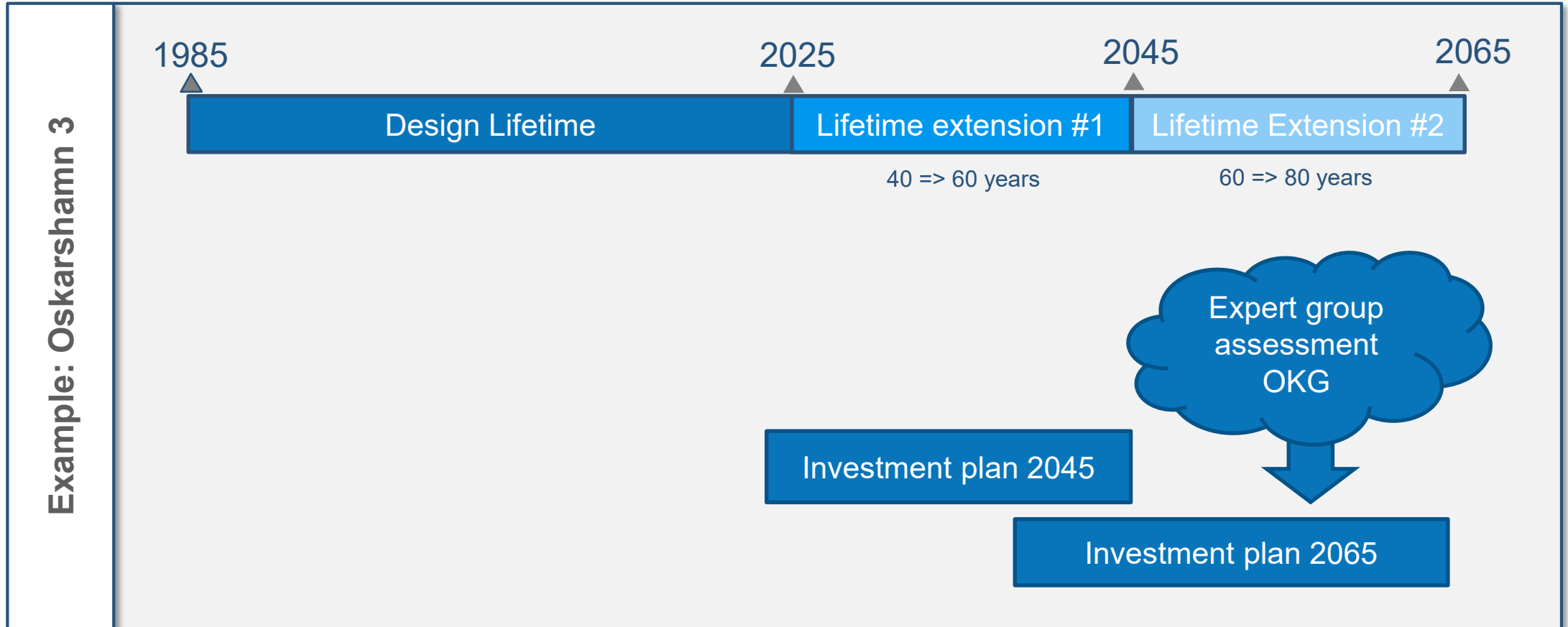
Oskarshamn 3



Lifetime extension – A step-wise approach



An expert group have identified necessary major investment for a lifetime extension to 80 years



Not just a technical challenge!

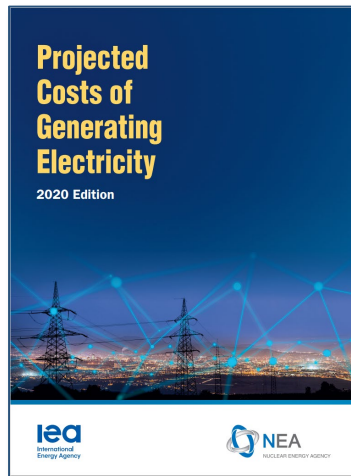
Basis for operation beyond 60 years is safe and efficient production until 60 years !



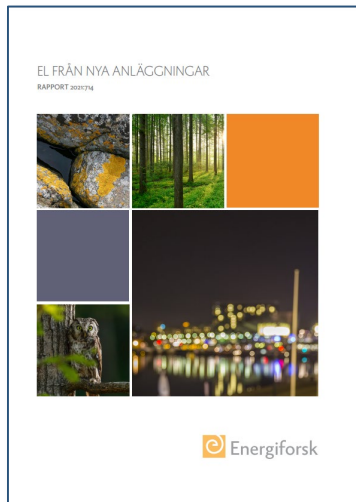
Examples of non-technical challenges:

1		Development of Swedish electricity system
		Legal and regulatory requirements
		Public opinion
2		Electricity market design and forecast
		Other revenues (ancillary services etc)
3		People
		Supply chain
4		Supplier market
		D&D and Back-End Program

Generic production costs for Lifetime Extensions



LTE 40 => 60 years
WACC 7%
85% Utilization
LCOE ≈ 30 öre / kWh
0.03 € / kWh



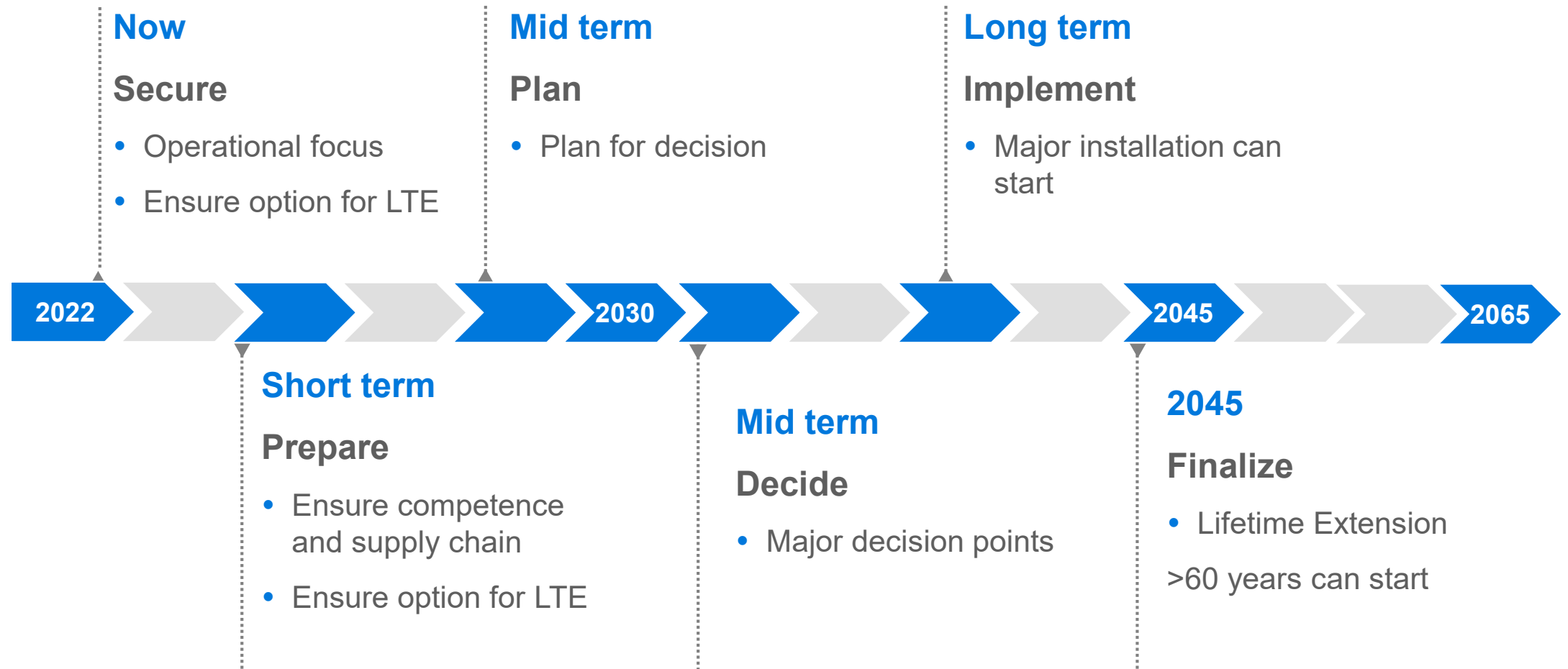
LTE 60 => 80 years
WACC 7%
89% Utilization
LCOE ≈ 25 öre / kWh
0.025 € / kWh



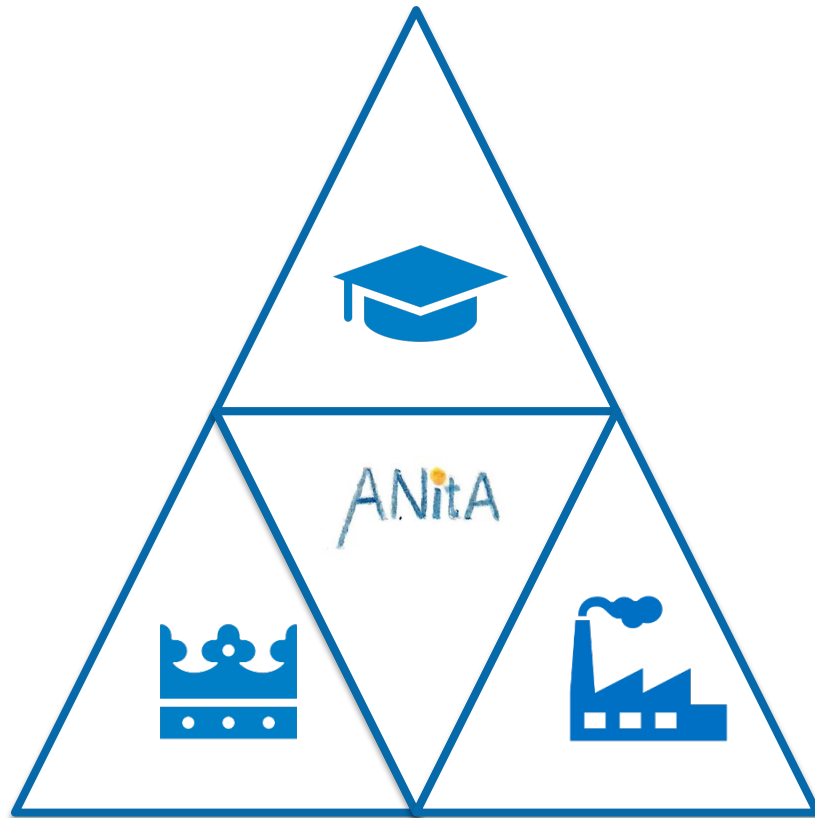
Lifetime extension is:
Cost-competitive!
And also competitive in
CO₂ – footprint
Material usage

LCOE = Levelized cost of Electricity
LCOE gives a simplified indication of production cost. This cost-metric shall only be compared for production techniques with similar production characteristics and similar potential revenue streams.

A Lifetime Extension beyond 60 years must be thoroughly prepared, and if so, it can provide a good opportunity!



ANitA - Academic-industrial Nuclear technology Initiative to Achieve a sustainable energy future



Goal:

Support near-time realization of light-water SMR's in Sweden

How:

Gather multi-disciplinary competence from academy and industry, with support from Swedish Energy Agency, in a Competence center started in 2022

What:

A coordinated project portfolio staffed with expertise from both academy and industry supporting the Goal



ANitA - Initial project portfolio

- SMR technologies and applications
- SMR-specific core, fuel, and operation
- SMR-specific reactor safety and safety systems
- Fuel cycles
- Deployment of new nuclear technology in Sweden

Wanted!



Phd-students with interest to be part of ANitA

