



Economics and Financing Aspects for New Nuclear in the UK

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Outline



- Prospects for nuclear new build in the UK currently are challenged; these challenges include long construction periods, high perceived and actual construction cost and risk, and reliance on private companies and investors to take most risks;
- Traditional investors struggle with these challenges, lately with the withdrawal of developers from proposed projects;
- The UK Government is still looking for approaches that will “close the nuclear gap”;
- This presentation will analyze these challenges and develop some ideas how they could be overcome.

Financing - Clarify the topic, focus

Often, only 1 or 2 of these are considered



The financial “technical aspects”

- Structuring a financial transaction: debt/equity, export credit, ECGs, surety, insurance, interest and exchange rate hedges, etc. and a contract model (EPC or other), risk allocations. – Challenging, but not what usually prevents nuclear new build from happening.


“Who should pay for it all (ultimately)?”

- Either ratepayers or taxpayers. In some potential new build countries, the national economy may not support such a burden. In the UK this is not an economic issue, but as a political uncertainty it is a factor for investors. Solutions to this political/regulatory challenge depend on expectations for public acceptance, energy system costs and other (e.g. State Support).

“Who will take the (ultimate) risk?”

- Must be an entity with the capacity, ability and will and that is acceptable to national stakeholders. Lack of answers is a key driver for nuclear new build cost, and why projects are cancelled. In liberalized markets only solved by state owned investors, so far.

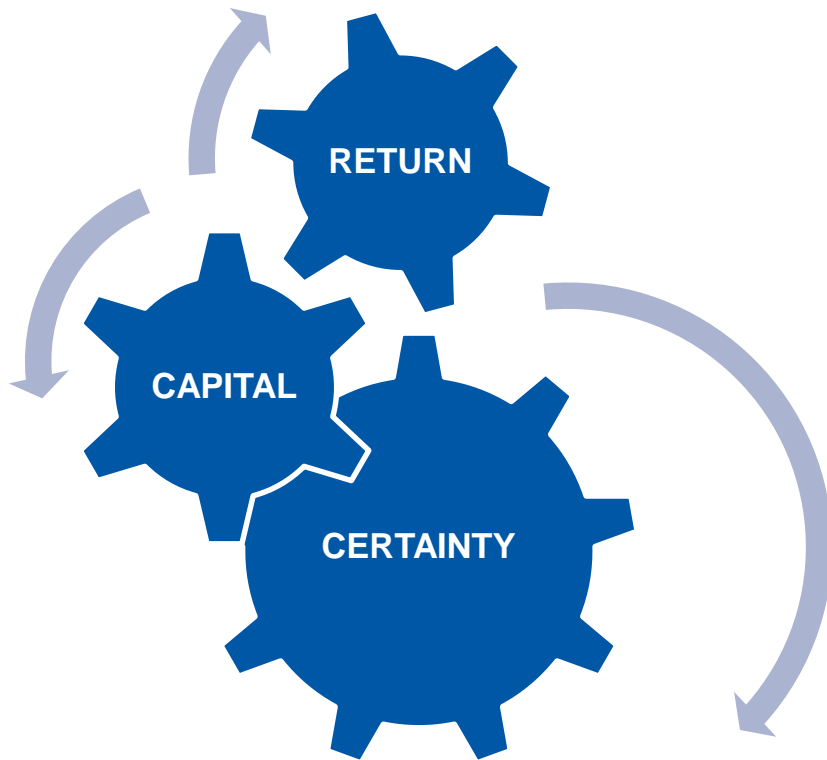
Different approaches to new build



Developer buys ...	Developer Technical Competence	Supplier Team Complexity	Contract Issues	Government Involvement		Examples
				Customer	Supplier	
... Plant <i>(multi-lot)</i>	High	None/Low	Technical	(None)	(Low)	<ul style="list-style-type: none"> • EDF • CGN • (HNP) • ...
... Project <i>(EPC turn key)</i>	Medium	Medium	Delivery	Low	Medium	<ul style="list-style-type: none"> • OL 3 • USA • ...
... Program <i>(Plant, Operator, Licensing)</i>	Low	High	Strategic	High	High	<ul style="list-style-type: none"> • (UAE) • Turkey • ...

➤ Allocation of responsibilities and risk is just part of the challenge.

Financing Challenges*



RETURN: Revenues (offtake volume and rates) can be made reliable by government action. Operating and backend cost are predictable and favorable. Initial CAPEX is high risk: cost estimates have tripled since 2007 but this is (partly) due to multi-layered risk compounding. Long duration compounds the problem.

CAPITAL (since non-recourse project finance is not feasible): (i) very few investors have balance sheets that can absorb large, nuclear cluster risk (major cost increases let alone abandonment of projects); (ii) involvement in nuclear projects hurts ratings, raising cost of debt capital cross board, leverage effect; (iii) stock markets punish if investors ignore these first two issues. - Risk allocation to vendors faces same issue.

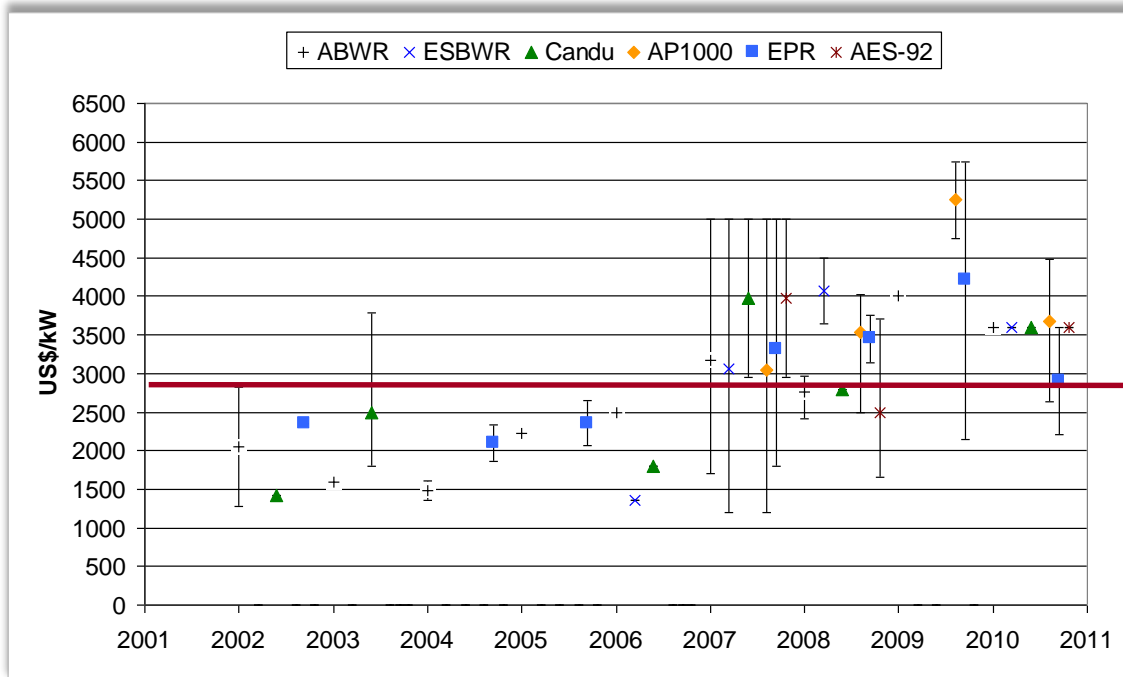
CERTAINTY: Nuclear new build in OECD countries has an abominable track record - cost and schedule seem to have no bounds. This has a circular effect in that vendors, investors, lenders include the worst case with added contingency, raising total cost and thereby absolute risk

*) Government owned investors may be part of a geopolitical strategy with non-financial drivers.

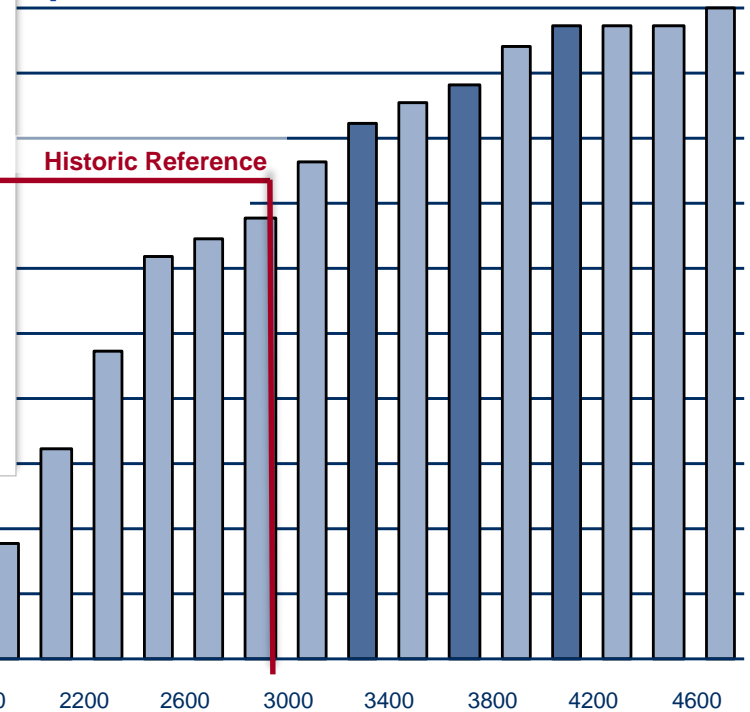
Certainty - Framework for New Build



Certainty – Cost Estimates From hype to wretched



Note more recent project cost estimates in UK and other experience even far exceed these previous estimates.

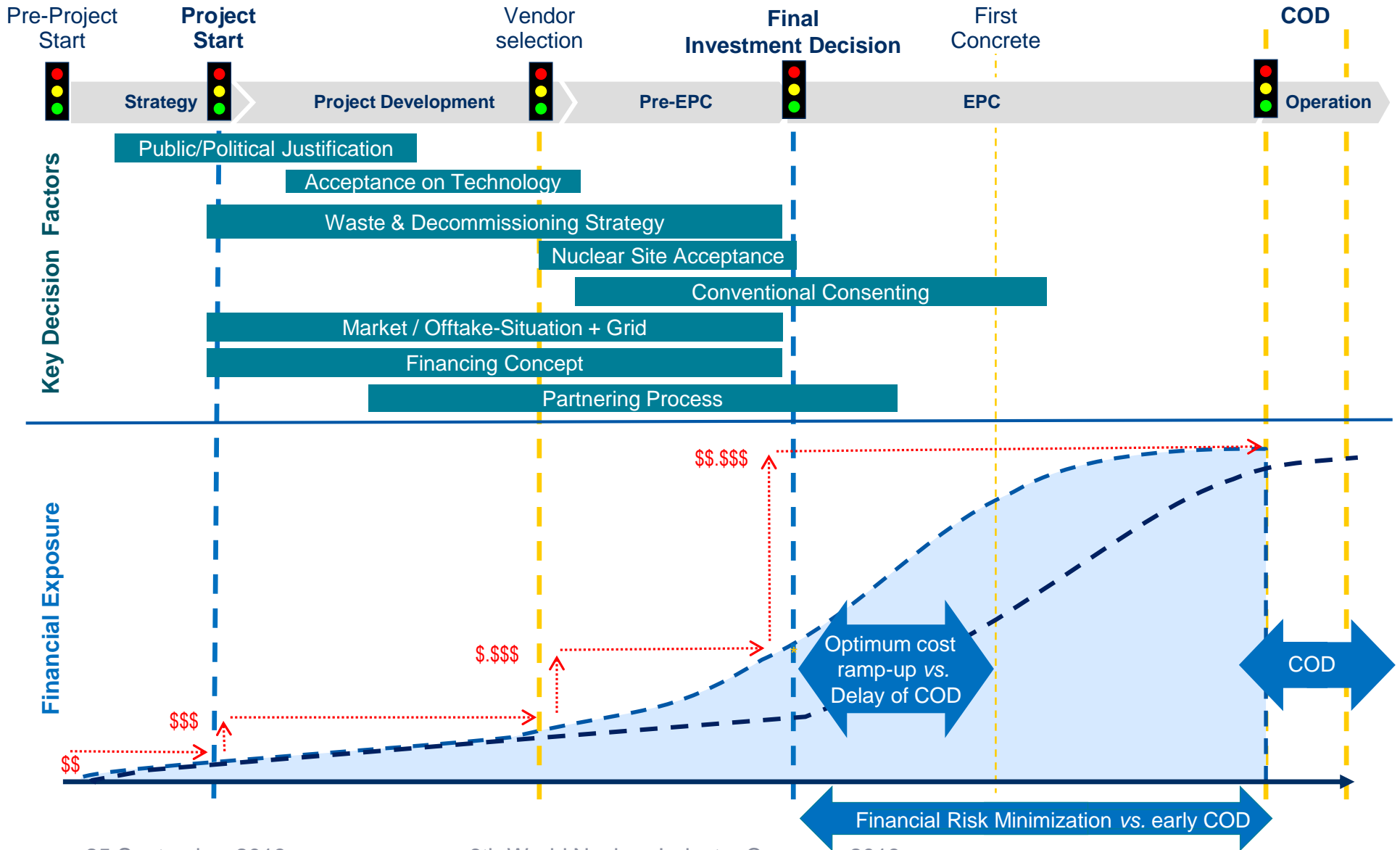


Data based on published cost estimates

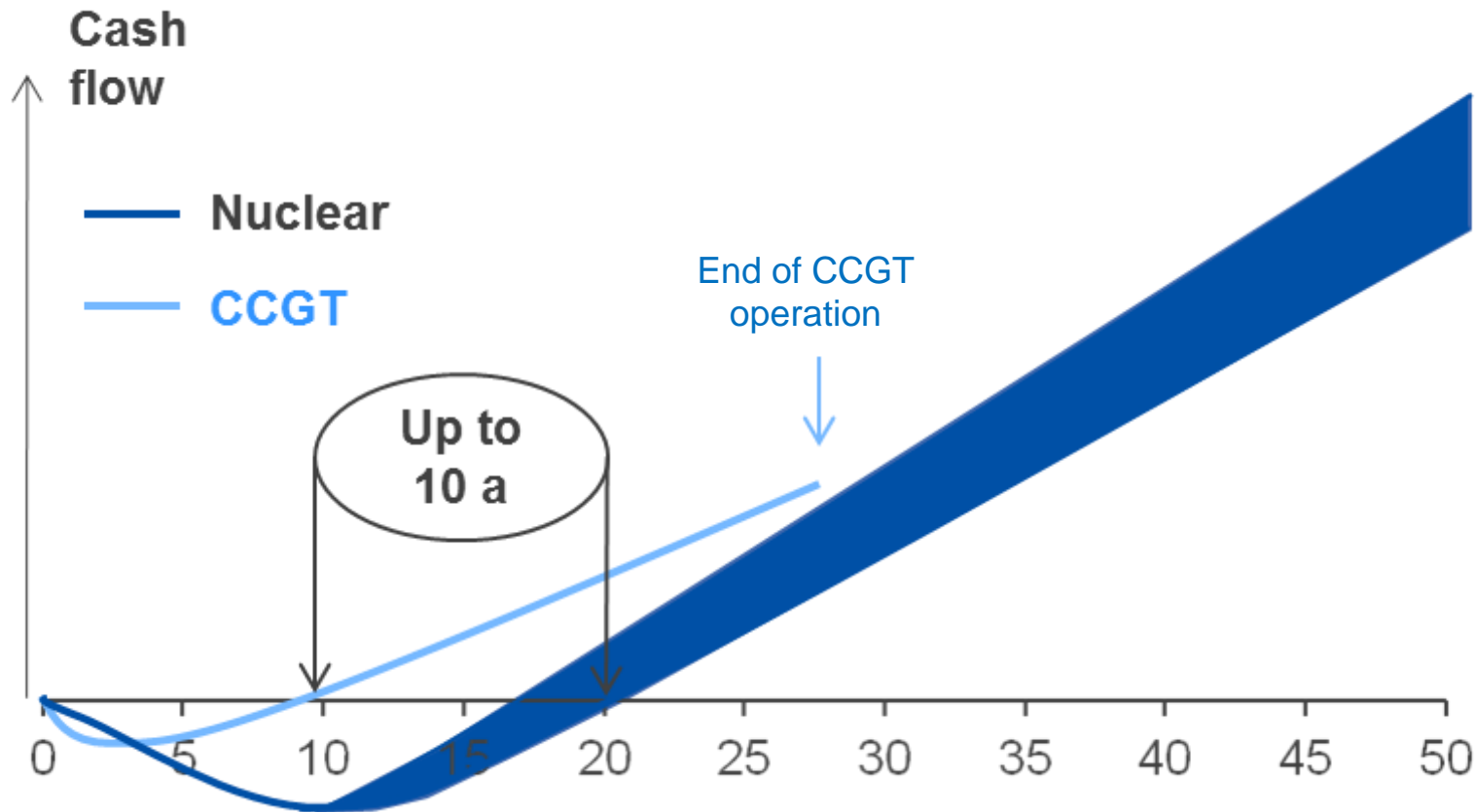


Risk – and opportunity? – priced in by market. Arbitrage?

Seeking Certainty - Programme Design



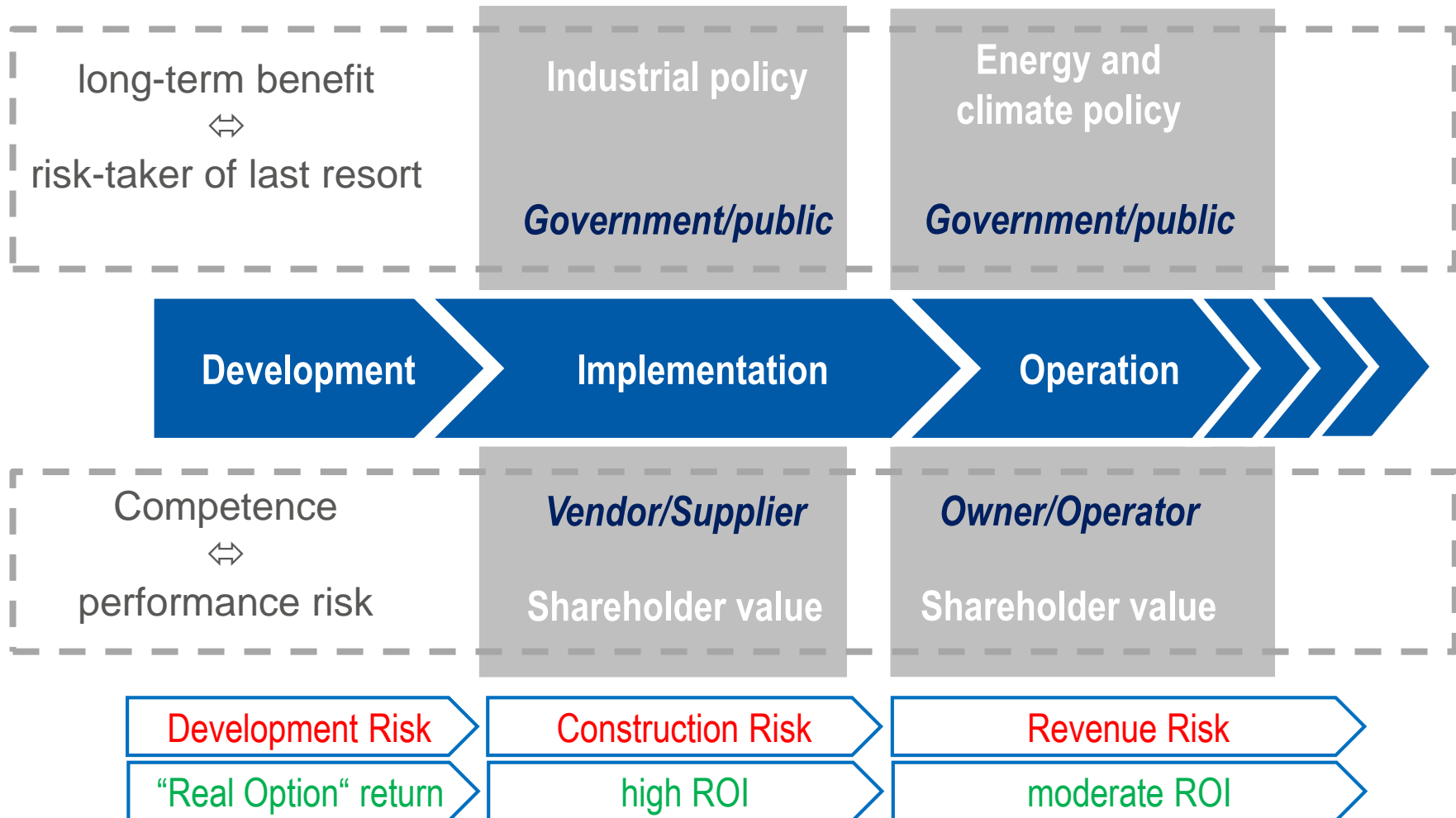
Payback is in the long run



➤ *Current electricity market is not attractive for any major investment by private investors. But even if it were ...*

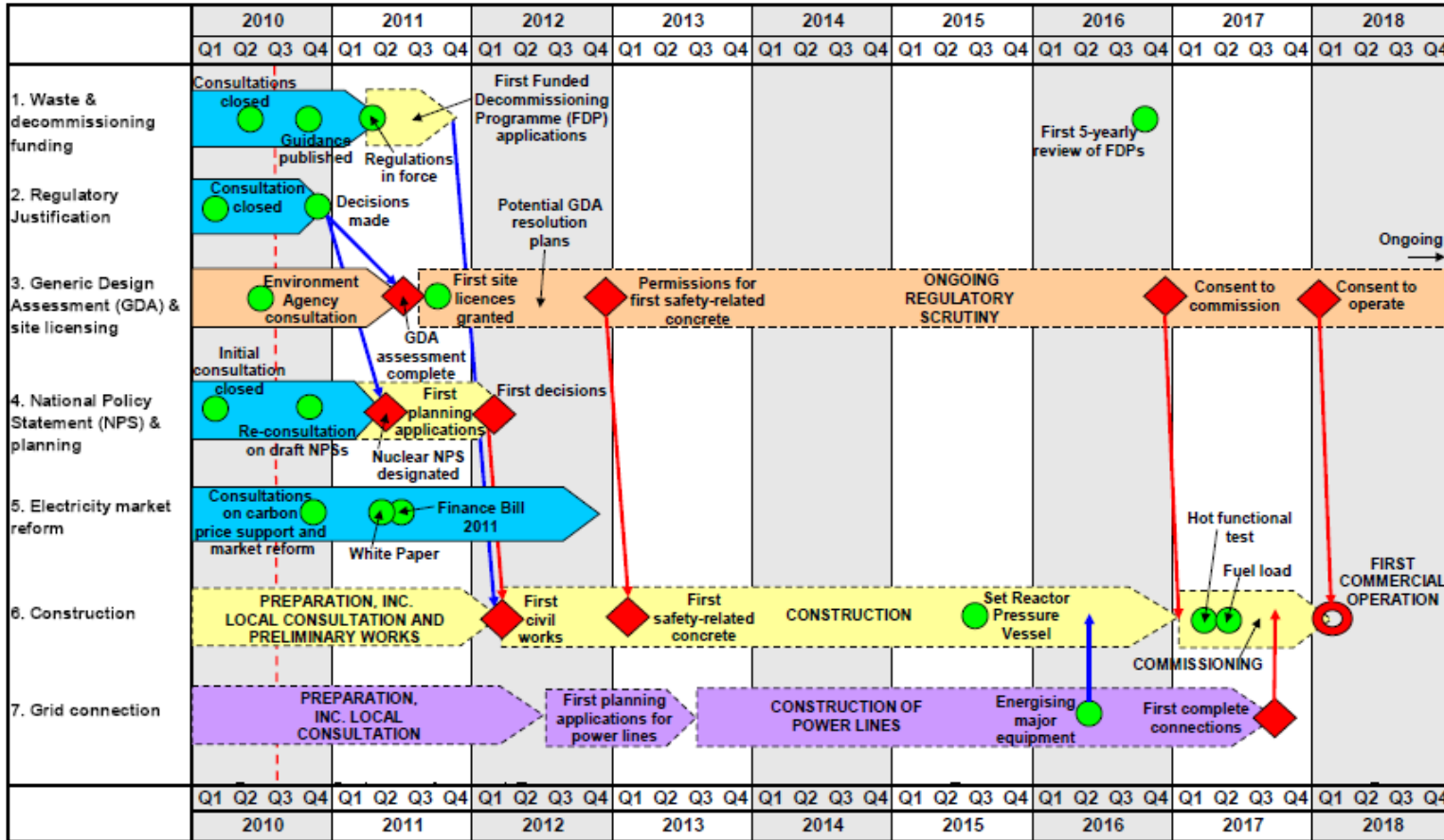
Nuclear plants provide public goods (e.g. very long-term, reliable clean energy) not compensated in liberalized electricity markets.

The case for Government involvement



UK Framework 2010

Excellent design and execution, but ...



- KEY:**
- Government
 - Regulators
 - Operators
 - National Grid
 - Milestone
 - Critical path
 - Generic activity
 - Project-specific activity

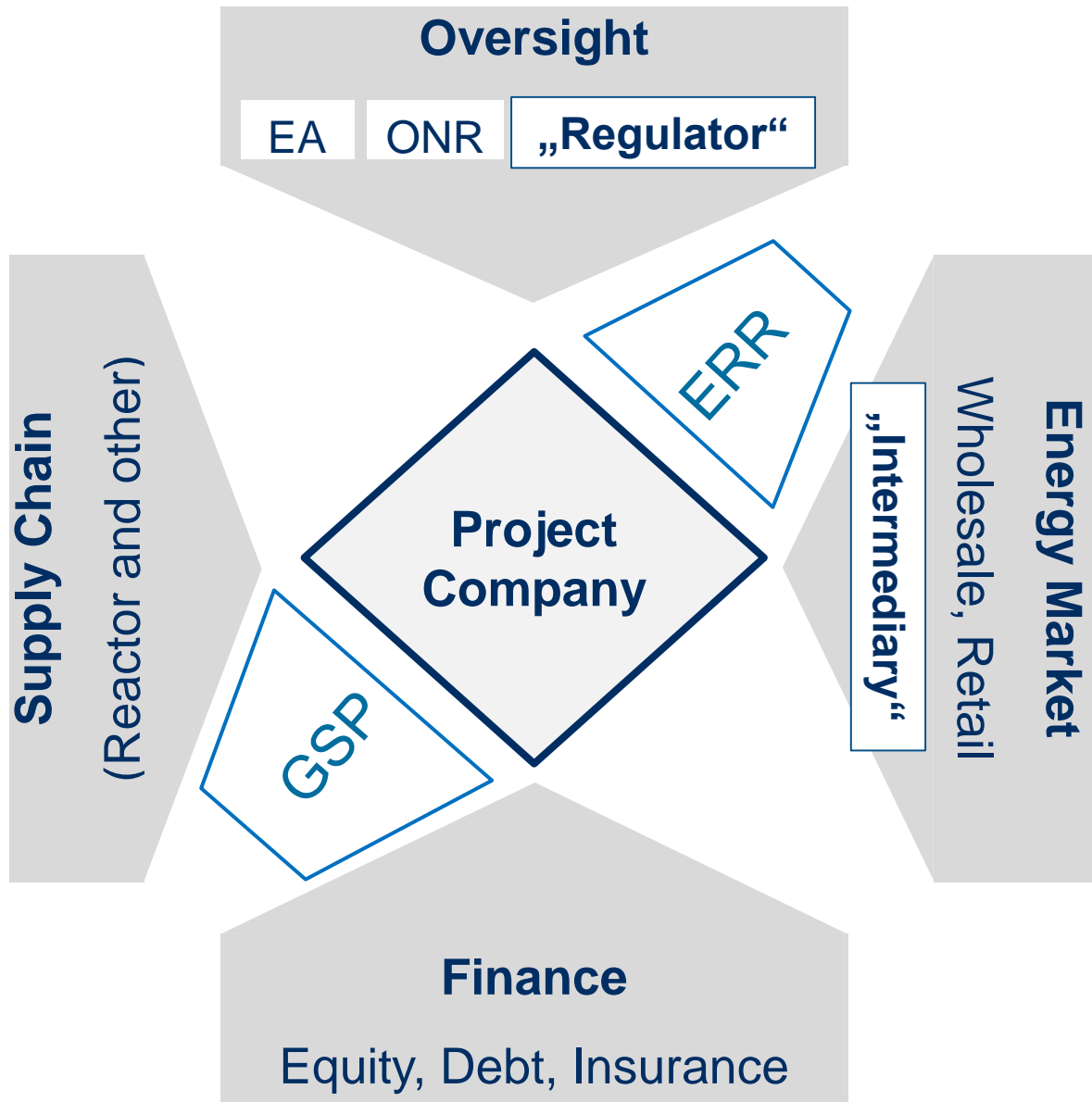
INDICATIVE TIMELINE FOR FIRST NEW NUCLEAR POWER STATIONS

NOTES:

- All timings given in this plan are indicative only and subject to change. This document was current as of **AUGUST 2010**.
- This plan shows an indicative pathway to commercial operation of the first new nuclear power station by 2018. In line with announcements from prospective operators, other new nuclear power stations are expected to become operational after 2018.
- Assumptions in this plan about future timings/milestones in no way prejudice the outcome of current or future Government processes, regulatory approvals or planning decisions.
- 'First safety-related concrete' refers to structural concrete within the nuclear island.

Source: UK Office of Nuclear Development - August 2010

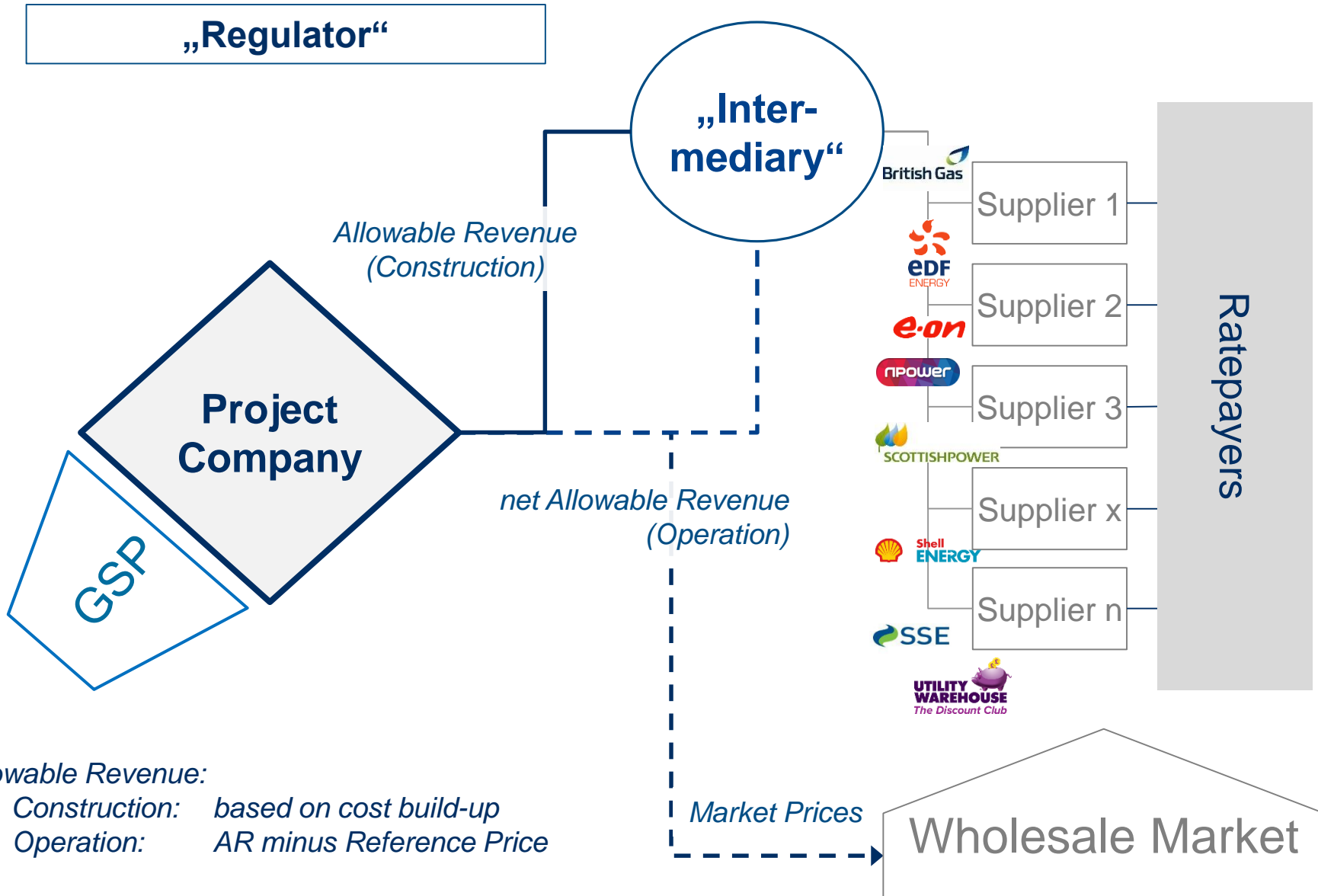
RAB – Regulated Asset Base



New Elements

- **ERR** = Economic Regulatory Regime. A regime for economic regulation of the nuclear power plant.
- **GSP** = Government Support Package. Government protection for investors and consumers against specific remote, low probability but high impact risk events.
- **Regulator**: The economic regulator of a project company under a RAB model.
- **Intermediary**: Providing a route for funds to be raised from energy suppliers to support new nuclear projects, with the amount set through the ERR, during both the construction and operational phases.

RAB – Regulated Asset Base Economic Regulatory Regime



Allowable Revenue:

- **Construction:** based on cost build-up
- **Operation:** AR minus Reference Price

RAB – might do the job



RAB – might do the job* ...

... but ... *it might be too complicated*

- time to identify and engage with investors and regulated plant owners, create and align the various elements
- negotiate individual ERR and GSP
- satisfy investor risk
- satisfy public/consumer interest
- arrange supply chain and finance
- ensure legal/regulatory, tax/accounting certainty

.... ***why not go one small step further?***

*) also note extensive historical and ongoing relevant experience in USA (AFUDC, CWIP; IRP, etc.)

Ideal project owner – where to find?

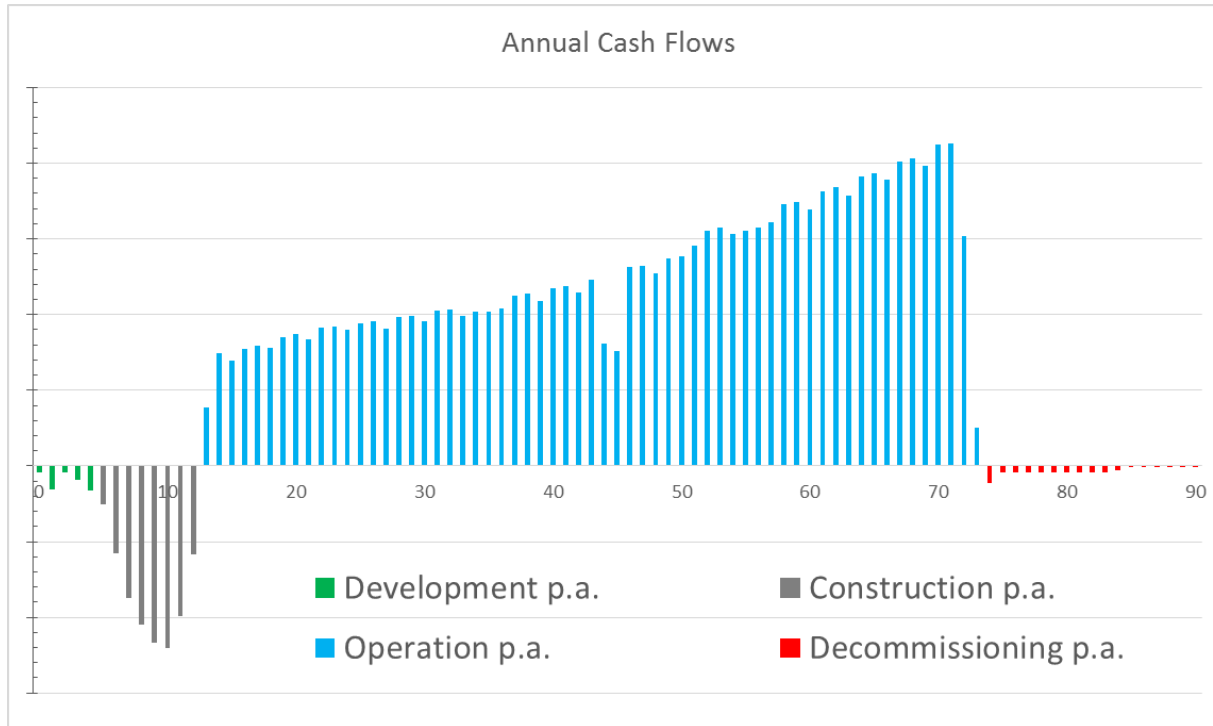
- A reputable nuclear operator, with a complete life cycle experience
- Intimate knowledge of the different state of art technologies, applicable regulatory requirements and processes
- A proven project delivery record, first hand technical and commercial experience with nuclear new build projects
- Strong project resources, control systems and procedures to ensure certainty in project scope, cost, schedule and quality
- ...
- Strong balance sheet
- Very long-term investment perspectives
- Strategic interest in UK energy market
- ...
- ... no unwanted political strings attached...

 ***If they have all that: Why would they take nuclear new build on themselves? And how many plants could they undertake?***

NPP Investment Opportunity



Randomized data and simplified econometric model, for demonstration purposes only.



	Scenarios		
	9% / 9%	15% / 7%	4% / 10%
Discount Rates			
Developer (NNB Co)	8,8%	15,5%	4,5%
Operator (OpCo)	8,8%	7,0%	7,0%
Price (in t=12)	19.858.570	25.840.227	25.840.227
Present Value (in t=0)			
Developer (NNB Co)	-0	0	5.020.336
Operator (OpCo)	0	-0	-0

Option 1:

NPP is built and operated by *one* investor (owns NNB Co and OpCo).

Option 2:

NPP is built by *private* investor (NNB Co) who sells plant to a 3rd party strategic investor (OpCo) upon completion.

Option 3:

NPP is built by *government* owned investor (NNB Co). Sells plant to a private 3rd party strategic investor (OpCo) upon completion.

one extra step: Alternative Approach



- Development and Construction:

Government owned and financed, PBO with programme manager

- *Government risk and credit*

- *Optimized fleet approach, maintain vendor competition, maximize lessons-learned*

- Operation:

Auction NPPs to private owner/operator investors – when successful COD is

- Auction: for most favorable support package

- Auction: for highest cash price

- *Simplified support package*

- *structured close to completion, competitive*



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NPP Economic Fundamentals



Randomized data and simplified econometric model, for demonstration purposes only.

Cash Flow for a 2-unit NPP
(in real value)
(cumulative data are factor 10 of annual data)

