



مكتب التنظيم و الرقابة  
Regulation & Supervision Bureau

## Identification and Discussion of Various Nuclear Power Project Finance Models

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*Disclaimer: The views presented are those of the presenter  
and not reflective of the Regulation and Supervision Bureau.*



# Overview



➤ **Investor Finance Model**

➤ **Phased Financing**

# Investor Finance Model



Where investors form a group to invest in a project



- Debt
- Banks
  - Export credit agencies
  - Capital markets (Bonds)

- Equity
- As Shareholders
  - Capital markets (IPOs)

Examples can be:

'Mankala' Model

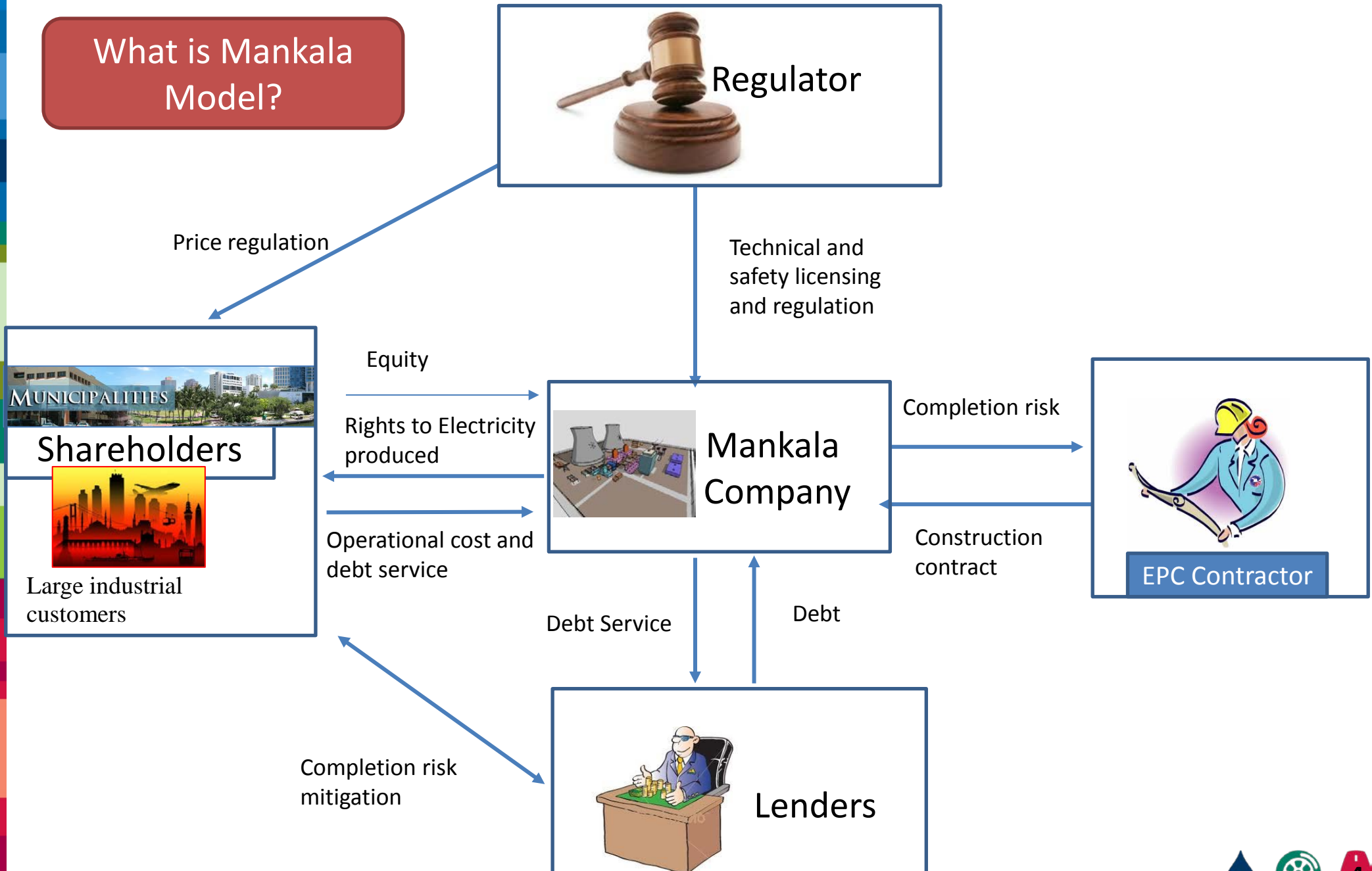
Very popular in the Finland electricity sector



# Investor Finance Model



What is Mankala Model?



# Investor Finance Model



- Built by TVO (Teollisuuden Voima Oyj)
- Type: EPR 1600MW (FOAK)
- Original cost: Fixed Price Turnkey Contract, with Areva-Siemens of €3.2 bn in Dec 2003
- Construction started in 2005
- Expected commercial operation in the first half of 2009
- Delay: 7 years
- Operational: 2016
- Expected cost € 8 bn
- Arbitration claim by Areva-Siemens against TVO of more than € 2 bn

## Olkiluoto-3 Project Finland

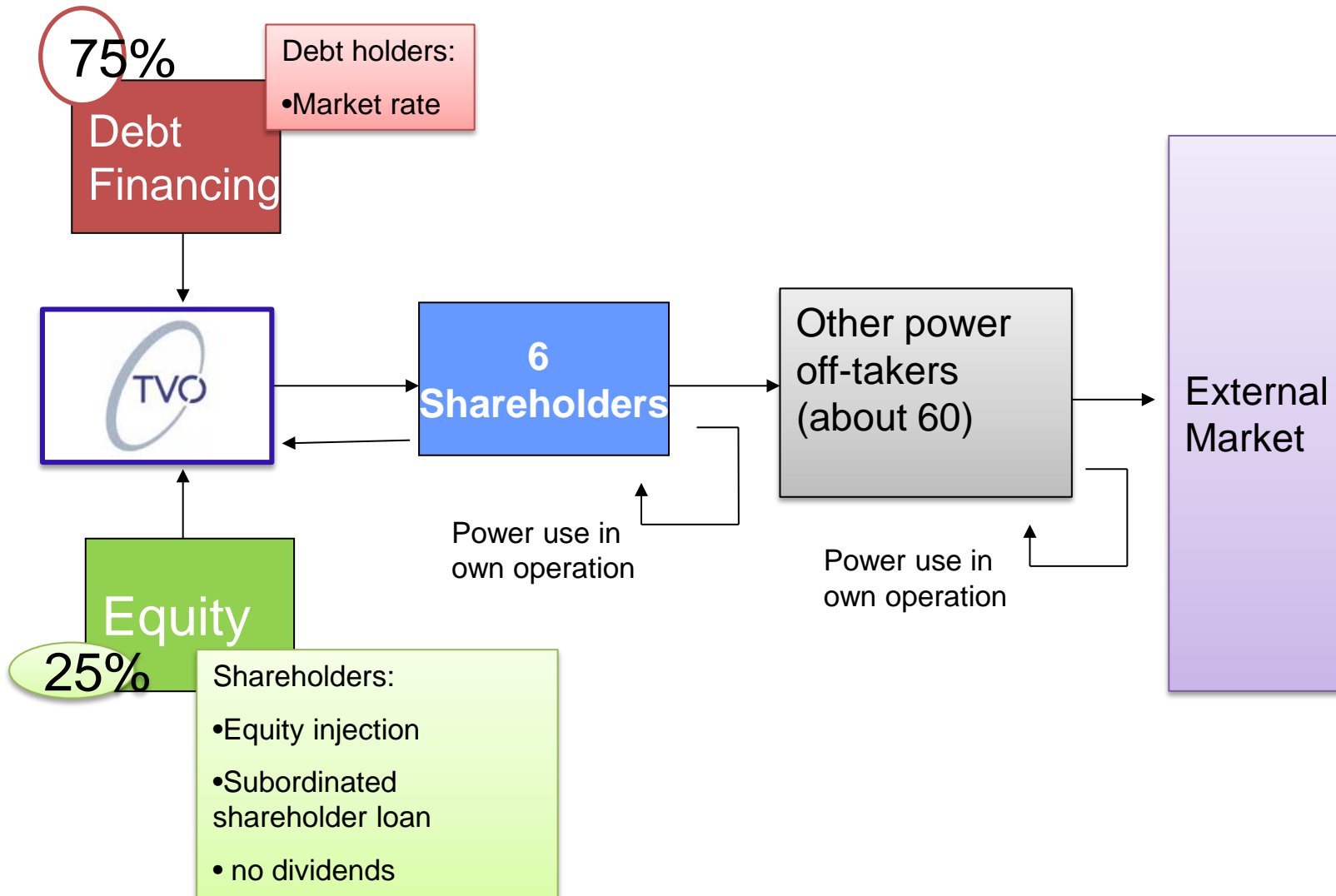


Who are sharing the risks and increased costs?

# Investor Finance Model



## Olkiluoto 3 Financing Model



➤ Characteristics of hybrid financing (corporate/project finance):

➤ The project financed on the balance sheet of TVO

➤ Part of equity and loan is provided by the large customers

➤ A long-term PPA with large customers ensuring future stable revenue stream from the project

➤ Leverage characteristics similar to project finance

➤ Export credit guarantee by the French and Swedish Governments

Very good example of multiple investors to diversify risk



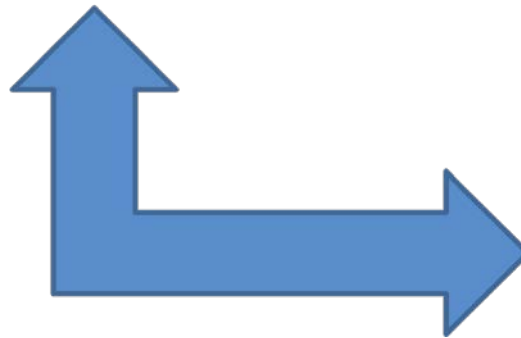
# Investor Finance Model



## Fennovoima's

The third nuclear company in Finland is a Mankala company

Shareholders E.ON (34%) , consortium of Finnish power and industrial companies (66%) with 69 shareholders in total, mostly small regional and municipal utilities, but also industry (trade, mining, steel manufacturing).

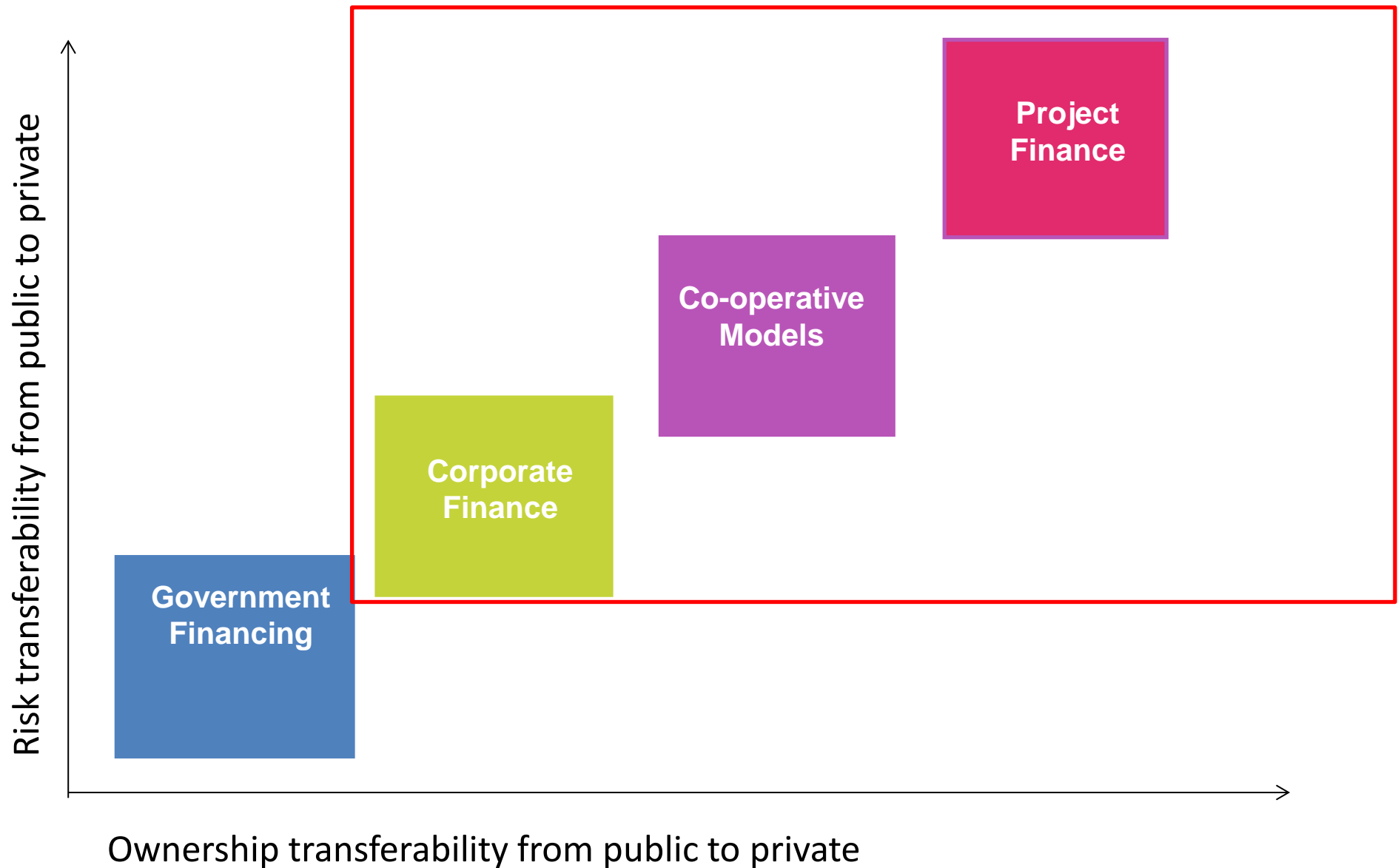


## Hanhikivi project



**Some other countries in Europe also want to adopt this model as it promotes risk diversification**

# Financing Models Trend







## ➤ Investor Finance Model

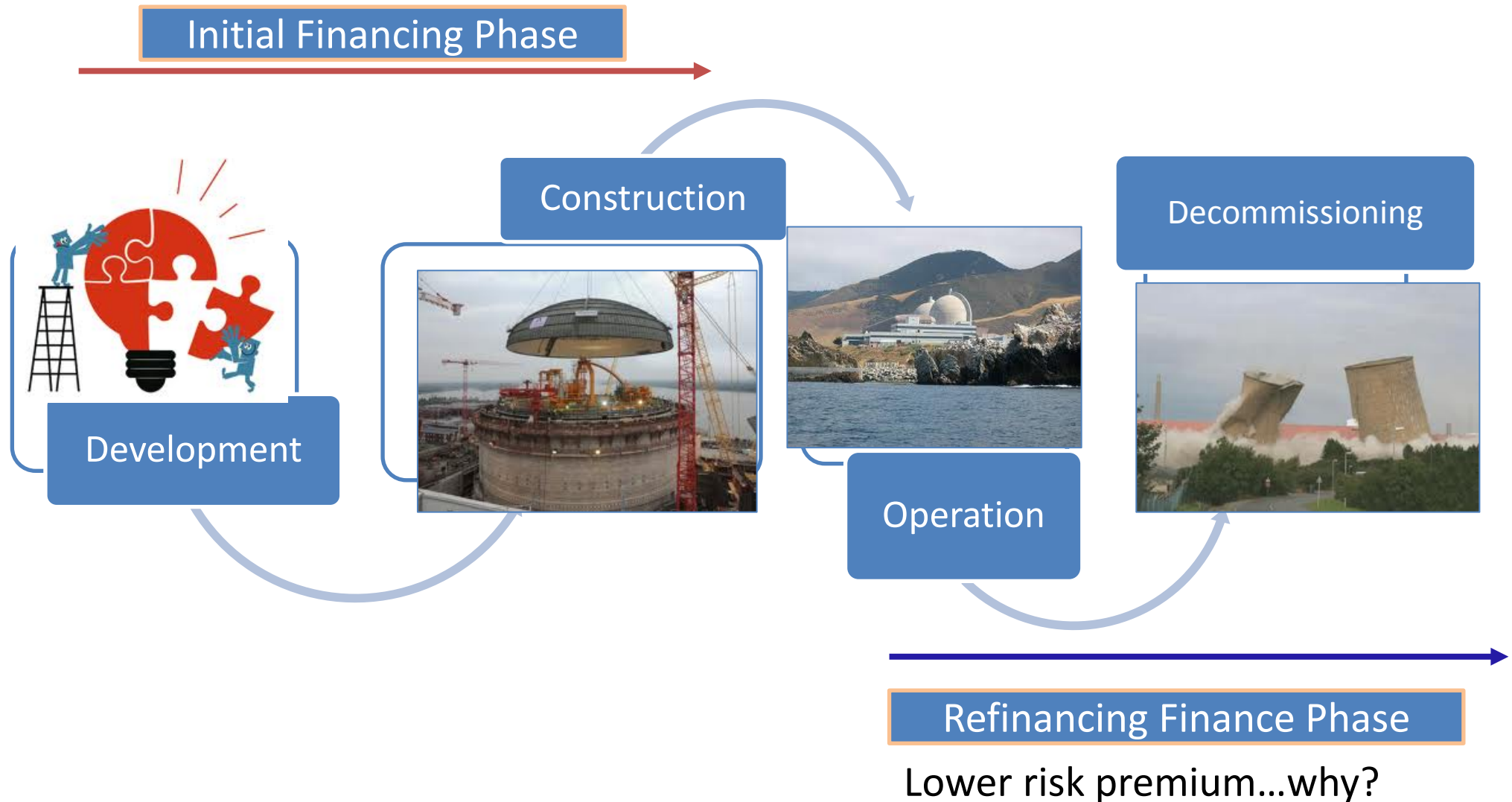
### ➤ Phased Financing

concept that could  
apply to any of the  
financing models  
discussed



# Phased Financing

## Nuclear Phases



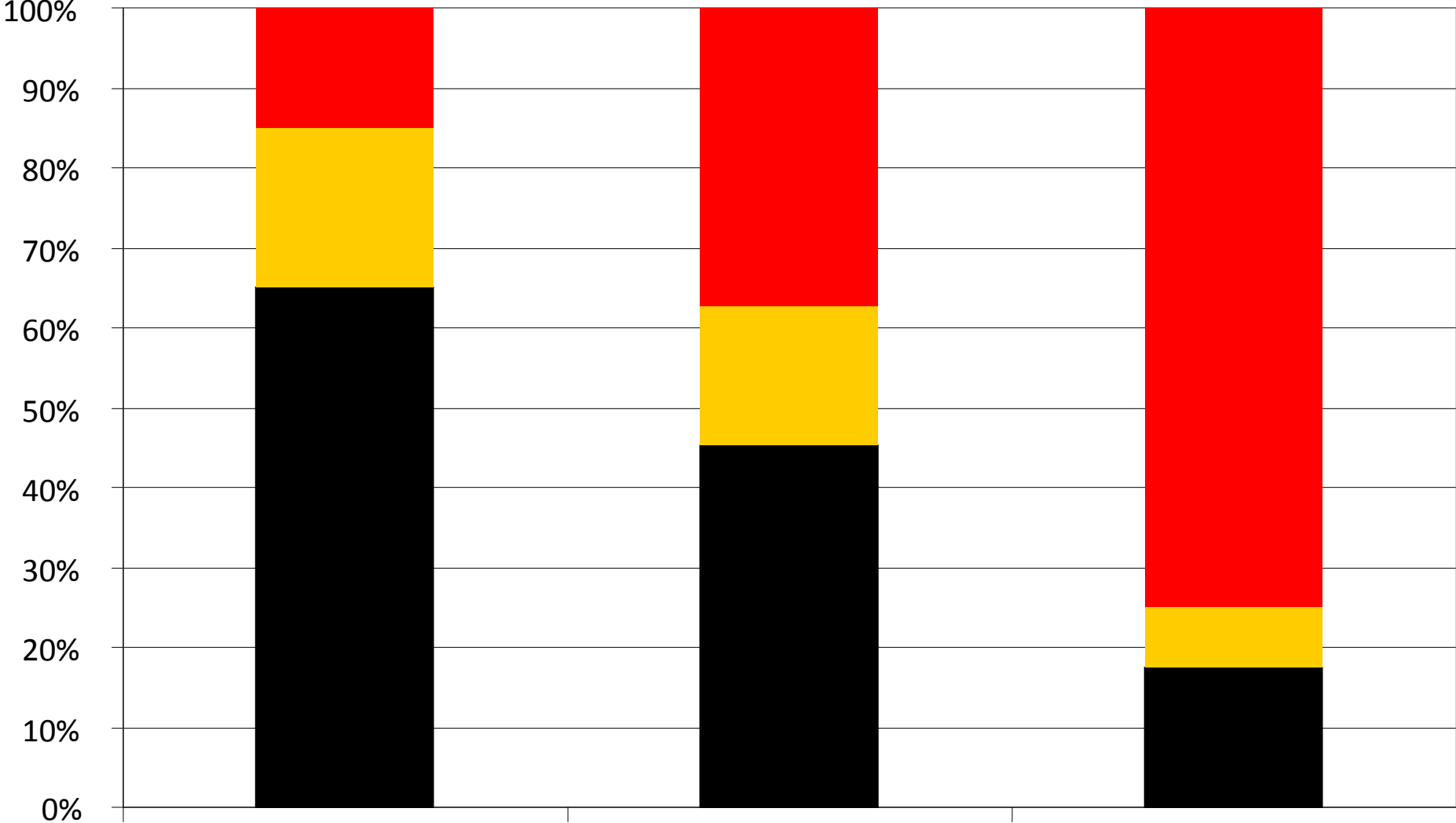
# Nuclear has High Capital Cost Component



Nuclear

Coal

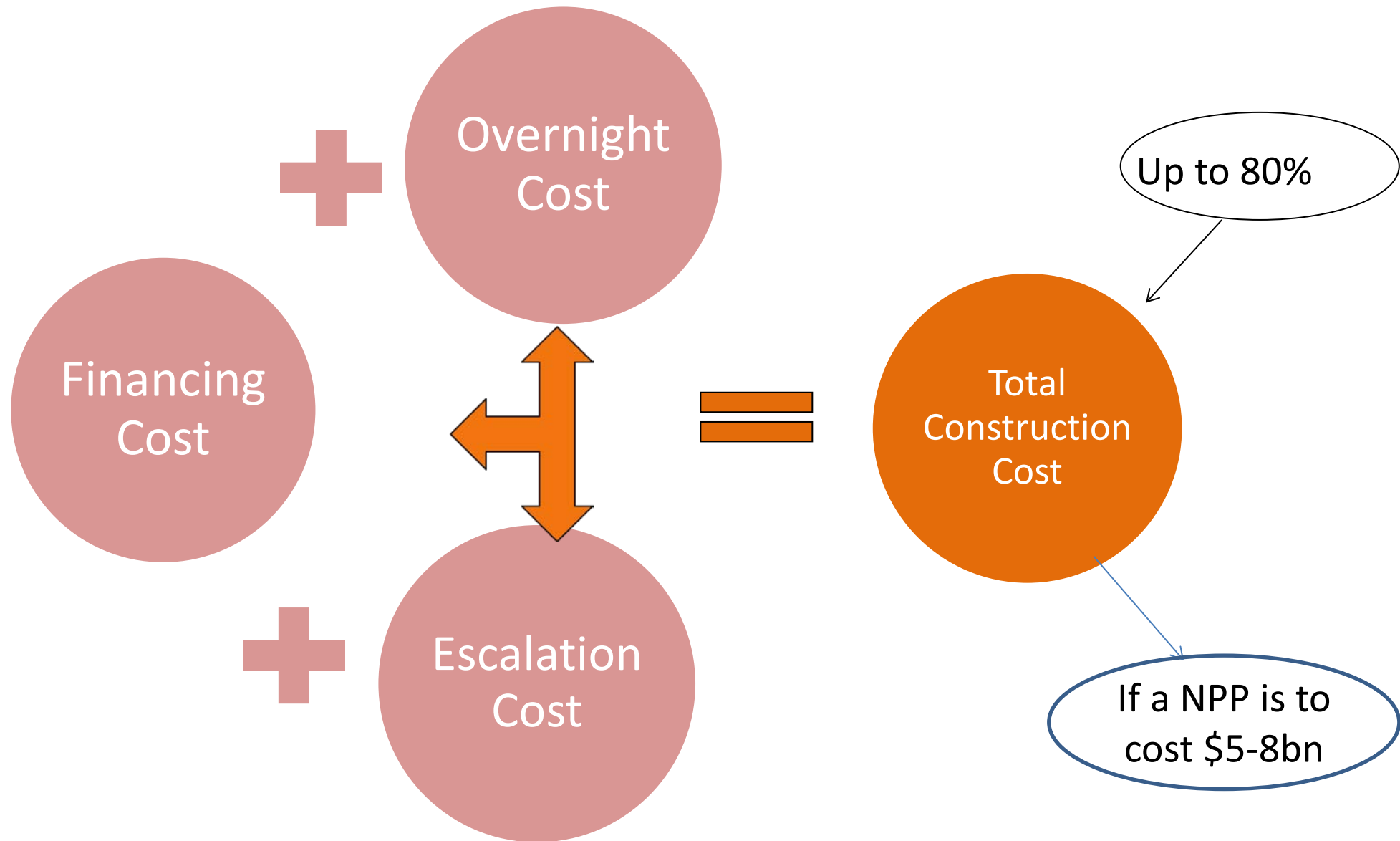
Natural gas



- Fuel
- O&M
- Capital



# Total Construction Cost



# Phased Financing NPPs Construction Risk



➤ **The most significant risk**

➤ ***High risk implies high premium***

➤ ***But why do we worry about construction risk?***



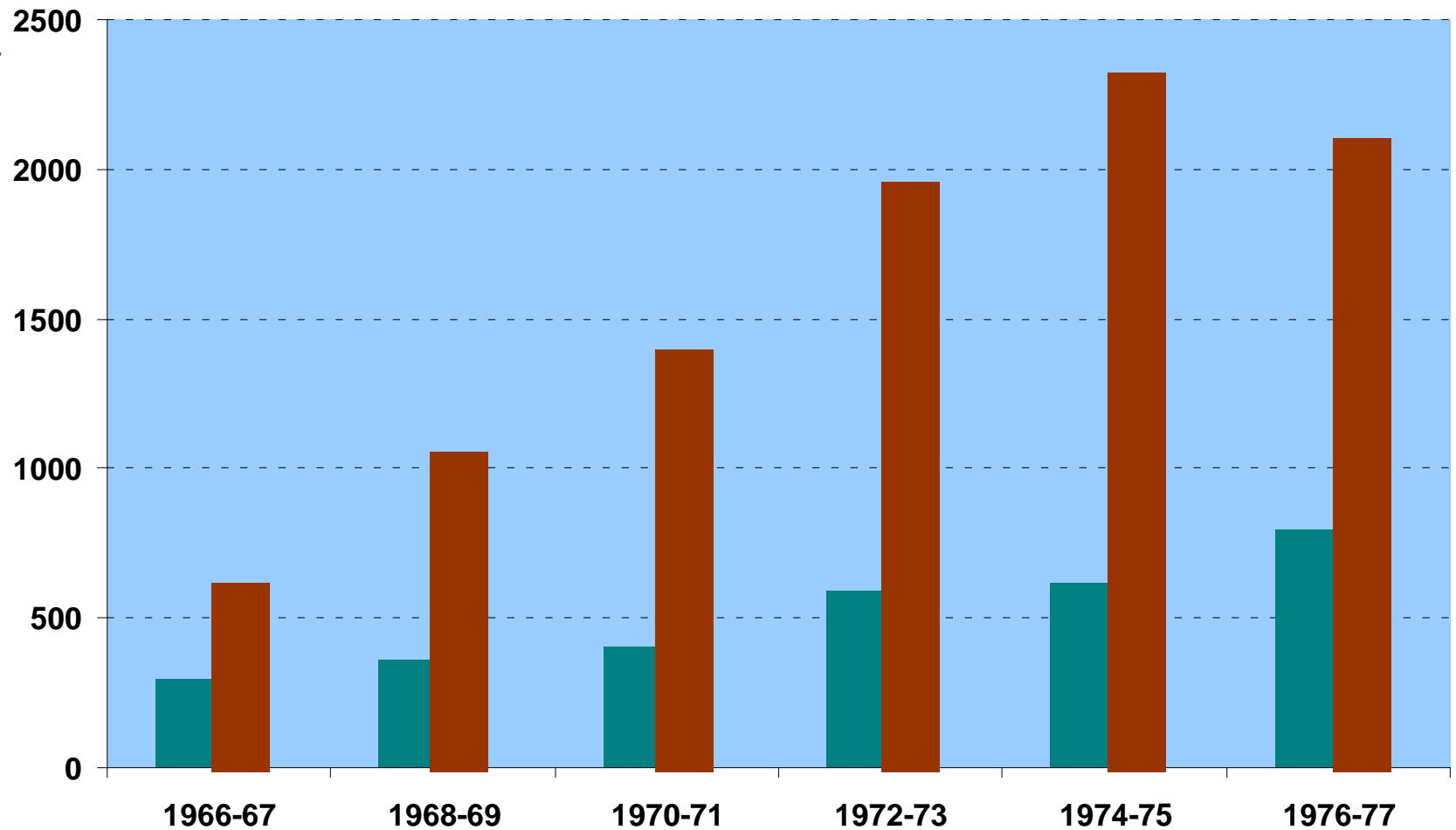


# Phased Financing

## Construction Risk: Longer construction duration

Average Estimated and Realized Overnight Cost  
(1982 US dollars/kW)

*A long history of construction delays and cost overruns still haunt the industry with average cost overruns for 75 nuclear plants built in the US between 1966-1977 was on average 200% (CBO 2008)*



Source of data: US DOE/EIA-0485

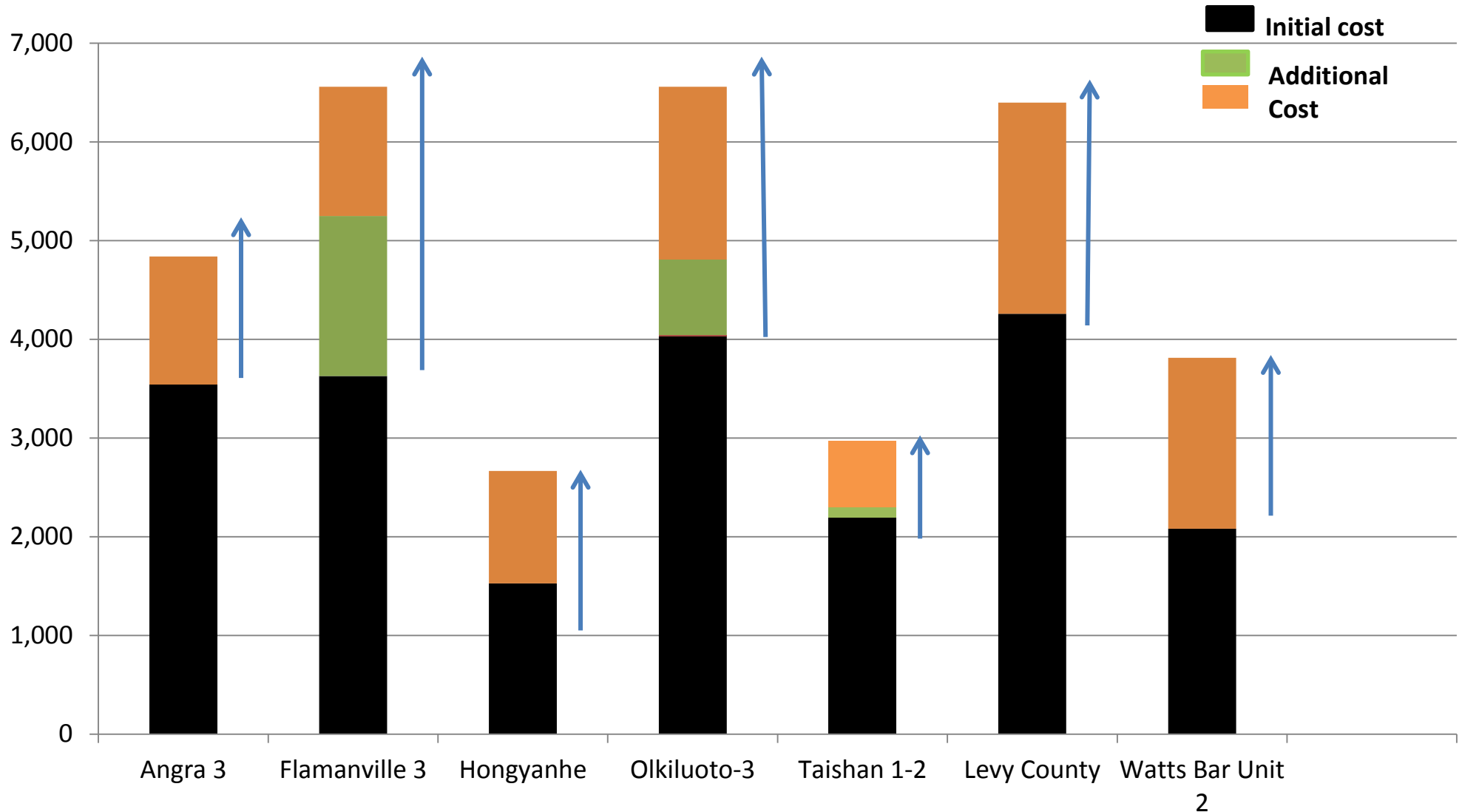




# Phased Financing

## Investment Cost Uncertainty

Overnight Investment Cost Change over time by Site (\$/kW)



**The variation in the overnight capital cost is daunting for newcomers and adds to the risk premium**

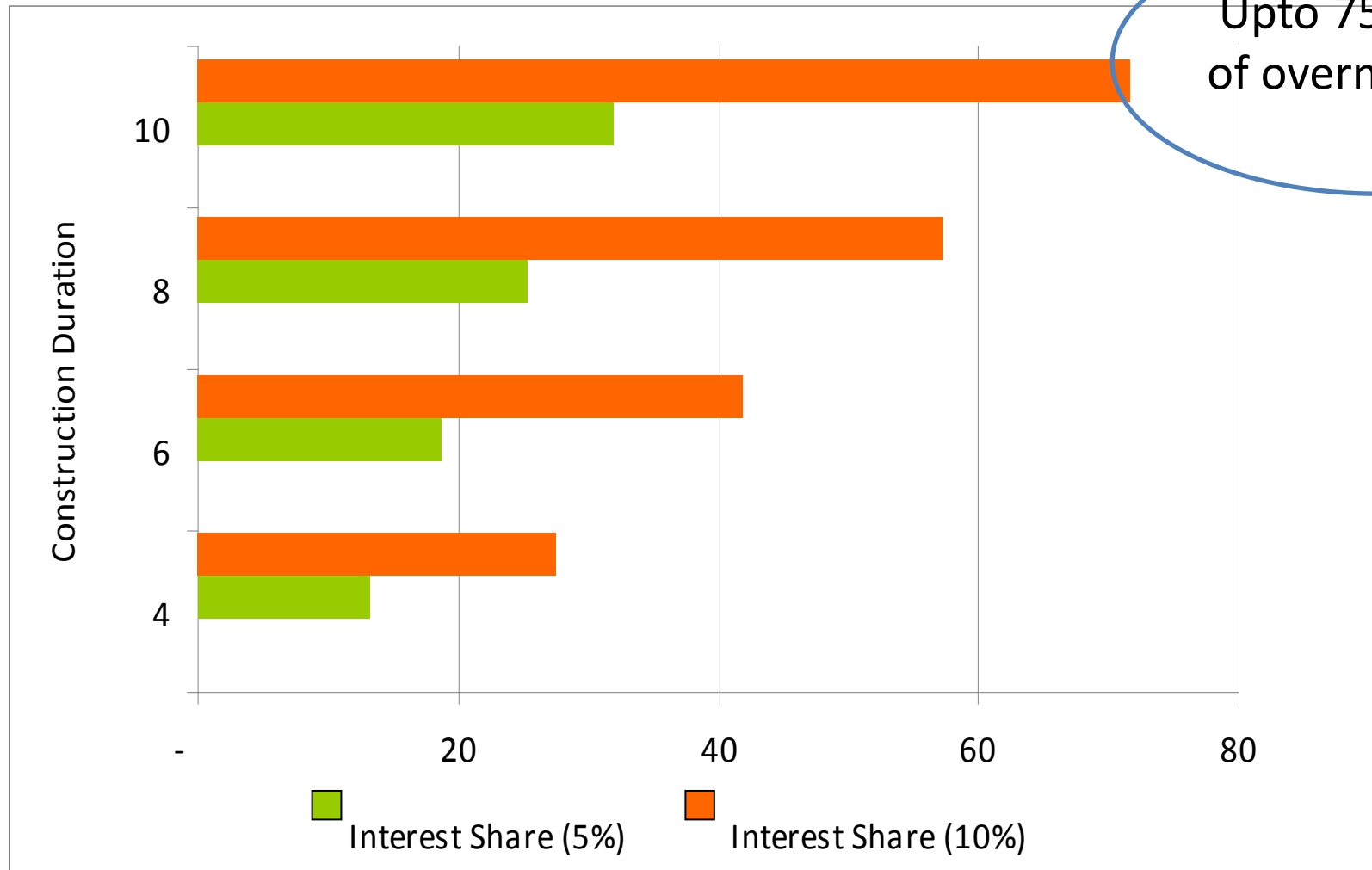
Source: World Nuclear News, Nucleonics and Other publications, 2008-2013

# Phased Financing



## NPPs Construction Risk: Longer construction and IDC

IDC % of overnight capital cost





# Phased Financing

## Construction risk premium



High risk premium during construction phase:  
why?



- Turkey's first nuclear plant facing further delays (Reuters February 7, 2014)
- Vietnamese delay confirmed (World Nuclear News, 28 January 2014)
- Finnish nuclear plant delayed again...(Reuters, February 28, 2014)
- S.C. Supreme Court hears arguments for V.C. Summer nuclear plant cost increase (Power Engineering, 22 April, 2014)
- Hinkley plant construction delay (BBC 25 April, 2013)

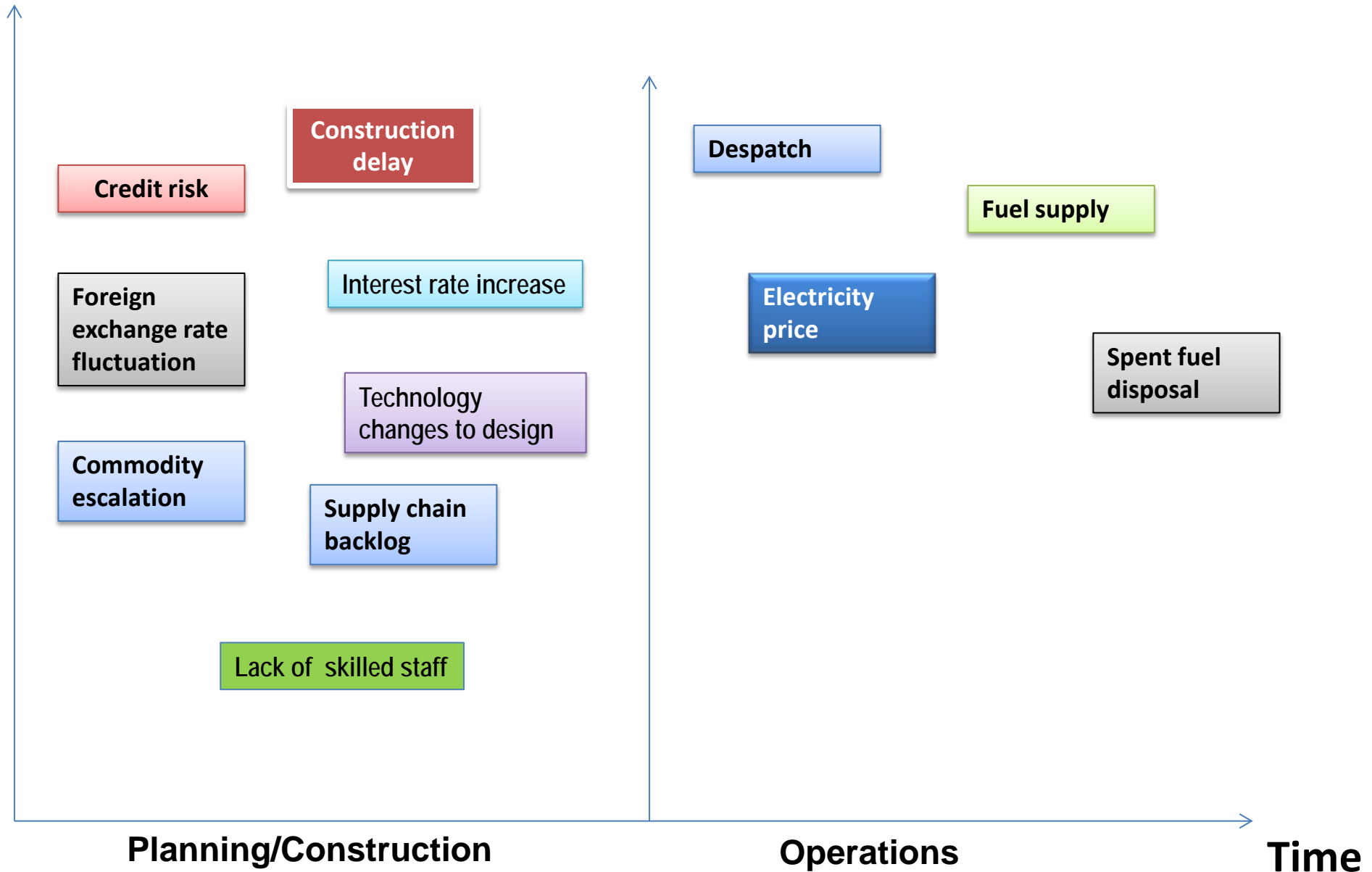


# Phased Financing



Risks

## NPP project: Construction/Operational Phase



# Phased Financing



## Construction Phase and Project Cashflow

Cash flow cycle

Refinance the project

Positive

Revenue

Project Cash Flow

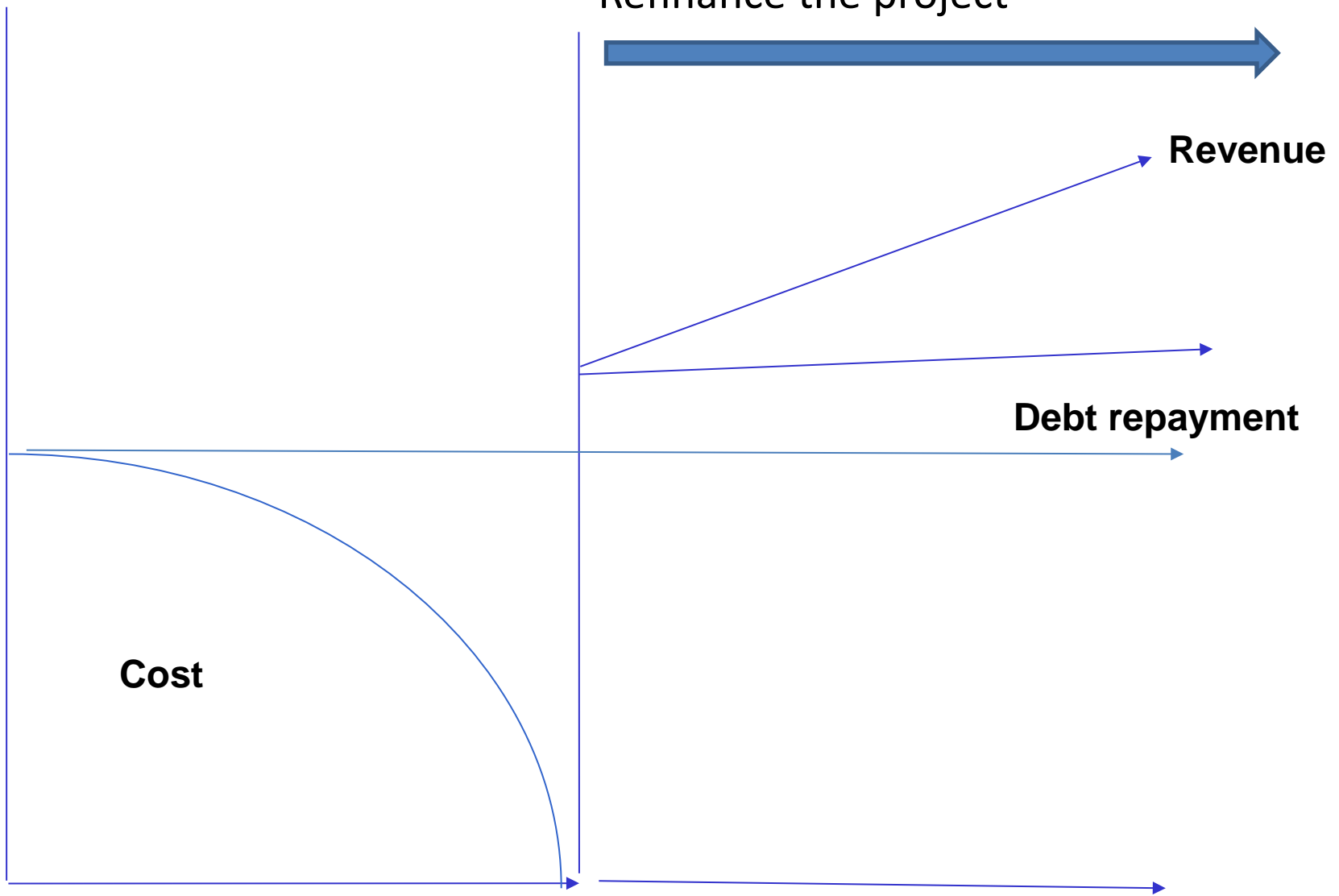
Debt repayment

Cost

Negative

Licensing/  
Construction  
duration

Operations



# Concluding Comments



- Governments have a critical role with explicit long-term commitment
- Investment cost uncertainty is challenging for newcomers
- Financing and construction duration key influencing factors to impact total investment cost
- Government financing still dominate the industry
- ECA support is vital and ensures bankability of the project
- Private financing – Investor models, JV among utilities with robust balance sheets and hybrid financing are being explored
- Risk diversification and meticulous Financial Risk Management Strategy imminent
- Strict financial industry regulation, like Basel III to impact liquidity and more vigilance of large scale risky projects
- Financing NPP is challenging but viable with new financing trends emerging to support nuclear new built

# Thank you

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