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Financing Structures for a Nuclear Power Plant Project

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Financing Structures for a Nuclear Power Plant Project

The IAEA Nuclear Energy Policy Management School
Trieste, Italy
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Overview

- The Economics of Nuclear
- Nuclear Power Plants (NPPs) Financing: Major Challenges
- Define Financing
- Sources and Types of Financing
- Existing and Emerging Financing Models and Trends
- Contractual and Ownership Arrangements
- Financial Risk Management
- Concluding Comments

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The Economics of Nuclear

Key Advantages of the Nuclear Power

- Relatively low fuel cost:
- Price stability
- Performance of nuclear reactors
- Long life time
- Guarantee for energy supply
- Security of Supply
- Clean source of energy
- Economic development: job creation, industrial development, etc

Key Challenges to the Nuclear Power

- Complex and highly capital intensive: high upfront capital costs, which are difficult to finance
- Sensitive to interest rates
- Long lead times (planning, construction, etc)
- Long payback periods
- Construction cost uncertainty
- Regulatory/policy risks (revised safety measures)
- New financing structures required to attract private investors

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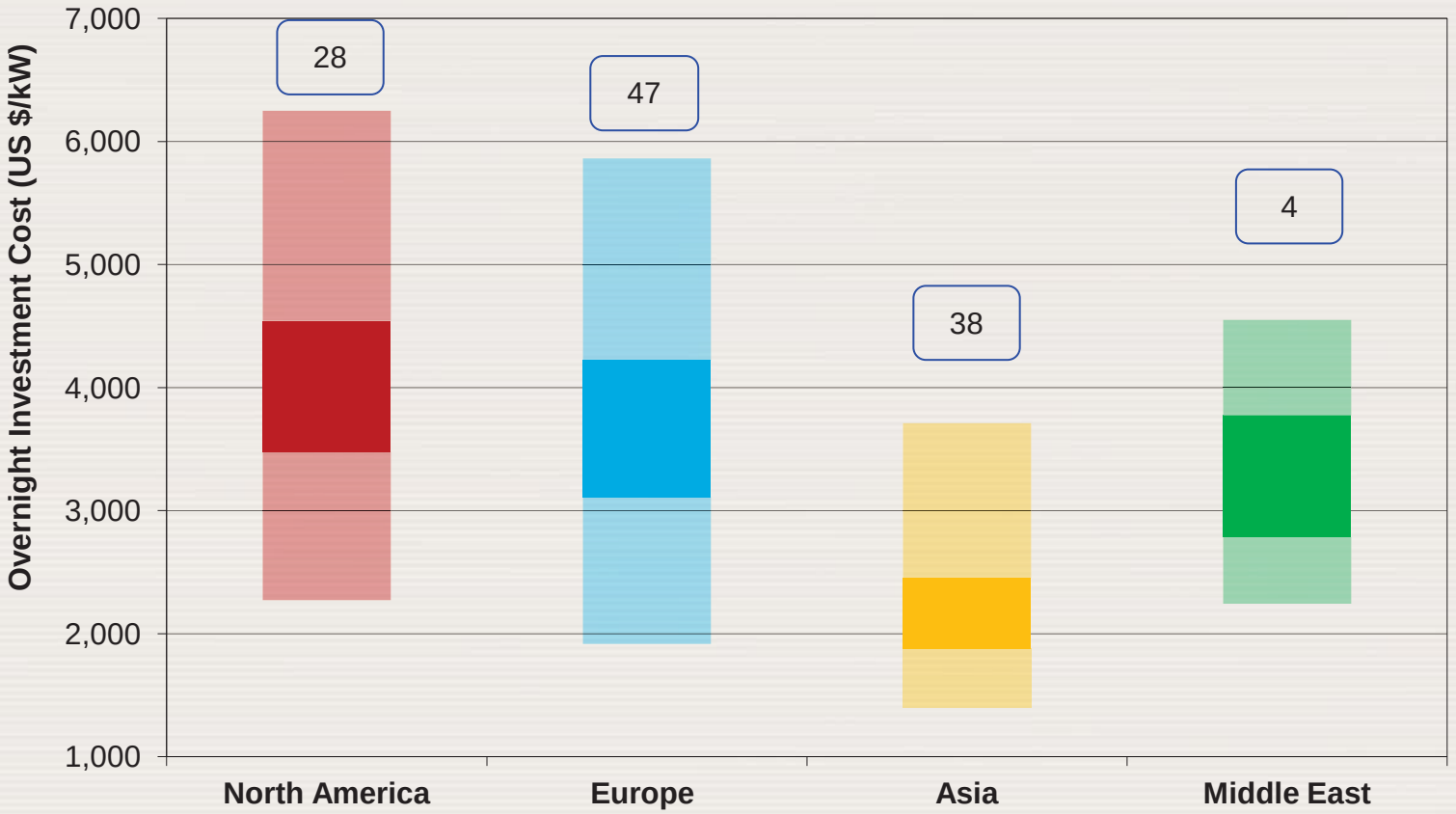
Challenge: NPPs overnight capital cost uncertainty -

Overnight capital cost range by region



- IAEA: Data collected from various publications and studies to keep track of nuclear power plants investment costs, since 2008 (updated August 2012)

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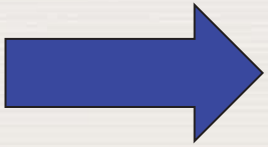
All data in 2008 USD

Challenge: NPPs overnight capital cost

Overnight capital cost quoted for a typical 1000MW NPP ranges from:



$2 - $6 billion!

Macro or economy level: GDP

Micro or Corporate level: Market capitalisation

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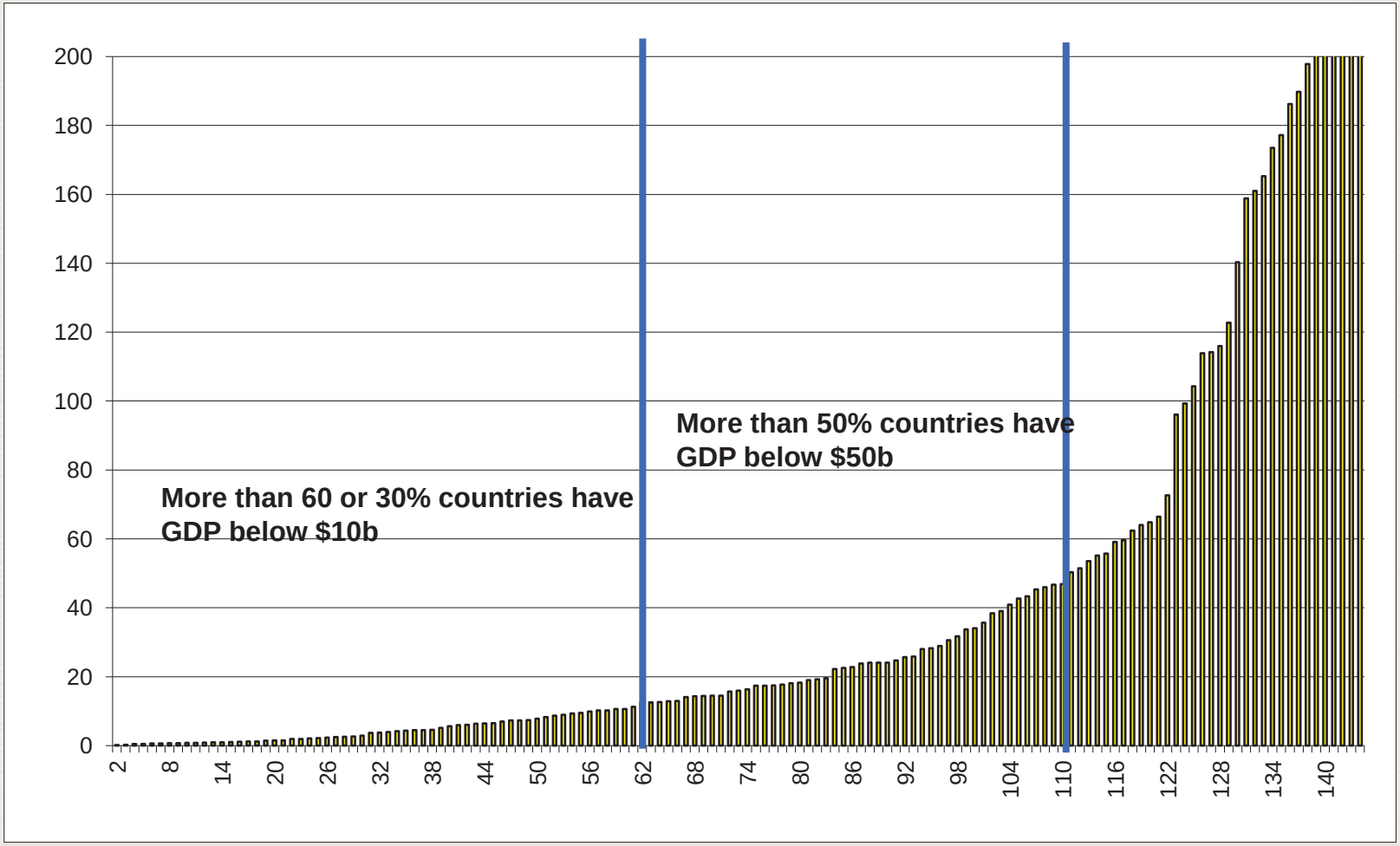
Challenge: Highly capital intensive

Gross Domestic Product (GDP) in $2011 billions



Source: IMF World Economic Outlook, October 2012

Challenge: Highly capital intensive

➢ Approximate market capitalisation of the leading EU, US and Asian utility companies

Country	Utility	Market capitalisation (USD billions)
EU	GDF SUEZ	53
EU	EDF	40
EU	Enel	35
EU	RWE	28
US	Duke Energy*	50
US	Southern Company	41
US	Exelon Corporation	30
US	Dominion Resources	30
Asia	Korea Electric Power Corporation	16
Asia	Saudi Electricity Company	16
LA	Centrais Eletricas Brasileiras	8

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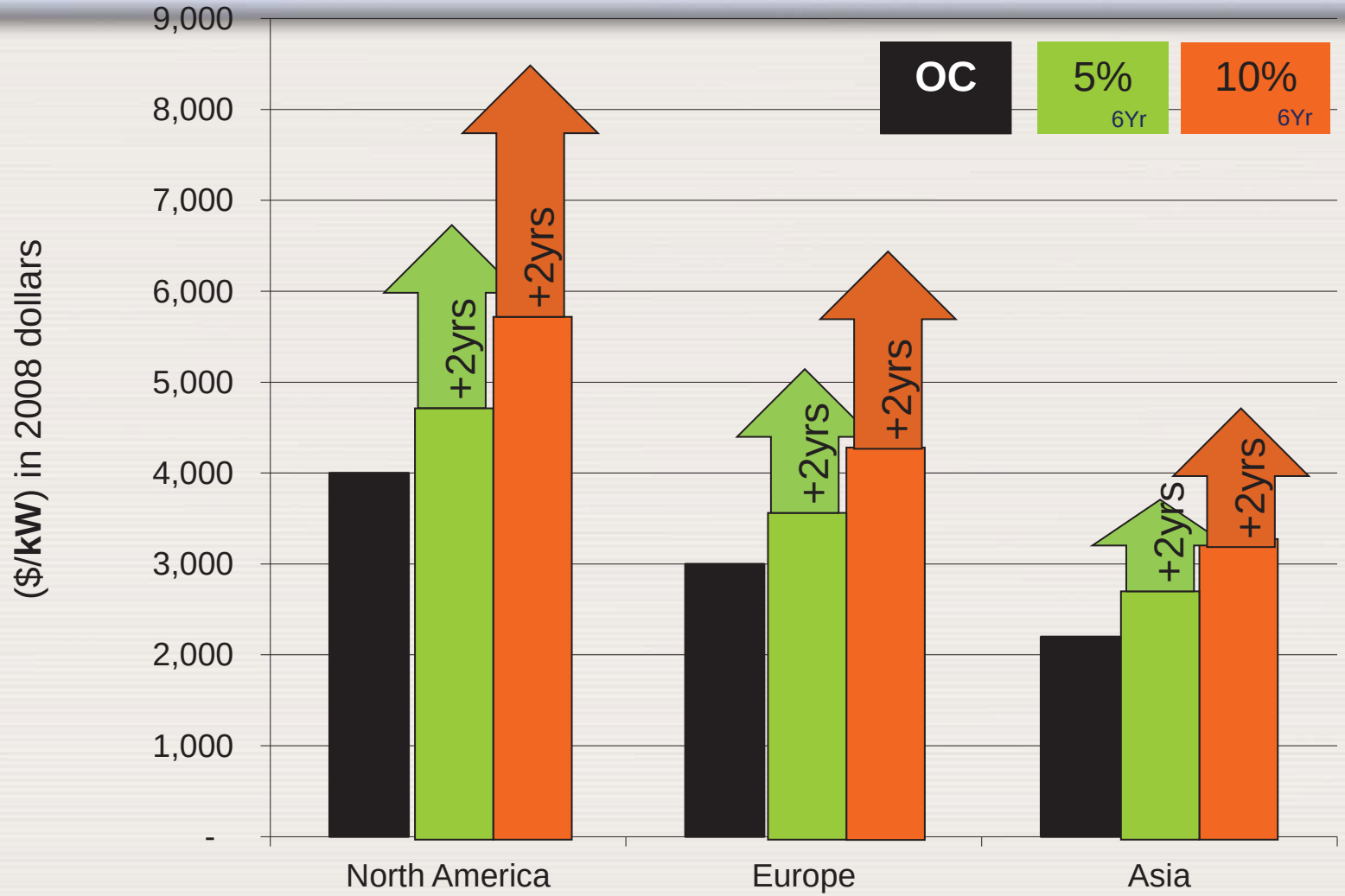
**Duke Energy merged with Progress Energy in July 2012 to form the largest US utility (Updated October 2012)*

Challenge: Investment cost and Interest During Construction (IDC)



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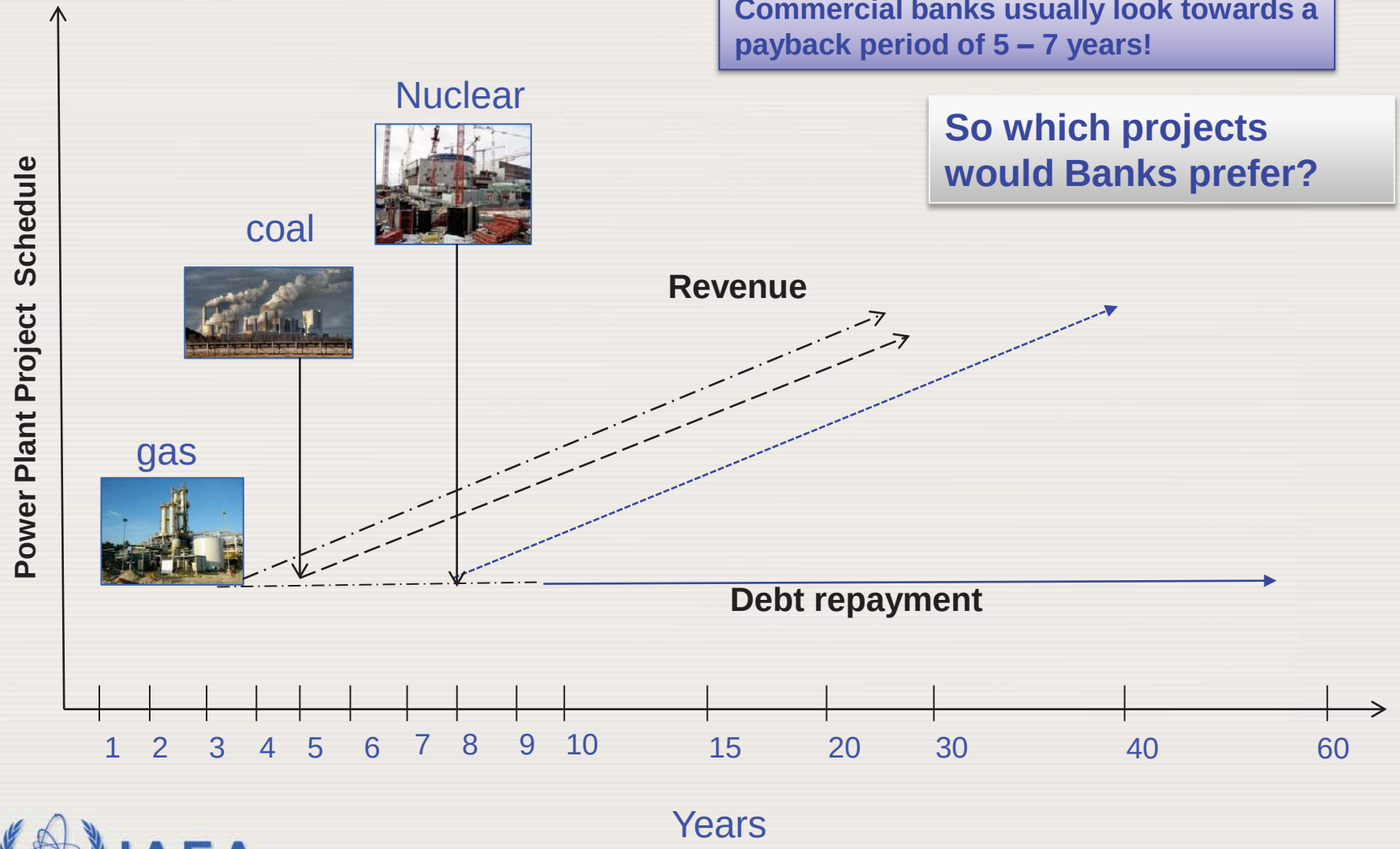
Challenge: Longer NPP Payback Period

Commercial banks usually look towards a payback period of 5 – 7 years!

So which projects would Banks prefer?



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Challenge: Long lead times

Finland

- Olkiluoto-3 project in Finland, an EPR 1600MW
- Original cost Dec 2003 Fixed Price Turnkey Contract (Areva-Siemens) € 3.2 billion
- Six year delay
- Operational: 2015?
- Consiberable cost overruns? $2 billion or more

Asia

- Some projects in Asia are constructed in 5 or less years
- Example: the success story Qinshan III CANDU Unit 1 reactor built in China in 51.5 months, 117 days ahread of schedule, total project cost of $2.5b
- Taishan EPR units, in China to built in approximately 52 months
- “Areva sees future EPR being built in 3-5 years”

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FUTURE? Financiers want to see more success stories

Challenge: Credit rating pressure

	Fitch	Standard & Poors	Moody's
Investment Grade	AAA	AAA	Aaa
	AA+	AA+	Aa1
	AA	AA	Aa2
	AA-	AA-	Aa3
	A+	A+	A1
	A	A	A2
	A-	A-	A3
	BBB+	BBB+	Baa1
	BBB	BBB	Baa2
	BBB-	BBB-	Baa3
Speculative Grade	BB+	BB+	Ba1
	BB	BB	Ba2
	BB-	BB-	Ba3
	B+	B+	B1
	B	B	B2
	B-	B-	B3
	CCC	CCC+	Caa1
		CCC	Caa2
		CCC-	Caa3
	CC	CC	Ca
	C	C	C
Default	D	D	C

Easier to borrow: lower interest rate

Tough to borrow: higher interest rates

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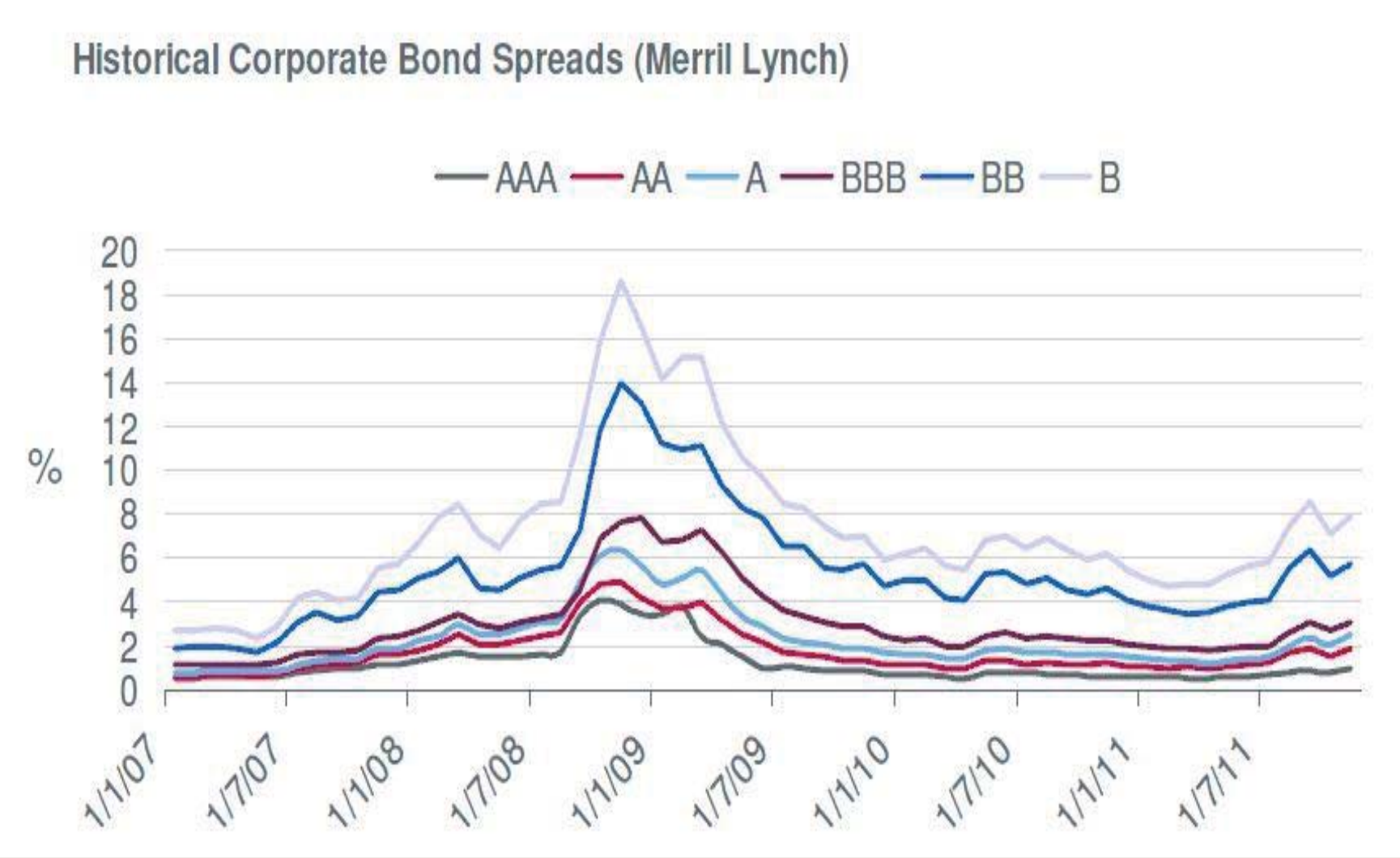
Challenge: Credit rating pressure



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Challenge: Credit rating pressure

- "Moody's Says Substantial Nuclear Plant Cost Overruns Increase TVA's Rate Pressure and Debt Ceiling Risks…" *(9 April 2012, Moody's Investors Service)*

- "…..ratings agencies could downgrade French energy giant EDF and British Gas owner Centrica if they decide to build four reactors.." *(7 April 2012 This is Money)*

- "S&P set to downgrade Italy's Enel rating" *(Reuters 12 March 2012)*

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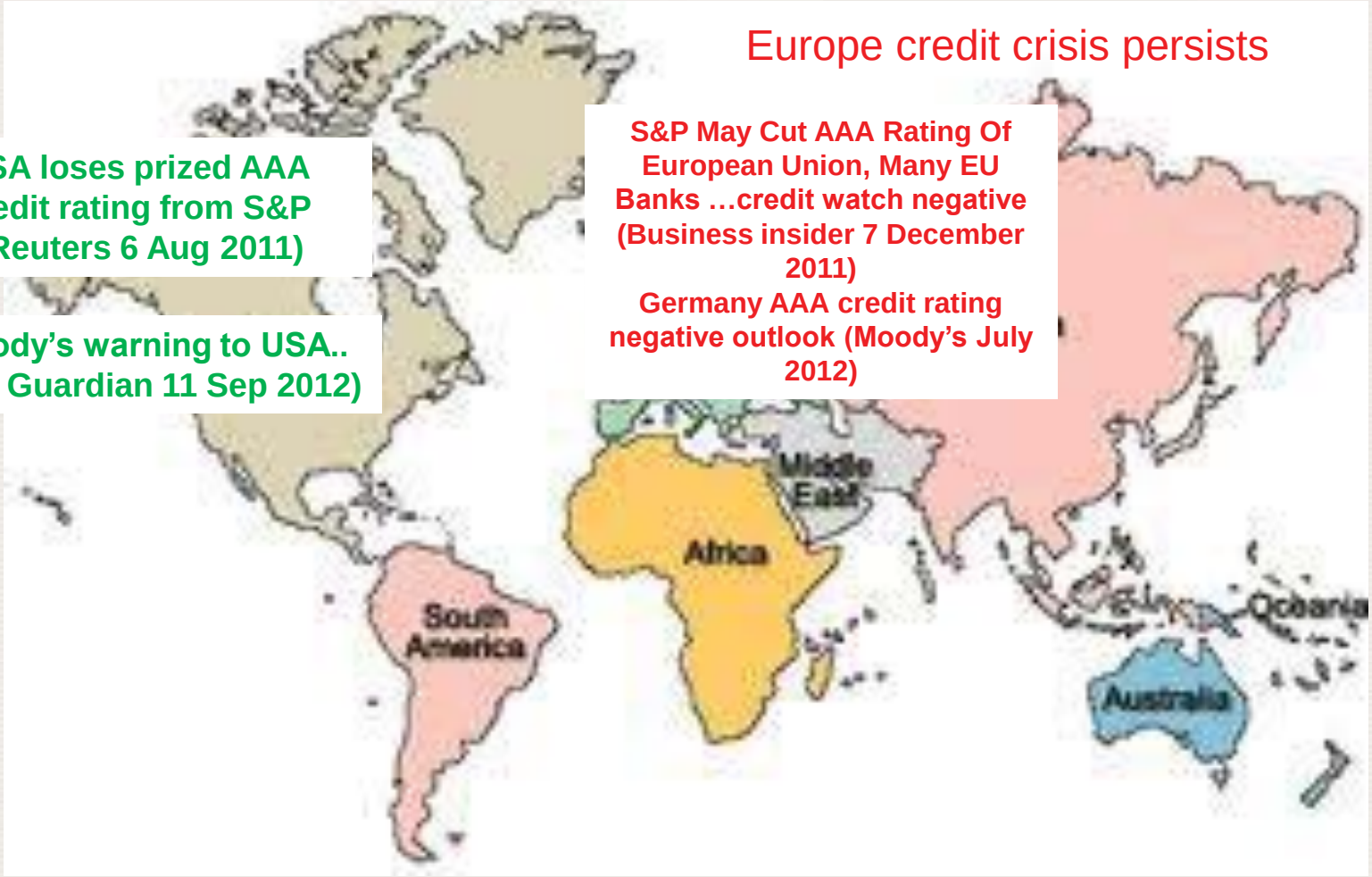
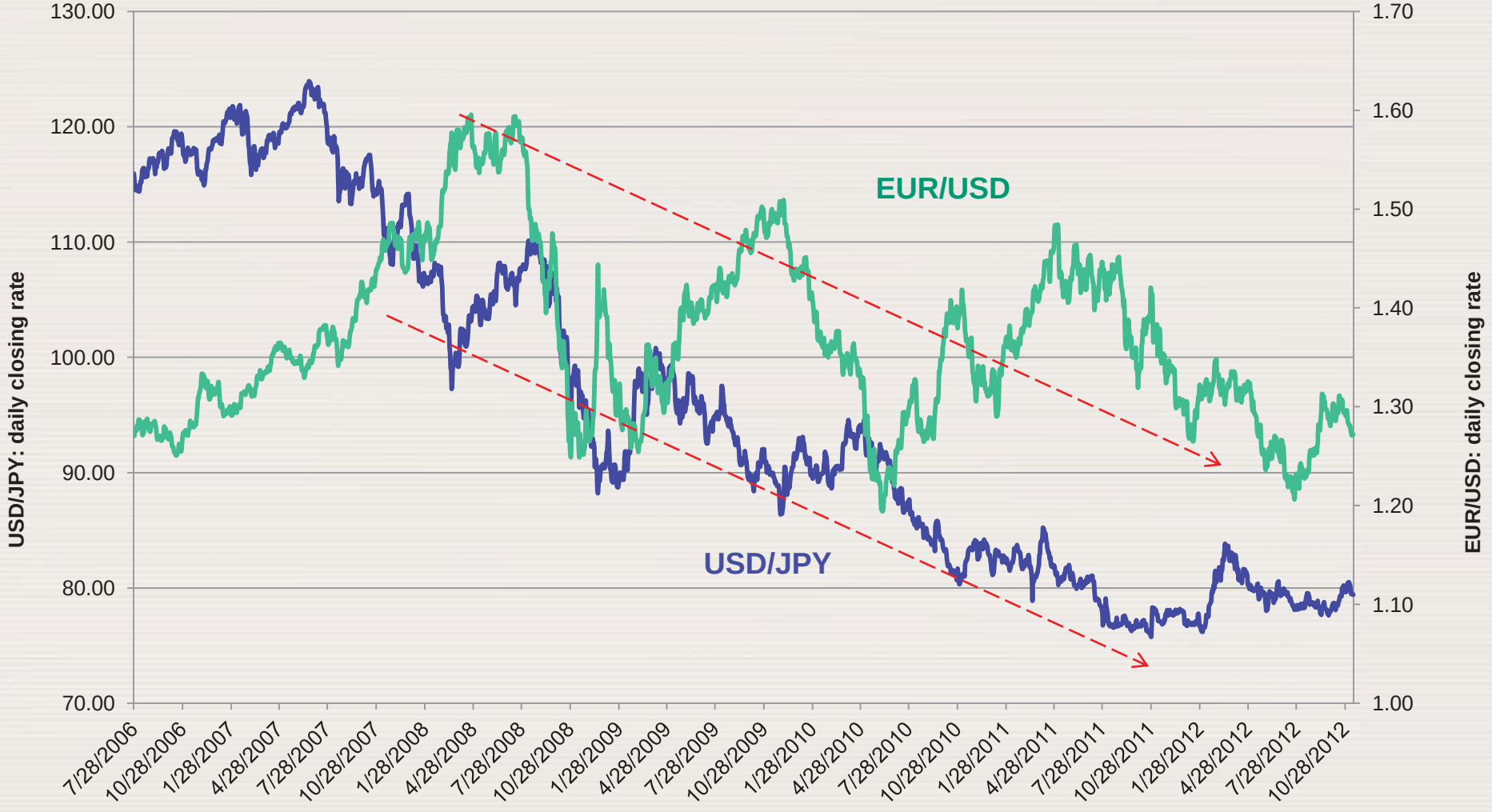
Challenge: Credit rating pressure

- If countries cannot manage their debt it has an impact on their sovereign credit rating



Challenge: Foreign exchange risk



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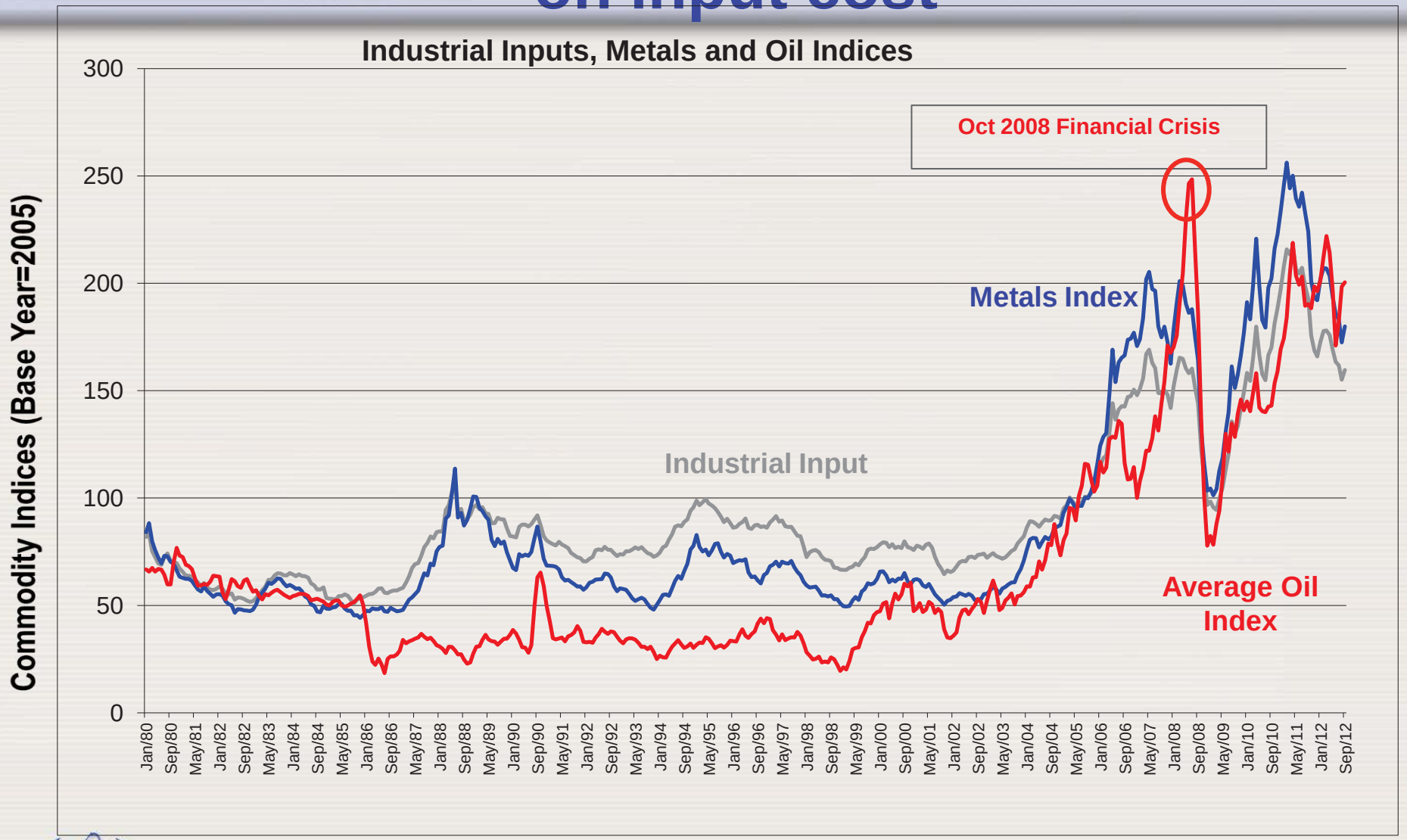
Risk mitigation: Hedging with derivative instruments

Challenge: Commodity prices risk – impact on input cost



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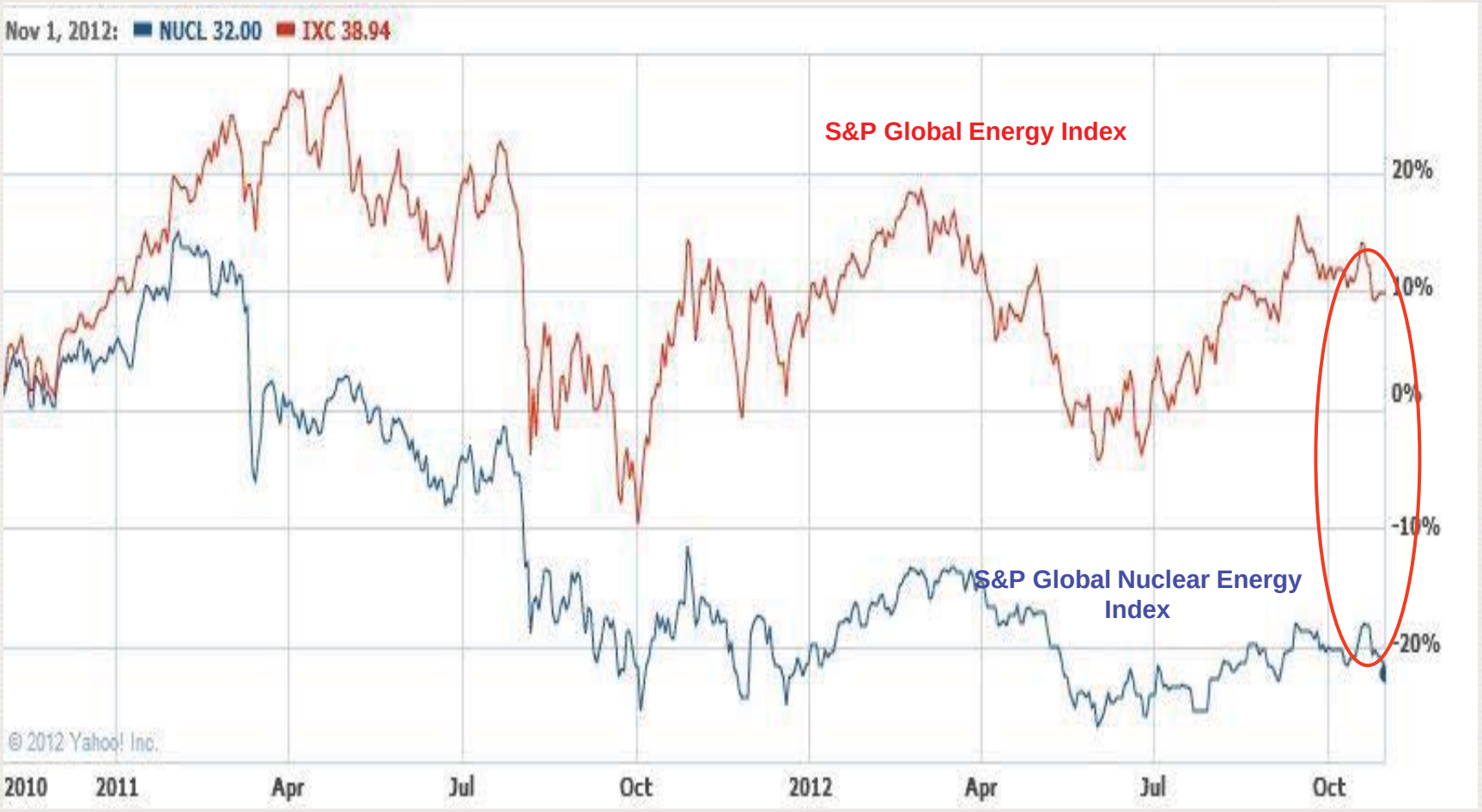
Source: IMF Primary Commodity Prices (October 2012)

Challenges: Yield Seeking Investors

- Nuclear vs non nuclear market index



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Source: Yahoo Finance.com, November 2012

Major Challenges to Financing NPP

- Other Challenges
  - Operational performance risk
  - Uncertainty in the Regulatory process
  - Construction Supply Chain risks
  - Deregulated electricity market rules and regulation
  - Multinational Institutions policy on credit availability
  - Negative Public Perception of nuclear
  - Nuclear liability and insurance on how to cap and allocate the “extraordinary nuclear occurrences”
  - Management of spent fuel and waste, and decommissioning

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Financing

- **So what is Financing? Providing necessary capital through issuance of debt and/or equity**

Debt Financing

Local banks
International financial institutions

Export credit agencies
Suppliers

International development organizations

Capital markets: like bonds

Cost of debt: Interest paid

Equity Financing

Local and foreign investors

Shareholder

Capital markets: like IPO

Cost of capital: return on capital

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Financing: Cost of finance

- In simple case weighted average cost of capital (WACC) is:*

$$WACC = \frac{Debt}{Debt + Equity} R_d + \frac{Equity}{Debt + Equity} R_e$$

Where:

- *Rd is the cost of debt*
- *Re is the cost of equity*

** Without any tax adjustment*

Financing: Cost of finance

Generally, for nuclear the cost of finance is higher – with risk premium of x% above other power generation assets added to the interest rate

$$WACC_{Other} + \text{Risk premium for nuclear} = WACC_{Nuclear}$$

How to attain finance?

- What are the different financing models employed in the nuclear industry?
  - Government
  - Industry

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Types of Financing

- **Government**
  - State Budget (like, tax revenue)
  - Equity ownership
  - Government incentives (like, loan guarantee, construction delay insurance, guaranteed long term power purchases agreements)
  - Export credit
  - Long-term Infrastructure bonds issuance

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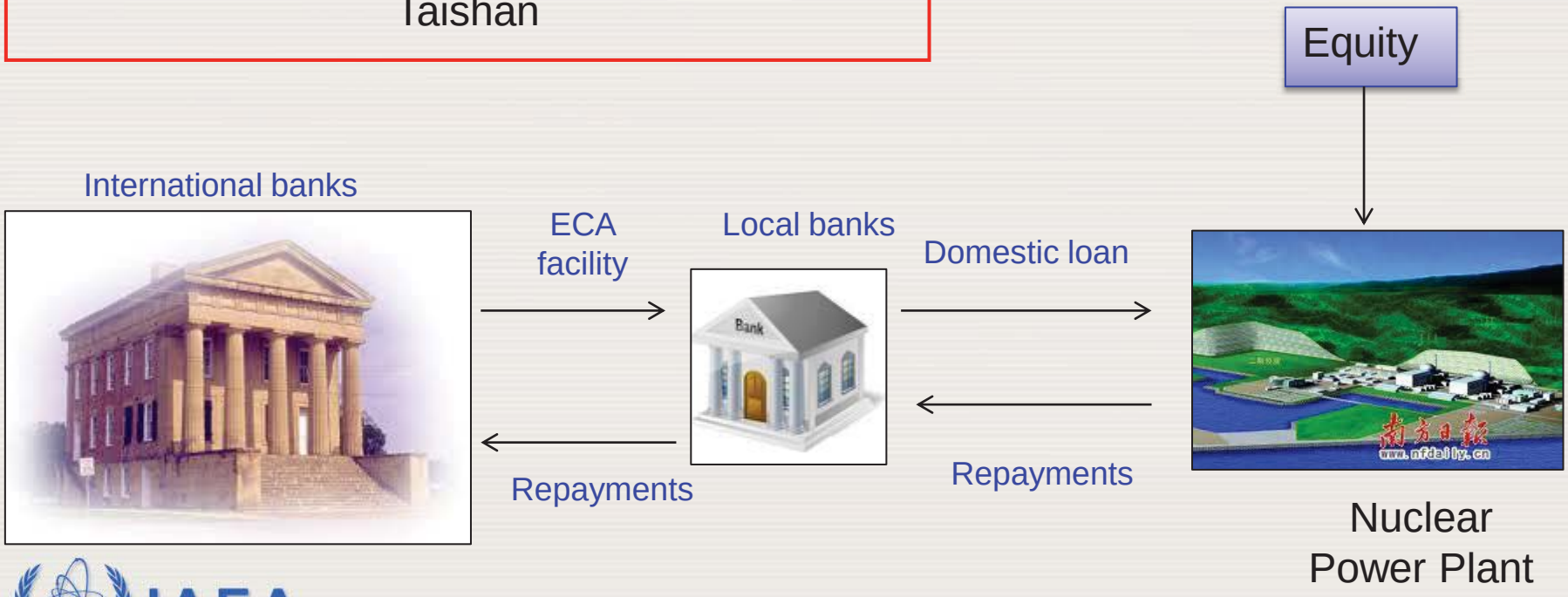
Government Financing: An example

China

JV between CGNPC* (70%) and EDF (30%) to co-own and operate two nuclear reactors at Taishan

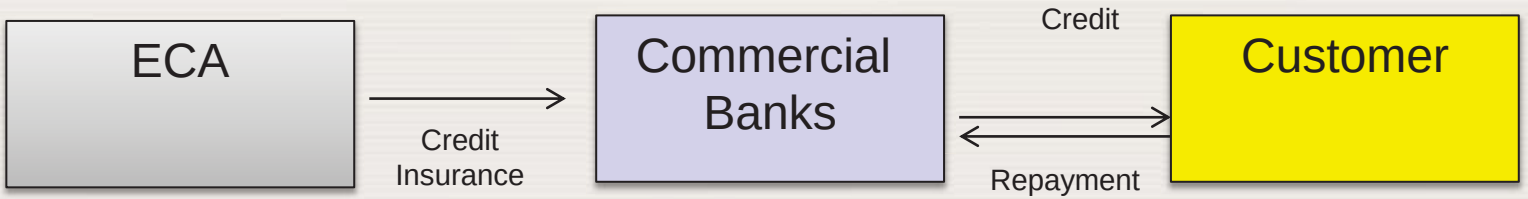
- **Nuclear power program cost about $10 billion to construct 2 EPR**



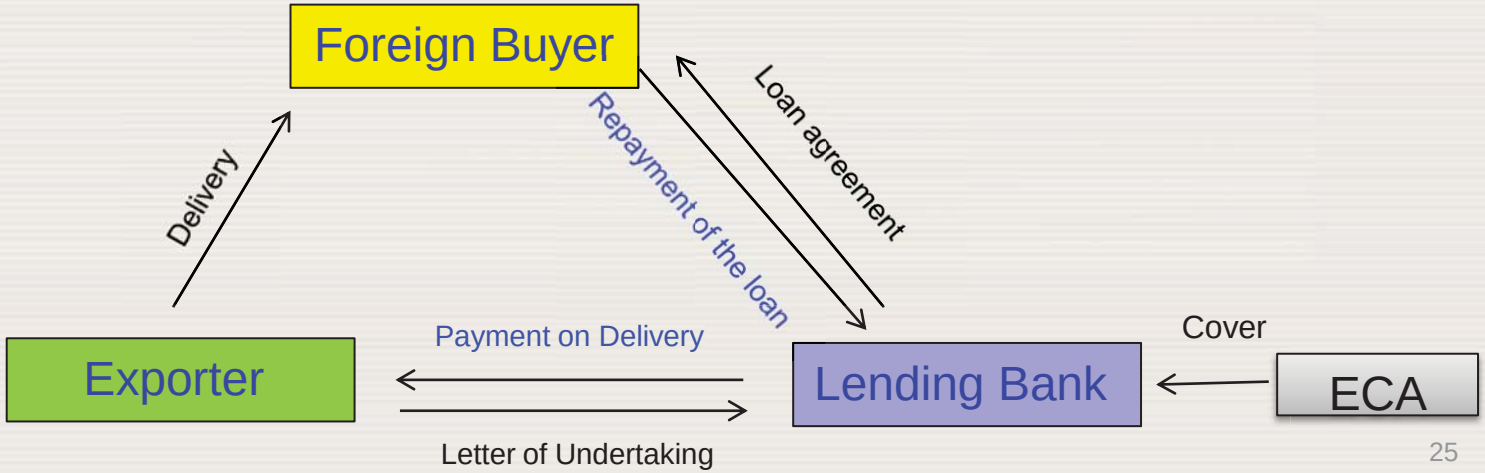
*CGNPC = China Guangdong Nuclear Power Company

Government Financing: Export Credit Agency

- **Export Credit Agency (trade finance): Provides financing services such as guarantees, loans and insurance to domestic companies for their activities in order to promote exports in the domestic country:**



- **How does it works?**



Types of Financing

Governments seeks private sector participation

- **Industry financing**
  - Corporate finance or balance sheet finance
  - Project Finance
  - Co-operative finance or hybrid financing
  - New financing trends

Industry Financing

- **Corporate finance or balance sheet finance**: borrowing or raising equity against the assets of the company as a whole. A bank or bond holder which provides funds to the company has a claim against the company's whole cashflows, unless the loan is secured against a particular asset, as is common for mortgages. Risk of that investment is borne by all providers of capital to that company – Example EDF

France

- Flamanville 3 project in France, by EDF (Areva PWR 1650MW)
- Construction cost €6b (Jul 2010)
- Operational: 2016?
- 4 yrs behind schedule
- More than € 2 billion over budget (2005 estimate € 3.3 billion)

Others: Enel, RWE, E.On GDF SUEZ..

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Industry Financing

- **Project Finance** (non or limited recourse) Long term finance based on the projected cash flow of the project - In nuclear pure project finance is still not applied but some combination of corporate finance and project finance…hybrid finance

- **Co-operative finance or hybrid financing**

Example Olkiluoto 3 or Finnish Model - expanding equity partners to diversity risk

- 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 – 75% debt and 25% Equity

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Industry Financing: New trends emerging

Expanding equity partners to diversity risk..others like Romania (state-controlled nuclear power generator Nuclearelectrica) seeks partners for 2 units at Cernavoda nuclear power plant (NPP).

Equity Investment by vendors (The strategic partner/s) - the new market trend? The extend of investment will depend on the structure of project

Regional Alliance: Small countries are forming regional alliance with regional partners to attract strategic investors with competence and financial capability to build the new nuclear power project

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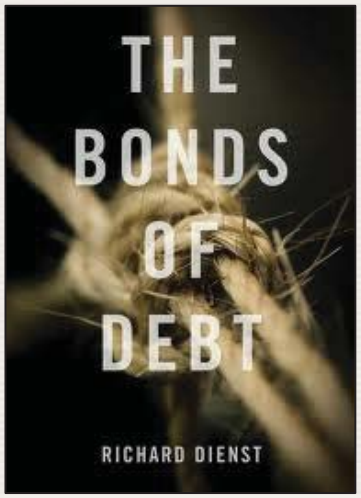
Industry Financing: New trends emerging

- **Owners and investors looking towards the capital markets**

Infrastructure Bonds



- State-owned China Guangdong Nuclear Power Holding (CGNPH) completed the sale of its first offshore yuan bond, raising CNY1.5bn ($240m) via a three-year bond at 3.75%..rated A+/A3 - Fitch & Moody's (Nuclear Business, Nov 2012)

- Korea Hydro and Nuclear power, which has issued $750 million in bonds (Reuters, 11 Sep, 2012)

Initial Public Offering

- IPO is issued by the China National Nuclear, formed late last year -state-owned parent is China National Nuclear Corporation (CNNC), which is a large state owned enterprise, backed by government with a strong credible AA- Stable (Moody's) credit rating (The Wall Street Journal, 20 Aug, 2012)

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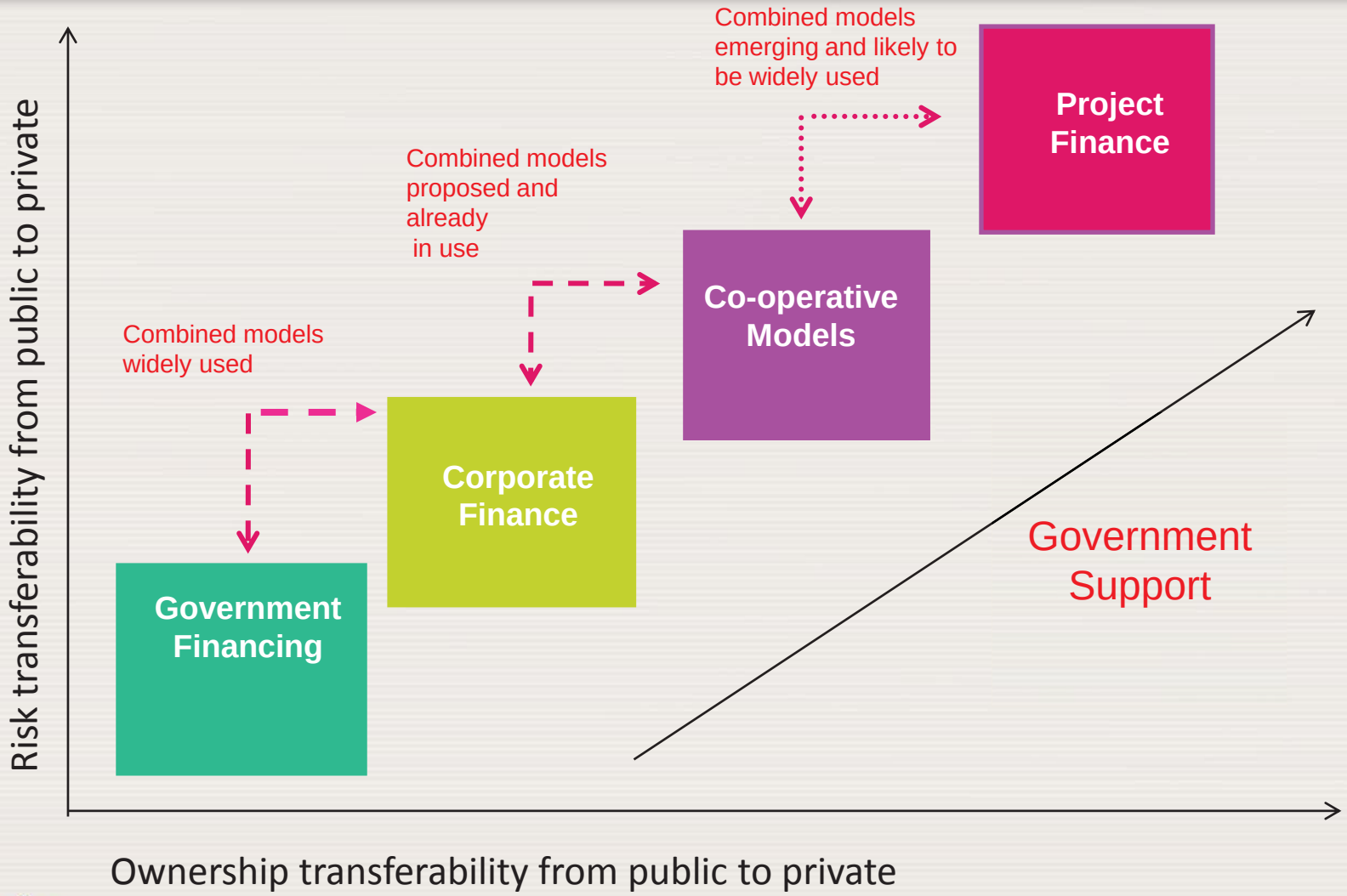
Financing Models Trend



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Existing Contractual Arrangements

- Basically there are the following main types of contractual approach that have been **applied** for NPP projects:
  - **Turnkey contract**: a single contractor or a consortium of contractors takes the technical responsibility for the whole NPP project.
  - **Split-package**: the overall responsibility is divided between a relatively small number of contractors, each building a large section of the work.
  - **Multi-contract:** the owner or its architect-engineer assumes overall responsibility for engineering and managing the NPP project, issuing a large number of contracts.

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New Contractual Arrangements

- Built Own Operate scheme: A contractual arrangement whereby a project company is authorized to **finance, construct, own, operate and maintain an infrastructure.**
- The project company is allowed to recover its total investment, operating and maintenance costs plus a reasonable return thereon by collecting tolls, fees, rentals or other charges from facility users.

Example:

- Akkuyu NPP Project in Turkey
- Russian design: VVER 1200MW – 4 units
- Main stakeholders: Russian Federation and the Republic of Turkey
- Project Company: Russian government companies affiliated with Rosatom to BOO the NPP
- Construction likely to starts in 2014

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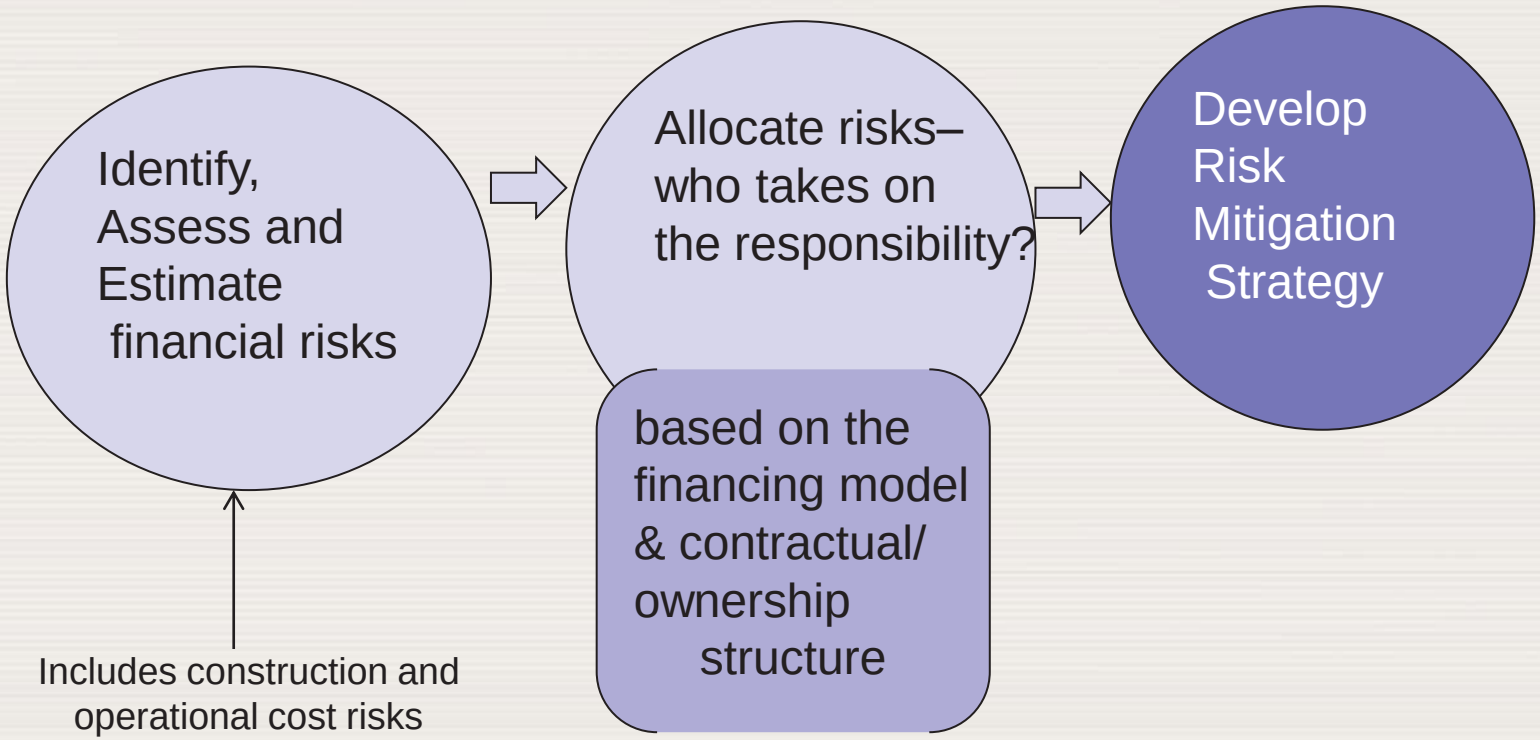
Financial Risk Management

- To attain finance requires development of “Financial Risk Management Strategy Framework”



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Financial risk mitigation strategy framework
An Example

- Construction Phase

Name of risk	Risk assessment	Allocation	Mitigation
Construction delay	Medium	Owner/Contractor	Qualified third party contractors/PMC
Credit risk	High	Owner/Lender	Well defined loan agreement
Foreign Exchange/Currency	Medium	Owner/Lender	FX hedging strategy
Interest	Medium	Owner	Fixed rate/ECA

Concluding Comments

- Governments have a critical role with explicit long-term commitment
- Wide range of overnight capital cost challenging for newcomers
- Financing and construction duration key influencing factors to impact total investment cost
- The Fukushima accident foreseeable risk might lead to additional safety measures, which might increase the cost of NPPs
- Government financing still dominate the industry
- ECA support is vital and ensures bankability of the project
- Private financing - JV among utilities with robust balance sheets and hybrid financing
- 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

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Thank very much you for your attention!

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