



DELIVERING A COMPETITIVE ECONOMIC OUTCOME FOR NEW NUCLEAR

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MZconsulting

OUR NUCLEAR FUTURE – MEASURING SUCCESS

- Of the many challenges to expanding the use of nuclear power, there is none greater than getting the costs right
- The industry can focus on improving public acceptance and demonstrating a need for low carbon generation, but only a cost competitive nuclear industry will really meet its full potential
- As nuclear plants are capital intensive with relatively long project schedules, their cost of energy is very sensitive to both the capital cost and the cost of capital
- This presentation is going to discuss strategies to improve the predictability of the cost and schedule outcome, reduce the cost of capital, and ultimately reduce the capital cost of new plants

ELECTRICITY ECONOMICS- VARY BY LOCATION

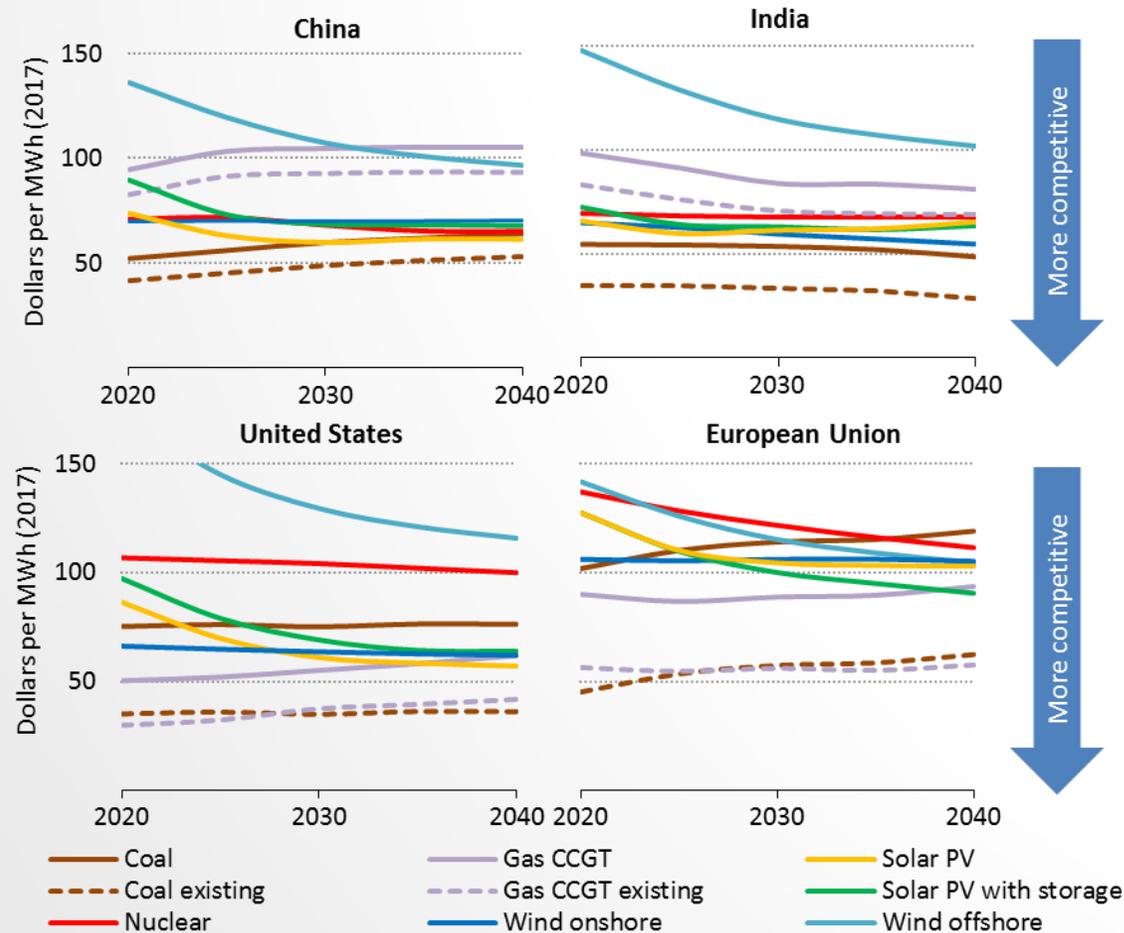


Fig 8-18 Value-adjusted levelised cost of electricity by technology in selected regions in the New Policies Scenario, 2020-2040
 'International Energy Agency (2018), World Energy Outlook 2018, OECD/IEA, Paris'

NUCLEAR IS ESSENTIAL TO DECARBONIZATION

Figure 1.5a: New England cost of electricity generation

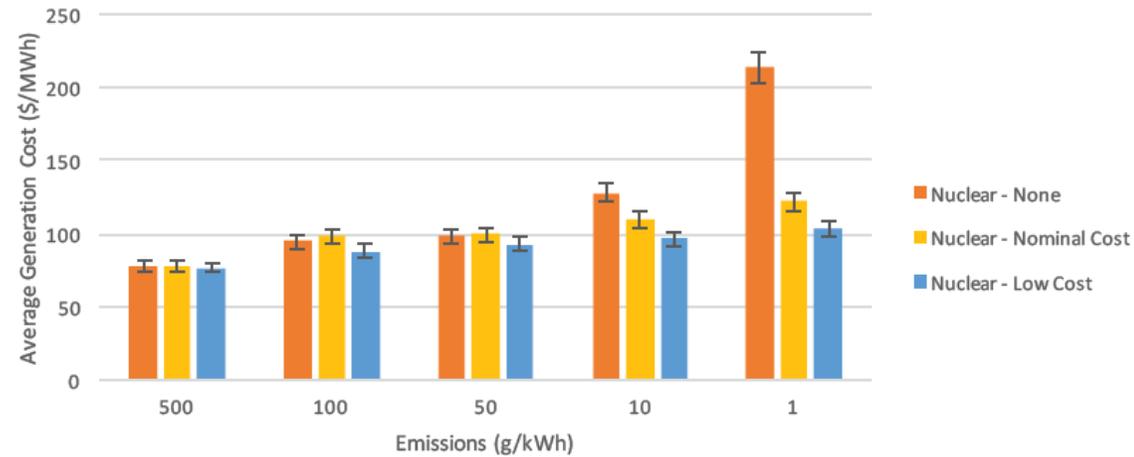
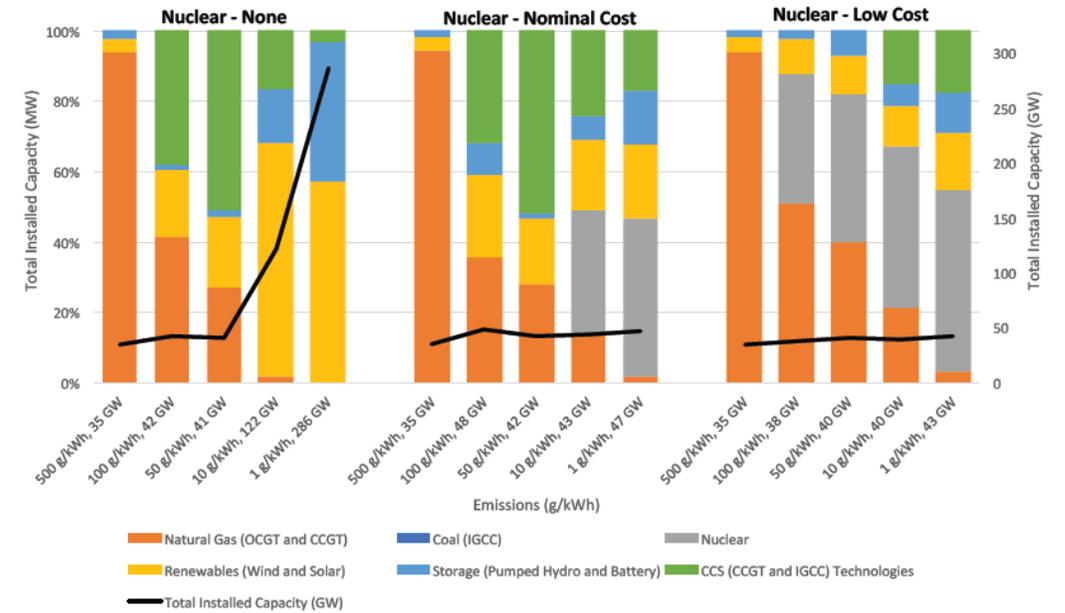


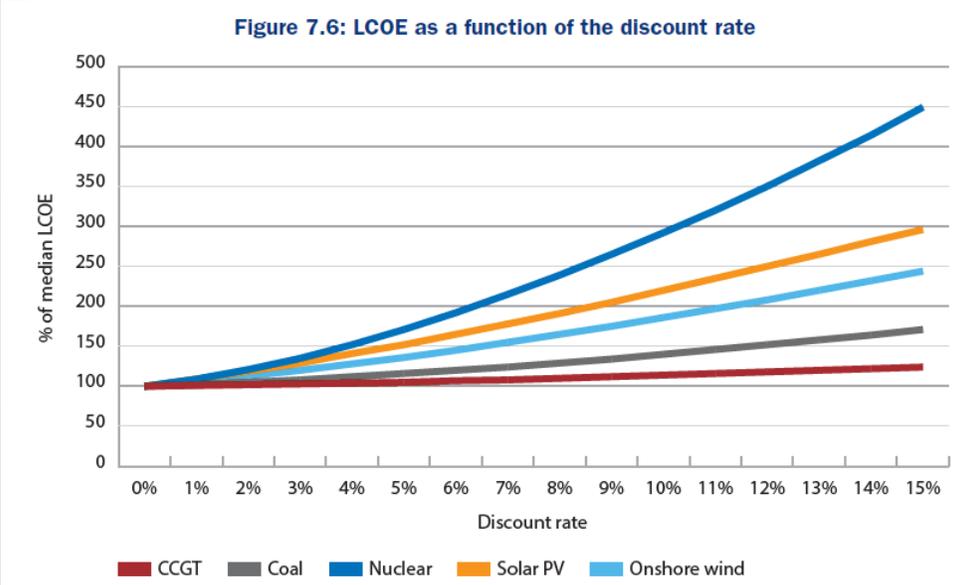
Figure 1.6: Optimal capacity mixes for New England



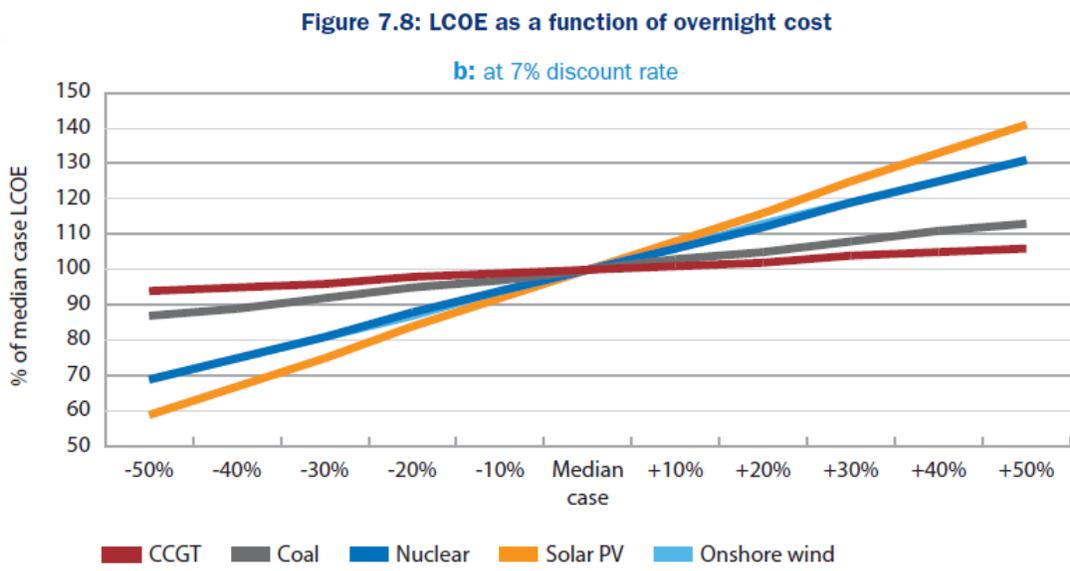
Source: The Future of Nuclear Energy in a Carbon-Constrained World
AN INTERDISCIPLINARY MIT STUDY

ENERGY COST SENSITIVITY

COST OF CAPITAL



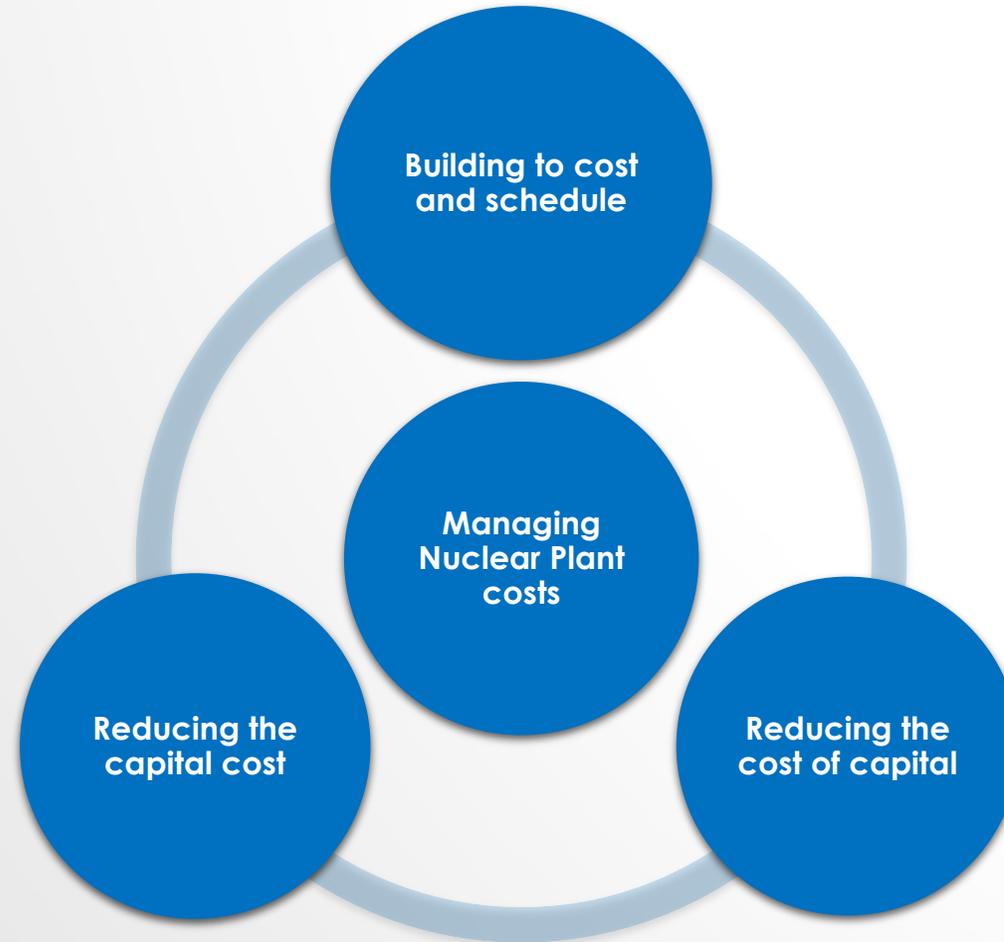
CAPITAL COST



Source: Projected Costs of Electricity, 2015 Edition, IEA and NEA



MANAGING COSTS – PLANNING FOR SUCCESS



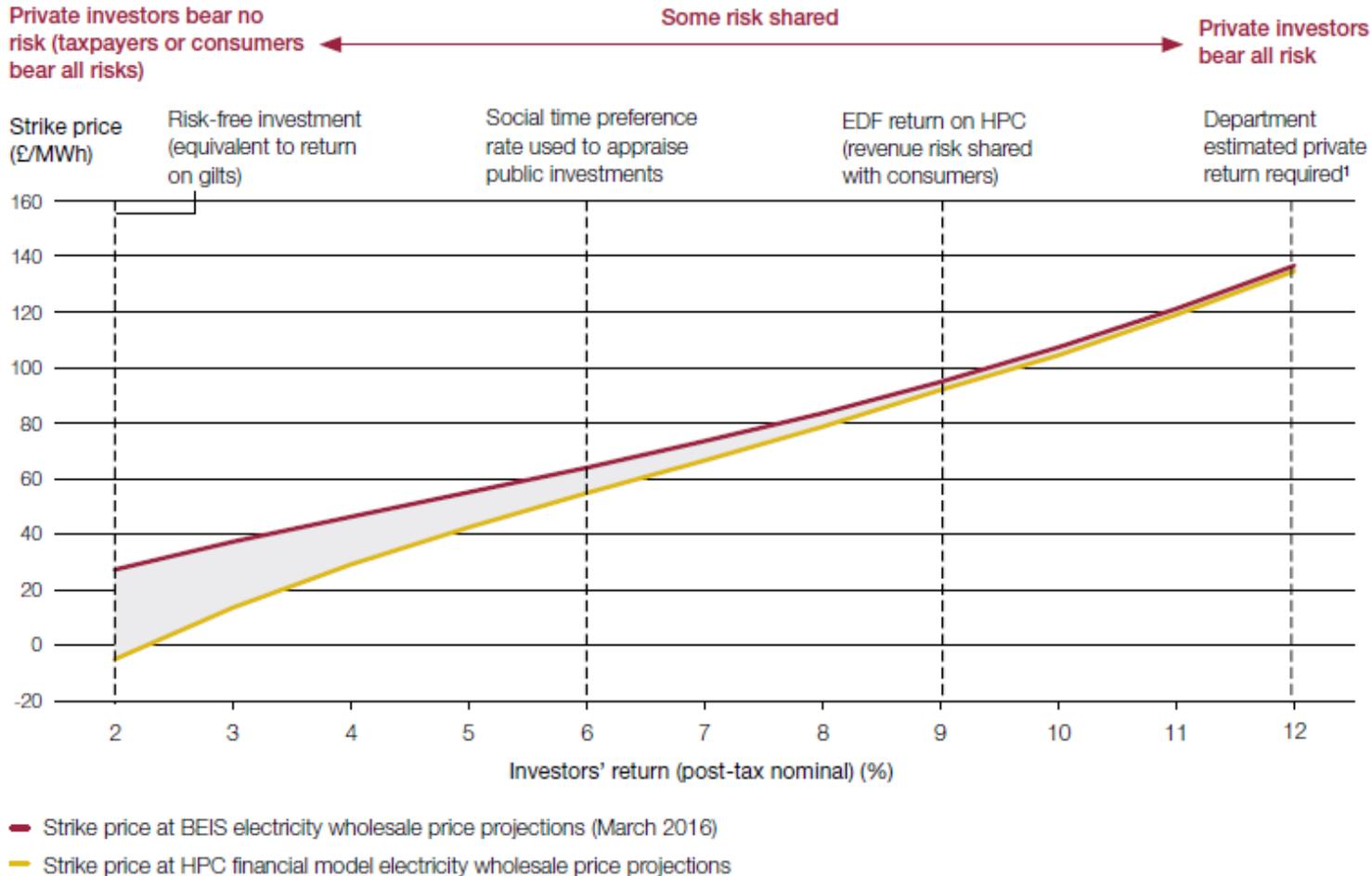
BE PREPARED

- Plan, plan and plan some more.
- Ensure adequate design completion before construction
- Ready your supply chain
- Create strong project metrics
- Develop and implement a robust risk management program. Use it as the basis for project contingencies
- Develop a project financial structure that supports preparation before final commitment
- Get the best possible people you can



UK ANALYSIS OF OPTIONS BASED ON HPC

Sensitivity of strike price to investors' return



The chart presents the strike price necessary for investors to achieve different levels of return based on two sets of electricity wholesale price projections. The higher level of risk private investors bear; the higher the strike price. In summary table *Figure 19), we show three different scenarios:

- '100% private risk' assumes private investors carry all risks. The Department has estimated that the hurdle rate for nuclear projects is about 12% (post-tax nominal). To achieve this return, the price they receive would need to be between £135 and £137 per MWh during the first 35 years of generation;
- 'HPC' scenario replicates the current deal. By removing the electricity price risk for 35 years as well as other risks, it reduces the investors' required return to 9% which results in a strike price between £91 and £95 depending on the forecasts for market prices after the CfD period; and
- '100% public risk' assumes all risks are transferred to the public sector and the tax payer would have to pay the full project cost (£19 billion). In this case the strike price for 35 years would range from -£6 to £28 depending on the electricity price forecasts. The combination of low discount rate and high future electricity prices makes the present value of the cash flows post CfD so high that it compensates for the negative strike price during the CfD period to achieve an overall investor return of 2%. Such a strike price is a theoretical price based on a comparison with the 35-year structure used in HPC.



PROJECT STRUCTURES ARE ABOUT MANAGING RISK

- As the project owner, the total risk resides with you
 - Transferring all risk to contractors is an illusion
 - Allocating risk is a form of risk management, it does not disappear
 - There is no scenario where your contractor fails and you succeed
- Complete transparency through to the contractor is essential so that actions can be taken when the problem arises and the costs to correct are manageable
- Ensure adequate oversight



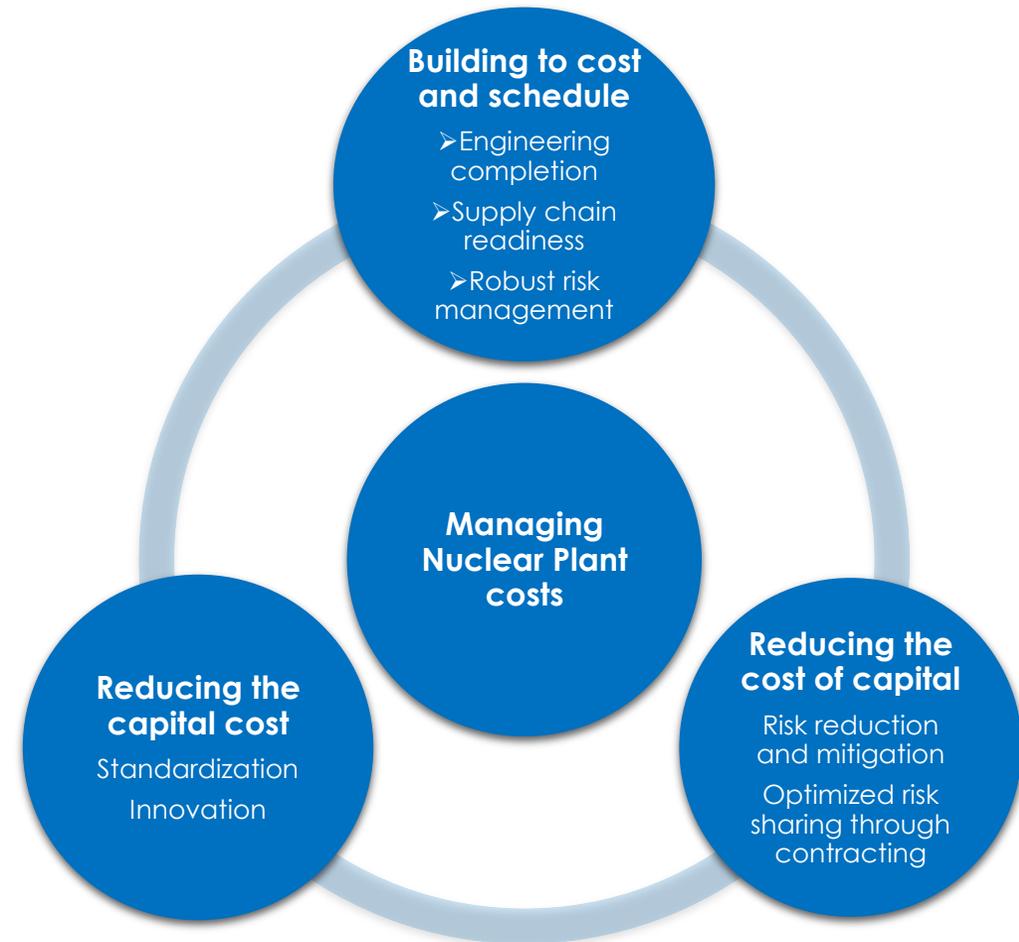
BUILD AND REPEAT

- Standardization – there is no doubt we get better as we repeat the same activities over and over
 - Goes beyond design. Includes site, supply chain, project model right down to individual workers
 - Recent example at Barakah in UAE, four unit site with the 4th unit cost about 40% less than the site average
- Innovation – replicating also allows for ideas on where there can be improvements that save both cost and schedule



LOWER AND PREDICTABLE NUCLEAR PLANT COSTS CAN BE ACHIEVED

- Be ready
- Manage risk
- Build and repeat
- Innovate



THANK YOU!

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