

Developments in LNG and Pipeline Technologies

- How will new technologies impact natural gas delivery costs?
- How do political and institutional factors, and the changing structure of the gas market interplay with technological developments?
- How do the project structures and players involved (countries, companies) affect the drive for cost reduction and shorter schedules?

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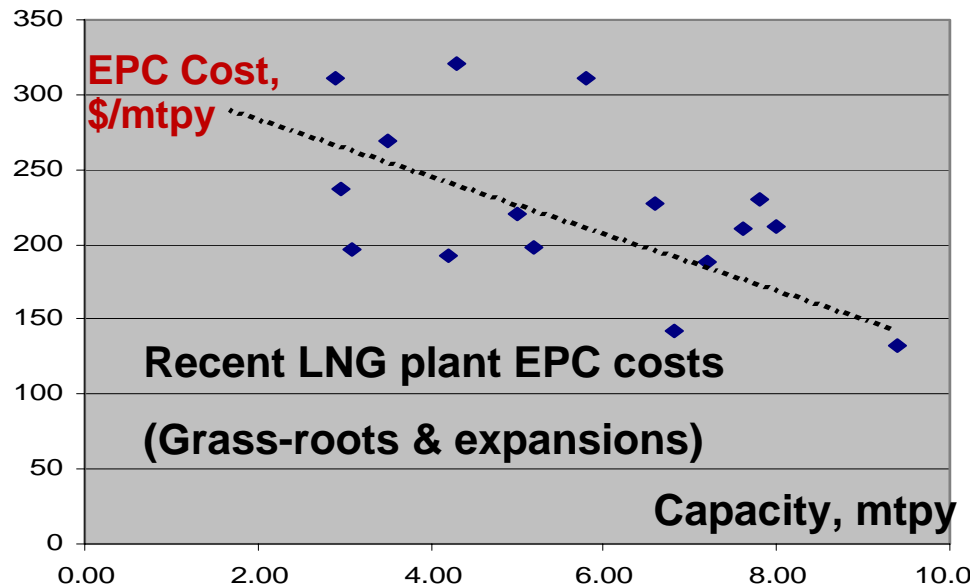
PVP, Bechtel Corporation

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Example: LNG Project EPC Performance, Schedule, and Costs have improved significantly in the past decade

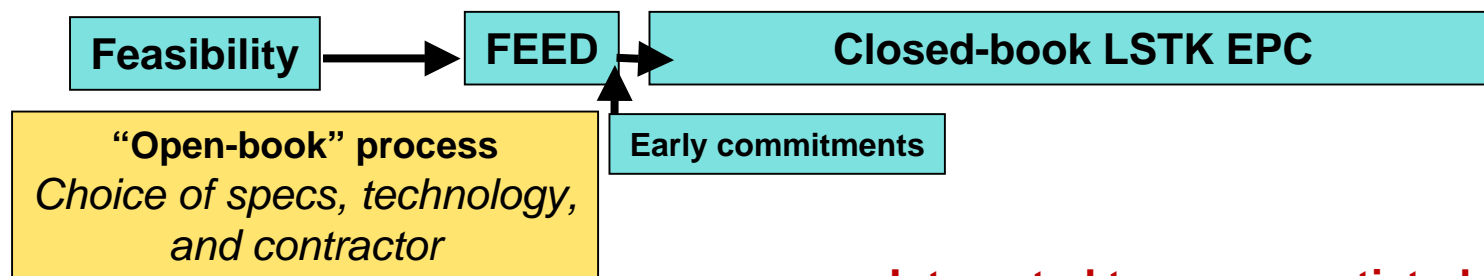
- Liquefaction EPC costs have decreased from over \$350/ton for a grass-roots project to about \$250/ton (*depending on capacity, local costs, number of trains, etc.*) :
 - *Economies of scale*
 - *New liquefaction technology*
 - *Changing players and market factors = more cost-effective designs*



"Typical" project		
	<u>1994</u>	<u>2004</u>
Market	Japan	Atlantic
Technology	APCI	APCI, POCLP, Shell, Linde
Redundancy	"n+2"	function
Cost \$/ton	350	200
FEED/EPC, months	60	44

Project Execution

Project Execution Options:	<u>Owner costs</u>	<u>Schedule months</u>
<i>Traditional bids</i>	100	60
<i>Design competition</i>	85	50
<i>Integrated team – negotiated</i>	70	44



Integrated team – negotiated Approach is gaining acceptance:

- Shortest schedule
 - Market advantage
 - Lowest owner costs - Highest NPV
- EPC contractor adds value early on (where it matters)
- Competitive EPC cost (80% is bid competitively)