

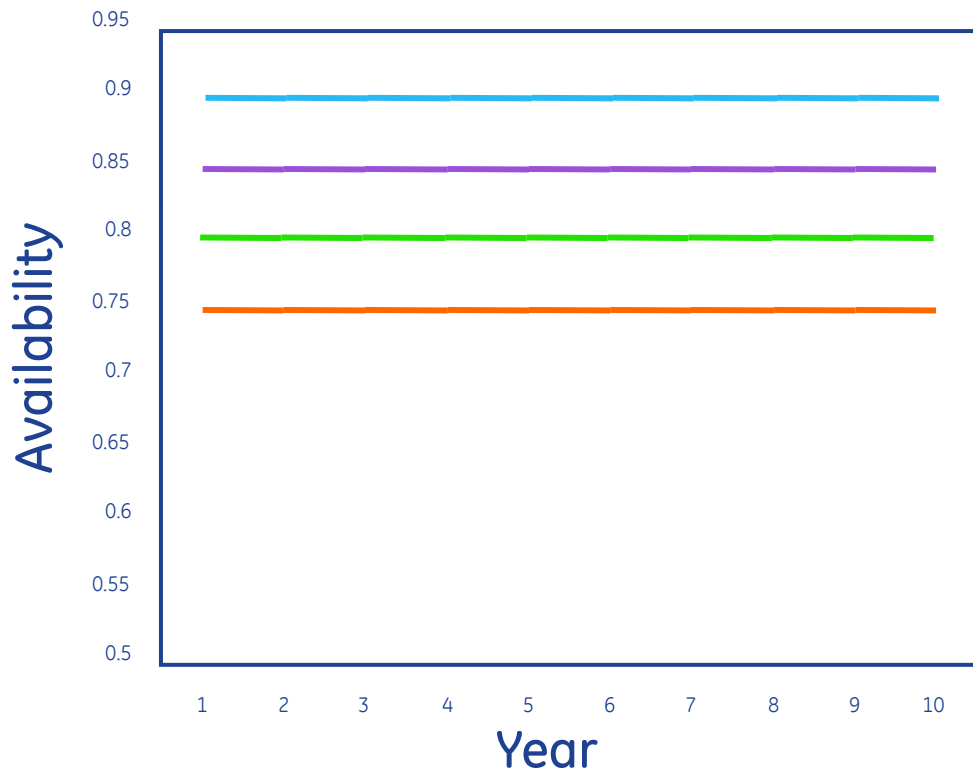
Revving Up RAM

DeLome Fair, Chief Engineer – GE Energy



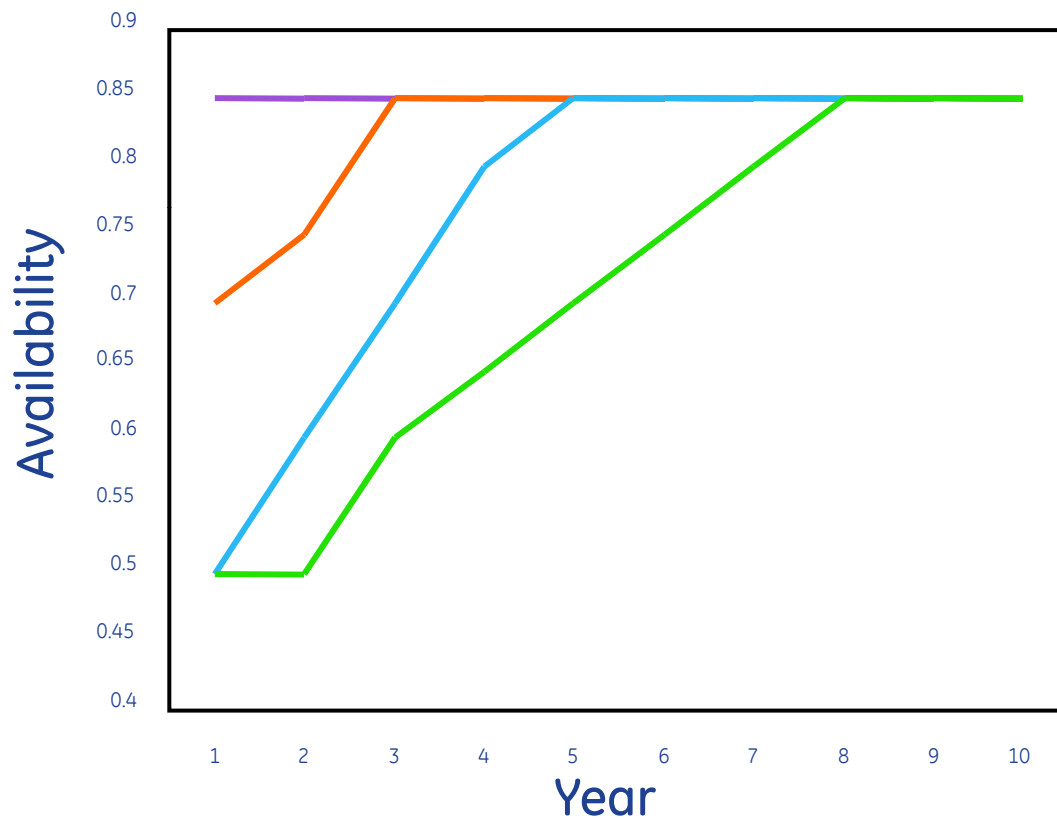
Mature plant reliability/availability

What is typically discussed with regards to RAM

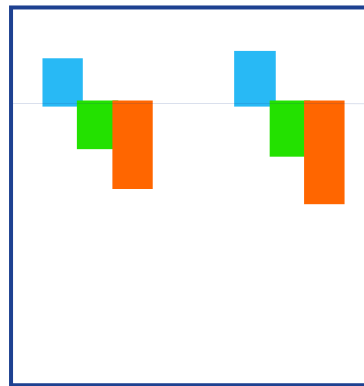
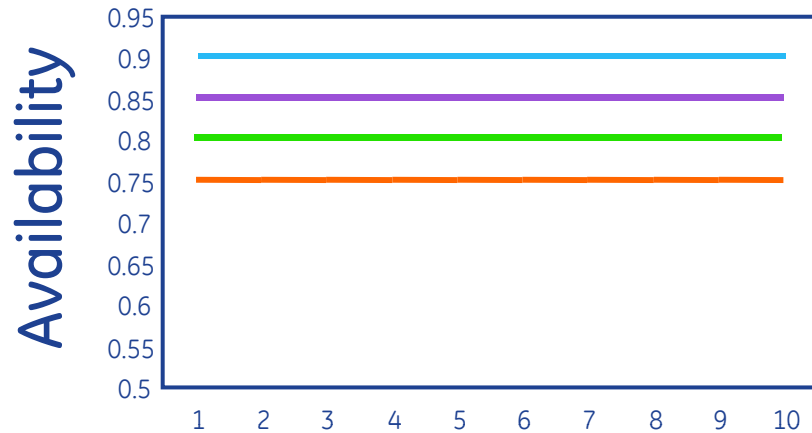


Time to Maturity

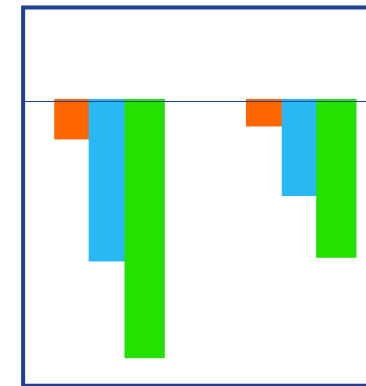
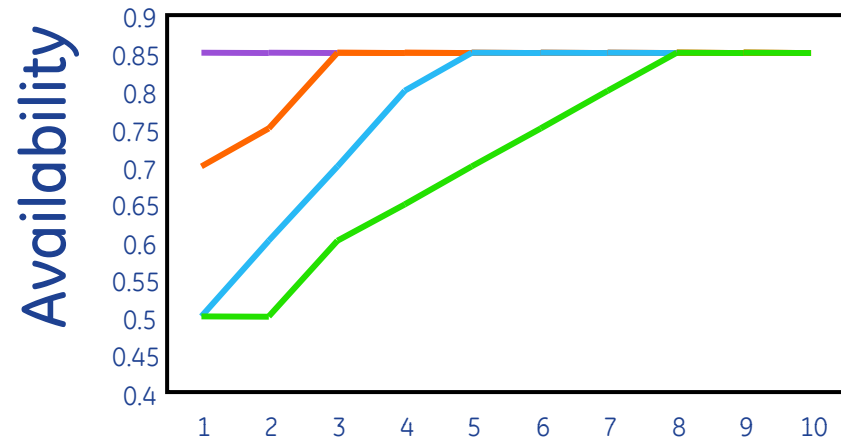
What needs to be considered when developing projects



Economics of reliability/availability



CCF - Yr 1-5 NPV

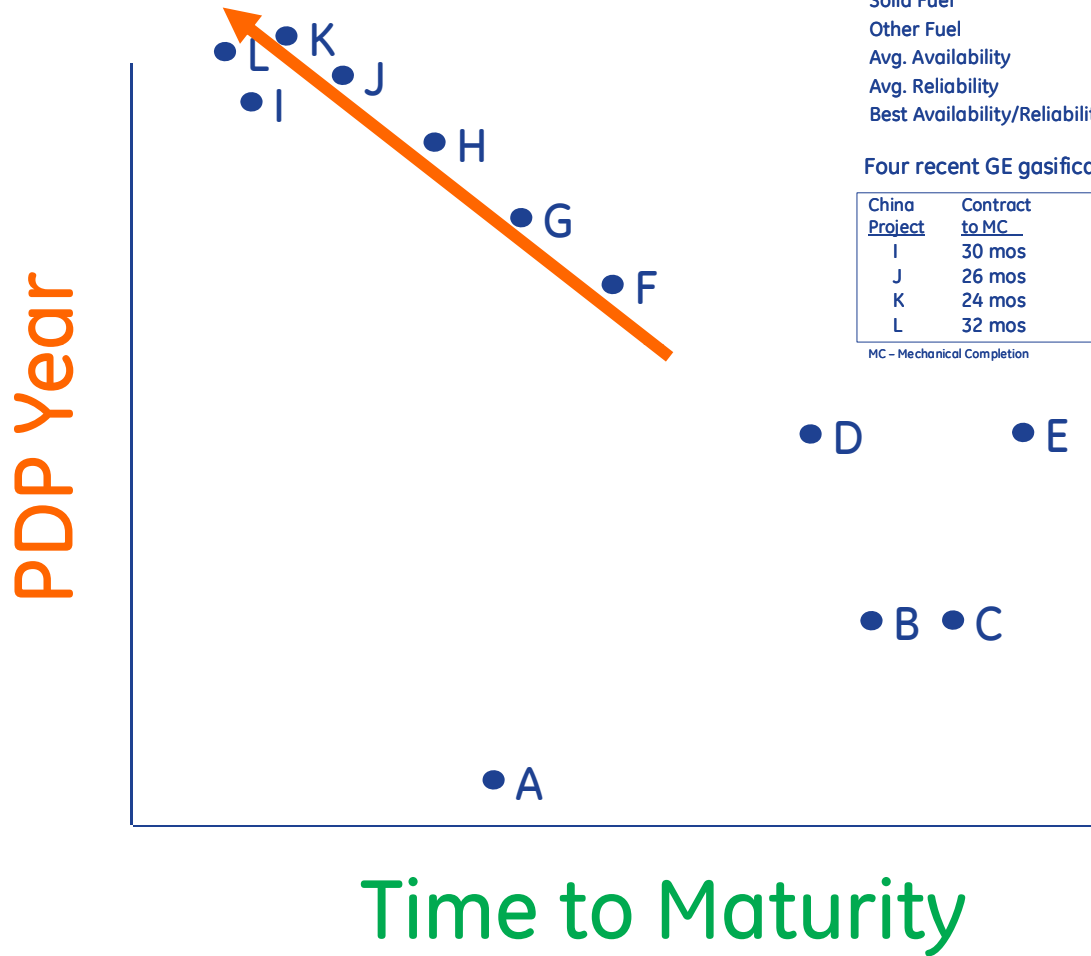


CCF - Yr 1-5 NPV

Poor time to maturity can result in **60%** decrease in early year cash flow and **35%** decrease in project NPV

Historical data..experience matters

GE Licensees



Short Cycle Times, Fast Startups and High Availability/Reliability

Licensed Projects	44
Solid Fuel	33
Other Fuel	11
Avg. Availability	~93%
Avg. Reliability	~95%
Best Availability/Reliability	96%/98.5%



Four recent GE gasification startups

China Project	Contract to MC	Start-up	1 st yr Avail	Config
I	30 mos	10 wks	92%	2+1
J	26 mos	12 wks	86%	2+1
K	24 mos	12 wks	90%	1+1
L	32 mos	2 weeks	92%	2+1

MC - Mechanical Completion

- Quench Design
- Good Constructability
- Short commissioning schedule
- High Availability
- Online making product faster

Experience:

Technology
Configuration
Feedstock
Operations

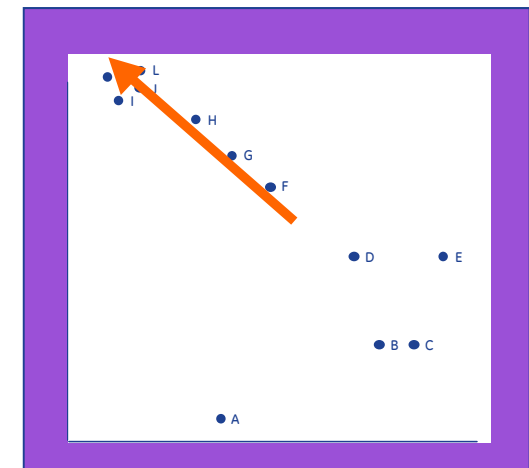
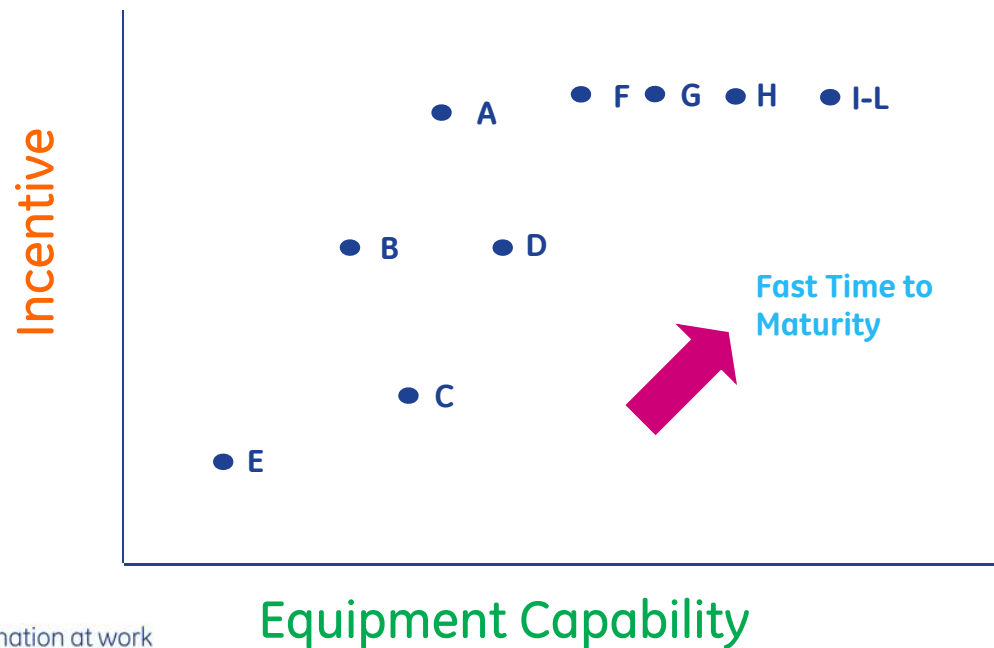
Other factors?

Capability

- Tech provider experience
- EPC experience
- Equipment quality
- Adequate installed spares, warehouse spares
- Experienced operations staff
- Advanced preparation

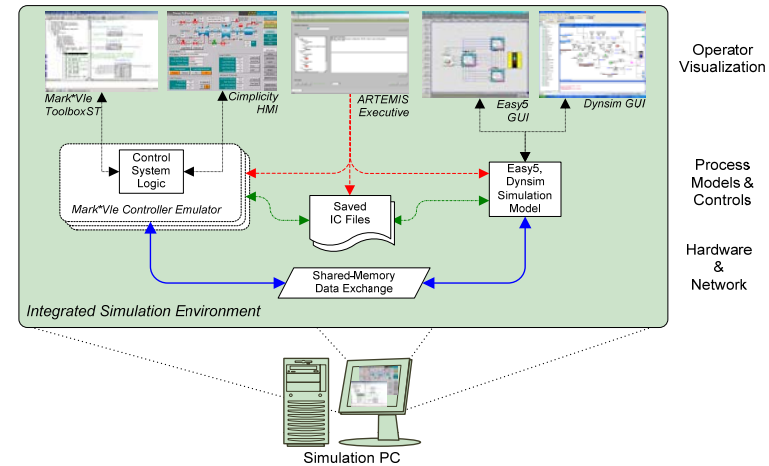
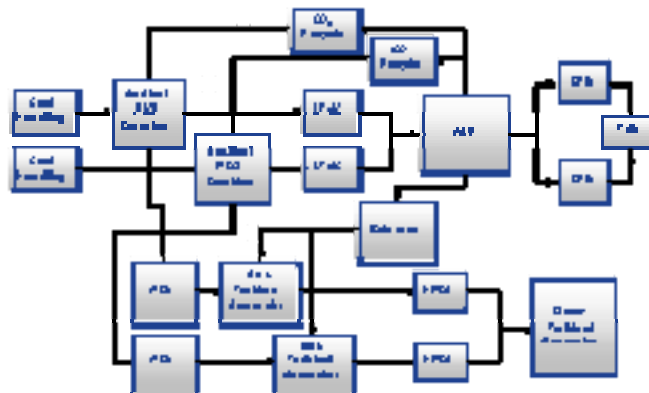
Incentive

- Round the clock startup
- Operations staff incentives aligned with owners incentives
- Proactive maintenance strategy
- Rapid response to issue resolution
- EPC ties to successful operation



Advanced preparation

Plant simulator



Simulation reduces time to maturity

From Coal Pile to Switchyard

- High fidelity
- Complete Scope
- Dynamic Model

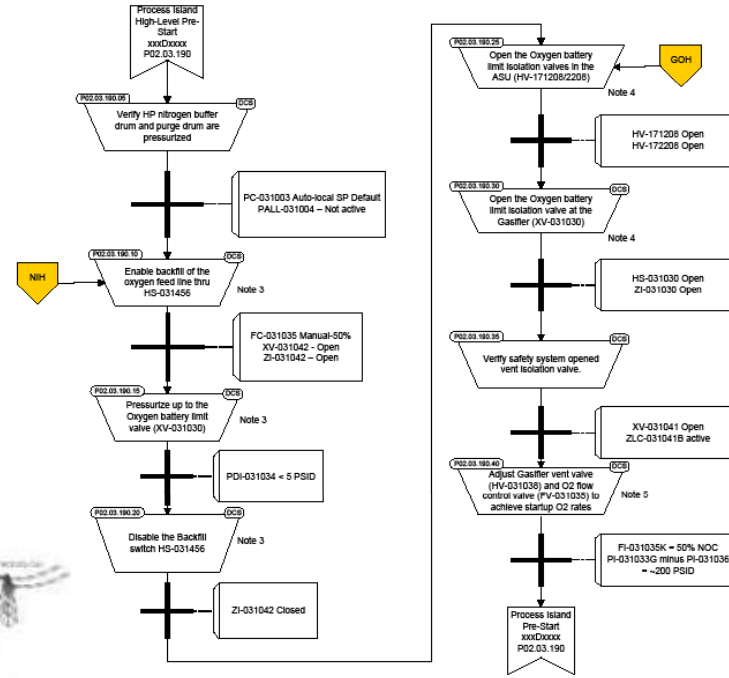
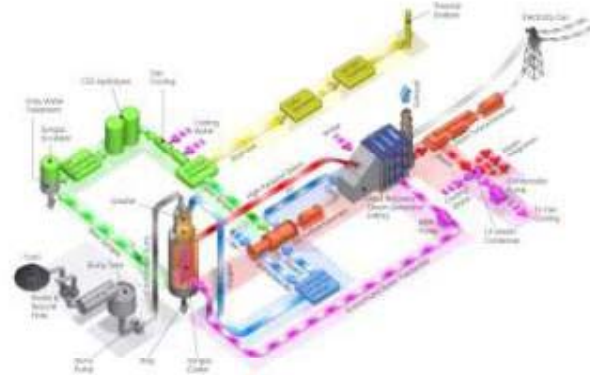


Advanced preparation

Operability

- 60+ operability scenarios are being simulated
- Lessons learned from TECO included
- Include fault & normal operating conditions
- Optimize operability:
 - Start-up times & avoid trips
 - Op flexibility, emissions, heat rate
 - Availability/reliability
 - Transient performance
 - Dynamic response & operability
 - Staffing requirements
 - Plant emissions during transient events

Operability studies: a successful best practice



Advanced preparation

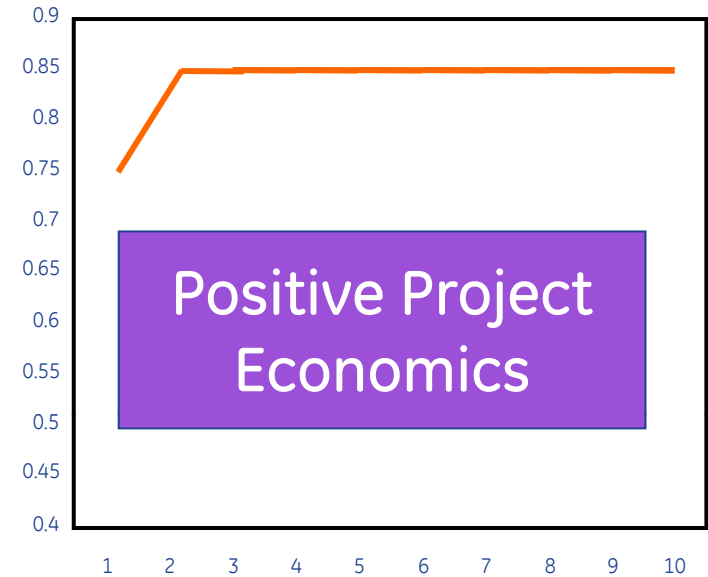
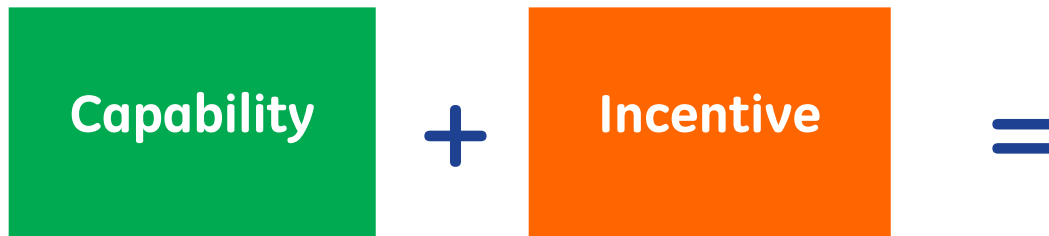
Operator training

- High adrenalin, realistic training environment.
 - Save, restore, pause, rewind, backup, replay
 - Instructor station controls training.
 - 50+ pre-programmed operational scenarios.
 - Fault and abnormal event injection.
- Continuous learning environment.
 - Prepare operators for future plant changes.
 - On-site customer engineering support tool.
 - Built on GE engineering design simulation.



Operator Training Simulator supports multiple customer functions over plant's lifecycle

GE delivers high RAM & high TTM capability



- Large Installed Based
- Proven Experience on Multiple Feeds
- Plant Simulation Capability
- Operator Training



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