Risk management on a large topsides design project

Peter Astley

About myself

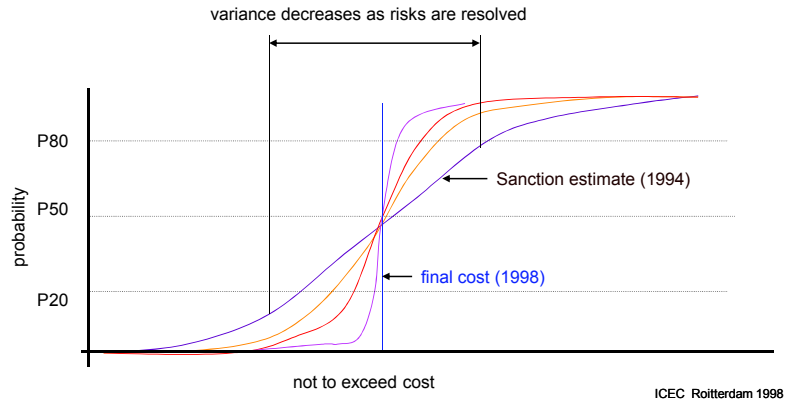
- Retired after 28 years cost engineering & project management with Amec
- Six platform design projects, three refinery projects
- Currently short course lecturing for Cranfield University
- Active FIMechE, FACostE

Purpose

- Explain how I have used risk management on large topsides design projects
- Discuss what lessons I have learned
- Stimulate future process improvement

Britannia platform

Britannia cost risk history



Britannia topsides risk drivers

- Alliance working
- Cost
- Schedule
- Weight

Lessons learned

- Risk management is an essential cost control tool
- Use of different probability levels:
  - stretched targets 20%
  - budgets 50%
  - corporate reporting 80%
  - contingency management
- Risk management increases buy-in from project participants
- It is valid to change quantitative results to match intuitive expectations

Amec´s adoption of risk management

- Focus on qualitative risk management process
- Risk matrix and risk register
- Company-wide training programme
- Facilitated brainstorming sessions
- Required for tenders and in-house project reporting

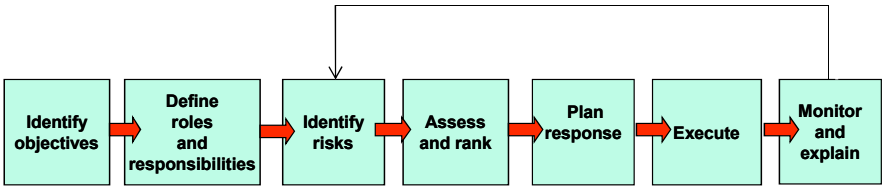
Amec´s risk driver

- Low margins/high risks in UK civil/construction contracting
- December 2007 Amec joined FTSE 100
- Oil & gas equipment & services sector
- Vision: to be the leading supplier of high-value consultancy, engineering and project management services to the world's natural resources, nuclear, clean energy, water and environmental sectors.

Risk management process

Management of any *uncertain* event that might *affect*

the achievement of our *objectives*



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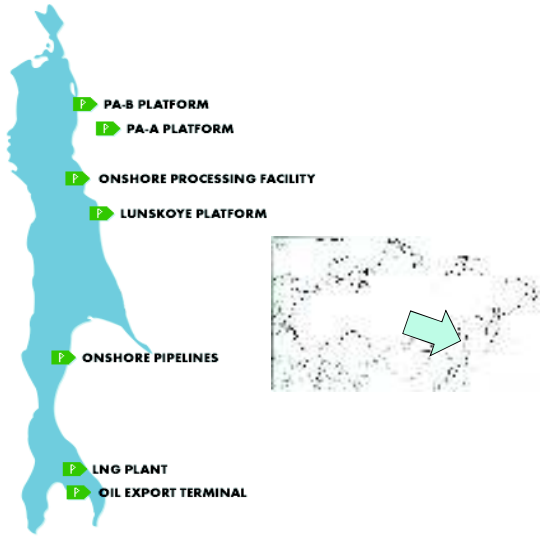
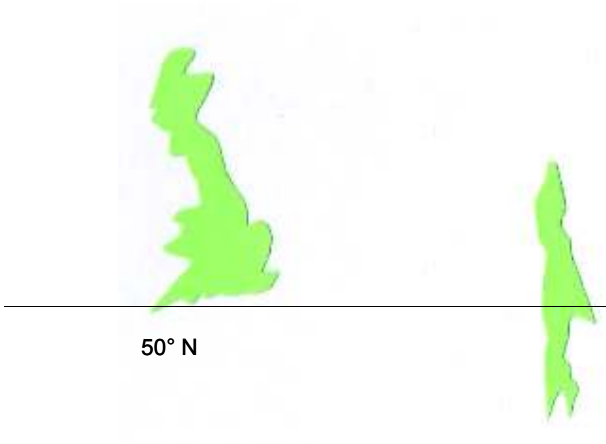
Sakhalin development facilities



Different islands



SEIC milestones

1991	Consortium formed of Marathon. McDermott, Mitsui, RF
1994	Production sharing agreement signed
1999	PA-A (Molitpak) installed
2000	Marathon traded its share with Shell
2001	Amec started design
2005	Environmental issues force sale of 50% share to Gazprom
2006	Lun-A (Lunskoye) installed
2007	Piltun drilling operational
2009	First LNG delivered

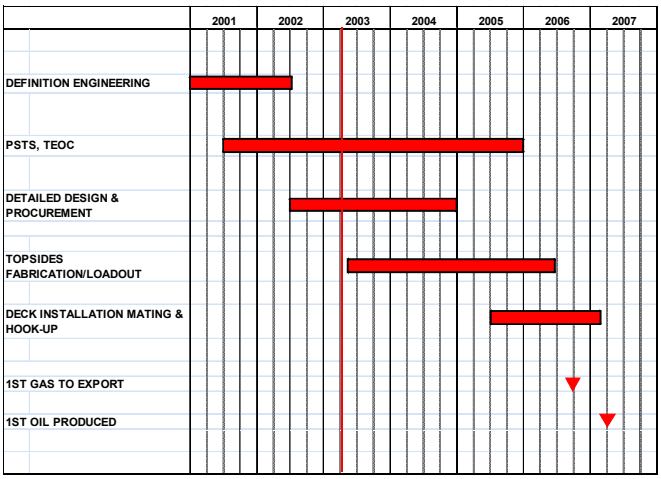
Risk drivers (revised)

- Arctic conditions
  - winterisation
  - safety
  - wave height
  - weather window
- Earthquake zone
  - structural design
  - pendulum bearings
- Project size
  - resources
  - management
- Schedule expectations
  - rework
- Gas sales price
- Russian influence
  - TEOC
  - Russian content
  - production sharing agreement
- Change control
  - client change
  - conceptual design
  - steel to concrete jacket
- Korean fabricator
  - no topsides experience
  - design support resources
  - design construction overlap
  - culture & communication
- Environmental protection

Amec bid/execution strategy

- Select team known to Marathon & Shell
- Subcontract Jacket design to TriOcean
- Subcontract Quarters design to Rubin (St Petersburg)
- Use existing Amec Environmental consultant in Moscow

Sakhalin early high level schedule



Lunskoye transportation

Lunskoye installed winter 2007

Piltun February 2009

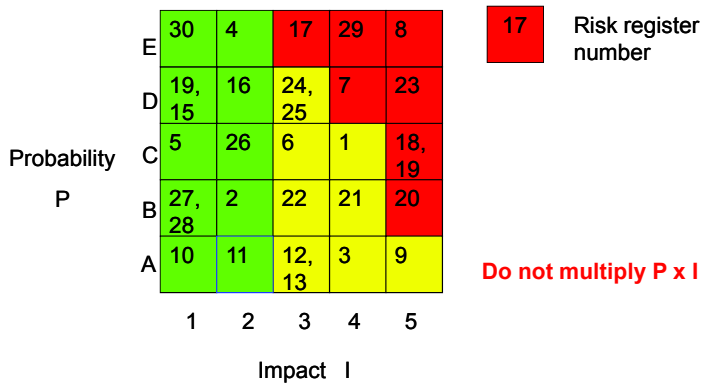
Sakhalin production capacity

Production capacity cu m/day			
	Gas	Cond	Oil
PA-A	1.7 m		14 000
PA-B	2.6 m		11 000
Lun-A	50 m	7 900	2 500

Qualitative risk score table

Probability Score (P)		Impact Score (I)	Design	Cost	Schedule
A	Not very likely 0-20%	1	Accommodate with no significant effect	<£50,000	<2 weeks
B	Unlikely 21-40%	2	Minor consequential effects	<£500,000	<1 month
C	50/50 41-60%	3	Multi-discipline change/ rework	<£1 million	<3 month
D	Likely 61-80%	4	Major abortive work	<£2 million	<6 month
E	Highly likely 81-100%	5	Major design change	<£5 million	<6 month

Risk matrix



Risk drivers (used)

DD	Detail design change
FC	Fabrication contractor
FE	FEED carry over
FU	Functional change
GS	Gravity base structure (GBS)
HU	Hook up & commissioning
IS	Instrument control & safety system
IC	Installation contractor
LC	Local content/approval
OM	Load out/transportation grillage
OT	Operations/maintenance
PR	Other parties (not GBS)
SC	Schedule risk
WI	Winterisation
WT	Weight engineering

Mitigation strategies

T	Transfer
A	Accept
M	Mitigate
C	Use contingency

Simple risk register

Risk No.	Risk Driver	Risk Statement	Mit. Strat	Prob	Impact	Action by
17	KF	**If** vendor data from fabricator is late **then** there will be delays to design schedule which will subsequently affect fabrication	C	5	3	SR

Risk categories

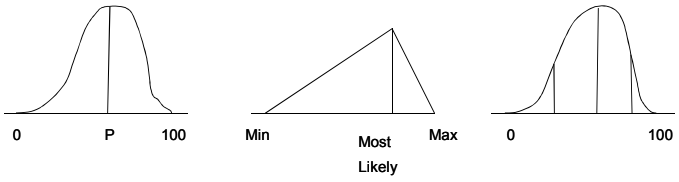
- Technical risks & design assumptions
- Cost/price/profit, finance/cash flow
- Contractual risks (form of contract, liabilities)
- Schedule
- HSE
- Legislation
- Reputation
- Stakeholders
- Interfaces
- Supply chain

Risk management levels

Level 1 (Qualitative) Risk register

P_{A-E} I_{1-5} R

Level 2 (Quantitative) Monte Carlo Analysis



ICEC Ljubljana 2006

Quantitative risk forecasting

- Base line forecast
- Select from risk register all risks with impact > 3
- Interview lead engineers (12 disciplines) . What uncertainties will affect your forecast to complete?
- What is the probability of occurrence (including P=1)?
- What is the best case, worst case, most likely?
- Run Monte Carlo analysis
- Discuss results and rerun
- Check against resources and planned completion date.

Lessons learned

+	Δ
❑ Involve the project team	❑ Consistency across project WBS
❑ Consider all high impact risks	❑ Improve cost driver identification
❑ Asking the 3 point question	❑ Better risk correlation
❑ Cost engineering tool	❑ Better estimation of probability
❑ Use for contingency management	❑ Consider systemic risk
❑ Use stretched targets	❑ Opportunity management
	❑ Don´t use risk as an excuse

Risk management, art or science?

Art	Science
Vision Professionalism Leadership Creativity	Organisation Policies Procedures Coding structures
People Communication Persuasion Facilitation	Logic Data collection Measurement Analysis

Questions & discussion