www.pwc.com

Establishing a Governance Approach and Control Environment for New Nuclear Power Projects

2 June 2011
Nuclear Industry Association of South Africa
Cape Town, SA

pwc

Agenda

1. Governance and control environments
2. Lessons learned from prior and active nuclear power plant construction
3. Trends in quantitative risk assessments (QRA) and schedule analytics
4. Conclusion and questions

Governance & control environments

1

What makes a project successful

- Availability of skilled resources
- Adequate front end planning before project authorisation
- Clarity of organisational structure & accountability
- Standardized and transparent project processes
- Systematic approach to managing change
- Effective stakeholder management
- Accurate and relevant information in performance reports to help senior management make informed decisions
- Strong governance and independent assurance

What is project governance and why is it important

- The term “project governance” is used in industry to describe the organisational framework, processes and procedures that provide the execution approach and oversight for a successful project
- Project governance is an active rather than just a controlling role
- Project’s often fail to achieve established objectives because project governance is not well understood and even less well executed

What is project governance and why is it important (continued)

- Project governance from the perspective of Senior Management
  - Manage the contracts and requirements - hold the project management team and contractors accountable
  - Regularly identify issues and risks and establish timely mitigation plans
  - Escalate issues when Management attention is required
  - Be skeptical, trust but verify, and don't minimize an issue - If it feels bad it usually is!
  - Ask for insights and perspectives in addressing each issue - Don't be a hero and go at it alone
  - "No Surprises"

Key project governance objectives

- Establish a structured control environment to support:
  - **Transparency**
  - **Accountability**
  - **Audit Trail**
- Identify potential risks early in the project life cycle and implement tools & procedures for testing, monitoring and mitigating project risks
- Establish expectations and accountability for timely reporting to management
- Clearly define and delineate responsibilities for project delivery, oversight and assurance

Integrated organizational & procedural framework

The integrated risk management framework consists of two parts:

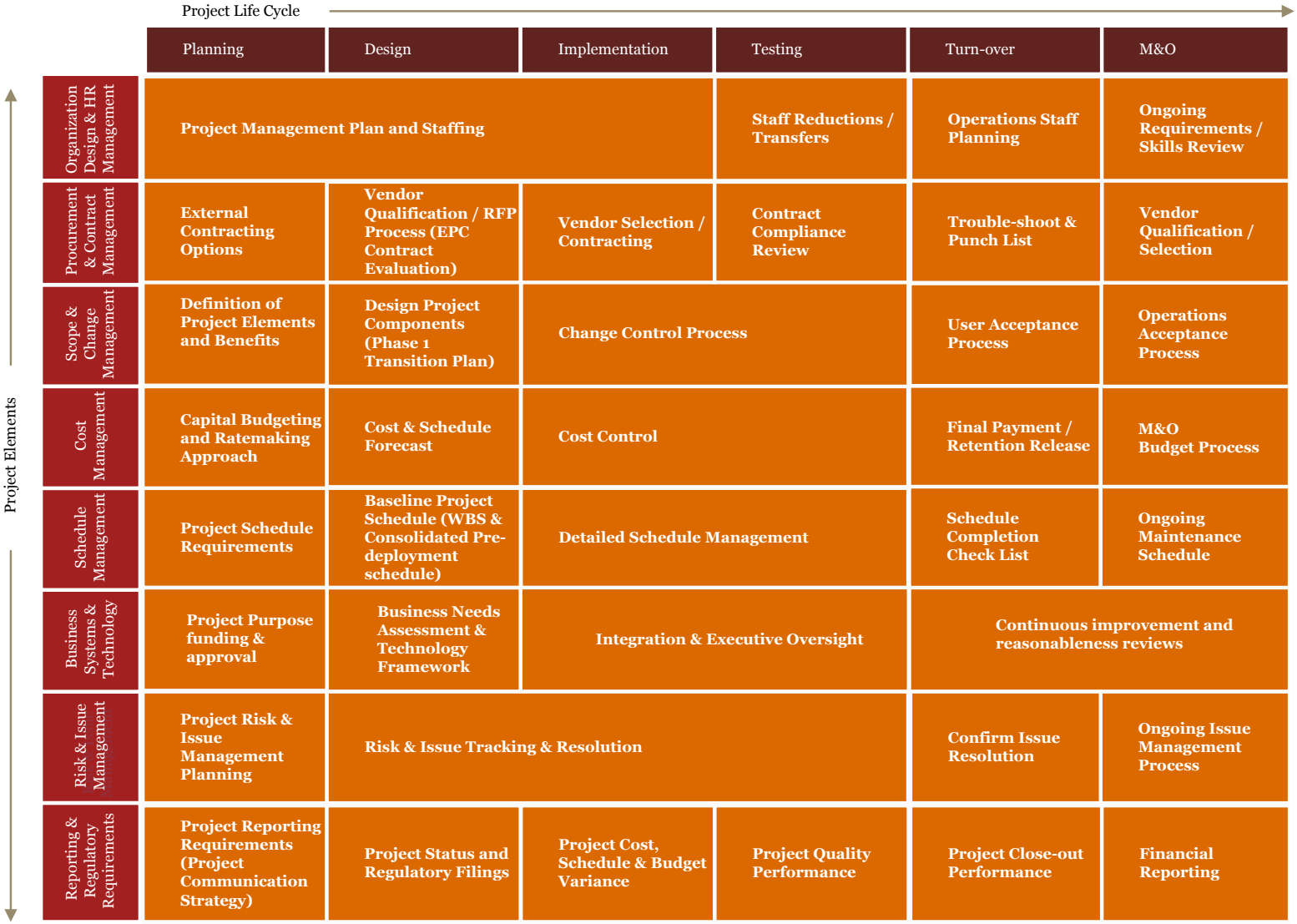
- **Organisational Framework:** The organisational framework provides a context in which the project stakeholders define their roles and responsibilities in relation to various project risk considerations over the project life-cycle.
- **Procedural Framework:** The procedural framework is a series of detailed risk management procedures for each project element across all phases of the project life cycle.

Objectives of an organisational & procedural framework

- Clearly define roles and responsibilities of project participants and stakeholders as they relate to project governance and the key risk elements of a capital project (e.g., cost, scope, schedule, quality, safety)
- Establish specific procedures to address the elements of risk within each phase of the project (i.e., planning through O&M)
  - Refine “standard” procedures to adapt to specific aspects of individual projects and contract terms and conditions
  - Consider reporting and other documentation requirements to support governmental and regulatory requirements, where applicable
  - Address the needs and potential concerns of external parties affected by the project (e.g., regulators, media, governmental entities, financiers, customers and the general public)

Organisational framework

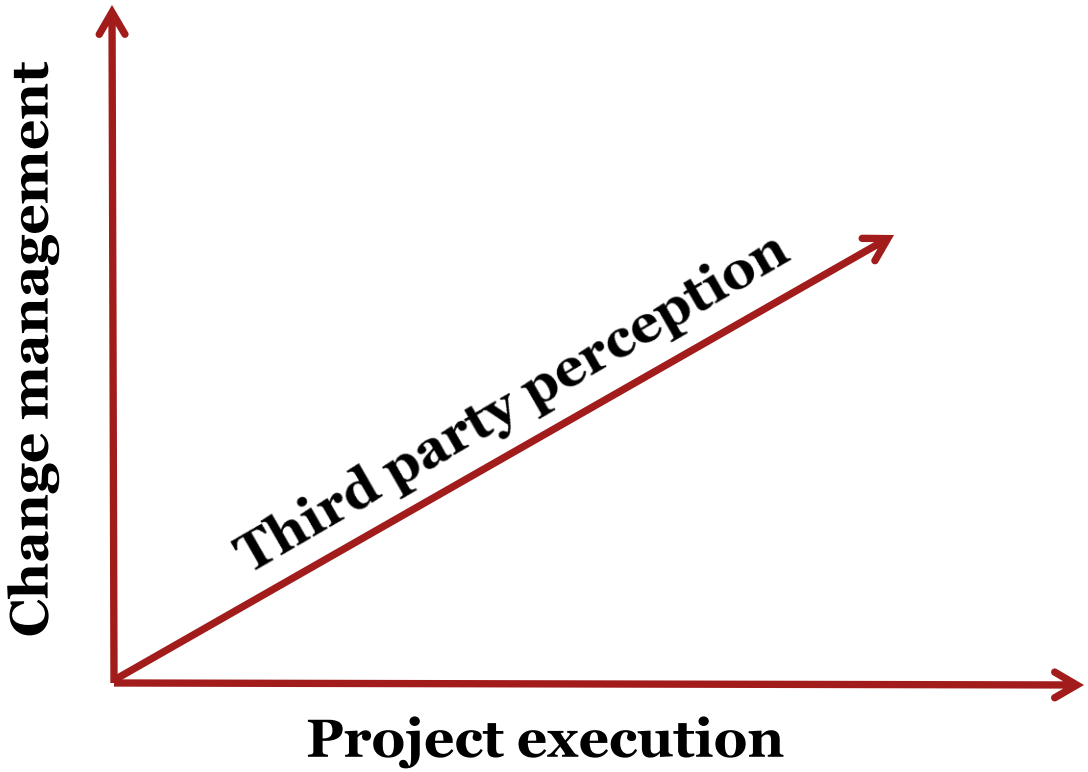
Procedural framework



Lessons learned from prior and active nuclear power plant construction

2

"3-D" aspect of a project control environment



Key lessons learned from past and current nuclear power plant projects

- Focus on the risk profile created by the selected project delivery method ***prior*** to finalising contracts
  - Do contracts establish a proper balance of risk/reward?
  - Are risks allocated to the party best able to manage the risks?
  - Do contracts provide timely owner access to important performance data (e.g., schedule source files, productivity data)?
  - Perform detailed scenario analysis on commercial terms (including escalation, suspension and termination clauses) to assess potential impact of significant project changes
  - Establish clear expectations and requirements for systems and technology to be used to manage the project (e.g., document management, cost and schedule, issue and risk management)

Key lessons learned from past and current nuclear power plant projects (continued)

High value efforts and activities:

- Early and regular engagement with external project stakeholders
- Active, continuous engagement of executive steering committees
- Early focus on project schedule and implement regular and detailed schedule analytics
- Develop detailed cost to complete models incorporating quantitative risk assessment tools
- Development and consistent use of a detailed work breakdown structure (WBS) linked to cost, schedule, and retirement unit catalogs
- Early engagement of start-up and operations teams and early consideration of reliability centered maintenance and materials traceability tools and techniques to be used during operations
- Active project assurance function with SMEs to assess contract compliance, highlight performance risks and support continuous process improvements

Key lessons learned from past and current nuclear power plant projects (continued)

Observed challenges:

- Attracting and maintaining a skilled and experienced workforce has been a challenge for both owners and contractors – especially regarding nuclear quality requirements and expectations
- Organisations launching into projects without proper planning and development of Project Execution Plans to establish expectations and roles
- Late and incomplete analysis of commercial implications of contracting strategies
- Design control and configuration management processes need to be more specific, especially when entering into an EPC contract – record retention and turnover is critical to maintain the design basis for the facility
- Weak vendor and sub-supplier QA/QC programs
- Poorly defined change management procedures

Trends in quantitative risk assessments and schedule analytics

3

Quantitative risk assessments (QRA)

- Common questions from Management and external project stakeholders on mega-project and nuclear power plant construction:
  - How confident are you that we will complete this project on budget?
  - How have you quantified the risk inherent in constructing a nuclear power plant?
  - How are you managing project cost contingencies?
  - What will happen to the total project cost if one of our significant risks comes to fruition?
- Quantitative risk assessments are attractive to Management because they indicate a project outcome in terms of a range not a single point – this is much closer to reality

QRA tools and techniques

- Project owners and management teams are incorporating stochastic tools to analyse risks on large complex projects and establish / monitor the implications of project risks and changes to the forecasted cost to complete
- Quantitative risk models allow a project management team to test the sensitivity of each assumption underlying their baseline estimates and potential changes to the baseline estimates
- Performing sensitivity analysis involves recalculating the cost estimates with different quantitative values for selected input values, risks, likely events or parameters, in order to compare these results with original base estimates to determine where changes in the value of any individual cost element's parameter, risk or assumption yields a significant change in the overall cost estimate
- These 'sensitive' elements can then be identified, addressed through improved scope definition, or closely monitored and managed within a risk and contingency management plan

Analysing project schedule performance

- Schedule management has historically been, and continues to be one of the most challenging aspects of new nuclear power plant construction
- Whilst contract provisions may require a contractor to track and report a total Schedule Performance Index (SPI) or other Earned Value metric, many contractors on nuclear plants struggle to produce meaningful metrics that allow a project management team to assess schedule performance
- Some project owners are starting to perform detailed analytics on periodic schedule submissions to assess contractor performance and provide early warnings for potential problems.
- For example, analytics may consider trends in:
  - Activity constraints
  - Float density
  - Activity progress
  - Activity duration variances
  - Open ended activities
  - Critical and near-critical paths

Conclusion and Q&A

4

Thank you

Stephen Lechner
Principal, USA
Tel: +1 415 498 6596
Mail: stephen.p.lechner@us.pwc.com