Exceptional service in the national interest

Sandia National Laboratories

SAND2015-0295PE

International Data Centre (IDC) Re-engineering

ROM Cost Estimate Overview (Leveraging USNDC)

Bob Huelskamp
J. Mark Harris
Jericah Dawson

December 11, 2014

SAND2015-XXXXX

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

ROM Cost Estimate Disclaimer

Contained herein is a Rough Order of Magnitude (ROM) cost estimate that has been provided to enable initial planning for this proposed project. This ROM cost estimate is submitted to facilitate informal discussions in relation to this project and is NOT intended to commit Sandia National Laboratories (Sandia) or its resources.

Furthermore, as a Federally Funded Research and Development Center (FFRDC), Sandia must be compliant with the Anti-Deficiency Act and operate on a full-cost recovery basis. Therefore, while Sandia, in conjunction with the Sponsor, will use best judgment to execute work and to address the highest risks and most important issues in order to effectively manage within cost constraints, this ROM estimate and any subsequent approved cost estimates are on a 'full-cost recovery' basis. Thus, work can neither commence nor continue unless adequate funding has been accepted and certified by DOE.

IDC Project Background

- Sandia participated in the IDC Reengineering Phase 1 project at a low level funded by Department of State (DOS) – part of the US Contribution-in-Kind for CTBTO. NNSA NA-243 (Office of Nuclear Verification) provides oversight for CiK program.
- Department of State (DOS) provided SNL $0.75M in FY14 to provide US technical support to the ongoing IDC re-engineering Phase 2 effort through the end of the Inception phase (January 2015)
  - Strongly leveraged by ongoing USNDC Modernization effort at SNL (funded by DoD)
  - Deliverables include a cost estimate for development with leveraging NDC (full deliverables on next slide)
- Requirements and Architecture Products:
  - Inception Iteration 1 (completed July 2014) – Leveraged the US NDC System Requirements Document (SRD) to develop the IDC SRD – accepted by international community
  - Inception Iteration 2 (planned completion January 2015) – Leveraging the US NDC System Specifications Document (SSD) and Use Cases to develop IDC SSD and Use Cases

IDC Inception Phase Deliverables

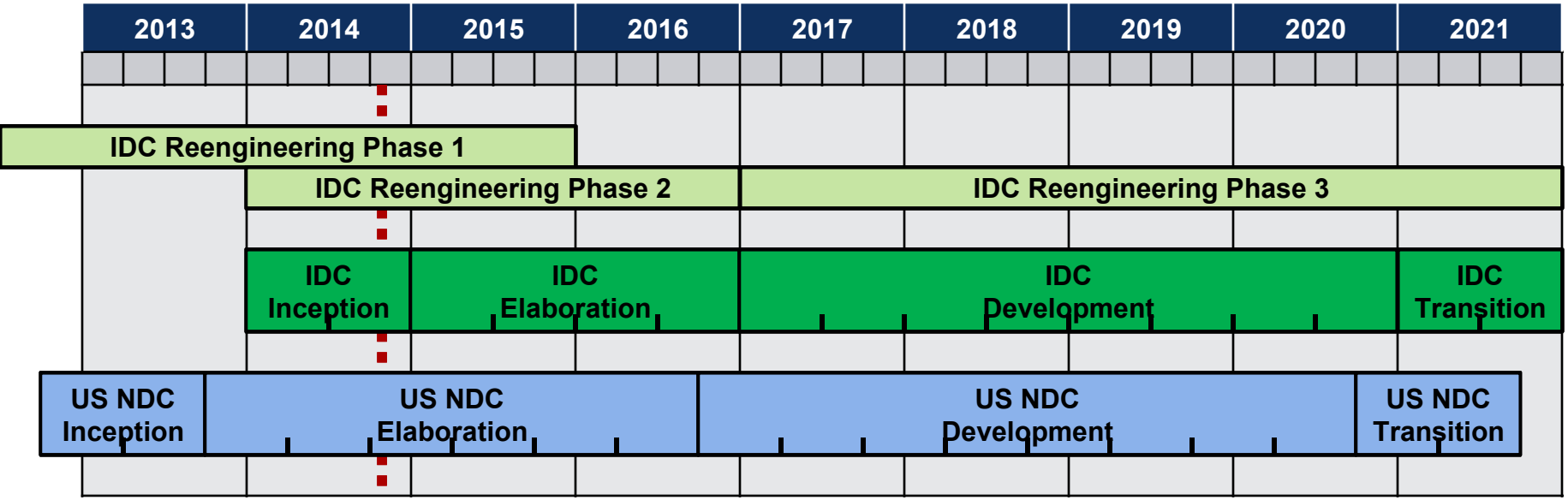
Sandia National Laboratories

ID	Deliverable	Planned Iteration
1	Project Scope Document	I2
2	Integrated Master Plan (IMP)	I2
3	Draft Integrated Master Schedule (IMS)	I2
4	System Requirements Document (SRD)	I1
5	System Specification Document (SSD)	I1 draft, I2 baseline
6	Risk List	I2
7	Use-Case Model Survey	I1 draft, I2 baseline
8	Glossary	I1 draft, I2 update
9	Architectural Prototype Demonstration	I2
10.a	Cost Estimate (leveraging US NDC)	I1 draft, I2 update
10.b	Cost Estimate (independent IDC project)	I1 draft, I2 update

Iteration 1 (I1) deliverables due 7/31/2014; I2 deliverables due 1/31/2015

IDC Reengineering Project

- The IDC recognized the need to reengineer their waveform processing system in 2011
- IDC Reengineering Phase 1 project addresses some needed capability enhancements, planned to complete in 2015
- IDC Reengineering Phases 2 and 3 were defined to extend reengineering to the USNDC-leveraged development effort



Cost Estimate Assumptions

- Major reengineering of the IDC software using Rational Unified Process (RUP)
  - Leveraging requirements, analysis, and design from US NDC Modernization
  - Components integrate with the new US NDC system architecture/infrastructure
  - Re-use of existing low-level application software designs and algorithms
  - Re-implementation of most existing application software (80 – 90%)
- Execution of the IDC RP3 (Development and Transition phases) assumes Sandia labor rates and staff capabilities
- Incremental delivery & integration of system components as features are validated
- Estimate accounts for PM practices consistent with current NDC project
- Operations and Maintenance (O&M) and system hardware are not included in this estimate (IDC responsibility)
- International participation will include extensive IDC staff in Vienna and limited RUP-certified software engineers from other countries.

Cost Estimation Methodology

- IDC Reengineering cost estimate uses the same methodology as US NDC Reengineering estimate
  - Parameters set for multi-site development
- The cost estimate consists of three components
  - Labor – estimated using the *SEER for Software (SEER-SEM)* (95% of Estimate)
  - Purchases & Travel – estimated based on current collaborative projects (5% of Estimate)
  - SNL Project Estimating Tool (PET) to ensure appropriate current and forward pricing rates
- SEER labor estimate generated at the 80% confidence level
  - 80% estimate includes project margin (industry standard for fixed-price bids)
  - Based on Monte-Carlo analysis accounting for uncertainty in cost model inputs
  - Uses SNL-calibrated staff capabilities – the parameter model is calibrated to actual SNL project results for a similar sized ground system

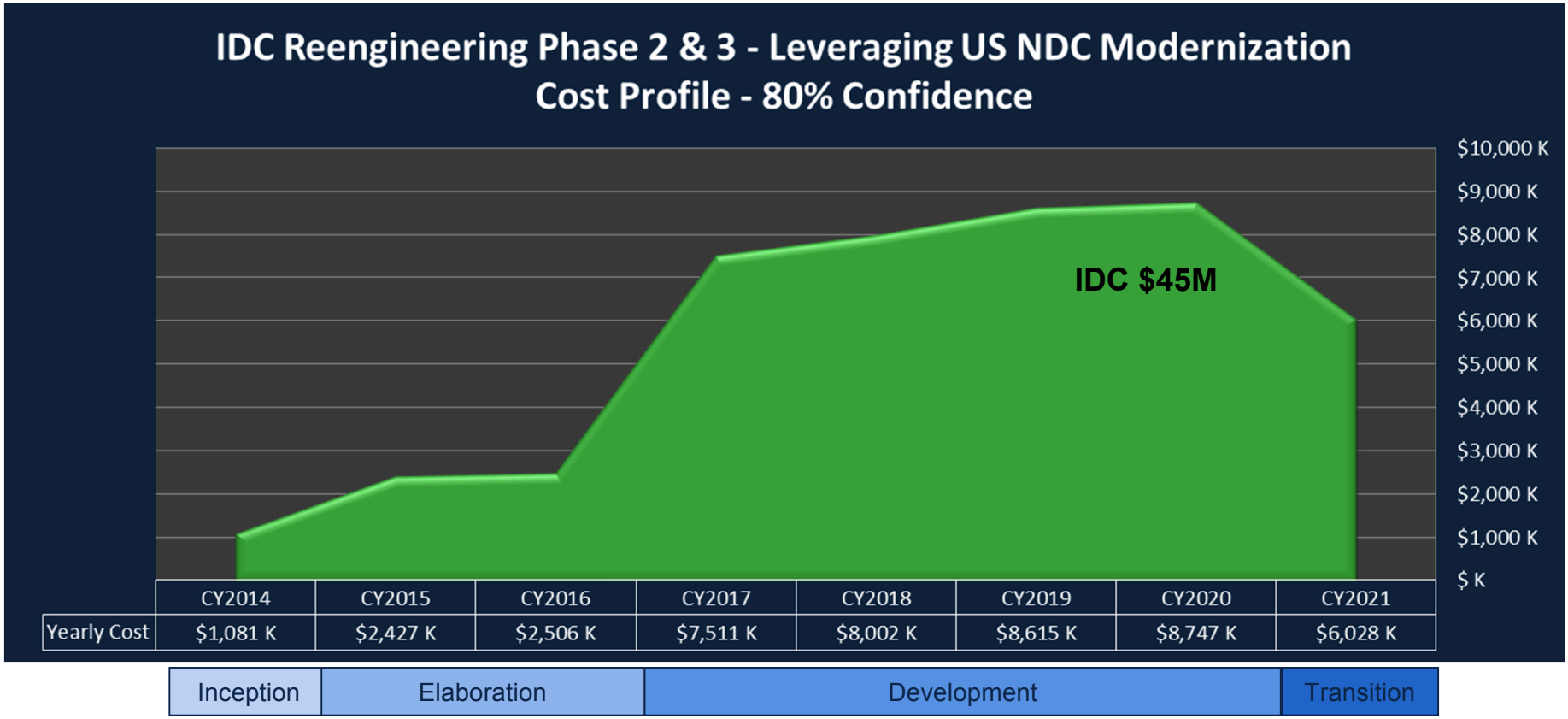
Cost Summary

IDC Reengineering Phase 2 & 3	*Leveraging fully-funded US NDC Modernization*
	80% Confidence
RP2 - Inception	$1,081 K
RP2 - Elaboration	$4,933 K
RP3 - Development & Transition	$38,904 K
Total Cost	**$44,918 K**
Current Investment in RP2 - Inception	$1,081 K
Balance Due	**$43,837 K**

- Estimated additional cost for IDC Re-engineering if leveraging a fully-funded US NDC Re-engineering project is $45M (80% confidence)
- Although this is an initial ROM estimate; uncertainty is low due to:
  - Similarity to the NDC Re-engineering project
  - Capability of the IDC leadership and staff demonstrated in similar project over the past three years
  - Full support from AFTAC in providing starting artifacts from the NDC Re-engineering project

IDC Re-engineering Estimate

(Leveraging US NDC Re-engineering)



Summary

- Leveraging the fully-funded US NDC Re-engineering project will achieve substantial cost reduction for the IDC Re-engineering project
  - ROM cost estimate for IDC Re-engineering phases 2 & 3 = $45M
  - 80% confidence estimate accounts for margin, consistent with industry practice for fixed-price bids