

High Bridge Associates, Inc.

June 29, 2015

Phase 1 Executive Summary & Overview prepared for the MOX Services Board of Governors

**High Level Independent Review of
Aerospace April 13, 2015 LCCE Report TOR-2015-01848
Plutonium Disposition Study Options Independent Assessment**



“Connecting Vision and Plans with Performance and Execution”

**Phase 1 Executive Summary and Overview
High Level Independent Review of
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1. EXECUTIVE SUMMARY

High Bridge Associates, Inc. (High Bridge) performed an Independent Review of the Aerospace April 13, 2015 LCCE Report TOR-2015-01848 Plutonium Disposition Study Options Independent Assessment. High Bridge preliminary key findings and conclusions regarding the Aerospace Assessment Report include:

- A. The Option 1 MOX project is at a CD-3 status of complete design/construction and Aerospace generally evaluates risk/cost impacts as high impact and high likelihood of occurrence. The Option 4 Downblend is at a CD-0 status of pre-conceptual design and Aerospace generally evaluates risk/cost impacts as low impact and low likelihood of occurrence. High Bridge finds this illogical and incorrect.
- B. The identification and analysis of risk issues/contingency impacts identified in Appendix B for Option 1 MOX Fuel and Option 4 Downblend is flawed. High Bridge concludes that several Option 1 MOX risk elements and resulting impact costs are overstated and inconsistent. High Bridge also concludes that several Option 4 Downblend risk elements and resulting impact costs are understated, and that technical/licensing requirements do not appear to be well understood.
- C. Base costs, contingency/risks, funding limits, escalation, and real year (RY) costs for Options 1 and 4 were presented in a manner that was difficult to follow. This provided an apparent focus on escalated RY costs which are highly influenced by the assumed funding levels in the report. High Bridge performed a preliminary evaluation of risks/contingency base costs excluding escalation. **Table E1** reflects that the \$FY14 LCCE for Option 1 MOX and Option 4 Downblend are nearly the same after incorporating the High Bridge assessment of risks and contingency cost impacts:

Table E1 (Same as Exhibit 5)

High Bridge Cost Comparison		
Option 1 MOX Fuel and Option 4 Downblend Alternatives		
Cost Element	Option 1 - MOX (\$B FY14)	Option 4 - Downblend (\$B FY14)
Unescalated Base Cost (with Contingency)	24.3	13.0
Aerospace Evaluation of Risks/Contingency	7.4	2.3
High Bridge Evaluation of Risks/Contingency	3.7	9.3
Aerospace and High Bridge Differences	-3.7	7.0
Evaluated Cost Reflecting Differences	20.6	20.0

- D. Without adequate funding levels, no NNSA/DOE project will have an optimum schedule as a basis to proceed effectively and to achieve its mission efficiently. The funding levels evaluated in the Aerospace Report were below the levels that allow for efficient completion of the Option 1 MOX project and result in longer schedules and higher costs. Aerospace also utilized inconsistent assumptions in calculating the impacts of reduced funding in that they used escalated costs but did not escalate funding to match. High Bridge also concludes that the funding levels for Option 4 Downblend will need to be higher and include MOX termination costs.
- E. The programmatic risks associated with abandoning Option 1 MOX Fuel and transitioning to Option 4 Downblend are enormous and are not addressed, either qualitatively or quantitatively. The geo-political and non-proliferation value for Option 1 MOX Fuel that is defined in the original 2000 Plutonium Management and Disposition Agreement (PMDA) remain relevant today and cannot be ignored.
- F. As a new project at CD-0 status, there are significant Option 4 Downblend production facility and WIPP issues and risks that have not been adequately considered or evaluated in the Option 4 LCCE. Commencing Downblend operations in 2018 would require moving from CD 0 to CD 4 in less than three years. High Bridge concludes this is extremely unrealistic and not achievable.

2. REPORT OVERVIEW

Background - On June 10, 2015, the MOX Services LLC Board of Governors (MOX Services) requested High Bridge Associates, Inc. (High Bridge) to perform an Independent Review of the Aerospace April 13, 2015 LCCE Report TOR-2015-01848 Plutonium Disposition Study Options Independent Assessment (Aerospace Assessment Report). The purpose of this High Bridge task is to provide an objective analysis of the approach/process used by Aerospace, and of the results contained in its Assessment of the April 2014 Plutonium Working Group (PWG) Report of Disposition Options for the Option 1 MOX Fuel Project and Option 4 Downblend Life Cycle Cost Estimates (LCCE).

High Bridge is a planning and project management company providing consulting and project staffing support services to the commercial nuclear power generation, Department of Energy (DOE), petro-chemical, and industrial business sectors. High Bridge experts are intimate with and understand the technical design and regulatory licensing requirements that drive the parameters for program planning and project execution for complex nuclear and process facilities. It has performed hundreds of 3rd party reviews of cost estimates/schedules/risk contingency assessments developed by others. High Bridge organized a Review Team of industry experts with an average of 40 years of relevant commercial nuclear power and DOE program experience spanning power generation, plutonium disposition, and complex FOAK facilities. This report provides its initial key findings and conclusions.

Overview of Findings and Conclusions - Given the Aerospace charter began with the PWG Analysis To-Go values, High Bridge found the Aerospace Assessment Report to be organized and professional. However, based on its preliminary two-week review, High Bridge finds that various aspects of the Aerospace assessment approach, analysis, and presented results were unclear, inconsistent, and unsupported. Some key findings and conclusions include:

1. The programmatic risks associated with abandoning Option 1 MOX Fuel and transitioning to Option 4 Downblend are enormous and are not addressed, either qualitatively or quantitatively:
 - a. In the past, Russia has rejected any option that does not convert weapons Plutonium to a non-weapons transuranic form, including immobilization. The Option 4 Downblend process is less rigorous than the Immobilization Option that was rejected by Russia in the past.
 - b. Transitioning to the Option 4 Downblend approach would at best require years of negotiation and/or result in Russia withdrawing from the PMDA. This in turn would delay the start and significantly increase overall costs.
 - c. For Option 1 MOX Fuel, there is no identification or discussion of its strategic value that is consistent with the ROC 62 and the 2000 Plutonium Management and Disposition Agreement (PMDA) between the US and Russia.

High Bridge concludes that the geo-political and non-proliferation value for Option 1 MOX Fuel that is defined in the original 2000 United States-Russia Plutonium Management and Disposition Group (PMDA) remain relevant today and cannot be ignored.

2. There are significant Option 4 Downblend production facility and WIPP issues and risks:
 - a. There are very high risks for proceeding with Downblend Production Facility and WIPP activities without a revised agreement and concurrence from Russia (see Item 1 above).
 - b. The assumptions of a fast track schedule and no funding restraints for the Option 4 Downblend Facility and WIPP are very unrealistic and unlikely. Commencing Downblend operations in 2018 would require moving from CD 0 to CD 4 in less than three years.
 - c. Inadequate time exists for licensing/design of the Downblend Production Facility.
 - d. Option 4 will require a license amendment, have related impacts on WIPP operations, and require a modification approval of the Waste Acceptance Criteria.
 - e. The likelihood for an increase in physical size of the Waste Isolation Treatment Plant (WIPP) is higher than presented by Aerospace. Various issues will drive this like criticality, concentration, and waste acceptance criteria. Transportation and material handling costs are also likely understated.
 - f. The requirements for the National Environmental Policy Act (NEPA) Environmental Impact Statement process for the Downblend and WIPP facilities were not addressed.

High Bridge concludes these above issues and risks have not been adequately considered or evaluated in the Option 4 LCCE. The schedule impact on escalation and the contingency risk exposure window is significant. Commencing Downblend operations in 2018 would require moving from CD 0 to CD 4 in less than three years. High Bridge concludes this is extremely unrealistic and not achievable.

3. Without adequate annual funding levels, no NNSA/DOE project will have an optimum schedule as a basis to proceed effectively and to achieve its mission efficiently:
 - a. For Option 1, the To-Go cost estimate outcome is distorted by the extended project schedule due to the assumed funding constraints.
 - b. For Option 1, project costs were escalated but annual funding was not escalated, which is an inconsistent approach to the LCCE. This approach exacerbated the impact on the project schedule and the ultimate cost of funding constraints. The normal practice would be to evaluate an investment decision based on constant year dollars.
 - c. For Option 1, it is not clear why a LCCE case was not developed for full funding consistent with the 2012 Re-Baseline proposal. If fully funded, the MOX project construction would complete years earlier than the Aerospace report stated with a reduction in total cost.
 - d. For Option 4, the funding levels will need to be higher and include MOX termination costs.

High Bridge will evaluate full funding outcomes during its Phase 2 detailed review.

4. Base costs, contingency/risks, funding limits, escalation, and real year (RY) costs for Options 1 and 4 were presented in a manner that was difficult to follow. This provided an apparent focus on escalated RY costs. High Bridge developed the below **Exhibit 1** (Option 1) and **Exhibit 2**

(Option 4) to provide a simple breakdown of FY2014 \$ costs for construction, operations, other programs, and total. This provides a clearer picture for these key decision making cost elements.

Exhibit 1

OPTION 1 MOX AEROSPACE REPORT COSTS (\$FY14 - ETC Unconstrained)						
	MFFF Construction	Operations	MIFT and Other	Changes Since PWG 2014	Total	% of Total
Base	\$ 4,342.0	\$ 6,255.4	\$ 5,924.2	\$ 1,136.0	\$ 17,657.6	73%
Contingency	\$ 2,113.8	\$ 2,249.2	\$ 2,310.2	\$ -	\$ 6,673.2	27%
Total	\$ 6,455.8	\$ 8,504.6	\$ 8,234.4	\$ 1,136.0	\$ 24,330.8	100%
Escalation	\$ 1,255.0	\$ 3,551.0	\$ 1,864.0	\$ 4,340.0	\$ 11,010.0	
	\$ 7,710.8	\$ 12,055.6	\$ 10,098.4	\$ 5,476.0	\$ 35,340.8	

In comparison to the constrained Aerospace funding model, the \$35.3 billion compares to the \$47.5 billion, illustrating the tremendous impact of the assumed funding limitation on contingency and escalation. **Exhibit 1** utilizes the Aerospace data with only the assumed funding level adjusted.

Exhibit 2

OPTION 4 DOWNBLEND AEROSPACE REPORT COSTS (\$FY14 - ETC)							
	MFFF Termination	WIPP Capital	Operations	MIFT and Other	Changes Since PWG 2014	Total	% of Total
Base	\$ 1,492.0	\$ 214.0	\$ 2,094.0	\$ 4,444.0	\$ 1,873.0	\$ 10,117.0	78%
Contingency	\$ 571.5	\$ -	\$ 1,142.9	\$ 1,205.7	\$ -	\$ 2,920.1	22%
Sub Total	\$ 2,063.5	\$ 214.0	\$ 3,236.9	\$ 5,649.7	\$ 1,873.0	\$ 13,037.1	100%
Escalation	\$ 34.0	\$ 73.0	\$ 912.0	\$ 1,082.0	\$ 1,547.0	\$ 3,648.0	
Total	\$ 2,097.5	\$ 287.0	\$ 4,148.9	\$ 6,731.7	\$ 3,420.0	\$ 16,685.1	

Exhibit 2 reflects the Aerospace data presented consistently for comparison with **Exhibit 1**.

5. The identification and analysis of risk issues/impacts identified in Appendix B for Option 1 MOX Fuel and Option 4 Downblend is flawed:
 - a. Risk elements and resulting impact costs for Option 1 MOX Fuel appear to be overstated, redundant, and inconsistent.
 - b. Risk elements and resulting impact costs for Option 4 Downblend appear understated and technical/licensing requirements do not appear to be well understood. Some specific risks were not identified.

High Bridge developed **Exhibit 3** (Option 1) and **Exhibit 4** (Option 4) to provide a preliminary parametric assessment (no Monte Carlo simulation performed) of key risks, likelihood of occurrence, and approximate cost impacts. These indicate that Option 1 MOX Fuel evaluated risk/cost impacts are significantly overstated and that Option 4 Downblend evaluated risk/cost impacts are significantly understated. The added risk values in **Exhibit 4** are rough order-of-magnitude based on experience. High Bridge will review and evaluate these risk/cost impacts in greater detail during Phase 2 of the High Bridge independent review.

Exhibit 3

Option 1, MOX Fuel Risk Table Comparison from Aerospace 2015 Assessment, Appendix B					
Rank	Title	Aerospace		High Bridge	
		Likelihood	Total Impact (\$M)	Likelihood	Total Impact (\$M)
1	Fuel Production Rate Lower Than Expected	75%	\$ 3,111.50	75%	\$ 3,111.50
2	Feedstock Production Rate Lower Than Expected	75%	\$ 1,362.80	0%	\$ -
3	MFFF Construction Cost Uncertainty / Growth	75%	\$ 998.60	0%	\$ -
4	MFFF Temporary Suspension of Operations	90%	\$ 697.30	0%	\$ -
5	MFFF Full Construction Re-Start Delay	50%	\$ 641.60	10%	\$ 100.00
6	Feedstock Temporary Suspension of Operations	90%	\$ 283.20	25%	\$ 75.00
7	SRS Overhead Cost Increases	75%	\$ 194.10	25%	\$ 50.00
8	Facilities and Infrastructure Life-cycle/Sustainment (Recapitalization)	90%	\$ 157.00	90%	\$ 157.00
9	LANL Overhead Cost Increases	25%	\$ 118.10	25%	\$ 118.10
10	MFFF Hot Operations Delay after CD-4 Complete	50%	\$ 100.00	0%	\$ -
11	MFFF Integrated Functional Testing Delay Before CD-4	25%	\$ 96.70	50%	\$ 175.00
12	Needs for Additional Storage	50%	\$ 46.10	0%	\$ -
13	LANL Feedstock Production Re-Start Delay	25%	\$ 30.40	25%	\$ 30.40
14	Funding for Depleted Uranium	10%	\$ 2.10	10%	\$ 2.10
15	Feedstock Production Consolidated at LANL (Remove HB-Line)	75%	\$ (396.10)	25%	\$ (130.00)
	Total		\$ 7,443.40		\$ 3,689.10
High Bridge - Aerospace = (\$3.7 billion)					
	Gray = Project Cost Risk		\$ 1,736.90		\$ 275.00
	White = Federal Cost Risk		\$ 5,706.50		\$ 3,414.10

- The Option 1 MOX technical risks are not as high or as likely as characterized. The MOX process is not new. The design is based on similar facilities operating in France. The Option 1 MOX project is at a CD-3 status of complete design/construction and Aerospace generally evaluates risk/cost impacts as high impact and high likelihood of occurrence. The Option 4 Downblend is at a CD-0 status of pre-conceptual design and Aerospace generally evaluates risk/cost impacts as low impact and low likelihood of occurrence. High Bridge finds this illogical and incorrect. High Bridge will review the LCCE operating campaigns, throughput, availability, and other basis parameters in the 2012 Re-Baseline in greater detail during Phase 2 of the High Bridge independent review.
- High Bridge identified no apparent duplication of risk between the Aerospace report and the PWG report. Overall, the PWG identified risks were more technical in nature and the risks identified by Aerospace were more programmatic in nature. However, within the Aerospace risk list there appear to be risks that are duplicative, or additive of other risk within the Aerospace list. The Aerospace risks were used to calculate cost and schedule contingency and

added to the earlier PWG estimated values. This results in larger than necessary cost and schedule contingency impacts. It should be noted that the majority of Aerospace identified risks are federal/programmatic and not project. The risk/contingency costs for Option 1 will be evaluated and reconciled during Phase 2 of the High Bridge independent review.

Exhibit 4

Option 4, Downblend Risk Table Comparison from Aerospace 2015 Assessment, Appendix B					
Rank	Title	Aerospace		High Bridge	
		Likelihood	Total Impact (\$M)	Likelihood	Total Impact (\$M)
1	Feedstock Production Rate Lower Than Expected	75%	\$ 1,341.50	75%	\$ 1,341.50
2	SRS Downblend Facility Start Delay	25%	\$ 338.50	90%	\$ 1,500.00
3	Feedstock Temporary Suspension of Operations	90%	\$ 247.00	90%	\$ 247.00
4	Downblend Production Rate is Lower Than Expected	25%	\$ 188.10	75%	\$ 600.00
5	Downblend Facility Temporary Suspension of Operations	90%	\$ 175.90	90%	\$ 175.90
6	Downblend Construction Cost Estimate Uncertainty/Growth	75%	\$ 174.70	75%	\$ 174.70
7	LANL Overhead Cost Increase	25%	\$ 119.20	75%	\$ 420.00
8	MFFF Project Termination Cost Uncertainty	25%	\$ 81.10	25%	\$ 81.10
9	Downblend Repository Temporary Suspension of Operations	90%	\$ 41.60	90%	\$ 41.60
10	SRS Overhead Cost Increase	75%	\$ 31.40	75%	\$ 31.40
11	Feedstock Production Re-Start Delay at LANL	25%	\$ 30.10	25%	\$ 30.10
12	Exceed Downblend Repository TRU Allowable Storage Volume	10%	\$ 22.00	50%	\$ 1,000.00
13	Need for Additional Storage Volume	25%	\$ 12.70	25%	\$ 12.70
14	Facilities and Infrastructure Life-cycle/Sustainment (Recapitalization)	75%	\$ 8.60	75%	\$ 8.60
15	Feedstock Milling and Blending Not Needed/Quality Control Reductions	90%	\$ (44.10)	50%	\$ (22.10)
16	Feedstock Production Consolidated at LANL (Remove HB-Line)	90%	\$ (479.30)	10%	\$ (100.00)
	Sub Total		\$ 2,289.00		\$ 5,542.50
17	Programmatic failure of PMDA Due to Russian Federation Rejection of Op 4		\$ -	90%	\$ 1,000.00
18	Inability to address Licensing issues at WIPP due to recovery program for 2/14 accident until after restart (~FY2017)		\$ -	90%	\$ 250.00
19	NEPA Process for Dilution and Disposal Option takes more than expected		\$ -	50%	\$ 250.00
20	NEPA Revision to WIPP EIS process takes longer than expected		\$ -	75%	\$ 250.00
21	NMED Disputes Land Use Issues		\$ -	50%	\$ 250.00
22	High risk of proceeding with Downblend production facility and WIPP without revised agreement and concurrence from Russia (see Item 17 above).		\$ -	90%	\$ 500.00
23	Fastrack Licensing not permitted		\$ -	50%	\$ 500.00
24	Funding Constraints imposed on dilution option		\$ -	50%	\$ 500.00
25	Potential licensing impact on WIPP operations and modification/acceptance of Waste Acceptance Criteria.		\$ -	25%	\$ 250.00
	Sub Total		\$ -		\$ 3,750.00
	Total		\$ 2,289.00		\$ 9,292.50
High Bridge - Aerospace = \$7.0 billion					
	Gray = Project Cost Risk		\$ 525.90		\$ 1,687.40
	White = Federal Cost Risk		\$ 1,763.10		\$ 7,605.10

For Option 4, the project risks for constructing the facilities are notably absent, which is inconsistent with a CD 0 program.

High Bridge's evaluation of these risks/impacts indicates the LCCE costs for Options 1 and 4 are nearly the same.

8. Base costs, contingency/risks, funding limits, escalation, and real year (RY) costs for Options 1 and 4 were presented in a manner that was difficult to follow. This provided an apparent focus on escalated RY costs. High Bridge performed a preliminary evaluation of risks/contingency cost impacts. **Exhibit 5** reflects that the \$FY14 LCCE for Option 1 MOX and Option 4 Downblend are nearly the same after incorporating the High Bridge assessment of risks and contingency cost impacts:

Exhibit 5 (Same as Table E1)

High Bridge Cost Comparison		
Option 1 MOX Fuel and Option 4 Downblend Alternatives		
Cost Element	Option 1 - MOX (\$B FY14)	Option 4 - Downblend (\$B FY14)
Unescalated Base Cost (with Contingency)	24.3	13.0
Aerospace Evaluation of Risks/Contingency	7.4	2.3
High Bridge Evaluation of Risks/Contingency	3.7	9.3
Aerospace and High Bridge Differences	-3.7	7.0
Evaluated Cost Reflecting Differences	20.6	20.0

9. The Aerospace values presented and added for “changes” to the PWG To-Go costs lacked visibility, formal discussion, and back up. High Bridge concludes that a significant cost element like this (~\$5 Billion RY) should have been covered in more detail.
10. The Aerospace and PWG values presented and added for “MIFT” to the To-Go costs lacked visibility, formal discussion, and back up. High Bridge concludes that a significant cost element like this (~\$10 Billion RY) should have been covered in more detail.
11. As reflected on **Exhibits 1 and 2**, escalation represents a significant portion of the total RY LCCE with full annual funding levels, and an even greater portion under the Option 1 MOX Fuel constrained funding levels/extended schedules presented in the Aerospace Assessment Report. High Bridge preliminary conclusions indicate that:
- Escalation indices for Options 1 and 4 applied by Aerospace for capital costs were higher than industry guidance/High Bridge experience would apply.
 - Escalation for Option 1 MOX Fuel construction-to-complete duplicated what the PWG had already calculated.

High Bridge will review this item in greater detail during Phase 2 of the independent review.

12. The Aerospace Assessment Report references the potential for revenue generation from the sale of MOX fuel elements, but provides no analysis or credit to offset LCCE costs. High Bridge will review this item in greater detail during Phase 2 of the High Bridge independent review.
13. The Aerospace Assessment Report provides no mention or analysis of value for the generation of clean/non carbon emitting electric energy, or of the GNP and federal tax revenue value related to electricity generation sales. High Bridge will review these items in greater detail during Phase 2 of the High Bridge independent review.

3. BACKGROUND

3.1 High Bridge Associates

High Bridge Associates, Inc. (High Bridge) is a Certified Woman Owned Business. It is a planning, integration, and project management company providing consulting and project staffing support services to the commercial nuclear power generation, Department of Energy (DOE), petrochemical, and industrial business sectors. **Appendix A** provides an Overview of High Bridge Qualifications. Commercial nuclear power represents over 60% of High Bridge business, with DOE and other Federal programs forming about 20% of our activities. In summary:

Customers

- 70% Utility, Industrial, & Federal Government *Owners*
- 20% Engineering, Procurement, & Construction *Contractors*
- 10% Original Equipment *Manufacturers*

Industries

- 90% Commercial Power Generation
 - 70% Nuclear
 - 20% Fossil (Coal/CGTG) & Renewable (Wind/Solar/Biofuel)
 - 10% Government, Science/R&D, Industrial, & Petro Chemical

High Bridge experts are intimate with and understand the technical design and regulatory licensing requirements that drive the parameters for program planning and project execution for complex nuclear and process facilities. It has supported many First of a Kind (FOAK) projects providing a broad cadre of project management and planning services. **Exhibit 6** below provides a summary of selected High Bridge customers spanning owners, EPC, and OEM organizations.

Exhibit 6

Selected Owner & Agency Customers

Ameren Energy, Amoco, American Electric Power, Arizona Public Service, British Energy/UK, BNFL, Chevron, Constellation Energy, Dominion Energy, Duke Energy, Entergy, Exelon, Exxon, Florida Power & Light/NextEra, Honeywell, International Atomic Energy Agency (IAEA), ITER International Fusion Project, Luminant Energy, Magnox Electric UK, Nebraska Public Power District, Nuclear Management Corp., Nuclear Management Partners/Sellafield, Ontario Power/Canada, Southern California Edison, STPNOC/NRG, Tennessee Valley Authority, Louisiana Energy Services/URENCO, & US DOE/National Nuclear Security Agency/National Labs at Albuquerque, Argonne, Fermi, Idaho, Kansas City Plant, Los Alamos, Oak Ridge, Princeton, Richland, Savannah River, & Stanford

Selected EPC Customers

Alberici, Altran Mediterranee, Bechtel, Burns and Roe, CH2MHill, Fluor, Graycor, Jacobs, Kiewit, Parsons, Sachs Electric, SAIC, Sargent & Lundy, Shaw Environmental, CB&I Shaw Nuclear, Tetra Tech, URS/Washington Group, Worley Parsons

Selected OEM Customers

Alstom, Areva, Babcox & Wilcox, Cogema, Framatome, Foster Wheeler, GE Power, Holtec, Mitsubishi, NuScale, SPX Technologies, Toshiba, Voith Power, Westinghouse

3.2 Independent Review Selection, Charter, and Approach

On June 10, 2015 MOX Services Board of Governors requested High Bridge to perform an Independent Review of the Aerospace April 13, 2015 LCCE Report TOR-2015-01848 Plutonium Disposition Study Options Independent Assessment (Aerospace Assessment Report). The purpose of this High Bridge task is to provide an independent and objective analysis of the approach, process, and results that Aerospace used for its Assessment of the Option 1 MOX FUEL Project and Option 4 Down-Blending approach Life Cycle Cost Estimates (LCCE) provided in the April 2014 Plutonium Working Group (PWG) Report of Disposition Options. High Bridge was selected based on its unique corporate qualifications and Team Expert experience including:

- Experience supporting Plutonium Disposition Program activities in the 1990's leading to the January 21, 1997 Record of Decision (ROD 62 FR 3014) and Final Programmatic Environmental Impact Statement for the Storage and Disposition of Weapons-Usable Fissile Materials, including fabrication of surplus plutonium into MOX fuel for use in existing domestic commercial reactors.
- Experience and DOE team member in the 1990's for negotiating the September 2000 PMDA Plutonium Disposition Agreement between Russia and the USA.
- Relevant insights and experience supporting the MOX FUEL project with planning, scheduling, risk assessment, and earned value activities since 1999. This included independent assessments to provide realistic construction labor hours, schedule duration, and contingency inputs for the MOX FUEL 2012 Revised Baseline.
- Best in class commercial nuclear power and FOAK project experience dealing with the requirements and parameters for planning and executing complex projects.

A reference material eRoom was established to provide High Bridge experts with access to the Aerospace Assessment Report and other relevant information. A two-phase approach is being used by High Bridge to provide this Independent Review:

- Phase 1 – Conduct a high level Independent Review in two weeks and produce an Executive Summary Report of key findings, analyses, and conclusions by June 24, along with a plan and approach to continue with a more detailed Phase 2 independent review and analysis.
- Phase 2 – Continue the Independent Review with a more detailed analysis of Aerospace and other program information over seven weeks and produce a Detail Report of issues, analyses, and conclusions by August 14, 2015. This Phase 2 will include interviews with MOX Services stakeholders and digging into the 2012 MOX Revised Baseline that served as the basis for the Plutonium Working Group (PWG) April 2014 Plutonium Options Report and the Aerospace Assessment Report.

3.3 Review Team Organization and Experience

High Bridge organized a Review Team of industry experts in several days and began review and analysis of the Aerospace Assessment Report and other information in the eRoom.

- Detail Review Experts – Ken Aupperle, Rick Drake, Charlie Hess, Dr. Mike High, and Barth Loney
- Peer Review Experts – Charlie Anderson, Dr. Andy Kadak, and Steve Maehr

The High Bridge Review Team members have an average of 40 years of relevant commercial nuclear power and DOE program experience spanning power generation, plutonium disposition, environmental/waste management, and complex FOAK facilities. Most of the Review Team members have worked together in the past performing similar Independent Reviews and Assessments, allowing for a quick start and efficient communications/analyses to perform this task in an expedited and intense fashion. **Exhibit 7** below provides a summary of High Bridge Review Team Expert Experience.

Exhibit 7

High Bridge Independent Review of Aerospace April 13, 2015 LCCE Report TOR-2015-01848 Summary of High Bridge Review Team Expert Experience							
Name		Years Nuclear/ DOE Experience	Past Experience Working Together	MOX Project Experience	Plutonium Disposition Program Experience	FOAK Project Experience	Specific Unique/Relevant Experience
	<u>Detail Review Experts</u>						
1	Ken Aupperle (Task Lead)	>40	X	X	X	X	Task Lead for Fissile Material Disposition Program (FMDP), DOE HQ Office, Historical Cost Estimating Program Review & Support, Assessment of Technology Cost Impacts/Trends (2000 to 2002).
2	Rick Drake	>35	X	X	X	X	Assessment Team Member for review of MOX 2012 Re-Baseline construction labor hours, schedule duration, & contingency. Member of other MOX Assessment Teams since 2010.
3	Charlie Hess	>35	X	X	X	X	Was DOE team member in the 1990's that negotiated the Plutonium Disposition Agreement between Russia & the USA. He was responsible for developing/integrating the schedule of activities for the Russian MOX facilities & for coordinating with the US MOX program .
4	Dr. Mike High	>50	X	X	X	X	Assessment Team Member for review of MOX 2012 Re-Baseline construction labor hours, schedule duration, & contingency. MOX schedule/risk assessment team member 2000-2002.
5	Barth Loney	>35	X	X	X	X	Performed multiple Independent Project Reviews of the MOX project for the Office of Environmental Management (EM) in 2007-2009. Worked with EM from 2003-present on all of their waste disposition projects. Experience with other FOAK project for DOE such as the Waste Treatment Plant (WTP) at Hanford. Was on original recovery team from HQ for WTP in 2005-2006.
	<u>Peer Review Experts</u>						
6	Charlie Anderson	>35	X	X	X	X	Currently serving as General Manager of the TRU Waste Processing Center (TWPC), Oak Ridge, for processing and extended storage. Prior to this, supported Nuclear Waste Partners in recovery efforts at the WIPP.
7	Dr. Andy Kadak	>40	X			X	Served on the DOE Nuclear Waste Technology Review Board regarding high-level waste disposal. Is familiar with the challenges of WIPP and HLW waste disposal as well as NRC nuclear licensing and construction experience.
8	Steve Maehr	>35	X	X	X	X	Mr. Maehr is president, CEO, and co-founder of High Bridge Associates. He has led or participated in over 50 independent assessments of complex nuclear and process facilities.

One-page Experience Biographies for each Review Team Expert are provided in **Appendix B**.

Detailed Experience Resumes for each Review Team Expert are provided in **Appendix C**.

One-paragraph Experience Summaries for each Review Team Expert are provided below.

Ken Aupperle (Task Lead) - Mr. Aupperle is a High Bridge Senior Vice President and Management Consultant. He has over 40 years of experience in project and construction management, cost estimating, planning, scheduling, project controls, earned value, and risk management. His experience spans the design, construction, operation/maintenance, and outage/modification of commercial nuclear/fossil power, industrial, environmental, and U.S. Department of Energy (DOE) projects. He has managed/performed numerous high level consulting assignments providing independent detailed cost estimates; independent high level cost reviews, schedule and risk assessments; and due diligence reviews for large capital projects, Life Cycle Cost Estimates, operating/maintenance activities, and decommissioning/waste management programs. *He was Task Lead for the DOE Fissile Material Disposition Program (FMDP) HQ Office to perform a Historical Cost Estimating Program Review and Support Task to compile and analyze Disposition Technology Cost Impacts/Trends (2000 to 2002).* Mr. Aupperle leads High Bridge development and maintenance of its nuclear industry cost and schedule data base, and its analysis of industry risk issues and contingency considerations. He has conducted research of cost/schedule/risk performance records for more than 100 US commercial nuclear and DOE science projects, and presented numerous Industry Lessons Learned presentations/papers at the American Nuclear Society and other industry forums. He consults as a Subject Matter Expert (SME) for the International Atomic Energy Agency (IAEA) for Project Management, Program Planning, and Integration on IAEA Planning/Training Missions for Member Nations.

Rick Drake - Mr. Drake has over 35 years of experience in the commercial nuclear power industry spanning design, construction, procurement, Project Management, startup, operation/maintenance, and outage/modification phases. He began his career working for Bechtel Power and held positions of increasing responsibility in support of construction, start up, outage, and continuing maintenance activities during the construction, commissioning, and operation of Palo Verde Nuclear Plant from 1978 to 1990. He held key department line management positions with the Tennessee Valley Authority Nuclear (TVAN) organization from 1990 to 2005 at each of the TVA Nuclear Sites and the corporate headquarters. He served as the construction manager for the completion of Watts Bar Unit 1 and Browns Ferry Unit 1 restart. Since 2006, Mr. Drake has been a Vice President and Senior Consultant with High Bridge Associates. He has led multi-discipline teams of personnel spanning numerous locations and contractor organizations, producing effective results in dynamic environments amid multiple priorities and aggressive deadlines. He has worked supporting various Project Assessments and Project Management/Controls Deployment Planning Reviews for New Nuclear Projects. He led the High Bridge activities for STPNOC STP 3 & 4 supporting independent cost and schedule assessments of Toshiba and Fluor. Mr. Drake was Co-Lead on an Independent Project Assessment Team for Toshiba to review and critique Fluor's estimates for STP Units 3&4, which identified more than \$1 billion in potential reductions to the Fluor Estimate, and developed alternative strategies for contractual approaches for future contracting.

Charlie Hess - Mr. Hess has over 35 years of experience in the power industry and has been involved with development, design, engineering, construction, operation, and decommissioning of various nuclear facilities. He is active with industry programs in preparation for new large and small reactor nuclear facilities, and is familiar with all nuclear technologies and NRC requirements. He is a recognized expert in light water reactors, sodium cooled fast reactors, and high temperature gas cooled reactors. He also has worked on pool-type research reactors, homogeneous aqueous reactors and Thorium based fuel cycles. He has designed fuel fabrication facilities, reprocessing

facilities high-level waste vitrification facilities, and fuel storage facilities. He managed completion of engineering, operational support, and decommissioning projects for large and small energy facilities. With nearly 20 years in responsible positions for nuclear industry, he has a thorough understanding of owner and regulatory issues balanced with extensive EPC experience and constructability/maintainability issues. He is a Registered Professional Engineer in Pennsylvania, with a BS degree in Nuclear Engineering and has been a Certified Project Management Professional. *Mr. Hess was part of the DOE team that negotiated the Plutonium Disposition Agreement between the Russians and the USA. He was responsible for developing and integrating the schedule of activities for developing the Russian MOX facilities and for coordinating with the US MOX program in the 1990s. He understands the issues surrounding plutonium disposition.*

Dr. Mike High - Dr. High has over 50 years of experience with advanced technology and first-of-a-kind (FOAK) projects spanning research, development, demonstration, engineering, construction, operations, and maintenance in the power generation, environmental, and aeronautical industries. He has testified before various congressional subcommittees regarding environmental issues, acid rain legislation, and the U.S. Department of Energy's fossil and nuclear energy budgets. He chaired the Electric Power Research Institute's (EPRI) Environmental Research Division Advisory Committee and served for five (5) years as a member of the EPRI Research Advisory Committee. As a member of the EPRI Ad Hoc Committee on Advanced Reactor Programs (ARP), he provided policy and technical guidance on making light water reactors simpler and enhancing their safety features through the Advanced Light Water Reactor (ALWR) Utility Steering Committee. Dr. High practiced in the field of aeronautical and aerospace engineering for nearly twenty years, first at Pratt & Whitney Aircraft Company and more extensively at the U.S. Air Force Arnold Engineering and Development Center located near Tullahoma, Tennessee. He joined the Tennessee Valley Authority (TVA) in 1980 and served as Division Director for nine years where he was responsible for all aspects of Research, Development, and Demonstration (RD&D) for the TVA electric power system. Since 2000, Dr. High has worked extensively with High Bridge Associates as a Management Consultant providing consulting services, technology assessments, and independent reviews. He has extensive technical, scientific, and financial analytical skills, and is accustomed to supporting large, complex, and multi-disciplined projects with numerous participants. He has performed independent project reviews, risk assessments, feasibility/due-diligence and life cycle cost studies for various commercial and Department of Energy (DOE) projects.

Barth Loney - Mr. Loney has more than 35 years of experience in program / project / engineering management serving in various positions with increasing responsibilities. As a Senior Vice President with High Bridge Associates, Inc., he has a history of successful project/program completions, implementations, reengineering and process improvements. He is an adept professional with the ability to work comfortably in diverse environments, handle multiple tasks simultaneously, and creatively address root causes to develop innovative solutions that have improved processes and contributed directly to bottom line performance. He is a Subject Matter Expert with extensive experience in Project Management, Earned Value Management, Risk Management, and Engineering and Construction Management. His industry experience includes nuclear power, construction and utility background, both in private and federal sectors. He has ten years of experience leading and participating in project reviews for the Department of Energy. He is familiar with multiple standards and requirement, including, but not limited to, DOE Order 413,

PMBOK, and ANSI 748. Some recent assignments for High Bridge supporting multiple DOE Offices include:

- Oak Ridge National Lab (WAI) – TRU Waste Processing Center, Support General Manager in areas of Risk, Earned Value and Budget/Proposal development. Evaluating waste stream trends and cost for the project and budget forecasting options
- Office of Acquisition Project Management (Headquarters) – Led External Independent Review (EIR) team for the CD2/3 submittal of the K-27 D&D project at Oak Ridge. Also served as Risk SME for the review.
- Office of Environmental Management (Headquarters) – provided project controls expertise for a project involving research reactor fuels disposition.

Charlie Anderson - Over 33 years with increasing responsibilities in executive, technical, operations, program, and project management of nuclear materials disposition, nuclear materials production, nuclear waste management, and nuclear and coal fired power generation programs with *Los Alamos National Lab, Nuclear Management Partners, URS Corporation, Washington Group International, the Department of Energy* and the *Tennessee Valley Authority* covering laboratories and complex operating facilities from construction through decommissioning and demolition. He served in senior management positions as a key member of these organizations with responsibilities in leadership, management, oversight, strategic planning, and execution of startups, transitions, and problematic programs. Responsibilities have included annual budgets of \$6.2 Billion and workforces of 3,000 Federal and 30,000 contractor personnel. Work has typically involved bridging technical, business, and political agendas to solve problems in order to achieve programmatic and operational goals and objectives. Performance has always demonstrated a focus on progress and personal commitment. He lead key cross cutting initiatives in most of these organizations, which includes commercial, government, international, and government contractor. He served as Principal Deputy Assistant Secretary of Environmental Management, with the DOE in Washington, DC. Provided innovative and sound leadership in a number of management positions at the Savannah River Site for the Department of Energy including Deputy Site Manager, Assistant Manager for High Level Waste; Director, Office of Defense Nuclear Nonproliferation; Director, Nuclear Materials Disposition; Director, Reactors and Spent Fuel Division; Director, High Level Waste Programs Division; and Director, Liquid Waste Division.

Dr. Andy Kadak - Dr. Kadak has over 40 years of commercial nuclear experience and is President of Kadak Associates, Inc., a consulting firm specializing in management issues and nuclear energy. Prior to resuming his private consulting practice, Dr. Kadak was Principal and Director of Nuclear Services at Exponent, a worldwide company offering multidisciplinary expertise and rapid response capabilities to provide stewardship in addressing complex engineering and scientific problems. Dr. Kadak served on the IAEA special team assessing earthquake and tsunami damage of the Onagawa Nuclear Plant in Japan and has performed extensive studies of the Fukushima Di-iachi Nuclear Plant. Dr. Kadak was s a Professor of the Practice in the Nuclear Engineering Department of the Massachusetts Institute of Technology. His research interests include the development of advanced reactors, in particular the high temperature pebble bed gas reactor, space nuclear power systems, improved technology neutral licensing standards for advanced reactors and operations and management issues of existing nuclear power plants. Recently he was asked to serve on the Small Modular Reactor subcommittee of the Secretary of Energy's Advisory Board. His expertise ranges

from reactor physics, power conversion, safety analysis and engineering systems. Dr. Kadak was President and CEO of Yankee Atomic Electric Company. In this capacity, he was responsible for overseeing all Yankee operations, including the decommissioning of the Yankee plant in Rowe, Massachusetts and engineering, licensing, environmental and operational support to all eight nuclear plants in New England and many other national and international clients. Dr. Kadak was President of the American Nuclear Society in 1999/2000. He was appointed by the President to serve on the US Nuclear Waste Technology Review Board. He has made more than 70 lectures and speeches on topics related to the technical and business aspects of nuclear power.

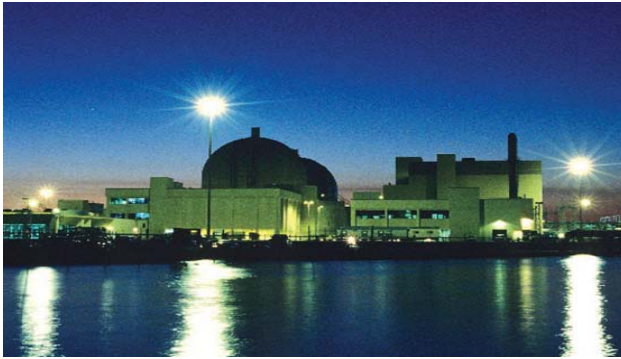
Steve Maehr - Mr. Maehr is President, CEO, and co-founder of High Bridge Associates. He has more than 35 years of experience in Engineering, Project Management, and Executive leadership positions in the electric utility and management services industries. His principal areas of expertise include Strategic Planning, Business Development and Sales, Planning and Scheduling, Budgeting, Financial Planning and Accounting, Maintenance, Outage Management, Management Information Systems, Licensing, Engineering and System Testing. With degrees in Mathematics, Nuclear Engineering (BS) and Industrial Management (MS), he has held positions of increasing responsibility with electric utilities, management service contractors, and consulting/project management companies. Mr. Maehr has a demonstrated record of accomplishment in developing opportunities and assisting customers with managing their projects, programs, and corporate operations. He is an entrepreneurial and strategic thinker, an excellent communicator, and a versatile leader. With his network of resources developed over the years by working with hundreds of owners, specialty contractors, and staff resources, he has an exceptional proficiency in assembling project teams to deliver “Just in Time” skills to customers, when and where they are needed.

APPENDIX A

High Bridge Corporate Qualifications Overview

June 2015

High Bridge Qualifications Overview



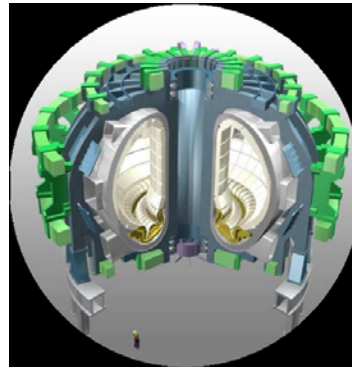
Vogtle Nuclear Power Plant, Georgia



Nuclear Waste Management Complex, Idaho



Sellafield Nuclear Facility, England



ITER Fusion Research Facility, France



Oconee Nuclear Power Plant, South Carolina



“Connecting Vision and Plans with Performance and Execution”

High Bridge Associates



- High Bridge Associates, Inc. (High Bridge) provides project management consulting & staff augmentation services
- We assist owners, engineer/constructors, & manufacturers with new projects & operating plant modifications/O&M
- 2008 through 2014:
 - Average revenue ~ \$50M per year
 - Average 200 employees in >30 states and 8 countries
- Offices in Greensboro, GA and Chattanooga, TN



High Bridge Corporate Evolution

Team Associates 1994 to 2003

- Founders from utilities and EPC firms
- Commercial nuclear, fossil, and DOE EM focus
- Project controls, planning/scheduling, & cost estimating “niche”
- Sold business in 2001 to major customer...GE Power Systems
 - Developed “Web/PC-Based” global project controls/reporting system

High Bridge Associates 2004 to Present

- Expanded staff augmentation support to consulting services
- Established Work Management Inc. (WMI) for operating nuclear plant “niche”
- Developed detailed project scope definition & cost estimating process
 - Best in industry process for scope definition & detailed cost estimating
 - Establishes comprehensive basis for effective change management
 - Data base covering nuclear quantity, U/R, hours, \$, & schedule metrics
- Established High Bridge Energy Development (HBED) to capture Small Modular Reactor (SMR) project development/integration opportunities



3

Customers, Industries, & Business Model

Customers

- 70% Utility, Industrial, & Federal Government *Owners*
- 20% Engineering, Procurement, & Construction *Contractors*
- 10% Original Equipment *Manufacturers*

Industries

- 90% Commercial Power Generation
 - 70% Nuclear
 - 20% Fossil (Coal/CGTG) & Renewable (Wind/Solar/Biofuel)
 - 10% Government, Science/R&D, Industrial, & Petro Chemical

Business Model

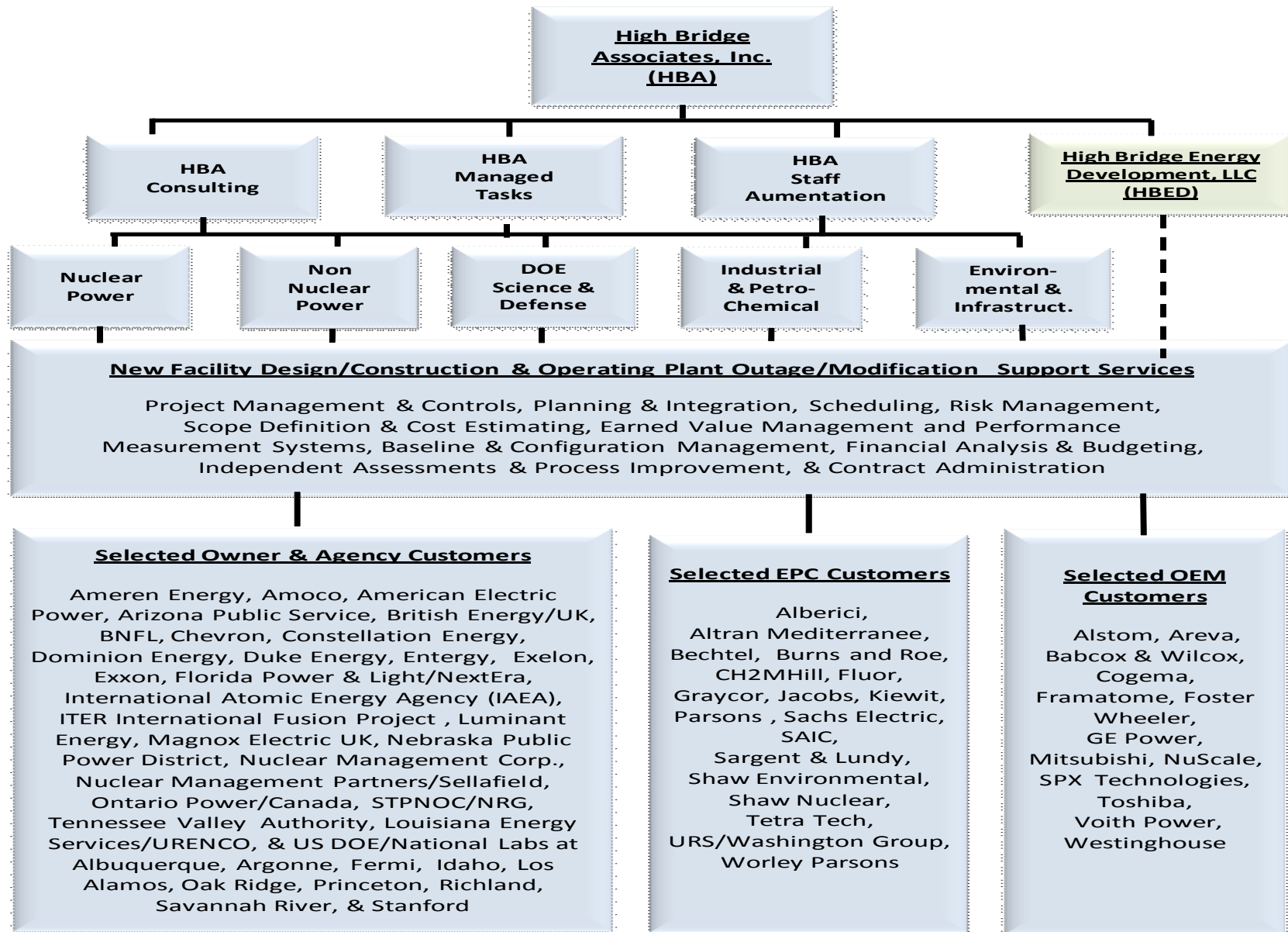
- Since 1994, >90% of our business is sole source negotiated
- Prior working relationships with customer decision makers
- Trust & proven track record for value added services



4




High Bridge Associates, Inc. (HBA) Industries, Capabilities, and Customer Overview





High Bridge Associates Representative Ongoing & Recent Nuclear Projects

Reference	1	2	3	4	5	6	7
Customer and Project	<u>Spallation Neutron Source (SNS) Project - ORNL</u> Project Mgt. & Controls Support to Owner/Operator Team	<u>International Atomic Energy Agency (IAEA)</u> Senior Consulting & Subject Matter Expert Emerging Commercial Nuclear Program Support to Member Nations	<u>Entergy Grand Gulf #2</u> Owner's Team Project Controls Support to Evaluate LLWR Supplier Options; Evaluated Price, Technical, & Risk Parameters for OEM/EPC Consortia	<u>Dominion Energy, North Anna #3</u> Owner's Team to Support Open Competition for LLWR OEM/EPC Supplier & Services; Developed Financial Submittal Templates & Evaluated Proposals	<u>24 Units & 17 Sites - Dominion, Entergy, & NextEra/FP&L</u> US Operating Nuclear Fleet, Post-Fukushima Support for NRC Orders & Initiatives	<u>>20 Utilities and >50 Nuclear Units</u> US Operating Nuclear Fleet Outage/Mod Support for EPU/Major/Minor Projects	<u>Sellafield UK Nuclear Management Partners/NMP</u> Site cleanup, risk & hazards reduction
Services	Project Controls, Planning, Scheduling, Integration, Cost Estimating, Risk Assessment, Plans & Procedures, Training	Program Planning, Project Organizing, Project Management, Project Controls, & Integration	Project Controls, Planning, Scheduling, Integration, Cost Estimating, & Risk Assessment	Support RFP Development for Cost/Price/Schedule Templates & Evaluation of Supplier Proposals	Scoping Studies, Basis Documentation, Detailed Cost Estimates, & Monte Carlo Risk Assessments	Scoping Studies, Basis Documentation, Detailed Cost Estimates, & Monte Carlo Risk Assessments	Project Mgt., Conduct of Operations Review, Project Controls, Planning, Scheduling, Integration, Plans & Procedures, EVMS
Years	1999 to 2007	2010 to Present	2006 to 2008	2008 to 2011	2011 to Present	2007 to Present	2011 to Present
Reference	8	9	10	11	12	13	14
Customer and Project	<u>ITER IO</u> International (7-Nations) Fusion Demonstration Project, Cadarache France	<u>Tennessee Valley Authority Watts Bar #2</u> Construction Completion & Startup Owner's Team	<u>Westinghouse & CB&I/Shaw AP1000</u> New Nuclear Corporate and Project Support	<u>Duke Power Crystal River #3</u> Owner's Team, Reactor Building Modification Support	<u>Urenco USA Uranium Enrichment Project</u> Owner's Construction Management & Integration Team	<u>Stone & Webster Mixed Oxide Fuel Processing Facility (MOX)</u> Duke Cogema Stone & Webster and Shaw Areva	<u>UniStar</u> Constellation Calvert Cliffs #3, New Nuclear Project Areva EPR, Owner's Team
Services	Proj. Mgt, Risk Mgt., Assessments, Project Controls, Planning, Scheduling, Estimating, EVMS, Training	Project Mgt., Assessments, Project Controls, Planning, Scheduling, Estimating, Risk Mgt., Plans & Procedures	Cost Estimating, Project Controls, Planning/Scheduling, Risk Management, Plans & Procedures, EVMS, IT Hardware Support	Independent Cost, Schedule, & Risk Assessment of Containment Concrete Cracking Repair Options	Independent Cost Estimate, Assessment of Deployment Planning, PMP/PEP, Construction Mgt. Site Staffing	Assessmt of Cost, Schedule, & Risk; Transition Support to Construction; EVMS Plans, Procedures, & Training	Independent Cost Estimate, Deployment Planning, PMP/PEP, Constr. Mgt. Support, Owner Staffing Planning
Years	2006 to Present	2010 to Present	2007 to 2013	2012	2006 to Present	2004 to 2012	2008 to 2011

Commercial Nuclear Plant Description	Units	BWR			Commercial Nuclear Plant Description	Units	PWR			
		Nat1	Nat2	Nat3			V&L	CE	ESB	Grdu
Browns Ferry	3	3			Arkansas	2		1	1	
Brunswick	2	2			Beaver Valley	2	2			
Clinton	1			1	Big Rock	1	1			
Cooper	1	1			Bellefonte	2			2	
Dresden	2	2			Braidwood	2	2			
Fitzpatrick	1	1			Catawba	2	2			
Gina	1	1			Calvert Cliffs	2		2		
Grand Gulf	1			1	Crystal River	1			1	
LaSalle	2		2		DC Cook	2	2			
Nine Mile Point	2	1	1		Indian Point	1	1			
Oyster Creek	1	1			McGuire	2	2			
Peach Bottom	2	2			Millstone #3	1	1			
Perry	1			1	North Anna	2	2			
Pilgrim	1	1			Oconee	3			3	
Quad Cities	2	2			Palo Verde	3		3		
River Bend	1			1	Pickering	10				10
Shoreham	1		1		Rancho Seco	1	1			
Total 17 Sites & 25 Units					Salem	2	2			
					Seabrook	1	1			
New Nuclear Power Facilities, Advanced Reactor Designs, and Uranium Enrichment					Sequoyah	2	2			
					South Texas	2	2			
					Vogtle	2	2			
					Three Mile Island	2			2	
					Waterford	1		1		
					Watts Bar	1	1			
					WPPS	1	1			
					Zion	2	2			
ITER Fusion Project	1									
LES Enrichment Plant	1									
Westinghouse AP1000	8									
AEP US APWR	1									
Luminant US APWR	2									
UniStar EPR	1									
Dominion NA3/All NSSS	1									
Entergy ESBWR	1									
South Texas ABWR	2									
Duke AP1000	2									
British Energy/EDF/EPR	10									
NuScale SMR	1									
B&W mPower SMR	1									
Total 20 Sites & 32 Units					Total 27 Sites					
Total Units	57				Total Units	55				
Total 64 Sites and 112 Units										





High Bridge Associates/Work Management Experience Summary US DOE/NNSA, DOD, Advanced Technology, & Science Projects



Facility/Program Location/Description		Facilities/ Projects
1	ITER International Fusion Research & Demonstration Facility, Cadarache France	
a.	Project Management, Planning, Integration, Scheduling, Estimating, Project Controls, & Risk Management	1
2	SMART Park Alternative Energy Project (Sustainable Manufacturing and Recycling Technology)	
a.	Develop, Integrate, Design, Construct, Own, & Operate a Municipal Solid Waste to Ethanol Renewable Fuel fa	1
3	DOE Michigan State University (MSU):	
a.	Facility for Rare Isotope Beams (FRIB): Strategic Planning, Project Management, Preparation, & Organizing	1
4	DOE National Nuclear Security Administration (NNSA)	
a.	Supporting planning, project controls, & program integration for weapons systems development in Albuquerque	1
5	DOE Los Alamos National Laboratory (LANL)	
a.	Weapons Experimental Program: Project Controls, Planning, Scheduling, EVM Reporting, Procedures, & Risk N	1
b.	Accelerator Production of Tritium (APT) Project: Cost Estimating, Planning, & Scheduling	1
6	DOE Fermi National Accelerator Laboratory (FNAL)	
a.	Long Baseline Neutrino Project: Executive Consulting for Integrated Planning, Project and Program Performanc	1
7	Korea National Science Research Center, Rare Isotope Science Project, Daejeon, KR	
a.	Executive Consulting for Planning/Project Management & Member of the International Advisory Committee	1
8	DOE Idaho Site/Idaho National Engineering Laboratory	
a.	Program Planning/Scheduling Support: Primavera Upgrade & Training	1
b.	Pit 9 Waste Management Project: Project Controls, Planning, Scheduling, & Training	1
c.	Advanced Mixed Waste (AMWTP) Project: Project Controls, Scheduling, & Construction Management	1
d.	Idaho Cleanup Project: Project Controls Process Improvement	1
9	Oak Ridge DOE Site/Oak Ridge National Laboratory	
a.	Operating Contractor Support: Executive Consulting for Cost Reduction & Re-Organizing	1
b.	Spallation Neutron Source (SNS) Accelerator: Planning, Organizing, Risk Management, & Scheduling	1
c.	Y-12 Enriched Uranium Project: Independent Estimate/Schedule Review	1
d.	Gaseous Diffusion D&D Project: Planning, Scheduling, Cost Estimating, & Claims	1
e.	Clinch River Breeder Reactor: Project Controls, Planning, Scheduling, & Cost Estimating	1



High Bridge Associates/Work Management Experience Summary US DOE/NNSA, DOD, Advanced Technology, & Science Projects



Facility/Program Location/Description		Facilities/ Projects
10	Savannah River DOE Site	
a.	Mixed Oxide Fuel Facility (MOX): Project Controls, EVMS, Planning, Scheduling, Cost Estimating, Risk Mgt.	1
b.	Regulatory Monitoring/Bioassay Laboratory: Independent Cost Estimate	1
c.	F Canyon Ventilation Upgrade Project: Independent Estimate & Schedule Validation Review	1
d.	High Level Nuclear Waste Tank Farm: Operations Review	1
e.	Environmental Restoration Program: Technology Review & Cost Estimating	1
f.	Defense Waste Processing Facility (DWPF), High Level Nuclear Waste Vitrification: Project Management	1
g.	K-Reactor Upgrade Modifications & Restart: Project Management	1
11	Nevada DOE Test Site	
a.	Yucca Mountain Nuclear Waste Repository: Project Controls & Independent Estimate/Schedule Assessment	1
12	DOE Richland Site	
a.	High Level Waste Treatment Project: Planning & Schedule Integration	1
b.	Reactor D&D Program: Independent Cost Estimate Validation Review	1
c.	K-Basin Spent Fuel Cleanup: Independent Cost Estimate & Construction Management	1
d.	High Level Waste Tank Farm D&D: Cost Estimate/Schedule Independent Assessment	1
e.	High Level Waste Treatment Project: Construction Management	1
13	DOE Argonne National Laboratory (ANL)	
a.	Project Controls Process Improvement, Procedures, Training, & Scheduling	1
14	DOE Lawrence Livermore National Laboratory	
a.	Atomic Vapor Laser Isotope Separation (AVLIS) Project: Cost Estimating & Scheduling	1
15	DOE Headquarters Washington DC/Germantown Office	
a.	Office of Environmental Management (EM): Program Planning, Scheduling, & Integration	6
b.	Weapons Fissile Material Disposition Program: Independent Cost Estimate Review	1
16	DOD US Army COE, Chemical Demilitarization Program	
a.	Pine Bluff Arsenal Project, Estimating and Claims Support	1
b.	Anniston Fort McClellan Project, Estimating and Claims Support	1
Total 16 Sites/Locations		41

High Bridge Commercial Nuclear Power New Build Projects

- Licensee/Owner “New Nuclear” Planning, Organizing, & Project Deployment Programs
 - URENCO LES Enrichment Facility; Watts Bar 2; North Anna 3; Calvert Cliffs 3; Grand Gulf 2; STP 3&4; DC Cook 3; Vogtle 3&4; Summer 2&3; Levy 1&2; Lee 1&2
- OEM/EPC New Nuclear Consortiums & Large Light Water Reactor (LLWR) Technologies:
 - Areva/Bechtel EPR; GE Hitachi/URS ESBWR; Mitsubishi/URS APWR; Toshiba/Shaw/CB&I ABWR; Westinghouse/Shaw/CB&I AP1000
- Small Modular Reactor (SMR) Technologies
- Supporting International Atomic Energy Agency (IAEA)
 - Subject Matter Expert consulting for Project Management & Business Systems Integration for IAEA member nation training & development



10

Independent Assessments & Process Improvement Reviews – Project Management, Organization Roles & Responsibilities, & Integrated EPC Project Teams

- Since 1995, have led/been part of customer assessment teams
 - Over 200 commercial nuclear & government science projects
- Project Management Core Business focus with details including:
 - Engineering & design
 - Procurement & manufacturing
 - Construction & installation
 - Startup testing & commissioning
- Assisted with validating engineering/construction scope
- Have developed Industry Lessons Learned expertise to apply to project assessments & project recovery assignments



11

High Bridge Commercial Nuclear Power Outage/Modification/Cost Estimating

- Since 1995, independent assessments & process improvement studies for >50 projects with total capital cost value > \$300 B
 - Preliminary/conceptual cost, budget & schedule studies
 - Detailed/baseline cost, budget & schedule reviews
 - Independent/Oversight/Third Party assessments
- Compiled extensive industry historical information data base
 - Outage & modification projects for operating fleet
 - New project construction - 20th & 21st centuries
 - Quantities, unit installation rates, wage rates, hours, and \$
 - Nuclear Industry lessons learned insights
- Established Chattanooga Cost Estimating Center in 2007



12

High Bridge Commercial Nuclear Power Outage/Modification/Cost Estimating

- Developed detailed project scope definition & cost estimating process
 - Comprehensive scope/assumptions definition approach & best in industry process for detailed cost estimating and risk assessment
 - Establishes comprehensive basis for effective change management
 - Utilizes user-friendly WinEstimator & Excel platform
 - Facilitates web-based integration, cost effective remote estimate development, & timely task deliverable submittals
- Supporting Multiple Extended Power Up-Rate (EPU) projects
 - NextEra, Constellation, Entergy, & NPPD
- Supporting Post-Fukushima requirements & opportunities
 - Dominion, Entergy, & NextEra



13

High Bridge DOE/DOD Federal Services Planning, Integration, & Project Controls

- Life Cycle support spanning design, construction, startup testing, operation, outage, modification, waste management, decommissioning, & cleanup/closure activities
- DOE Headquarter Programs, National Laboratories, Projects, & Facilities
 - Includes 34 projects/programs for headquarter/site/operation/laboratory activities at Argonne, Idaho, Los Alamos, Lawrence Livermore, Nevada Test Site/Las Vegas, Princeton Plasma Physics Lab, Oak Ridge, Richland/Hanford, and Savannah River
- Current larger contracts include the:
 - ITER 7-Nation International Fusion Power Demonstration Project at Cadarache, France
 - MSU National Cyclotron Facility for Rare Isotope beams (FRIB).
 - ORNL Spallation Neutron Source (SNS) Second Target Station (STS).
 - DOE headquarters Office of Environmental Management.
- We understand how to plan and deliver services in accordance with DOE orders, manuals, and guidelines:
 - Insights regarding FAR and DEAR requirements that drive process, methodology, and related planning and execution details



14

Small Modular Reactors (SMR) Experience, Capabilities, & Services

- ANS SMR Licensing Committee Leadership
- Extensive SMR Consulting/Program Planning since 2008
- Business Case Studies –US Military Base, Government Research, Desalinization, Small Industrial, Mining, Remote Communities, & Other Distributed Settings
- Established High Bridge Energy Development in 2011 to develop, integrate, own, operate SMR ~ 50 MWE facilities
- Planning, Scheduling, & Integration
- Project Controls, Cost Estimating & Risk Management
- Independent Assessments & Process Improvement
- Project and Construction Management



15

High Bridge Recent & Representative Experience Project Management Support & Assessments

- Dominion Power North Anna #3 NNP
- Entergy Grand Gulf #2 NNP
- TVA Watts Bar #2 Startup
- URENCO LES Uranium Enrichment Facility
- Shaw Areva MOX Project
- Duke Energy Crystal River Containment
- ITER International Fusion Project
- Sellafield UK Site Cleanup, Hazards, & Risk Reduction

16

Dominion Power, North Anna #3 NNP Procurement Planning & Management Support Preparation of Bid Invitation & Evaluation of Proposals

- Provided project management/controls support to Owner Team
- Developed proposal pricing/schedule/risk templates for inclusion in Requests for Proposals for NNP OEM/EPC
- Performed evaluation/ranking of proposals for price/schedule/risk
- Supported Owner negotiations & interactions with proposers
- Evaluated/ranked OEM EPC proposed organizations, qualifications, & responsiveness
- Proposals submitted by Areva Bechtel (EPR), GE URS (ESBWR), Westinghouse Shaw (AP1000), Toshiba Shaw (ABWR), & Mitsubishi URS (APWR)



17

Entergy, Grand Gulf #2 NNP Technical & Management Support to Owner's Team

- Provided project management & technical support
- Developed project planning program support for work breakdown structure (WBS), division of responsibilities (DOR), contracting strategy, integrated project schedule, & owner staffing/cost estimate
- Performed evaluation/ranking of proposals for price, schedule, risk, & technical considerations (constructability, operability, maintainability, & reliability)
 - Evaluated designs by Areva Bechtel (EPR), GE URS (ESBWR), Westinghouse Shaw (AP1000), Toshiba Shaw (ABWR), & Mitsubishi URS (APWR)



18

TVA Watts Bar #2 Completion Planning & Management Support Engineering, Procurement & Construction

- Performed initial assessment of project schedule in spring 2011
- Performed follow up assessment, validated engineering/construction scope, & recommended streamlining design package process for support of construction
- Implemented recommendations covering cost control, scheduling, project controls, change management, & engineering work package closure
- Assessed & assisted with developing baseline cost estimate/schedule implementation
- Mobilized project/construction management organization for completion of the project
 - Currently >80 personnel at site as part of Owner's Team



19

URENCO/LES Uranium Enrichment Facility Completion Planning & Management Support Engineering, Procurement & Construction

- Providing Owner's Representative support since 2006
- Assessed/recommended/assisted with implementing integrated owner/EPC project team organization & contracting approach
 - Identified dysfunctional/silo project organization & assisted with implementing Integrated Project Team approach
- Assisted with validating engineering/construction scope
- Developed baseline cost estimate
- Peaked at 70 personnel at NM site as part of Owner's Team
 - Construction managers/superintendents; Field engineering managers/specialists; Procurement managers/specialists; Material managers/specialists; QA managers/specialists



20

Shaw Areva MOX Services Completion Planning & Support Management & Scheduling System Simplification

- Providing Owner's Representative support since 2006
- Assisted with performance baseline revisions & implementation for scope, cost, & schedule
- Led transition & construction readiness team for EVMS Certification
- Developed training program & provided implementation support for project management/EVMS system (Good Practice Pamphlet)
- Presently at request of CB&I Chairman of Board of Governors:
 - Assessment & improvements to EVMS & scheduling system
 - Assessments & improvements in construction management organization
 - Anticipate supporting ETC/EAC development for reduced annual spending
 - Anticipate development of re-baseline schedule & simplified planning system



21

Duke Energy Crystal River #3 Containment Concrete Cracking Repair Assessment Design, Construction, Cost Estimate, Schedule, & Risk

- Selected sole source by Duke based on past experience, capabilities, personnel, & reputation
- Worked with other Duke Team members to assess three design & construction options to repair/replace containment concrete cracking
 - Zapata, Tetra Tech, & Weidlinger
- Performed detailed assessment of EPC contractor estimate & schedule
- Performed detailed assessment of owner scope/cost estimate
- Developed independent cost estimate, schedule, & risk assessment
- Duke utilized High Bridge cost estimate & schedule
- Supported Duke with Florida PUC reviews



22

ITER International Fusion Project (France) Planning & Integration Support

- Providing Owner's Team support since 2008
 - ITER Integrating Organization (IO) is owner/operator/licensee
 - 7-nation collaboration with China, EU, India, Japan, Russia, South Korea, & US
- Planning, organizing, and scoping definition activities, including development and maintenance of the Program/Project Work Breakdown Structure (WBS).
- Program integration, project controls, performance measurement reporting, risk management, and training support activities
- Assessed/recommended/supported implementation for simplified risk management approach.
 - Developed/implemented risk workshops in Japan, China, South Korea, USA
- Assessed/recommended/supported implementation for simplified scheduling/integration approach.
 - Assisted with transition from 200,000 activity project schedule to 20,000 activity project schedule



23

Sellafield UK Nuclear Decommissioning Authority Nuclear Management Partners (NMP) Implementation of Nuclear Performance Model

- Provided two top-down assessments of all facets of the operating organization including:
 - Engineering
 - Operations
 - Maintenance
 - Work Management
 - Outage Management
- Supported development of Management Change Plan to implement the INPO Standard Nuclear Performance Model
- Provided Change Management Team focused on guiding the implementation of process and culture in the above functional areas.



24

High Bridge Commercial Nuclear Power Extended Power Uprate/EPU Cost Estimating

- EPU Projects 2010 to 2012 – Approximately \$3-\$4 Billion
 - NextEra (FP&L) Turkey Point 1&2
 - NextEra (FP&L) Point Beach 1&2
 - Entergy Grand Gulf 1
 - Constellation Nine Mile Point 2
- EPU Projects 2013
 - NPPD Cooper 1
- EPU Estimated costs ranged \$500M to \$1,000M
 - Each EPU comprised of 25-50 individual project modification estimates
 - Individual project modification estimates ranged \$5M - \$50M



25

High Bridge Commercial Nuclear Power Post-Fukushima Studies, Scoping, & Cost Estimating

- NRC Orders & Initiatives: 24 units & 17 sites
 - Dominion : 5 units & 3 sites
 - Entergy: 11 units & 9 sites
 - NextEra (FP&L): 8 units & 5 sites
- Scoping studies & options
- Spent Fuel Pool (SPF) level
- Communications
- GE BWR hardened vents
- FLEX Mods & flexible coping strategies
 - Portable equipment
 - Storage buildings
 - Site connections
 - Staging areas



26

High Bridge Commercial Nuclear and Government O&M Studies – Large, Experimental, & Small Modular Reactors

- Staffing Studies
- Maintenance, Operations, Work Control, and Outage Process Improvement
- PM Optimization
- Asset Management System Implementation
- Work Package Planning



27

APPENDIX B

High Bridge Biographies

Review Team

Ken Aupperle (Task Lead)

Rick Drake

Dr. Mike High

Charlie Hess

Barth Loney

Peer Review Group

Charlie Anderson

Dr. Andy Kadak

Steve Maehr

High Bridge Independent Review of Aerospace April 13, 2015 LCCE Report TOR-2015-01848 Summary of High Bridge Review Team Expert Experience							
	Name	Years Nuclear/ DOE Experience	Past Experience Working Together	MOX Project Experience	Plutonium Disposition Program Experience	FOAK Project Experience	Specific Unique/Relevant Experience
	<u>Detail Review Experts</u>						
1	Ken Aupperle (Task Lead)	>40	X	X	X	X	Task Lead for Fissile Material Disposition Program (FMDP), DOE HQ Office, Historical Cost Estimating Program Review & Support, Assessment of Technology Cost Impacts/Trends (2000 to 2002).
2	Rick Drake	>35	X	X	X	X	Assessment Team Member for review of MOX 2012 Re-Baseline construction labor hours, schedule duration, & contingency. Member of other MOX Assessment Teams since 2010.
3	Charlie Hess	>35	X	X	X	X	Was DOE team member in the 1990's that negotiated the Plutonium Disposition Agreement between Russia & the USA. He was responsible for developing/integrating the schedule of activities for the Russian MOX facilities & for coordinating with the US MOX program.
4	Dr. Mike High	>50	X	X	X	X	Assessment Team Member for review of MOX 2012 Re-Baseline construction labor hours, schedule duration, & contingency. MOX schedule/risk assessment team member 2000-2002.
5	Barth Loney	>35	X	X	X	X	Performed multiple Independent Project Reviews of the MOX project for the Office of Environmental Management (EM) in 2007-2009. Worked with EM from 2003-present on all of their waste disposition projects. Experience with other FOAK project for DOE such as the Waste Treatment Plant (WTP) at Hanford. Was on original recovery team from HQ for WTP in 2005-2006.
	<u>Peer Review Experts</u>						
6	Charlie Anderson	>35	X	X	X	X	Currently serving as General Manager of the TRU Waste Processing Center (TWPC), Oak Ridge, for processing and extended storage. Prior to this, supported Nuclear Waste Partners in recovery efforts at the WIPP.
7	Dr. Andy Kadak	>40	X			X	Served on the DOE Nuclear Waste Technology Review Board regarding high-level waste disposal. Is familiar with the challenges of WIPP and HLW waste disposal as well as NRC nuclear licensing and construction experience.
8	Steve Maehr	>35	X	X	X	X	Mr. Maehr is president, CEO, and co-founder of High Bridge Associates. He has led or participated in over 50 independent assessments of complex nuclear and process facilities.

KENNETH J. AUPPERLE

Mr. Aupperle is a High Bridge Senior Vice President and Management Consultant. He has over 40 years of experience in project and construction management, cost estimating, planning, scheduling, project controls, earned value, and risk management. His experience spans the design, construction, operation/maintenance, and outage/modification of commercial nuclear/fossil power, industrial, environmental, and U.S. Department of Energy (DOE) projects. He has managed/performed numerous high level consulting assignments providing independent detailed cost estimates; independent high level cost reviews, schedule and risk assessments; and due diligence reviews for large capital projects, Life Cycle Cost Estimates, operating/maintenance activities, and decommissioning/waste management programs. He has led multi-discipline teams of personnel spanning numerous locations and contractor organizations, producing effective results in dynamic environments amid multiple priorities and aggressive deadlines. Mr. Aupperle leads High Bridge development and maintenance of its nuclear industry cost and schedule data base, and its analysis of industry risk issues and contingency considerations. He has conducted research of cost/schedule/risk performance records for more than 100 US commercial nuclear and DOE science projects, and presented numerous Industry Lessons Learned presentations/papers at the American Nuclear Society and other industry forums. He is currently supporting or has recently supported various utility owner “New Nuclear” planning, organizing, risk management, and project deployment programs spanning numerous vendor OEM/EPC New Nuclear consortiums including Areva EPR; Mitsubishi APWR; GEH ESBWR; Toshiba ABWR; and Westinghouse AP1000. He consults as a Subject Matter Expert (SME) for the International Atomic Energy Agency (IAEA) for Project Management, Program Planning, and Integration on IAEA Planning/Training Missions for Member Nations. He has held positions of increasing responsibility including:

SENIOR VICE PRESIDENT & MANAGEMENT CONSULTANT: High Bridge Associates, 2004 to present – Responsible for providing planning, scheduling, estimating, project controls, construction management, independent reviews, process improvement, and risk management services to the energy, power, industrial, and government business sectors. He is responsible for developing High Bridge business opportunities, recruiting personnel, and managing contracts/activities for various customer projects.

PRESIDENT (2003/2004) & VICE PRESIDENT: Team Associates, 1995 to August 2004 - Assisted in developing Team as a planning, estimating, project controls, and project management consulting and professional service company. Established in 1994, Team grew to 200 employees working in over 20 states, with more than 40 active contracts and 2002 gross revenues of \$28 million. He managed corporate operations, developed new business, and directed consulting, construction and project management services.

VICE PRESIDENT & REGIONAL MANAGER: Stone and Webster, 1990 to 1994 – Responsible for profit/loss operations of a full-service engineering and construction corporate office in Chattanooga and serving a seven-state southeastern region. He led the development of a corporate business strategy, and managed the expansion of a project office to a 1,200 person regional operation, with 60 projects, 2,400 construction personnel, and an average of over \$500 million in annual gross revenues over four years.

DEPUTY DIRECTOR OF CONSTRUCTION AND MANAGER OF PROJECTS: Stone and Webster, 1988 to 1990 – He was assigned to a full service office in Cherry Hill, NJ and was responsible for the performance, profitability, quality, and safety of various construction projects in the southeast United States.

MANAGER OF CORPORATE COST ESTIMATING: Stone and Webster, 1983 to 1988 – He was assigned to the Boston headquarter office and he was responsible for managing the development and maintenance of project capital cost estimates, life cycle cost estimates, expenditure forecasts, performance measurement systems, and historical cost programs for nuclear projects valued in excess of \$20 billion.

PROJECT CONTROLS MANAGER/ENGINEER/SPECIALIST: Stone and Webster, 1971 to 1983 – He was assigned to various projects to implement construction management and project controls programs for various clients. This included New England Power; Niagara Mohawk; Gulf States Utilities; Illinois Power; TVA; and the DOE at Oak Ridge, Savannah River, Idaho Falls, Richland, and Lawrence Livermore.

RICHARD V. DRAKE

Mr. Drake has over 35 years of experience in the commercial nuclear power industry spanning design, construction, procurement, Project Management, startup, operation/maintenance, and outage/modification phases. He began his career working for Bechtel Power and held positions of increasing responsibility in support of construction, start up, outage, and continuing maintenance activities during the construction, commissioning, and operation of Palo Verde Nuclear Plant from 1978 to 1990. He held key department line management positions with the Tennessee Valley Authority Nuclear (TVAN) organization from 1990 to 2005 at each of the TVA Nuclear Sites and the corporate headquarters. He served as the construction manager for the completion of Watts Bar Unit 1 and Browns Ferry Unit 1 restart.

Since 2006, Mr. Drake has been a Vice President and Senior Consultant with High Bridge Associates. He has led multi-discipline teams of personnel spanning numerous locations and contractor organizations, producing effective results in dynamic environments amid multiple priorities and aggressive deadlines. He has worked supporting various Project Assessments and Project Management/Controls Deployment Planning Reviews for New Nuclear Projects. He led the High Bridge activities for STPNOC STP 3 & 4 supporting independent cost and schedule assessments of Toshiba and Fluor. Mr. Drake was Co-Lead on an Independent Project Assessment Team for Toshiba to review and critique Fluor's estimates for STP Units 3&4, which identified more than \$1 billion in potential reductions to the Fluor Estimate, and developed alternative strategies for contractual approaches for future contracting.

CHARLES W. HESS

Mr. Hess has over 35 years of experience in the power industry and has been involved with development, design, engineering, construction, operation, and decommissioning of various nuclear facilities. He is active with industry programs in preparation for new large and small reactor nuclear facilities, and is familiar with all nuclear technologies and NRC requirements. He is a recognized expert in light water reactors, sodium cooled fast reactors, and high temperature gas cooled reactors. He also has worked on pool-type research reactors, homogeneous aqueous reactors and Thorium based fuel cycles. He has designed fuel fabrication facilities, reprocessing facilities high-level waste vitrification facilities, and fuel storage facilities. He managed completion of engineering, operational support, and decommissioning projects for large and small energy facilities. With nearly 20 years in responsible positions for nuclear industry, he has a thorough understanding of owner and regulatory issues balanced with extensive EPC experience and constructability/maintainability issues. He is a Registered Professional Engineer in Pennsylvania, with a BS degree in Nuclear Engineering and has been a Certified Project Management Professional.

Mr. Hess was the co-chair of the American Nuclear Society (ANS) President's Special Committee on SMR Licensing Issues. The Committee is comprised of ANS members including representatives from SMR designers, developers, academia, industry, and government who are working to develop consensus on issues challenging the deployment of SMR technology. Mr. Hess is a frequent speaker at SMR and other nuclear technical conferences, has been quoted on SMR matters in various publications, and has testified before the House Energy and Commerce Committee regarding SMR issues.

Mr. Hess was the lead technical reviewer for CB&I's support team for the DOE's Advanced Reactor Concepts Program. He provided valuable feedback to National Lab personnel on the commercial implications of the advanced designs. As a result, he is thoroughly knowledgeable in all advanced reactor design concepts in terms of reactor design, fuel cycle development, accident tolerant fuel designs, fuel storage including dry storage options and deep borehole disposal. He was a lead engineer on the Advanced Liquid Metal Reactor program and on the GE-H Team for the Global Nuclear Energy Partnership.

Mr. Hess was part of the DOE team that negotiated the Plutonium Disposition Agreement between the Russians and the USA. He was responsible for developing and integrating the schedule of activities for developing the Russian MOX facilities and for coordinating with the US MOX program in the 1990s. He understands the issues surrounding plutonium disposition.

DR. MICHAEL D. HIGH

Dr. High has over 50 years of experience with advanced technology and first-of-a-kind (FOAK) projects/programs spanning research, development, demonstration, engineering, construction, operations, and maintenance in the power generation, environmental, and aeronautical industries. He has testified before various congressional subcommittees regarding environmental issues, acid rain legislation, and the U.S. Department of Energy's fossil and nuclear energy budgets. He chaired the Electric Power Research Institute's (EPRI) Environmental Research Division Advisory Committee and served for five (5) years as a member of the EPRI Research Advisory Committee (RAC). As a member of the EPRI Ad Hoc Committee on Advanced Reactor Programs (ARP), he provided policy and technical guidance on making light water reactors simpler and enhancing their safety features through the Advanced Light Water Reactor (ALWR) Utility Steering Committee.

Since 2000, Dr. High has worked extensively with High Bridge Associates as an Executive Consultant providing consulting services, technology assessments, and independent reviews. He has extensive technical, scientific, and financial analytical skills, and is accustomed to supporting large, complex, and multi-disciplined projects with numerous participants. He has performed independent project reviews, risk assessments, feasibility/due-diligence and life cycle cost studies for various commercial and Department of Energy (DOE) projects including:

- Evaluation/selection study of next generation nuclear reactor technologies from OEM/EPC suppliers (Areva/EPR, GE/ESBWR; Hitachi GE/ABWR; and Westinghouse/AP 1000), for the New Nuclear Plant Project for Entergy. (Commercial)
- Evaluation/selection study of next generation nuclear reactor technologies from OEM/EPC suppliers (Areva/EPR, GE/ESBWR; Hitachi GE/ABWR; and Westinghouse/AP 1000), for the Dominion Power Corporation. (Commercial)
- Red Team Westinghouse AP1000 Price Certainty review. (Commercial)
- Independent reviews of cost and risks for the NuScale SMR development. (Commercial)
- Feasibility of establishing a privately funded Fast Flux SMR. (Commercial)
- Risk assessment of the United States, Japan, South Korea, and Republic of China scope of work for the International Thermonuclear Experimental Reactor (ITER). (ITER and DOE)
- Development of Project Management Plans and identifying/quantifying project risks for the Mixed Oxide Fuel Fabrication Facility for Shaw Areva located at the DOE Savannah River Site (SRS) in SC.
- Performing an independent risk/contingency assessment of the Spallation Neutron Source (SNS) research accelerator project for the DOE at the Oak Ridge National Laboratory (ORNL).

Dr. High practiced in the field of aeronautical and aerospace engineering for nearly twenty years, first at Pratt & Whitney Aircraft Company and more extensively at the U.S. Air Force Arnold Engineering and Development Center located near Tullahoma, Tennessee. He joined the Tennessee Valley Authority (TVA) in 1980 for nearly nine years as Division Director responsible for all aspects of Research, Development, and Demonstration (RD&D) for the TVA electric power system. Under his direction, TVA pioneered wet limestone scrubbing technologies for the removal of sulfur dioxide. His division carried out the national research, development, and demonstration program for fluidized bed combustion of coals with high sulfur

content, culminating in the construction of a 160-megawatt demonstration power plant at the TVA Shawnee Steam Plant in Kentucky.

In 1988 Dr. High was appointed to the Burkett Miller Chair of Excellence in Management and Technology at the University of Tennessee at Chattanooga (UTC). Dr. High has served on numerous Boards, national committees, and directed several planning studies for the City of Chattanooga and Hamilton County. He served on the State of Tennessee's first Science and Technology Advisory Council being appointed to that council by Governor McWherter. Dr. High is a registered engineer in the State of Tennessee and the Commonwealth of Kentucky. He has over 50 articles published in national and international journals.

BARTH P. LONEY, PE, PMP, CM

Mr. Loney has more than 35 years of experience in program / project / engineering management serving in various positions with increasing responsibilities. As a Senior Vice President with High Bridge Associates, Inc., he has a history of successful project/program completions, implementations, reengineering and process improvements. He is an adept professional with the ability to work comfortably in diverse environments, handle multiple tasks simultaneously, and creatively address root causes to develop innovative solutions that have improved processes and contributed directly to bottom line performance. He is a Subject Matter Expert with extensive experience in Project Management, Earned Value Management, Risk Management, and Engineering and Construction Management. His industry experience includes nuclear power, construction and utility background, both in private and federal sectors. He has ten years of experience leading and participating in project reviews for the Department of Energy. He is familiar with multiple standards and requirement, including, but not limited to, DOE Order 413, PMBOK, and ANSI 748. Some recent assignments for High Bridge supporting multiple DOE Offices include:

- Oak Ridge National Lab (WAI) – TRU Waste Processing Center, Support General Manager in areas of Risk, Earned Value and Budget/Proposal development. Evaluating waste stream trends and cost for the project and budget forecasting options
- Office of Acquisition Project Management (Headquarters) – Led External Independent Review (EIR) team for the CD2/3 submittal of the K-27 D&D project at Oak Ridge. Also served as Risk SME for the review.
- Office of Environmental Management (Headquarters) – provided project controls expertise for a project involving research reactor fuels disposition.

CHARLIE E. ANDERSON

Over 33 years with increasing responsibilities in executive, technical, operations, program, and project management of nuclear materials disposition, nuclear materials production, nuclear waste management, and nuclear and coal fired power generation programs with *Los Alamos National Lab, Nuclear Management Partners, URS Corporation, Washington Group International*, the *Department of Energy* and the *Tennessee Valley Authority* covering laboratories and complex operating facilities from construction through decommissioning and demolition. Served in senior management positions as a key member of these organizations with responsibilities in leadership, management, oversight, strategic planning, and execution of startups, transitions, and problematic programs. Responsibilities have included annual budgets of \$6.2 Billion and workforces of 3,000 Federal and 30,000 contractor personnel. Work has typically involved bridging technical, business, and political agendas to solve problems in order to achieve programmatic and operational goals and objectives. Performance has always demonstrated a focus on progress and personal commitment. Have lead key cross cutting initiatives in most of these organizations, which includes commercial, government, international, and government contractor.

Currently, providing professional management services on an independent basis. Previously served as a Vice President to URS, providing management and programmatic strategic advice on major contracts. Prior to returning to URS corporate offices in Aiken, served as Associate Director of Nuclear & High Hazard Operations at Los Alamos National Lab, with broad responsibility for all facility operations at Los Alamos National Laboratory, including nuclear operations, safety basis, criticality safety, startup and restart, packaging and transportation, fire protection and engineering. Joined URS as General Manager of Nuclear Management Partners, the Management & Operations contractor consortium for the Sellafield operations in the northwest of England. Within the consortium, responsibility included serving as Business Unit Vice President with the Washington Division of the URS Corporation. Prior to joining URS in 2007, served as Principal Deputy Assistant Secretary of Environmental Management, with the DOE in Washington, DC. Provided innovative and sound leadership in a number of management positions at the Savannah River Site for the Department of Energy including Deputy Site Manager, Assistant Manager for High Level Waste; Director, Office of Defense Nuclear Nonproliferation; Director, Nuclear Materials Disposition; Director, Reactors and Spent Fuel Division; Director, High Level Waste Programs Division; and Director, Liquid Waste Division. In 1990, transferred from the Tennessee Valley Authority. Initially started career with the Tennessee Valley Authority as a construction project engineer at the Yellow Creek Nuclear Plant construction site. Relocated to the corporate engineering office in several system engineering positions which lead to Browns Ferry Nuclear Plant leading the system engineering efforts for a three unit operating nuclear plant. Last position with the Tennessee Valley Authority was Special Projects Manager at Browns Ferry Nuclear Plant with responsibility for the site program management of multi-discipline, site-wide problem recovery projects.

ANDREW C. KADAK, Ph.D.

Dr. Kadak has over 40 years of commercial nuclear experience and is President of Kadak Associates, Inc., a consulting firm specializing in management issues and nuclear energy. Prior to resuming his private consulting practice, Dr. Kadak was Principal and Director of Nuclear Services at Exponent, a worldwide company offering multidisciplinary expertise and rapid response capabilities to provide stewardship in addressing complex engineering and scientific problems. Dr. Kadak served on the IAEA special team assessing earthquake and tsunami damage of the Onagawa Nuclear Plant in Japan and has performed extensive studies of the Fukushima Daiichi Nuclear Plant.

Prior to joining Exponent, Dr. Kadak was a Professor of the Practice in the Nuclear Engineering Department of the Massachusetts Institute of Technology. His research interests include the development of advanced reactors, in particular the high temperature pebble bed gas reactor, space nuclear power systems, improved technology neutral licensing standards for advanced reactors and operations and management issues of existing nuclear power plants. Recently he was asked to serve on the Small Modular Reactor subcommittee of the Secretary of Energy's Advisory Board. His expertise ranges from reactor physics, power conversion, safety analysis and engineering systems. Dr. Kadak has recently been working on Hybrid Fusion Energy systems and sodium cooled fast reactors. He is also a principal author of the MIT fuel cycle study.

Dr. Kadak was also President and CEO of Yankee Atomic Electric Company. In this capacity, he was responsible for overseeing all Yankee operations, including the decommissioning of the Yankee plant in Rowe, Massachusetts and engineering, licensing, environmental and operational support to all eight nuclear plants in New England and many other national and international clients.

Dr. Kadak's expertise ranges from day to day operations of nuclear plants to senior executive management. In the past, he has lead Yankee Atomic in license renewal of operating reactors, systematic evaluation of older plants to allow them to demonstrate compliance to new regulations, financial rate proceedings to assure adequate capital for safe operation, innovative fuel purchase agreements, high level nuclear waste disposal

and storage solutions. His technical background has allowed him to actively direct the Yankee strategy dealing with reactor vessel embrittlement, boiling water reactor pipe replacements and how to manage aging of nuclear plants. At Yankee he managed the economic analysis of the value of continued operation of the Rowe plant. He presently consults on decommissioning of nuclear plants and has served on safety review boards of nuclear utilities.

Dr. Kadak was President of the American Nuclear Society in 1999/2000. He has served as a board and executive committee member of the Nuclear Energy Institute and the industry's Advisory Committee on High Level Waste. He has served as a member of the National Association of Regulatory Utility Commissioners special panel on high level nuclear waste and the Aspen Institute's "Dialogue on Nuclear Waste Disposal". In 1995, he was a member of the Advisory Committee on External Regulation of Department of Energy Nuclear Safety. He has also conducted several audits of nuclear companies to assess management and served as chairman of a panel providing suggestions to the DOE's Nevada Test Site as to how to make their operations more like commercial industries. Dr. Kadak was appointed by the President to serve on the US Nuclear Waste Technology Review Board. *He also served as a member of the Senior Nuclear Safety Oversight Board of the Daya Bay nuclear power stations in Guangdong Province in China* and served as a member of the Rhode Island Atomic Energy Commission. Dr. Kadak has made more than 70 lectures and speeches on topics related to the technical and business aspects of nuclear power.

STEVE R. MAEHR

Mr. Maehr is President, CEO, and co-founder of High Bridge Associates. He has more than 35 years of experience in Engineering, Project Management, and Executive leadership positions in the electric utility and management services industries. His principal areas of expertise include Strategic Planning, Business Development and Sales, Planning and Scheduling, Budgeting, Financial Planning and Accounting, Maintenance, Outage Management, Management Information Systems, Licensing, Engineering and System Testing. With degrees in Mathematics, Nuclear Engineering (BS) and Industrial Management (MS), he has held positions of increasing responsibility with electric utilities, management service contractors, and consulting/project management companies.

Mr. Maehr has a demonstrated record of accomplishment in developing opportunities and assisting customers with managing their projects, programs, and corporate operations. He is an entrepreneurial and strategic thinker, an excellent communicator, and a versatile leader. With his network of resources developed over the years by working with hundreds of owners, specialty contractors, and staff resources, he has an exceptional proficiency in assembling project teams to deliver "Just in Time" skills to customers, when and where they are needed.

APPENDIX C

High Bridge Detailed Resumes

Review Team

Ken Aupperle (Task Lead)

Rick Drake

Dr. Mike High

Charlie Hess

Barth Loney

Peer Review Group

Charlie Anderson

Dr. Andy Kadak

Steve Maehr

High Bridge Associates, Inc.



KENNETH J. AUPPERLE

SUMMARY:

Mr. Aupperle is a High Bridge Senior Vice President and Management Consultant. He has over 40 years of experience in project and construction management, cost estimating, planning, scheduling, project controls, earned value, and risk management. His experience spans the design, construction, operation/maintenance, and outage/modification of commercial nuclear/fossil power, industrial, environmental, and U.S. Department of Energy (DOE) projects. He has managed/performed numerous high level consulting assignments providing independent detailed cost estimates; independent high level cost reviews, schedule and risk assessments; and due diligence reviews for large capital projects, Life Cycle Cost Estimates, operating/maintenance activities, and decommissioning/waste management programs. He has led multi-discipline teams of personnel spanning numerous locations and contractor organizations, producing effective results in dynamic environments amid multiple priorities and aggressive deadlines. Mr. Aupperle leads High Bridge development and maintenance of its nuclear industry cost and schedule data base, and its analysis of industry risk issues and contingency considerations. He has conducted research of cost/schedule/risk performance records for more than 100 US commercial nuclear and DOE science projects, and presented numerous Industry Lessons Learned presentations/papers at the American Nuclear Society and other industry forums. He is currently supporting or has recently supported various utility owner "New Nuclear" planning, organizing, risk management, and project deployment programs spanning numerous vendor OEM/EPC New Nuclear consortiums including Areva EPR; Mitsubishi APWR; GEH ESBWR; Toshiba ABWR; and Westinghouse AP1000. He consults as a Subject Matter Expert (SME) for the International Atomic Energy Agency (IAEA) for Project Management, Program Planning, and Integration on IAEA Planning/Training Missions for Member Nations. He has held positions of increasing responsibility including:

SENIOR VICE PRESIDENT & MANAGEMENT CONSULTANT: High Bridge Associates, 2004 to present – He is responsible for providing planning, scheduling, estimating, project controls, construction management, independent reviews, process improvement, and risk management services to the energy, power, industrial, and government business sectors. He is responsible for developing High Bridge business opportunities, recruiting personnel, and managing contracts/activities for various customer projects.

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MANAGER OF CORPORATE COST ESTIMATING: Stone and Webster, 1983 to 1988 – He was assigned to the Boston headquarter office and he was responsible for managing the development and maintenance of project capital cost estimates, life cycle cost estimates, expenditure forecasts, performance measurement systems, and historical cost programs for nuclear projects valued in excess of \$20 billion.

PROJECT CONTROLS MANAGER/ENGINEER/SPECIALIST: Stone and Webster, 1971 to 1983 – He was assigned to various projects to implement construction management and project controls programs for various clients. This included New England Power; Niagara Mohawk; Gulf States Utilities; Illinois Power; TVA; and the DOE at Oak Ridge, Savannah River, Idaho Falls, Richland, and Lawrence Livermore Lab.

High Bridge Associates (2004 to Present) and Team Associates (1994 to 2004)

Mr. Aupperle is a Senior Vice President and Management Consultant. He has managed Project Management, Project Controls, and Construction Management consulting assignments and staffing services for owner, engineer/constructor, and original equipment manufacturer customers in the US, United Kingdom, France, Japan, China, and South Korea. He leads the development of a High Bridge Nuclear Industry data base for historical/estimated costs, labor hours, bulk commodities, staffing, and schedule durations. He is responsible for developing High Bridge business opportunities, recruiting personnel, administering contracts, and managing activities for various projects. Representative Corporate Sponsor/Task Consulting assignments have included:

International Atomic Energy Administration (IAEA) – Subject Matter Expert (SME) for Project Management & Program Integration supporting IAEA Planning/Training Missions for Member Nations (2010 – Present)

NuScale Small Modular Reactor – Independent Cost Assessment, Program Planning, Organizing, and Initial Development of Risk Assessment Process (2010 - present)

ITER Fusion Project, ORNL and International Organization (IO) – Program Planning, Project Controls, Scheduling, Cost Estimating, Training, and Risk Management Support in Cadarache France. This included supporting development of the ITER Risk Assessment process and line of questioning, and leading stakeholder meetings and training with ITER representatives in the US, Japan, China, and South Korea. (2006 – Present)

Dominion New Nuclear Program – Program Planning, Organizing, Cost, Schedule, & Risk Studies for Evaluation of Vendor Proposals for Unit #3 at North Anna Station (2008 - 2012)

Duke Power Oconee Nuclear Station - Project Controls, Planning/Scheduling, & Project Management for the Oconee Plant Refurbishment & Life Extension Program (2000 – present)

Shaw Nuclear AP1000 Program – Program Planning, Organizing, Project Controls, Cost Estimating, Scheduling, and Risk Management support for the Westinghouse AP 1000 Program (2007 to 2012)

Westinghouse AP1000 New Nuclear Program – Program Planning, Organizing, Scheduling, and Systems Integration Support for Global Deployment of Eight (8) Plants in China and the US (2008 – 2012)

Unistar Calvert Cliffs #3 New Nuclear Program Support – Independent Assessment/Development of Construction Installation Manhour Unit Rates & Assessment of Owner Organization/Staffing (2008 - 2010)

American Electric Power (AEP), New Nuclear Program Support – Program Planning, Cost, Schedule, & Risk Evaluation Studies for Deployment of a New Unit #3 Nuclear Plant at DC Cook Station (2008 - 2010)

Project Controls Manager, Entergy New Nuclear Project – Program Planning, Organizing, Project Controls, Scheduling, Estimating, Risk Analysis, & Reactor Technology Evaluations for Grand Gulf #2 (2006 – 2008)

Mixed Oxide Fuel Fabrication Facility, Duke Cogema Stone & Webster –Program Planning, Scheduling, & Estimating Support; Earned Value System Readiness for Construction; Independent Schedule/Estimate Assessments; & Development/Implementation of Risk Management Program; (2003 – present)

Idaho Cleanup Project, CH2MHill Washington Group – Project Controls Transition Team & Independent Assessment, Scheduling Integration, Training, & Risk management Support (2005 – 2007)

Yucca Mountain Repository, DOE/Burns & Roe Project Team – Independent Cost Estimating Support & Assessments of Bechtel Project Estimating & Controls Activities (2004 – 2005)

Westinghouse UK, Springfields Fuel Plant & MAGNOX Sites – Developed & conducted orientation program with managers in preparation for transition under government Decommissioning guidelines (2004 – 2005)

Project Controls Process Improvement Initiative for GE Power – Development, Implementation, & Refinement of Global Web-based Project Controls System Platform (2002 – 2004)

British Nuclear Fuels Limited – Corporate Project Management Program Evaluation, Process Improvement, & Policy/Procedure Development Support (2001 – 2002).

Fissile Material Disposition Program (FMDP), Dept. of Energy Headquarters Office – Historical Cost Estimating Program Review & Support, Assessment of Technology Cost Impacts/Trends (2000 to 2002)

Advanced Mixed Waste Treatment Project (AMWTP), British Nuclear Fuels – Program Planning, Independent Estimate/Schedule Assessment of Design, Construction, & Operations (2000 - 2002)

Spallation Neutron Source (SNS) Accelerator Project, Oak Ridge National Lab – Program Planning, Cost Estimate/Contingency Risk Assessment, & Planning/Scheduling Review & Support (1998 – 2002)

Environmental Restoration Division, Savannah River Site - Baseline Estimate Validation Assessments, Project Management Training, & Independent Cost Estimating (1996 – 1998)

Pit 9-Mixed Waste Remediation Project, Idaho National Engineering Laboratory – Independent Assessment, Project Controls, Scheduling, Training, & Start-Up Planning (1995 – 1997)

Stone and Webster Engineering Corporation (1971 to 1994)

Mr. Aupperle had various assignments of increasing responsibility in project controls, estimating, and project/construction management on numerous projects involving power generation, technology research, defense nuclear materials production, and environmental remediation/waste management. In 1990, he was appointed Vice President and Southeast Regional Manager in Stone and Webster's Chattanooga, TN office covering projects and customers in seven states. With full profit and loss (P&L) responsibility, he:

- Exceeded corporate revenue and profitability goals for four consecutive years. Responsible for a \$6 million annual operating budget. Annual gross revenue averaged approximately \$500 million.
- Led a corporate marketing team comprised of managers from four (4) major offices, resulting in the award of contracts for more than three (\$3) billion dollars of new engineering and construction work.
- Surpassed annual marketing goals for new work awards and expanded the southeast regional organization to over 1,200 professional office personnel and 2,400 construction crafts.

In 1988, Mr. Aupperle was assigned as Deputy Director of Construction Operations in Stone and Webster's Cherry Hill, NJ office. In this position he was responsible for the quality and safety of activities on various construction and operating plant modification projects in the southeastern U.S. In 1983, he was assigned as Corporate Manager of Project Cost and Estimating in Stone and Webster's Boston headquarter office. He was responsible for directing the development and maintenance of project construction estimates, expenditure forecasts, earned value performance measurement systems, and actual cost historical programs for nuclear construction projects valued in excess of \$20 billion located around the country.

During the late 1970's, he was assigned to support Stone and Webster's development of the Nuclear Power Construction Stabilization Agreement (NPCSA), a strategic corporate collaboration with Gulf States Utilities, several other engineer/constructors, and the Building and Construction Trades of the AFL/CIO. From 1979 to 1982, he was Superintendent of Project Controls on the River Bend Nuclear Project, the only commercial U.S. nuclear power facility constructed completely under the provisions of the NPCSA. He was responsible for development and implementation of estimating, scheduling, cost control, earned value, performance measurement, and other construction management systems to support a fast track schedule based on utilizing the Alternating 4/10's shift-work approach. River Bend construction/startup was completed in 72 months, representing a 40-month schedule savings compared to industry norms of the time. Significant cost savings were achieved related to reducing escalation, interest during construction, and indirect/distributable activities driven by project duration. Principal assignments and positions have included:

VICE PRESIDENT AND REGIONAL MANAGER - South Regional Office, Chattanooga, TN.; Responsible for Profit and Loss (P&L) Performance of a Full Service Office (1990 – 1994)

DEPUTY DIRECTOR OF CONSTRUCTION AND MANAGER OF PROJECTS – Construction and Project Management Departments, Cherry Hill, NJ; Responsible for Department Activities (1988 – 1990)

MANAGER OF PROJECT COST DIVISION - Boston, MA; Responsible for Managing Project Estimating Cost Reporting, and Maintaining Historical Data for \$20 Billion in Capital Projects (1983 – 1988)

PROJECT MANAGER - US Dept. of Energy, Savannah River Site, Defense Waste Processing Facility, DWPF (1984 – 1990) and K-Reactor Restart and Operations (1988 – 1990). Provided Owner's Technical Engineering and Management Services and Oversight of M&O Contractor (Westinghouse Savannah River)

PROJECT ESTIMATING MANAGER - Lawrence Livermore National Lab; DOE Uranium Enrichment Program, Atomic Vapor Laser Isotope Separation Project, Conceptual Estimating (1984 – 1985)

PROJECT CONTROLS AND SCHEDULING MANAGER - DOE, Clinch River Breeder Reactor Project (CRBRP), Estimate and Schedule Development, Project Controls System Implementation (1982 – 1983)

SUPERINTENDENT OF COST AND SCHEDULING - Gulf States Utilities, River Bend Unit 1, Construction Management System Implementation (1979 – 1982)

CHIEF CONSTRUCTION PLANNING ENGINEER - Niagara Mohawk, Nine Mile Point Nuclear Station Unit 2, Construction Management System Implementation (1975 – 1979)

PROJECT PLANNING/SCHEDULING ENGINEER - New England Power, Salem Station #5, and Indianapolis Power and Light, Stout Station #7, Project Management System Implementation (1971 – 1975)

Department of Energy Summary

Mr. Aupperle has over 20 years of Project Controls, Project Management, and Construction Management experience with DOE programs and projects. He is accustomed to working in large multiple participant organizations involving emerging technologies, various disciplines, and numerous locations. He has a successful background in managing and providing technical, planning, estimating, scheduling, earned value, performance measurement, project management, and business operations support to major prototype projects involving physics research, energy and power generation, defense nuclear material production, high level waste management, and environmental remediation facilities. He held an active DOE "Q" Clearance from 1984 to 1994. He has a comprehensive knowledge of the DOE Savannah River Site (SRS), based on several management assignments supporting Defense Programs and High Level Waste Projects as follows:

- EXECUTIVE SPONSOR - R-Reactor Decontamination and Decommissioning (D&D) Project (1993 to 1994). He led a corporate initiative to develop a D&D Demonstration Project, based on an innovative Partnering and Integrated Organization approach with DOE, Stone and Webster, and BNFL, Inc.
- PROJECT MANAGER - Defense Waste Processing Facility (DWPF) Project (1984 to 1990). He managed a technical support services contract that provided a wide range of specialists to assist DOE with the oversight and management of this high level waste project. This included engineering, design, procurement, construction, startup, and commissioning tasks covering technical and management issues. He performed numerous cost estimate and schedule assessments at various project stages.
- PROJECT MANAGER - K-Reactor Restart and Operations Project (1988 to 1992). He managed a technical support services contract that provided a wide range of specialists to assist DOE with the oversight and management of this Defense Programs Project. This included various engineering, design, procurement, construction, startup, and commissioning tasks covering technical and management issues. He performed numerous cost estimate and schedule assessments at various project stages.

Other DOE Assignments Include the Following:

Principal Consultant, Mixed Oxide Fuel Fabrication Facility, Duke Cogema Stone & Webster – Independent Schedule and Estimate Assessments, Development/Implementation of Risk Management Program; Planning/Scheduling Support; Estimating Support; Project Controls/Earned Value System Readiness Upgrade for Transition to Construction (2003 – 2008)

Weapons Non-Proliferation Fissile Material Disposition Program (FMDP), Department of Energy Headquarters – Project Management, Project Controls, and Independent Estimating Support (2000 to 2002)

Advanced Mixed Waste Treatment Project (AMWTP), Idaho National Engineering Laboratory – Independent Estimate/Schedule Review for Design, Construction, and Operations (2000 -2004)

Spallation Neutron Source (SNS) Accelerator Project, Oak Ridge National Laboratory – Program Planning, Project Controls, Planning/Scheduling, Baseline Control, & Configuration Management (1998 – 2002)

Environmental Restoration Division, Savannah River Site - Baseline Estimate Assessment and Validation Reviews, Project Management Training, and Independent Cost Estimating (1996 – 1998)

Pit 9-Mixed Waste Remediation and Privatization Demonstration Project, Idaho National Engineering Laboratory – Project Controls, Scheduling, and Start Up Planning (1995 – 1997)

Nuclear Materials Production Division (NMPD), Savannah River Site – Assessment of Engineering Organization Functions, Processes, and Staffing (1995)

Hanford Waste Vitrification Plant (HWVP), Hanford Reservation in Richland – Estimate and Schedule Validation Reviews and Assessments (1987 – 1988)

Atomic Vapor Laser Isotope Separation Project (AVLIS), Lawrence Livermore National Laboratory – Estimating and Cost Baseline Development for Balance of Plant Systems (1984 – 1986)

Solvent Refined Coal Project (SRC 1), Alternative Fuel Demonstration Facility, Department of Energy – Schedule and Cost Estimate Development and Integration (1983)

Clinch River Breeder Reactor Plant Project (CRBRP), DOE Oak Ridge – Development and Integration of Cost/Schedule Baselines, and Construction Management System Implementation (1981 – 1983)

EDUCATION

Graduate Level Executive Certificate in Business Administration - Northeastern University, 1987
BS in Construction Management - Syracuse University, Summa cum Laude, 1971
AS in Construction Management - Hudson Valley Community College, Magna cum Laude, 1969
National Honor Society of Phi Kappa Phi, Syracuse University Chapter, 1971

PROFESSIONAL ASSOCIATIONS AND COMMUNITY ACTIVITIES

American Nuclear Society, ANS; -Member 2007 to Present
Association for the Advancement of Cost Engineering, AACE; -Member, 1975 to Present
U.S Department of Energy "Q" Clearance (Top Secret), active from 1984 to 1994
International District Energy Association (IDEA); -Member, 1998 to 2003
Chattanooga State Technical Community College; Curriculum Advisory Board 2010 to 2014; and Technical Advisory Board, Sustainable Technologies, 1999 to 2004
International Congress for Environmental Commerce and Technology (ICONECT)
-Member, Board of Directors and Strategic Planning Committee, 1993 to 1995
National Association of Local Government Environmental Professionals (NALGEP)
-Smart Growth Advisory Council Member, 1997 to 2001
Chattanooga Area Chamber of Commerce; Member, Board of Directors, 1993 to 1996
Greater Chattanooga Area United Way; Member, Board of Directors, 1993 to 1996

SELECTED PAPERS AND PUBLICATIONS

"Nuclear Industry Management Lessons Learned" - An Analysis of 20th and 21st Century New Nuclear Construction Projects; A Digest of Over 150 Industry White Papers and Assessments for Over 100 Projects; presented at the IAEA/Arab Atomic Energy Agency Project Management Workshop; Kuwait, April 2011.

"Developing Nuclear Project Invitations for Tenders and Evaluation of Proposals" - An Analysis and Outline of New Nuclear Power Project OEM/EPC Scope Planning and Preparation Approach; presented at the IAEA/Arab Atomic Energy Agency Project Management Workshop; Kuwait, April 2011.

"Nuclear Project Price/Schedule Definitization and Contract Negotiation" - An Analysis and Outline of New Nuclear Power Project OEM/EPC Scope Planning and Preparation Approach; presented at the IAEA/Arab Atomic Energy Agency Project Management Workshop; Kuwait, April 2011.

"Nuclear Industry Management Lessons Learned" - An Analysis of 20th and 21st Century New Nuclear Construction Projects; A Digest of Over 150 Industry White Papers and Assessments for Over 100 Projects; Nordic Nuclear Conference; Stockholm, December 2010.

"Nuclear Industry Challenges and Insights" - An Analysis of Current Project Controls and Planning Issues; Have We forgotten to Keep Things Simple and Less Is More; presented at the American Nuclear Society (ANS) Winter Meeting; Washington DC, November 2009.

"20th Century Lessons Learned in the Nuclear Industry" - A Critique of Root Causes for Failure and Success Required to Support the 21st Century Nuclear Renaissance; presented at the American Nuclear Society (ANS) Winter Meeting; Washington DC, November 2007.

"Smart Growth, Urban Sprawl, and Sustainable Development" - Partnerships Provide the Foundation for Economic Development and Environmental Stewardship; The Chattanooga Renaissance and SMART Park® Industrial Ecology Model; presented at the Policy Forum on Urban Sprawl for The Center for Environmental Studies; Budapest, Hungary April 2000.

"Keeping the Pace at River Bend" - Fast Track Planning and Construction Management under the Provisions of the Nuclear Power Construction Stabilization Agreement (NPCSA) and the Alternating Four-Tens Shift Work Approach; presented at the American Power Conference; Chicago IL April 1986.



RICHARD V. DRAKE

PROFESSIONAL SUMMARY

Mr. Drake has 32 years of experience in the commercial nuclear power industry spanning design, construction, procurement, Project Management, startup, operation/maintenance, and outage/modification phases. He began his career working for Bechtel Power and held positions of increasing responsibility in support of construction, start up, outage, and continuing maintenance activities during the construction, commissioning, and operation of Palo Verde Nuclear Plant from 1978 to 1990. He held key department line management positions with the Tennessee Valley Authority Nuclear (TVAN) organization from 1990 to 2005 at each of the TVA Nuclear Sites and the corporate headquarters. He served as the construction manager for the completion of Watts Bar Unit 1 and Browns Ferry Unit 1 restart.

Since 2006, Mr. Drake has been a Vice President and Senior Consultant with High Bridge Associates. He has led multi-discipline teams of personnel spanning numerous locations and contractor organizations, producing effective results in dynamic environments amid multiple priorities and aggressive deadlines. He has worked supporting various Project Assessments and Project Management/Controls Deployment Planning Reviews for New Nuclear Projects. He led the High Bridge activities for STPNOC STP 3 & 4 supporting independent cost and schedule assessments of Toshiba and Fluor. Mr. Drake was Co-Lead on an Independent Project Assessment Team for Toshiba to review and critique Fluor's estimates for STP Units 3&4, which identified more than \$1 billion in potential reductions to the Fluor Estimate, and developed alternative strategies for contractual approaches for future contracting.

EMPLOYMENT EXPERIENCE

(May 2006 to Present) High Bridge Associates / Work Management, Inc.

In the position of VICE PRESIDENT, REGIONAL MANAGER, EXECUTIVE MANAGEMENT CONSULTANT

Clients and assignments include:

- ***Generation mPower***-TEAM LEAD on an independent assessment and analysis of New Build Nuclear Project oversight costs for completeness, accuracy, appropriateness of methodologies applied, as well as contingency and allowance applications.

- ***Florida Power & Light, Turkey Point Nuclear Plant***-TEAM LEAD to provide an independent review and assessment for the Extended Power Uprate project to include cost, schedule, team strengths, outage readiness, and project maturity.
- ***NuScale Power*** – TEAM LEAD to Develop Program and Project Execution Plan
- ***Kiewit Power Constructors*** – TEAM LEAD on independent assessment of estimating processes, cost estimate, schedule, and comparative analysis for Small Modular Reactor Project.
- ***South Texas Project Nuclear Operating Company***, (STPNOC) Unit 3 & 4 – TEAM LEAD for an Independent assessment of cost and schedule of Toshiba America Nuclear Energy (TANE) and Fluor Constructors for the construction two nuclear units in South Texas.
- ***Toshiba*** – Seconded as CO-LEAD to review and critique the Fluor Constructors cost estimate to construct STP Units 3&4, which identified more than \$1 billion in potential reductions to the Fluor Estimate, and developed alternative strategies for contractual approaches for future contracting.
- ***Dominion Power*** – Independent assessment and parametric analysis of New Build Nuclear Project to include cost and schedule reviews of five nuclear technologies and EPC companies including Shaw, URS, Fluor, and Bechtel.
- ***Riverland BioFuels*** – Led Project Management Organization to complete 3 Million gallon ethanol plant.
- ***TVA*** – Led Project Management Organization to develop and complete a two-year recovery effort for the improvement of the 3-Unit 2500 MWe Paradise Steam Plant.
- ***American Electric Power*** (AEP) – MANAGEMENT CONSULTANT for the External Independent Review and Assessment of the Sargent and Lundy cost and schedule to construct a New Build Nuclear Plant at the DC Cook site.
- ***AEP*** – MANAGEMENT CONSULTANT to develop a parametric cost assessment of the current nuclear technologies.
- ***Duke Power*** – Led a team to review and assess the existing Project Management Organization processes and procedures. Based on findings from the assessment develop organizational and program requirements for the PMO.

(2002 to 2005)Tennessee Valley Authority, Browns Ferry Nuclear Plant, Unit 1 Restart, Decatur, AL

In the position of MAINTENANCE AND MODIFICATIONS MANAGER,

- Design Scheduling Engineering and Planning (DSEP) and Browns Ferry Unit 1 Restart Maintenance and Modifications Manager
- Developed the plan, schedule, resources, and negotiated the contracts for the maintenance and modifications required to restart BFNP Unit 1

Managed the resources for the implementation phase of BFNP Unit 1 Restart (over 1500 craft, 400 non-manual, annual budget greater than \$100M)

(2000 to 2002) Tennessee Valley Authority, Sequoyah Nuclear Plant, Soddy Daisy, TN

As MAINTENANCE AND MODIFICATIONS MANAGER, Units 1/2

- Managed all activities associated with the Maintenance and Modifications department at this dual-unit nuclear plant
- Both units were INPO 1, and during the 2002 evaluation both units were given a strength in maintenance for the period

(1996 to 2000) Tennessee Valley Authority, TVA Nuclear, Chattanooga, TN

In the position OF SENIOR MANAGER OF NUCLEAR PROJECTS AND CAPITAL CONTROLS

- Direct report to the Chief Nuclear Officer TVAN
- Managed the capital budget for TVAN
- Project Management at the TVAN sites reported directly to this position
- Responsible for project approval, project controls, and the development of five-year planning cycles at the TVAN sites

(1995 to 1996) Tennessee Valley Authority, TVAN, Chattanooga, TN

As MANAGER OF PROJECT MANAGEMENT TVAN

- Responsible for developing the project management process and guidelines for TVAN
- Developed project approval processes at the TVAN sites and TVAN corporate office

Direct report to the Vice President of Project Management for the Generating Group at the Tennessee Valley Authority.

(1994 to 1995) Tennessee Valley Authority, Watts Bar Nuclear Plant, Spring City, TN

In the position of CONSTRUCTION MANAGER WBNU UNIT 1 responsible for construction activities required to complete WBNU1. Managed construction resources and contracts. Direct report to the Senior Vice President WBNU1 Completion

(1991 to 1994) Tennessee Valley Authority, Sequoyah Nuclear Plant, Soddy Daisy, TN

As MANAGER OF PROJECT MANAGEMENT/PROJECT CONTROLS

- Responsible for project management and project controls, associated capital budget ranging from \$90M - \$120M per year
- Managed 12 – 15 project managers and 22 – 36 project control engineers
- Developed and implemented project approval process and project controls processes and policies

(1990 to 1991) Tennessee Valley Authority, Sequoyah Nuclear Plant, Soddy Daisy, TN

In the position of MODIFICATIONS FIELD SHIFT MANAGER

- Responsible for the implementation of plant modifications
- Developed the processes and procedures for Modifications Task Managers

(1978 to 1990) Bechtel Power Corporation, APS, Palo Verde Nuclear Plant, AZ

Construction, Start up, and Outage Activities

EDUCATION

(1992 to 1995) University of TN at Chattanooga

Attended Courses for a Master's Degree in Mathematics

- 26 course hours completed

(1990) Arizona State University, Tempe, AZ

Bachelor's Degree in Mathematics

- Graduated cum laude
- Lifetime member of Golden Key National Honor Society at Arizona State

PROFESSIONAL AFFILIATIONS

Project Management Institute

Institute of Nuclear Power Operations (INPO) Maintenance Managers

CHARLES W. HESS

Summary

Mr. Hess has over 35 years of experience in the power industry and has been involved with development, design, engineering, construction, operation, and decommissioning of various nuclear facilities. He is active with industry programs in preparation for new large and small reactor nuclear facilities, and is familiar with all nuclear technologies and NRC requirements. He is a recognized expert in light water reactors, sodium cooled fast reactors, and high temperature gas cooled reactors. He also has worked on pool-type research reactors, homogeneous aqueous reactors and Thorium based fuel cycles. He has designed fuel fabrication facilities, reprocessing facilities high-level waste vitrification facilities, and fuel storage facilities. He managed completion of engineering, operational support, and decommissioning projects for large and small energy facilities. With nearly 20 years in responsible positions for nuclear industry, he has a thorough understanding of owner and regulatory issues balanced with extensive EPC experience and constructability/maintainability issues. He is a Registered Professional Engineer in Pennsylvania, with a BS degree in Nuclear Engineering and has been a Certified Project Management Professional.

Mr. Hess was the co-chair of the American Nuclear Society (ANS) President's Special Committee on SMR Licensing Issues. The Committee is comprised of ANS members including representatives from SMR designers, developers, academia, industry, and government who are working to develop consensus on issues challenging the deployment of SMR technology. Mr. Hess is a frequent speaker at SMR and other nuclear technical conferences, has been quoted on SMR matters in various publications, and has testified before the House Energy and Commerce Committee regarding SMR issues.

Mr. Hess was the lead technical reviewer for CB&I's support team for the DOE's Advanced Reactor Concepts Program. He provided valuable feedback to National Lab personnel on the commercial implications of the advanced designs. As a result, he is thoroughly knowledgeable in all advanced reactor design concepts in terms of reactor design, fuel cycle development, accident tolerant fuel designs, fuel storage including dry storage options and deep borehole disposal. He was a lead engineer on the Advanced Liquid Metal Reactor program and on the GE-H Team for the Global Nuclear Energy Partnership.

Mr. Hess was part of the DOE team that negotiated the Plutonium Disposition Agreement between the Russians and the USA. He was responsible for developing and integrating the schedule of activities for developing the Russian MOX facilities and for coordinating with the US MOX program in the 1990s. He understands the issues surrounding plutonium disposition.

Work Experience

(2010 to 2015) CB&I Federal Services (Shaw Environmental and Infrastructure), Senior Project Manager

As a SENIOR PROJECT MANAGER he was the Project Manager for Shaw's participation in the Next Generation Nuclear Plant program working on Pebble Bed Module Reactors. He also was the Project Manager for a medical isotope reactor based on a homogenous aqueous reactor concept developed by B&W. When PBMR, Ltd. collapsed financially, he was responsible for developing, staffing, and managing a team to complete the deliverables needed for DOE to complete their assessment report by producing a Licensing Readiness Assessment and a cost estimate based on the German HTR 200 design. He was the capture manager for Small Modular Reactors to be sold in the Federal Business Sector. He identified the technical issues associated with sodium cooled fast reactors and identified design changes to be performed to better fit the reactor to the needs of the marketplace. He assisted the developer (High Bridge Energy Development, LLC) to conceptualize, develop, integrate, and prepare business cases for SMRs. Made presentations to the Army Corps of Engineers regarding SMRs on military bases. Was the Project Task Manager for the Support to Advanced Reactor Concepts Program to the DOE. Participated in third party reviews of DOE's ARC programs including fuel recycling approaches, Safeguards and Security by Design, advanced reactor concepts. He was the Project Manager for the EM² project with General Atomics that prepared a gap analysis in their design criteria document, developed a construction plan and a capital cost estimate.

(2008 to 2010) Tetra Tech, Director of Nuclear Engineering

In the position of DIRECTOR OF NUCLEAR ENGINEERING he provided direction to the conversion of the Tetra Tech design procedures and policy to make them compatible with the requirements and expectations of the nuclear industry. He was instrumental in identifying the tools necessary to enable a new entrant to the nuclear industry to compete and to prosper. He was responsible for identifying key staff members to position the Tetra Tech engineering in areas of extreme interest to the nuclear industry. Mr. Hess supported the effort to brand Tetra Tech's commercial nuclear capabilities by authoring or co-authoring numerous technical papers that highlighted Tetra Tech's understanding of complex nuclear management and design issues. He led the effort to install and to utilize Intergraph's Smart Plant design tool and used it to develop a detailed proposal to replace the condenser at the Columbia Nuclear Stations that was complete with an animated 3D graphics presentation. Mr. Hess served as Co-Chair of the ANS President's Special committee on Small Reactor licensing issues. He was instrumental in advancement of small reactors design criteria and business cases.

(1996 to 2008) Burns and Roe Enterprises, Chief Nuclear Engineer/Program Manager

As CHIEF NUCLEAR ENGINEER, developed and managed the nuclear engineering staff to ensure career and professional development and to assist in the performance of design and modification work. Led the International Nuclear Safety Program for the DOE that provided, updated and improved safety system, structures and components to operating Soviet Era

designed Russian nuclear plants. These plants were in Russia, the Ukraine and Armenia. Modifications included “Flex” items like diesel-driven High Pressure Safety Injection pumps, improved DC Safety Related power systems., and advanced fire detection and suppression systems. Developed engineering tools and management systems to improve the efficiency and quality of engineering products. Took part in many external independent design reviews of DOE programs to ensure that the management systems and engineering approach were both adequate and well applied. Served as the Project Manager of the Entergy Nuclear’s Owner’s Engineering team for their new build program. Was the Project Controls manager for the Plutonium Disposition Program supporting the DOE negotiating team as they attempted to coordinate the technical programs of Russia and the USA in disposing of excess weapons plutonium.

(1976 to 1996) Burns and Roe Enterprises, Nuclear Engineer

As a NUCLEAR ENGINEER performed nuclear shielding analysis and design for various nuclear plants. Also, developed and designed nuclear radioactive waste processing systems for Forked River Nuclear Station and for the post-accident TMI-2 reactor recovery program. Led design teams to make modifications to operating nuclear plants including Oyster Creek, TMI1, Indian Point 3. Developed Design Basis Reconstitution documents for Oyster Creek, Limerick, Cooper and Indian Point 3. Was a lead engineer on the advanced liquid metal reactor program and for the development of several advanced nuclear designs for AP-600 and for the SBWR which were both predecessors to the AP-1000 and the ESBWR reactors. Successfully performed modifications to the Oyster Creek nuclear generating station and for the Indian Point 3 nuclear plants.

Education

B.S., Nuclear Engineering, Pennsylvania State University

Licenses & Certifications

Professional Engineer License, The Commonwealth of Pennsylvania
Certified Project Management Professional (PMI), 2003, Inactive, Nationwide



DR. MICHAEL D. HIGH

SUMMARY

Dr. High has over 50 years of experience with advanced technology and first-of-a-kind (FOAK) projects/programs spanning research, development, demonstration, engineering, construction, operations, and maintenance in the power generation, environmental, and aeronautical industries. He has testified before various congressional subcommittees regarding environmental issues, acid rain legislation, and the U.S. Department of Energy's fossil and nuclear energy budgets. He chaired the Electric Power Research Institute's (EPRI) Environmental Research Division Advisory Committee and served for five (5) years as a member of the EPRI Research Advisory Committee (RAC). As a member of the EPRI Ad Hoc Committee on Advanced Reactor Programs (ARP), he provided policy and technical guidance on making light water reactors simpler and enhancing their safety features through the Advanced Light Water Reactor (ALWR) Utility Steering Committee.

Since 2000, Dr. High has worked extensively with High Bridge Associates as an Executive Consultant providing consulting services, technology assessments, and independent reviews. He has extensive technical, scientific, and financial analytical skills, and is accustomed to supporting large, complex, and multi-disciplined projects with numerous participants. He has performed independent project reviews, risk assessments, feasibility/due-diligence and life cycle cost studies for various commercial and Department of Energy (DOE) projects including:

- Evaluation/selection study of next generation nuclear reactor technologies from OEM/EPC suppliers (Areva/EPR, GE/ESBWR; Hitachi GE/ABWR; and Westinghouse/AP 1000), for the New Nuclear Plant Project for Entergy. (Commercial)
- Evaluation/selection study of next generation nuclear reactor technologies from OEM/EPC suppliers (Areva/EPR, GE/ESBWR; Hitachi GE/ABWR; and Westinghouse/AP 1000), for the Dominion Power Corporation. (Commercial)
- Red Team Westinghouse AP1000 Price Certainty review. (Commercial)
- Independent reviews of cost and risks for the NuScale SMR development. (Commercial)
- Feasibility of establishing a privately funded Fast Flux SMR. (Commercial)
- Risk assessment of the United States, Japan, South Korea, and Republic of China scope of work for the International Thermonuclear Experimental Reactor (ITER). (ITER and DOE)
- Development of Project Management Plans and identifying/quantifying project risks for the Mixed Oxide Nuclear Fuel Fabrication Facility for Shaw Areva located at the Savannah River Site (SRS) in SC. (DOE)

- Performing an independent risk/contingency assessment of the Spallation Neutron Source (SNS) research accelerator project for the DOE at the Oak Ridge National Laboratory (ORNL).

Dr. High practiced in the field of aeronautical and aerospace engineering for nearly twenty years, first at Pratt & Whitney Aircraft Company and more extensively at the U.S. Air Force Arnold Engineering and Development Center located near Tullahoma, Tennessee. He joined the Tennessee Valley Authority (TVA) in 1980 for nearly nine years as Division Director responsible for all aspects of Research, Development, and Demonstration (RD&D) for the TVA electric power system. Under his direction, TVA pioneered wet limestone scrubbing technologies for the removal of sulfur dioxide. His division carried out the national research, development, and demonstration program for fluidized bed combustion of coals with high sulfur content, culminating in the construction of a 160-megawatt demonstration power plant at the TVA Shawnee Steam Plant in Kentucky.

In 1988 Dr. High was appointed to the Burkett Miller Chair of Excellence in Management and Technology at the University of Tennessee at Chattanooga (UTC). Dr. High has served on numerous Boards, national committees, and directed several planning studies for the City of Chattanooga and Hamilton County. He served on the State of Tennessee's first Science and Technology Advisory Council being appointed to that council by Governor McWherter. Dr. High is a registered engineer in the State of Tennessee and the Commonwealth of Kentucky. He has over 50 articles published in national and international journals.

EXPERIENCE

(2002 to Present) Management Consultant, High Bridge Associates, Inc.

Dr. High provides management consulting and technical support to various projects and FOAK programs. He has supported project development, marketing, and proposal activities for renewable energy, distributed generation, and industrial facilities. He has performed independent project reviews, risk assessments, and feasibility/due-diligence studies for various commercial and Department of Energy (DOE) projects including:

- The New Nuclear Plant Project for Entergy, as part of the Burns and Roe/High Bridge Owner's Engineer team. He was the Task Lead for performing an evaluation/selection study of Reactor Technologies and OEM/EPC suppliers, i.e. Areva/EPR, GE/ESBWR; Hitachi GE/ABWR; and Westinghouse/AP 1000.
- The International Thermonuclear Experimental Fusion Reactor (ITER), a > \$10 billion multi-national (i.e., the US, EU, Japan, China, South Korea, Taiwan, and Russia) facility located in France. He led a high level Risk Assessment for US Team scope of work supporting this project.
- The DOE Mixed Oxide Nuclear Fuel Fabrication Facility for Shaw Areva located at the Savannah River Site (SRS) in SC. This included development of Project Management Plans, identifying/quantifying project risks, and facilitating Risk Mitigation brainstorming and planning.

- Performing an independent risk/contingency assessment of the Spallation Neutron Source (SNS) research accelerator project for the DOE at the Oak Ridge National Laboratory (ORNL).
- A renewable fuels/clean energy complex (SMART Park) for the City of Chattanooga, Tennessee.

(1996 to 2001) High Technologies Management, Inc. (HITEC)

As CHAIRMAN, CEO, and FOUNDER of a small consulting firm providing management analysis and support to government and private organizations. Some consulting efforts provided by HITEC include:

- Performed an assessment of the technical resources of the Department of Energy's Oak Ridge complex for the Hamilton County and City of Chattanooga. Made recommendations to the community of how to take advantage of those resources.
- Conducted a technical review and management assessment of a USAID project to develop coal research and development facilities in Indonesia. Made recommendations to the USAID Director and Indonesian's Minister of Technology and Science on how to salvage the project to meet the original objective of establishing the R&D facilities within the remaining financial resources.
- Conducted a technology assessment for USAID of the technical and economic readiness of a biomass gasifier feeding an aero-derivative gas turbine combined cycle electric generating plant for Brazil. Made recommendations to the USAID project staff as to the readiness of this technology.
- Conducted a study for the Tennessee Valley Authority for applying global positioning system (GPS) and geographical information systems (GIS) to their electric transmission and communication systems. Made recommendations to the Technology Applications Director of the cost benefit of applying these systems to TVA operations.
- Performed engineering, economic, and technical analyses for Team Associate's SMART Park study for River Valley Partners of Hamilton County and the City of Chattanooga. Analyzed the energy and water needs of industry and commercial buildings in the Southside of the City of Chattanooga. Made recommendations for equipment size and type to support a distributed central energy system for the Southside area. Made recommendations on the technical/economic feasibility of sharing water and energy resources among industries in the Southside area.

(October 1988 to 1996)

Professor and Burkett Miller Chair of Excellence, University of Tennessee (Chattanooga)

Dr. High taught engineering, design, and management courses. As the first holder of the Burkett Miller Chair of Excellence in Management and Technology, developed strategies to assist the University and the community to create new business opportunities, improve operations in existing businesses, and attract new businesses to the Chattanooga region.

As a professor in the School of Engineering, aided the Dean and faculty to define curriculum, exploit research opportunities, and set general strategies that helped UTC Engineering better fulfill its role in preparing engineering students for their profession. In this role participated in

development of courses for the Master of Science in Engineering Management (MSEM). Personally responsible for development of and teaching the graduate MSEM course in “Technical Project Management.” Personally responsible for development of in the MSEM capstone course “Technology Management”. Lead role in refining the MSEM course “Advanced Engineering Economics” to meet student/industry needs. Was responsible for developing the proposal to establish a Doctor of Philosophy in Engineering program at the University of Tennessee at Chattanooga.

Assisted the Dean and faculty of the School of Business Administration to define curriculum that placed more emphasis on the relation between technology development and management. Maintained an active involvement in appropriate research activities and publication of technology-related matters. He served as a Member on the Board of Directors of the Tennessee Society of Professional Engineers, and as a Member of the Governor’s Advisory Council on Science and Technology, State of Tennessee. As a professor in the School of Computer Science and Engineering, aided the Dean and faculty to define curriculum, exploit research opportunities, and set general strategies that help UTC better fulfill its role in preparing engineering students for their profession. In this role participated in development of courses for the Master of Science in Engineering Management (MSEM). Maintained active participation in appropriate research activities and publication in technology related matters. While a Professor and Chair participated in the following organizations:

- Member of the State Board of Directors of the Tennessee Society of Professional Engineers (July 1989 to July 1992).
- Member, Governor’s Advisory Council on Science and Technology, State of Tennessee.
- General Chairman and Principal Organizer for the conference emphasizing opportunities and technology developments for environmental oriented businesses - Conference on Environment Commerce (CONEC ‘93) held in Chattanooga, Tennessee, October 1993.
- President of the Tennessee World Trade Center Board of Directors, (1991 to 1997).
- Member of the Hamilton County/City of Chattanooga economic development agency (Partners for Economic Progress - PEP) Board of Directors (July 1991 to July 1995).
- Member of the Greater Chattanooga Television Corporation, WTCI-TV, Board of Trustees, (July 1989 to July 1995 and July 1997 to present).
- Chair, community task force for developing long range environmental plans (1992).
- Chair, community task force, recycling plans for unused, urban industrial sites (1991).
- Member of Hamilton County/City of Chattanooga Regional Planning Commission Committee for Downtown Chattanooga Economic Study (January 1990 to July 1990).
- Consultant, U.S. Agency for International Development (USAID) Energy Research Laboratory for Indonesian (1990 - 1991).

(1980 to 1988) Division Director, Division of Energy Demonstrations and Technology, Tennessee Valley Authority (TVA) – Chattanooga, TN

The division was the principal Research, Development, and Demonstration (RD&D) division within the Office of Power of the Tennessee Valley Authority (TVA). Dr. High was responsible for corporate management planning and implementing the TVA power system R&D

programs including fossil energy, nuclear energy, electricity end use applications, renewable energy sources, electricity transmission, and environment. This included managing internal TVA R&D budgets ranging from \$50 million to \$60 million a year. For several years, with projects funded by outside sources including direct U.S. Government appropriations and funds from the Department of Energy (DOE), the R&D budget was as large as \$100 million a year. Dr. High managed 250 to 350 division employees including 180 technical engineers and scientists. Managed all aspects of TVA's participation in the Electric Power Research Institute (EPRI). TVA's yearly contribution was approximately \$20 million.

A majority of TVA's electric generation capacity is produced by combustion of pulverized coal. A major part of TVA's research program was directed at producing technologies that mitigate the environmental effects associated with the burning of coal. Major research programs were carried out in the areas of reduction of gaseous emissions from burning pulverized coal, particularly sulfur dioxide and nitric oxides and better solid waste disposal technologies. He was responsible for developing the long-range plan, raising the funds, and conducting one of the largest technology efforts by any U.S. electric utility involving the development of atmospheric fluidized bed combustion (AFBC) for coal-burning power plants. This effort included the design, construction, and operation of a \$70 million pilot plant and the design and construction of a \$220 million commercial-size demonstration plant. Testified before several congressional subcommittees on environmental issues, acid rain legislation, and U.S. DOE fossil and nuclear energy budgets.

Dr. High served on several Electric Power Research Institute's Advisory Committee's including chairing the Environmental Research Division, five (5) years as a member of the Research Advisory Committee (RAC) and as a member of the Ad Hoc Committee on Advanced Reactor Programs (ARP). The Research Advisory Committee is responsible for formulating and approving all of the research programs for EPRI. The EPRI ARP was comprised of senior executives from several electric utilities who provided policy, strategy, and technical guidance on the U.S. DOE's Advanced Reactor Programs (SAFR, PRISM, and HGTR). The committee provided policy, strategy, and technical guidance on making current light water reactors simpler and enhancing their safety features through the ALWR Utility Steering Committee (senior vice-president of operations and plant superintendent-level participants).

(1964 to 1979) Engineering Supervisor, Branch Manager, and Research Engineer, Arnold Engineering and Development Center (AEDC) – Tullahoma, TN

From 1965 to 1979, he managed two separate branches, responsible for testing of U.S. Air Force weapons systems including satellite defense, re-entry vehicles, and aircraft. Supervised 50 to 100 technical personnel with approximately 50 to 100 support personnel. Supervised union trades and labor crafts personnel. Participated in developing Sverdrup Corporation business opportunities outside AEDC. (ARO, Inc. was a subsidiary of Sverdrup and Parcels Associates of St. Louis, Missouri, which later became Sverdrup Corporation.) The diversity of these assignments developed technical and personal skills necessary to manage people and highly technical installations from hands-on experience. Began to develop strategic planning capabilities.

Was responsible for many research areas related to physical phenomena important to air and spacecraft development involving basic aeronautics; high temperature, ionized gases; heat transfer; magneto hydrodynamics; re-entry, ablation and ballistic characteristics; and simulation problems associated with sub-scale testing in ground test facilities. Supervised 7 to 15 scientific personnel with advanced degrees. Was responsible for development of management philosophy to complement technical skills.

As Research Engineer from 1964 to 1968, he worked on and resolved many problems associated with air and spacecraft development. Technical issues required knowledge of fundamental physical phenomena important to air and spacecraft development involving basic aeronautics; high temperature, ionized gases; heat transfer; magneto hydrodynamics; re-entry, ablation and ballistic characteristics; and simulation problems associated with sub-scale testing in ground test facilities. Performed technology assessments critical to technical facilities and organizations. Began publishing and presenting technical papers nationally and internationally.

EDUCATION

Ph.D. in Aeronautical Engineering, University of Oklahoma, **1967**

Masters of Science in Aerospace Engineering, University of Oklahoma, **1962**

Bachelors of Science in Aeronautical Engineering, University of Colorado, **1960**

Associates of Science in Engineering, Mesa Junior College, **1958**

PROFESSIONAL AFFILIATIONS

Registered Professional Engineer, State of Tennessee and Commonwealth of Kentucky

PUBLICATIONS**Selected Publications at the University of Tennessee at Chattanooga:**

- Comprehensive View of Electric Utilities R&D Advanced Technologies in the United States, invited paper, Michael D. High and Dale T. Bradshaw, TVA, Japan Central Research Institute of Electric Power, Japan's Seventh Forum of Future Energy Technologies, Tokyo, **(1990)**.
- Assessment of Asbestos Insulation Substitutes in Fossil Fueled Plants, Prakesh Damshala, Michael D. High, Prem S. Chopra, and Phillip M. Kazemsky, EPRI Research Report **(1989)**.

Selected Publications at the Tennessee Valley Authority:

- Status of Atmospheric Fluidized-Bed Combustion for Electricity Generation, invited paper at the Sixth International Conference on Fluidized-Bed Combustion **(1980)**.
- Status of Atmospheric Fluidized-Bed Combustion for Electricity Generation, invited paper at the Ninth International Conference on Fluidized-Bed Combustion **(1986)**.

- Atmospheric Fluidized-Bed Combustion, invited paper, Second Mid-Western Acid Rain Conference, Chicago, IL (1986).
- Combustion Techniques and Global Warming, invited paper, 1987 Conference on Global Warming, Washington, D.C. (1987).

Also, provided numerous testimonies in the Congressional Record as an expert witness before House of Representatives and Senate Committees and Subcommittees on environmental and energy issues. As the Director of Research and Development for the TVA power system, Dr. High led and provided oversight for the publication of approximately 20 research reports per year for eight years.

Selected Publications at the Arnold Engineering and Development Center:

- Pressure Coefficient on Cones at Large Angles of Attack, AIAA Journal TN, 1963.
- Similarity Rules for Cones with Mass Injection, AIAA Journal TN, 1963.
- Analytical Solutions for a Parallel Plate Electrostatic Probe, Ph.D. Thesis, University of Oklahoma (1967).
- Compressible, Turbulent Boundary Layers with MHD Effects and Electron Thermal Nonequilibrium, Ninth Symposium on Engineering Aspects of Magneto hydrodynamics.
- Turbulent Boundary Layers with Electron Thermal Nonequilibrium and Finite Rate Ionization, Eleventh Symposium on Engineering Aspects of Magneto hydrodynamics.
- Turbulent Boundary Layers with Electron Thermal Nonequilibrium and Finite Rate Ionization, AIAA Journal, Vol. 10, No. 1.
- Acceleration of a Spherical Particle in a Uniform Gas Flow, AIAA TN, Vol. 9, No.5.
- Exhaust Plume Temperature and Reynolds Effects on Nozzle After body Performance Over the Transonic Mach Number Range, AGARD-CP-150, Proceedings on Airframe/Propulsion Interference, AGARD Fluid Dynamics Panel Symposium, Rome, Italy.
- Exhaust Plume Temperature and Reynolds Effects on Nozzle After body Performance Over the Transonic Mach Number Range □, AIAA Paper No. 74-481, AIAA/SAE 74th Propulsion Conference, San Diego, C.
- Transition Prediction Technique □, AIAA Journal TN, Vol. 12, No. 1
- Aircraft Turbine Engine Exhaust Emissions Under Simulated High Altitude, Supersonic Free Stream Flight Conditions, AIAA Paper No. 73-507, AIAA/AMS International Conference on Environmental Impact of Aerospace Operations in the High Atmosphere, Denver, CO. (Also article, AIAA Journal of Aircraft, Vol. 11, No.8).
- Velocity Temperature Relationships in Turbulent Boundary Layers with Non-Unity Prandtl Numbers, AIAA 9th Fluid and Plasma dynamics Conference, San Diego, CA (also published article in the International Journal of Mass and Heat Transfer).

Also, author or co-author of seven AEDC technical reports on fluid mechanics and ground testing.



BARTH P. LONEY, PE, PMP, CM

PROFESSIONAL SUMMARY

Mr. Loney has more than 30 years of experience in program / project / engineering management serving in various positions with increasing responsibilities. As a Senior Vice President with High Bridge Associates, Inc., he has a history of successful project/program completions, implementations, reengineering and process improvements. He is an adept professional with the ability to work comfortably in diverse environments, handle multiple tasks simultaneously, and creatively address root causes to develop innovative solutions that have improved processes and contributed directly to bottom line performance. He is a Subject Matter Expert with extensive experience in Project Management, Earned Value Management, Risk Management, and Engineering and Construction Management. His industry experience includes nuclear power, construction and utility background, both in private and federal sectors. He has ten years of experience leading and participating in project reviews for the Department of Energy. He is familiar with multiple standards and requirements, including, but not limited to, DOE Order 413, PMBOK, and ANSI 748. Some recent assignments for High Bridge supporting multiple DOE Offices include:

- Oak Ridge National Lab (WAI) – TRU Waste Processing Center, Support General Manager in areas of Risk, Earned Value and Budget/Proposal development. Evaluating waste stream trends and cost for the project and budget forecasting options
- Office of Acquisition Project Management (Headquarters) – Led External Independent Review (EIR) team for the CD2/3 submittal of the K-27 D&D project at Oak Ridge. Also served as Risk SME for the review.
- Office of Environmental Management (Headquarters) – provided project controls expertise for a project involving research reactor fuels disposition.
- Office of Environmental Management (Paducah) – Performed review/assessment of project management documents for CD-1 submittal

EMPLOYMENT HISTORY

(2012 to 2014) High Bridge Associates. Invensys, Foxboro, MA/Beijing China

Provide project management expertise to the China Nuclear Project. This includes advising the Senior Management Team on matters regarding all aspects of program management. Personally prepared policy documents in the areas of Project Controls, Earned Value, Configuration Management and Risk Management. Assisted the director and manager of project controls in designing and implementing an integrated schedule for the eight China Nuclear units into a single program schedule, including resources loaded and logically tied. Direct the daily activities of two PMO offices, one in Foxboro and one in Beijing.

(July 2011 to 2012) Edgewater Technical Associates, ADNHHO, Los Alamos National Security

In the position of PROGRAM MANAGEMENT CONSULTANT provided Consulting Expertise for assisting the Nuclear High Hazard Operations Senior Program Management to clearly identify and track all program commitments that were not part of the daily operations activities already in the program schedule for the Los Alamos Nuclear Security, LLC. This includes advising the Assistant Laboratory Director's Staff, the Senior Management Team and Project Directors on matters regarding Program Management. As well as mentoring the members of the senior management team in matters of work control and planning...

(October 2003 to July 2011) High Bridge Associates, Inc., US DOE-EM, EM-62

As SUBJECT MATTER EXPERT provided Expertise for both Project Management and Project Control activities for the Department of Energy's Office of Environmental Management. This includes advising the Assistant Secretary's Staff, the Senior Management Team and Federal Project Directors on matters regarding Project Management, developing and implementing the federal project control program and process, and training for all federal project activities. This also includes direct support to all field offices across the DOE-EM complex as well as participating in multiple project reviews and assessments. All programs and activities are designed based on the Project Management Institutes PMBOK philosophies as well as applicable DOE and federal regulations. Most frequent areas addressed were Risk Management and Contingency analysis, Cost Estimating, Scheduling, Earned Value Management (Per the ANSI standard), and Resource Management. Both prepared policy implementation standards as well as performed audits against implementation methodology for 86 projects ranging in value from \$100M to \$20B.

(2000 to 2003) Varitek Industries, Houston, TX

As Program Manager, managed the development, design, and manufacture and testing of the telematics hardware and software products and services through subcontractors. Program management responsibility including baseline development, performance management and reporting to Senior Management and Board of Directors. Line management responsibility for all activities of the R&D, Product Development, QA, Engineering, Training, Manufacturing plus Customer Integration and Customer Service Departments. Design and implement the work processes for each department. Develop corporate policy for all operational activities. Personally prepared the startup baseline budget and baseline schedule for each division. Prepared integrated startup and business plan for the entire corporation. Drafted the policies and procedures for every department in the corporation.

(1998 to 2000) Triconex Systems, Inc., Houston, TX

In the position of SENIOR PROJECT MANAGER managed Controls Projects in the petrochemical and utility industries. Defined project scope and deliverables with client. Prepared project baseline plans, budgets and schedules. Led project teams of Engineers, Designers, and Technicians while providing technical guidance and approval of the hardware and software products. Presented project plans and status monitoring and reporting to senior management, both internal and customer. Directed Factory Acceptance Test and final customer approval of system. Provided technical oversight for customer at commissioning. Performed project close out and presented to Senior Management, including the final performance and profit analysis.

(1994 to 1998) Houston Light and Power, Wadsworth, TX

As DIRECTOR OF PROJECTS managed Plant Projects Division for utility industry. Designed and implemented the project management process for the plant. Personally managed multiple large capital projects that required executive management skill set due to large cost or high visibility with local municipalities. Also directed the activities of eight other project managers. Responsible for operating budgets of \$12 million and individual project budgets greater than \$20 million. Supervised daily activities of up to 225 employees. Developed and taught teambuilding classes to better network the project teams and to improve the overall project team performance.

(1993 to 1994) AEI, Columbus, GA

As ENGINEERING MANAGER – Engineering and Power Development Managed design evaluation and testing projects at the *South Texas Nuclear Plant*. Prepared and presented project implementation plans to plant management team for approval. Supervised project teams of up to 25 engineers with project budgets up to \$4 million, including, providing technical direction and oversight. Performed business development activities.

(1991 to 1993) Bechtel Corporation, Athens, AL

In the position of MECHANICAL / NUCLEAR PROJECT ENGINEER managed Design Baseline Verification Project. Prepared project plans and presented them to Executive Management for approval. Directed activities of more than 75 Engineers, from electrical, chemical, mechanical and civil engineering disciplines, in Design Basis Reconciliation activities. Responsible for operating budget in excess of \$2 million with projects scopes up to 150,000 man-hours.

(1989 to 1991) Willo Products Co., Inc. Decatur, AL

As MANUFACTURING MANAGER managed the manufacture of control systems and modular steel products in the detention industry. Duties included long and short range planning, budget and schedule development, plus monitoring, development and implementation of the plant safety and quality programs, staying current on the latest manufacturing techniques and equipment and supervision of support personnel. Prepared and gave presentations on business practices and manufacturing techniques to the Board of Directors of the company and to other companies, community organizations, and business groups. The annual operating budget under my control was \$6-7 million dollars and was consistently ran 5-10% under budget.

(1982 to 1989) Tennessee Valley Authority

LEAD MECHANICAL ENGINEER: managed the Mechanical design organization and assisted the Project Engineer in supervising the activities for each of the various Engineering design groups. Reviewed and approved mechanical design documents to ensure compliance with the appropriate codes and standards.

1980 to 1982) Combustion Engineering, Chattanooga, TN

As ANALYTICAL ENGINEER performed structural engineering analysis on Westinghouse Nuclear Reactor pressure vessels, pressurizers, and piping.

(1976 to 1980) Chattanooga Boiler & Tank Chattanooga, TN

In the position OF PROJECT ENGINEER designed unfired pressure vessels per ASME and API codes. Prepared proposals and presented proposals to customers. Upon closing sale became the

project manager for manufacturing, delivery and installation of pressure vessels at customer plant site.

EDUCATION

BSE, Mechanical Engineering, Thermal, University of Tennessee, *1982*

SOFTWARE/TOOLS

- Primavera P6 V8.2
- Microsoft Office
- Adobe Professional
- SAP

CLEARANCES / PROFESSIONAL LICENSES / CERTIFICATIONS

- US-DOE Q Clearance
- PMP Certification - PMI
- Registered Professional Engineer, Texas
- Senior Reactor Operator Certification -- NRC
- Certified Manager, Institute of Certified Professional Managers, James Madison University



CHARLIE E. ANDERSON

PROFESSIONAL SUMMARY

Over 33 years with increasing responsibilities in executive, technical, operations, program, and project management of nuclear materials disposition, nuclear materials production, nuclear waste management, and nuclear and coal fired power generation programs with *Los Alamos National Lab, Nuclear Management Partners, URS Corporation, Washington Group International*, the *Department of Energy* and the *Tennessee Valley Authority* covering laboratories and complex operating facilities from construction through decommissioning and demolition. Served in senior management positions as a key member of these organizations with responsibilities in leadership, management, oversight, strategic planning, and execution of startups, transitions, and problematic programs. Responsibilities have included annual budgets of \$6.2 Billion and workforces of 3,000 Federal and 30,000 contractor personnel. Work has typically involved bridging technical, business, and political agendas to solve problems in order to achieve programmatic and operational goals and objectives. Performance has always demonstrated a focus on progress and personal commitment. Have lead key cross cutting initiatives in most of these organizations, which includes commercial, government, international, and government contractor.

Currently, providing professional management services on an independent basis. Previously served as a Vice President to URS, providing management and programmatic strategic advice on major contracts. Prior to returning to URS corporate offices in Aiken, served as Associate Director of Nuclear & High Hazard Operations at Los Alamos National Lab, with broad responsibility for all facility operations at Los Alamos National Laboratory, including nuclear operations, safety basis, criticality safety, startup and restart, packaging and transportation, fire protection and engineering. Joined URS as General Manager of Nuclear Management Partners, the Management & Operations contractor consortium for the Sellafield operations in the northwest of England. Within the consortium, responsibility included serving as Business Unit Vice President with the Washington Division of the URS Corporation. Prior to joining URS in 2007, served as Principal Deputy Assistant Secretary of Environmental Management, with the DOE in Washington, DC. Provided innovative and sound leadership in a number of management positions at the Savannah River Site for the Department of Energy including Deputy Site Manager, Assistant Manager for High Level Waste; Director, Office of Defense Nuclear Nonproliferation; Director, Nuclear Materials Disposition; Director, Reactors and Spent Fuel Division; Director, High Level Waste Programs Division; and Director, Liquid Waste Division. In 1990, transferred from the Tennessee Valley Authority. Initially started career with

the Tennessee Valley Authority as a construction project engineer at the Yellow Creek Nuclear Plant construction site. Relocated to the corporate engineering office in several system engineering positions which lead to Browns Ferry Nuclear Plant leading the system engineering efforts for a three unit operating nuclear plant. Last position with the Tennessee Valley Authority was Special Projects Manager at Browns Ferry Nuclear Plant with responsibility for the site program management of multi-discipline, site-wide problem recovery projects.

PROFESSIONAL HISTORY

(December 2013 to Present) High Bridge Associates, Greensboro, GA
MANAGEMENT CONSULTANT

(May 2013 to November 2013)URS Corporation
VICE PRESIDENT, GLOBAL MANAGEMENT & OPERATING SERVICES

(June 2009 to May 2013)URS Corporation, Los Alamos National Security, LANL, Los Alamos, NM
ASSOCIATE DIRECTOR/DEPUTY ASSOCIATE DIRECTOR, Nuclear & High Hazard Operations

(July 2008 to June 2009)URS Corporation, Nuclear Management Partners, Sellafield, Seascale, United Kingdom
GENERAL MANAGER

(October 2007 to July 2008)URS Corporation, Nuclear Management Partners, Sellafield, Seascale, United Kingdom
VICE PRESIDENT, ENERGY AND ENVIRONMENT

(May 2005 to October 2007)U.S. Department of Energy, Washington, DC Headquarters
PRINCIPAL DEPUTY ASSISTANT SECRETARY, Office of Environmental Management

(December 2004 to May 2005) U.S. Department of Energy, Washington, DC Headquarters
ACTING CHIEF OPERATING OFFICER, Office of Environmental Management

(June 2003 to December 2004)U.S. Department of Energy, Savannah River Operations Office, Aiken, SC
DEPUTY MANAGER FOR CLEANUP

(February 2001 to May 2003)U.S. Department of Energy, Savannah River Operations Office, Aiken, SC
ASSISTANT MANAGER, High Level Waste

(September 2000 to February 2001)U.S. Department of Energy, Savannah River Operations Office, Aiken, SC
DIRECTOR, Office of Defense, Nuclear Nonproliferation, NNSA

(March 2000 to August 2000) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

ACTING DEPUTY ASSISTANT MANAGER for Material & Facility Stabilization

(September 1999 to March 2000) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Nuclear Material Disposition Division

(July 1998 to September 1999) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Nuclear Material Storage Division

(April 1997 to July 1998) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Reactors and Spent Fuel Division

(December 1995 to April 1997) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Programs Division

(February 1995 to December 1995) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

SPECIAL ASSISTANT to Assistant Manager for High Level Waste

(May 1993 to February 1995) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Engineering Division

(June 1992 to May 1993) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

DIRECTOR, Liquid Waste Division

(May 1990 to May 1992) U.S. Department of Energy, Savannah River Operations Office, Aiken, SC

CHIEF, Tank Farm Branch

(April 1989 to May 1990) Tennessee Valley Authority, Browns Ferry Nuclear Plant, Athens, AL

SPECIAL PROJECTS MANAGER

(March 1986 to April 1989) Tennessee Valley Authority, Browns Ferry Nuclear Plant, Athens, AL

LEAD MECHANICAL ENGINEER

(November 1984 to March 1986) Tennessee Valley Authority, Browns Ferry Nuclear Plant, Athens, AL

STAFF SYSTEMS ENGINEER

(September 1981 to November 1984) Tennessee Valley Authority, Knoxville Corporate Offices

(September 1981 to November 1984)

MECHANICAL SYSTEMS ENGINEER

(December 1980 to September 1981) Tennessee Valley Authority, Yellow Creek Nuclear Plant, Iuka, MS

INSTRUMENTATION & CONTROLS CONSTRUCTION PROJECT ENGINEER

EDUCATION / PROFESSIONAL CERTIFICATIONS

- University of Tennessee - *January 1982 to June 1982*; postgraduate work in electromagnetic fields and transient analyses; no post graduate degree completed.
- Memphis State University - *September 1976 to December 1980*; Bachelor of Science in Mechanical Engineering; 3.41/4.0; cum laude; member of Tau Beta Pi Engineering Honor Society.
- Senior Technical Safety Manager Qualified
- *Q Clearance currently held.*



Andrew C. Kadak, Ph.D.

PROFESSIONAL SUMMARY

Dr. Kadak has over 40 years of commercial nuclear experience and is President of Kadak Associates, Inc., a consulting firm specializing in management issues and nuclear energy. Prior to resuming his private consulting practice, Dr. Kadak was Principal and Director of Nuclear Services at Exponent, a worldwide company offering multidisciplinary expertise and rapid response capabilities to provide stewardship in addressing complex engineering and scientific problems. Dr. Kadak served on the IAEA special team assessing earthquake and tsunami damage of the Onagawa Nuclear Plant in Japan and has performed extensive studies of the Fukushima Dai-ichi Nuclear Plant.

Prior to joining Exponent, Dr. Kadak was a Professor of the Practice in the Nuclear Engineering Department of the Massachusetts Institute of Technology. His research interests include the development of advanced reactors, in particular the high temperature pebble bed gas reactor, space nuclear power systems, improved technology neutral licensing standards for advanced reactors and operations and management issues of existing nuclear power plants. Recently he was asked to serve on the Small Modular Reactor subcommittee of the Secretary of Energy's Advisory Board. His expertise ranges from reactor physics, power conversion, safety analysis and engineering systems. Dr. Kadak has recently been working on Hybrid Fusion Energy systems and sodium cooled fast reactors. He is also a principal author of the MIT fuel cycle study.

Dr. Kadak was also President and CEO of Yankee Atomic Electric Company. In this capacity, he was responsible for overseeing all Yankee operations, including the decommissioning of the Yankee plant in Rowe, Massachusetts and engineering, licensing, environmental and operational support to all eight nuclear plants in New England and many other national and international clients.

Dr. Kadak's expertise ranges from day to day operations of nuclear plants to senior executive management. In the past, he has lead Yankee Atomic in license renewal of operating reactors, systematic evaluation of older plants to allow them to demonstrate compliance to new regulations, financial rate proceedings to assure adequate capital for safe operation, innovative fuel purchase agreements, high level nuclear waste disposal and storage solutions. His technical background has allowed him to actively direct the Yankee strategy dealing with reactor vessel embrittlement, boiling water reactor pipe replacements and how to manage aging of nuclear

plants. At Yankee he managed the economic analysis of the value of continued operation of the Rowe plant. He presently consults on decommissioning of nuclear plants and has served on safety review boards of nuclear utilities.

Dr. Kadak was President of the American Nuclear Society in 1999/2000. He has served as a board and executive committee member of the Nuclear Energy Institute and the industry's Advisory Committee on High Level Waste. He has served as a member of the National Association of Regulatory Utility Commissioners special panel on high level nuclear waste and the Aspen Institute's "Dialogue on Nuclear Waste Disposal". In 1995, he was a member of the Advisory Committee on External Regulation of Department of Energy Nuclear Safety. He has also conducted several audits of nuclear companies to assess management and served as chairman of a panel providing suggestions to the DOE's Nevada Test Site as to how to make their operations more like commercial industries. Dr. Kadak was appointed by the President to serve on the US Nuclear Waste Technology Review Board. *He also served as a member of the Senior Nuclear Safety Oversight Board of the Daya Bay nuclear power stations in Guangdong Province in China* and served as a member of the Rhode Island Atomic Energy Commission. Dr. Kadak has made more than 70 lectures and speeches on topics related to the technical and business aspects of nuclear power.

PROFESSIONAL EXPERIENCE

Kadak Associates, Inc.

1997 to Present

PRESIDENT

- Kadak Associates is a firm that specializes in decommissioning, licensing strategies, management reviews intending to improve competitiveness and effectiveness, organizational strategies for deregulation of the utility industry, safety assessments, license renewal, legal and political strategies, innovative solutions to tough problems, spent fuel management, public relations and communication, and adapting to changing regulatory environments.

Exponent

2010 to 2013

PRINCIPAL AND DIRECTOR OF NUCLEAR SERVICES

- At Exponent, Dr. Kadak applies his extensive experience in the nuclear industry to current problems facing operating nuclear plants and those proposed for construction.
- He leads the Nuclear Services practice to apply Exponent's skills to address problems of national and international significance.
- These areas include engineering fundamentals in mechanical, structural, metallurgical, chemical, electrical engineering.
- Additional areas include executive management consulting, construction, and operations covering such areas as risk, reliability, vulnerability and root cause analyses, and corrective action program development and assessment.
- Of significance to the nuclear industry, Dr. Kadak's responsibilities include regulatory strategy development and compliance assessment.

Massachusetts Institute of Technology**1997 –2010****PROFESSOR OF THE PRACTICE**

- Dr. Kadak supervised the modular high temperature gas reactor project and many graduate and undergraduate theses on many diverse topics from space nuclear power to nuclear powered container ships.
- He taught classes in design, engineering systems, operational reactor safety, and nuclear waste and engineering leadership.
- He also gave invited lectures on topics relevant to commercial nuclear power.

Kadak Associates, Inc.**1997 - 2010****President**

- Kadak Associates is a firm that specializes in decommissioning, licensing strategies, management reviews intending to improve competitiveness and effectiveness, organizational strategies for deregulation of the utility industry, safety assessments, license renewal, legal and political strategies, innovative solutions to tough problems, spent fuel management, public relations and communication, and adapting to changing regulatory environments.

Yankee Atomic Electric Company**1979 - 1997****PRESIDENT AND CHIEF EXECUTIVE OFFICER (1989 - 1997)**

- Oversaw the Yankee Nuclear Power Station operation and then decommissioning when the plant was permanently shutdown in 1992.
- Yankee also provides engineering and operations support for the Vermont Yankee, Maine Yankee, and Seabrook Nuclear Power Stations and other clients worldwide.
- Yankee was a \$ 100 million revenue company with over 500 professional staff with expertise ranging from engineering, environmental sciences, nuclear safety analysis, quality assurance, fuel procurement, inservice inspection and plant support.

VICE PRESIDENT (1986-88)

- Responsible for Nuclear Engineering, Environmental Engineering, Environmental Laboratory, Computer Services, Generic Licensing, and Commercial Sales.

PROJECT MANAGER, VERMONT YANKEE (1983-85)

- Managed engineering and licensing support for operation of the Vermont Yankee NPS (BWR).

PROJECT MANAGER, YANKEE NPS (ROWE) (1980-83)

- Directed engineering, capital projects, and licensing for the Yankee NPS.
- Managed Yankee's response to the NRC's Systematic Evaluation Program, for the oldest operating plant in the country.

ASSISTANT TO THE VICE PRESIDENT (1979-80)

- Coordinated emergency planning for the Yankee, Vermont Yankee, and Seabrook Nuclear Power Stations, performed post-TMI assessments of operating reactors, and represented Yankee on the Utility Waste Management Group.

New England Power Company**1975-1979**

MANAGER, NUCLEAR INFORMATION

- Directed efforts to educate the public on nuclear power. Managed the informational, advertising, citizen coalition and political support for a new power plant project proposed for Rhode Island.

Combustion Engineering Corporation**1972-1975**

PRINCIPAL PHYSICIST, PWR PHYSICS (1973-75)

- Concentrated on the operational control aspects of pressurized water reactors; formulated improved methods of reactor control and analysis; developed improved monitoring and safety protection systems; investigated reactor maneuvering capabilities and the application of space-time kinetics to safety analysis.

EDUCATION

Massachusetts Institute of Technology

- Ph.D., Nuclear Engineering - Reactor Physics (1972)
- M.S., Nuclear Engineering (1970)

Northeastern University - M.B.A. (1983)**Union College - B.S., Mechanical Engineering (1967)****PROFESSIONAL AFFILIATIONS AND HONORS**

- US Nuclear Waste Technology Review Board, Member (past)
- Commissioner, Rhode Island Atomic Energy Commission
- President, American Nuclear Society, 1999-2000
- Nuclear Energy Institute - Board of Directors (past)
- Nuclear Energy Institute - Nuclear Waste Advisory Committee (past)
- American Nuclear Society (ANS) – President 1999/2000, Board of Directors, (past)
- Advisory Committee on External Regulation of DOE Nuclear Safety (member)
- Electric Power Research Institute Research Advisory Committee (past member)
- The University of Massachusetts Engineering Task Force (past member)
- Edison Electric Institute - past member of the Policy Committee on Energy Resources, past member of the Nuclear Power Executive Advisory Committee
- Electric Council of New England - Board of Directors (past)
- New England Council - Board of Directors (past)
- Nuclear Utility Management and Resources Committee (NUMARC) - past member of the Issues Management Committee Board of Directors, and Executive Committee
- Northeast Section of the American Nuclear Society, Tau Beta Phi, Sigma Xi
- Member of the Industry Review Group on the Chernobyl Accident

SELECTED PAPERS AND LECTURE TOPICS**PAPERS IN REFEREED JOURNALS LIST**

1. Kadak, A.C., Freidberg, J.P. “ Fusion-fission hybrids revisited”, *Nature Physics*, June 2009, Vol. 5
2. Kadak, A. “ MIT Pebble Bed Reactor Project”, *Nuclear Engineering and Technology*, 39 (2), 2007, pp. 95-102.
3. Kadak, A.C., “A Future for Nuclear Energy: Pebble Bed Reactors”, *International Journal of Critical Infrastructures*, Vol. 1 No. 4, 2005, pp. 330-345.
4. Kadak, A.C., “Intergenerational Risk Decision Making: A Practical Example”, *Risk*, Vol. 20, No. 6, 2000, pp. 883-894.
5. Kadak, A.C., Matsuo, T., “The Nuclear Industry’s Transition To Risk Informed Regulation and Operation in the United States”, *Reliability Engineering and System Safety*, Vol. 92, Issue 5, May 2007, pp. 609-618.
6. Kadak, A.C., Zhai, T., “Air Ingress Benchmarking with Computational Fluid Dynamics Analysis”, *Nuclear Engineering and Design*, Vol. 236, Issue 5-6, March 2006.
7. Kadak, A.C., Berte M.V., “Advanced Modularity Design for the MIT Pebble Bed Reactor”, *Nuclear Engineering and Design*, Vol. 236, Issue 5-6, March 2006.

OTHER MAJOR PUBLICATIONS

8. Kadak, A.C, Berte, M.V. “Modularity Design of the MIT Pebble Bed Reactor”, American Nuclear Society Meeting, Reno, Nevada. November 2001.
9. Kadak, A.C., “An Advanced Nuclear Power Plant That Can Compete With Natural Gas”, Electric Power 2001 Conference Proceedings, March 21, 2001.
10. Kadak, A.C., “The MIT Modular Pebble Bed Reactor Project”, Seminar on HTGR Application and Development conference proceedings, Beijing, China, March 19, 2001.
11. Zhai, No, Kadak, “LOCA Analysis in a Pebble Bed Reactor”, American Nuclear Society paper submitted for June 2001 meeting in Milwaukee, Wi.
12. Kadak, A.C, Berte, M.V., “Advanced Modularity Design for the MIT Pebble Bed Reactor”, 2nd International Topical Meeting on High Temperature Reactor Technology, September 22-24, 2004, Beijing, China.
13. Kadak, A.C., Zhai, T., “Air Ingress Benchmarking with Computational Fluid Dynamics Analysis”, 2nd International Topical Meeting on High Temperature Reactor Technology, September 22-24, 2004, Beijing, China.
14. Kadak, A.C., Feng, B., “Conceptual Design of an Advanced Breeder Burner Reactor”, American Nuclear Society, June 2007.
15. Kadak, A.C., “Nuclear Power: Made in China”, *The Brown Journal of World Affairs*, Vol. XIII, Issue I, Fall/Winter, 2006.
16. Kadak, A.C., “Reconsidering Nuclear Power”, *Science Year Book* 2003, pp. 68-83.
17. Kadak, A.C., Bazant, M.Z., “Pebble Flow Experiments for Pebble Bed Reactors”, 2nd International Topical Meeting on High Temperature Reactor Technology, September 22-24, 2004, Beijing, China.
18. Kadak, A.C., “Establishing a Safety and Licensing Basis for Generation IV Advanced Reactors”, Workshop on Advanced Reactors, Advisory Committee on Reactor Safeguards, June 4-5, 2001.

19. Kadak, A.C, Brudieu, M.A, “Blind Benchmarking Predictions of NACOK Air Ingress Tests Using Computational Fluid Dynamics, 3rd International Topical Meeting on High Temperature Reactor Technology, October 1-4, 2006, Johannesburg, South Africa.
20. Kadak, A.C., Finan, A.E, Miu, K., “Nuclear Technology & Canadian Oil Sands: Integration of Nuclear Power with In-Situ Oil Extraction”, International Congress on Advances in Nuclear Power Plants, June 4-8, 2006, Reno, Nevada.
21. Kadak, A.C, Finan, A.B, “Integration of Nuclear Energy with Oil Sands Projects for Reduced Greenhouse Gas Emissions and Natural Gas Consumption”, MIT CANES white paper, June 2007.
22. Kadak, A.C., “Licensing and Deployment of Advanced Reactors” , American Nuclear Society Annual Meeting, June 2002.
23. Kadak, A.C., “An Advanced Nuclear Power Plant That Can Compete with Natural Gas”, Electric Power 2001 Conference, March 21, 2001.
24. V. Dostal, K. Gezelius, J. Horng, J. Koser, J.P. Iv, E. Shwageraus, P. Yarsky, and A.C. Kadak, "Mission to Mars: How to Get People There and Back with Nuclear Energy" (September 2004), MIT-NSA-TR-001
25. P. Yarsky, A.C. Kadak, and M.J. Driscoll, "Design of a Sodium-cooled Epithermal Long-term Exploration Nuclear Engine" (September 2004), MIT-NSA-TR-002
26. T. Zhai, A. Kadak, and H-C. No, LOCA and Air Ingress Accident Analysis of a Pebble Bed Reactor (March 2004), MIT- ANP-TR-102.
27. T.A. Galen, D.G. Wilson, and A.C. Kadak, Comparison Between Air and Helium for Use as Working Fluids in the Energy-Conversion Cycle of the MPBR (February 2001)

SELECTED INVITED LECTURES

- Woodrow Wilson International Center for Scholars, May 8, 2008 – Current and Future Prospects for Civilian Nuclear Power: US and Japanese Perspectives”, Washington, D.C.
- Manhattan Institute, New York City – Nuclear Energy Options, March 28, 2007.
- American Physical Society Conference - Nuclear Renaissance, October 31, 2006
- Westinghouse/BNFL, “MIT’s Pebble Bed Reactor Research” May 11, 2001, Monroeville, PA.
- Bettis Atomic Power Laboratory, “MIT Fuel and Safety Research”, May 11, 2001
- New England Council of Public Utility Commissioners, “The Inevitability of Nuclear Energy”, May 21, 2001, Mystic CT.
- Council of Scientific Society Presidents, “Advanced Nuclear Energy Plants – The Pebble Bed Reactor”, May 6, 2001, Washington, DC
- University of Rhode Island, “China’s Nuclear Energy Program”, December 2013
- Nuclear Innovation Alliance Workshop, Washington DC, “Technology Neutral Risk Informed Licensing Approaches and a Proposal”, October 2015
- World Nuclear Fuel Market Conference, New York City, “Nuclear Power Construction Programs – Can We Do It Again?” June 2014
- 45th Annual Meeting on Nuclear Technology, Frankfurt Germany, “US Decommissioning Experience”, May 2014
- Japan Atomic Industrial Forum, “The Environmental Imperative of Nuclear Energy – Despite the Challenges”, Tokyo, Japan, April 2014
- Department of Energy, Nuclear Energy Research Advisory Committee, Washington, DC, “Views and Priorities on Advanced Reactor Research and Development” January 2015.

- MIT Energy Conference, Cambridge MA, “Nuclear Power Plants – Will there be 6 or 60?”, April 2008.
- 6th Annual Technical VHTR Review Meeting 2013, Idaho Falls, “Nuclear Innovation in High Temperature Gas Reactors” May 2013
- SELECTED MANAGEMENT PRESENTATIONS
- "Airplanes Are Different - The Management Challenge," ANS Annual Meeting, New Orleans, Louisiana, June 1994.
- "The Safety Goal as a Regulation," ANS Executive Conference, Washington, D.C., March 1994.
- "Self Assessment - A Challenge to Human Nature," ANS Conference, San Diego, California, November 1993.
- "Engineering Excellence," ANS Executive Conference on Engineering Excellence, Jupiter Beach, Florida, October 1993.
- "The Quality of Management - The Next Self Assessment Challenge," American Nuclear Society Executive Conference, Self Assessment for Self Assurance, La Jolla, California, December 1990.
- "Excellent and Economic Nuclear Plant Performance Conference," ANS/ASME Joint Conference, Newport, Rhode Island, September 1990.
- "Promoting Professionalism and Credibility in the Engineering Organization," INPO Workshop, Atlanta, Georgia, May 1990.
- "What's a Safety Culture? How do I Get It? How Do I Keep It?" Presented to the Nuclear Nonoperating Owner's Group, Boston, September 1989.
- “Is Technology Enough? What About Management?,” 16th Reactor Operations International Topical Meeting, August 1993.

SELECTED OTHER LECTURES AND PRESENTATIONS

- “Generating Companies, An Idea Whose Time Has Come...Again,” Nuclear Engineering International, September 1989.
- “Utilities of the 1990's - Generators of Cash or Electricity?,” American Nuclear Society Executive Conference on Utility Management Strategies of the 1990's, April 1989.
- “Institutional Investors Conference on Economics of Older Nuclear Power Plants,” Lehman Brothers, New York, March 1992.
- “The Atom and Human Values,” 60th Steinmetz Memorial Lecture, Union College, October 1992.
- “How to Decide to Shut Down a Nuclear Plant Prematurely,” NUMARC panel presentation, October 1992.
- “How Long Will the Current Nuclear Power Reactors Operate?,” MIT October 1993.
- “The Safety Goal as a Regulation,” ANS Executive Conference, March 1994.
- “Yankee’s Decommissioning Program,” NRC Regulatory Information Conference, May 1994.
- “High Level Waste Legislation,” New England Conference of Public Utility Commissioners, March 1995
- “The Science and Politics of High Level Waste,” International Conference on High Level Radioactive Waste Disposal, May 1996.



STEVE R. MAEHR

SUMMARY

Mr. Maehr is President, CEO, and co-founder of High Bridge Associates. He has more than 35 years of experience in Engineering, Project Management, and Executive leadership positions in the electric utility and management services industries. His principal areas of expertise include Strategic Planning, Business Development and Sales, Planning and Scheduling, Budgeting, Financial Planning and Accounting, Maintenance, Outage Management, Management Information Systems, Licensing, Engineering and System Testing. With degrees in Mathematics, Nuclear Engineering (BS) and Industrial Management (MS), he has held positions of increasing responsibility with electric utilities, management service contractors, and consulting/project management companies.

Mr. Maehr has a demonstrated record of accomplishment in developing opportunities and assisting customers with managing their projects, programs, and corporate operations. He is an entrepreneurial and strategic thinker, an excellent communicator, and a versatile leader. With his network of resources developed over the years by working with hundreds of owners, specialty contractors, and staff resources, he has an exceptional proficiency in assembling project teams to deliver “Just in Time” skills to customers, when and where they are needed.

PROFESSIONAL SUMMARY

(July 2003 to Present) High Bridge Associates, Inc. and Work Management, Inc.

In the role of PRESIDENT responsible for all aspects of business operations for a management services company providing consulting and project management services to Oil & Gas, Electric Utility, Information Technology and Government industries. Operational control spans all phases of business and new product development, strategic planning, recruiting, management of consulting and service projects, and profit and loss. Provides management consulting for process reengineering and management control system development.

(July 2001 to June 2003) Team Associates, LLC.

As PRESIDENT responsible for all aspects of business operations of a GE affiliate company operating under Granite Services, Inc. and providing consulting and project management services to the utility, architect-engineering, construction and government industries. Operational control spans all phases of business and new product development, strategic planning, recruiting, management of consulting and service projects, and profit and loss.

(December 1994 to June 2001) Team Associates Inc., Norcross, GA

As SENIOR VICE PRESIDENT responsible for project and business management of consulting and management control services company. Grew the company from origination to \$19 MM annual revenue over a six-year period. Operational control spans all phases of business and new

product development, strategic planning, recruiting, management of consulting services and service projects, and profit and loss for assigned business lines. Provides management consulting for process reengineering and management control system development. Recent experience includes: Development of integrated restart schedules, outage management processes, and work control processes for shutdown nuclear power plants (Browns Ferry, Cooper, Dresden, LaSalle, DC Cook); development of a comprehensive baseline estimate and schedule for the demolition and decontamination of DOE's Uranium Enrichment Facility at Oak Ridge, TN; assessments of engineering processes, environmental restoration Life Cycle Cost Estimates, operations & maintenance activities, and project control processes for DOE's Hanford, Savannah River, & Oak Ridge Sites; and numerous management assessments for large electric utilities.

(October 1989 to December 1994) The Spear Group Inc., Norcross, GA

In the position of VICE PRESIDENT responsible to the President to ensure the successful acquisition, control, and execution of all assigned projects. Specific duties included all aspects of day-to-day operations, including client relations and fiscal accountability. Responsible for long-range planning and development of company goals and objectives. Performed consulting services in the power generation, construction, and government defense and energy industries. Specific experience includes project management and technical oversight for the development of an activity based budgeting and accounting process for a major western utility, development of integrated cost and schedule processes for the maintenance and operating contractor for a DOE facility, and development of project cost estimates, schedules, and management control processes for the restart effort of a shutdown nuclear power plant.

(August 1978 to September 1989) TVA, Browns Ferry Nuclear Plant, Decatur, AL

As WORK CONTROL/ OUTAGE SUPERINTENDENT responsible for managing all activities associated with unit outages including defining scope, planning, scheduling and implementation. Orchestrated all plant activities associated with the restart program for the first unit to be brought back into service. Also responsible for defining and implementing the process controlling day-to-day work activities to ensure compliance with plant licensing requirements and the achievement of schedule milestones.

(September 1985 to December 1988) TVA, Browns Ferry Nuclear Plant, Decatur, AL

As MANAGER, SITE PROJECT CONTROLS & FINANCIAL SERVICES was responsible for project management, planning, scheduling, budgeting, materials management and accounting functions for all site organizations. Organized and staffed a department which performed all project control functions for a site of over 6,000 employees and annual budgets to \$500M. Developed and implemented the first procurement engineering group utilized within TVA to ensure material procured for maintenance and modification activities complied with safety and quality requirements of the design basis.

(April 1984 to September 1985) TVA, Browns Ferry Nuclear Plant, Decatur, AL

As PLANNING AND SCHEDULING SUPERVISOR responsible for unit outage, maintenance and periodic test planning and scheduling for a three unit nuclear power plant. Developed and implemented an organization with responsibility for building new scheduling, tracking and management information data bases for all maintenance, engineering, and modification activities on site.

(April 1983 to April 1984) Sequoyah Nuclear Power Plant, Soddy Daisy, TN

As ASSISTANT OUTAGE DIRECTOR Responsible for the planning, scheduling and implementation of modifications and major maintenance activities for a two-unit nuclear power plant. Developed and implemented new planning programs that resulted in significant improvements in unit outage durations previously experienced. Chattanooga Corporate Office

(May 1981 to April 1983) TVA, Sequoyah Nuclear Power Plant, Soddy Daisy, TN

As REGULATORY GROUP SUPERVISOR responsible for power plant licensing interface with other TVA organizations and with the Nuclear Regulatory Commission. Developed and implemented a program involving technical review of nuclear events and experiences from other utilities. Developed an extensive knowledge of the overall design basis, operating practices, and regulatory framework involved with licensing and operating a nuclear power plant.

(December 1979 to May 1981) TVA, Sequoyah Nuclear Power Plant, Soddy Daisy, TN

In the position of NUCLEAR ENGINEER worked in the plant startup test program, operational and design change safety evaluations and the development and review of the TVA Action program in response to the Three Mile Island accident. Responsible for development of a special test program involving natural circulation tests never before performed at a commercial nuclear plant.

(August 1978 to December 1979) TVA, Sequoyah Nuclear Power Plant, Soddy Daisy, TN

In the position of PRE-OPERATIONAL TEST ENGINEER worked in the pre-op test program including researching, inspecting, coordinating, and testing of nuclear plant systems. Developed an in-depth knowledge of all phases of system testing including mechanical and electrical design verification. Assigned shift coordinator and test director for the plant hot functional test series

EDUCATION

- M.S. - Industrial Administration - Purdue University
- Krannert Graduate School of Management - **1978**
- B.S. - Nuclear Engineering - Purdue University, Lafayette, IN - **1977**
- B.A. - Mathematics - Augustana College, Rock Island, IL - **1977**