SEVEN COUNTY INFRASTRUCTURE COALITION
October 6, 2017

Resolution No. 2017-10A

RESOLUTION SELECTING A TEAM OF ANALYSTS TO STUDY THE VIABILITY OF A PARTNERSHIP RELATED TO THORIUM ENERGY AND RELATED MATTERS.

WHEREAS, Alpha Tech Research Corp. has approached the Coalition about investing in and partnering in the development of thorium energy and a molten salt reactor; and

WHEREAS, the Coalition has issued a Request for Qualifications for qualified analysts to study this technology, its market potential and risks, and the potential of partnering with Alpha Tech, and related matters; and

WHEREAS, the Coalition desires to select the team of analysts to perform the desired study:

NOW, THEREFORE, be it resolved by the Governing Board of the Seven County Infrastructure Coalition, Utah as follows:

1. The Governing Board hereby selects the team of analysts of ______________________ to perform the study on thorium energy and molten salt reactors to be performed consistent with the Request for Qualifications and directs the Executive Director to negotiate the terms of an agreement with this team and to enter into and execute such agreement with said team of analysts.

2. All parts of this Resolution are severable, and if any section, clause or provision of this Resolution shall, for any reason, be held to be invalid or unenforceable, the invalidity or unenforceability of any such section, clause or provision shall not affect the remaining sections, clauses or provisions of this Resolution.

3. All resolutions or parts thereof in conflict herewith are, to the extent of such conflict, hereby repealed and this Resolution shall be in full force and effect immediately upon its approval and adoption.
APPROVED AND ADOPTED this October 6, 2017

Motion by [Signature] and Seconded by [Signature]

SEVEN COUNTY INFRASTRUCTURE COALITION

VOTING:

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Co-Chair Phil Lyman
Co-Chair Jae Potter

ATTEST:

[Signature]

Eric Johnson
18 September 2017

Lenaye Harris  
175 S 830 E  
Smithfield, UT 84335  
lenayeharris@gmail.com  
435-535-1448

Seven County Infrastructure Coalition  
c/o Blaisdell, Church & Johnson, LLC  
Attn: Michael J. McKee  
5995 S. Redwood Rd.  
Salt Lake City, Utah 84123

Dear Mr. McKee:

I am excited to submit this proposal in response to the Seven County Infrastructure Coalition’s Request for Qualifications for a Project Financial Analyst on Potential Thorium Energy Project.

Evaluating any new technology is a complicated process, and thorium energy represents a new frontier in energy technology. Thorium energy is a vast and highly complex subset of nuclear technology; however, it also presents an enormous shift in the method of pursuing nuclear energy; thus, expertise in traditional nuclear technology does not equate to expertise in thorium technology and very few people possess real and relevant experience specific to thorium and molten salt reactors.

My name is Lenaye Harris. I have a strong background in financial analysis, and experience working with government bodies. I submit this proposal as an individual, but plan to work with two consultants. One is an expert in the field of thorium energy, and the other holds a doctorate in finance with past experience analyzing energy policy. Both are willing to share their expertise and participate as-needed for the successful completion of this project. With my unique perspective and access to a key individual in the thorium industry, I can help SCIC cut through any confusing technical jargon and determine the true merits of the proposed project following an objective, facts-based approach.

I certify that the enclosed information is true and complete to the best of my knowledge.

Sincerely,

Lenaye Harris

Enclosures
QUALIFICATIONS

**Lenaye Harris** is the lead analyst. She has a solid background in law, government, and finance, and knowledgeable contacts in the thorium molten salt reactor industry. Lenaye graduated summa cum laude from Utah State University with dual Bachelor of Arts in History and Law and Constitutional Studies in 2008. She completed an internship in the Utah State Legislature with Senator Lyle Hillyard, then the chair of the Executive Appropriations Committee. After pursuing several volunteer opportunities, Lenaye returned to Utah State and graduated with a Masters in Financial Economics in 2013. Lenaye now teaches at Utah State, focusing on courses in Corporate Finance, International Economics, Financial Management, and Financial Institutions. This fall, her only ongoing commitment is teaching a pair of finance courses on Tuesday and Thursday mornings.

**Consultants:**

**Benjamin Soon** is a technical and policy consultant. He currently serves as the Chief Business Development Officer for Flibe Energy, the world leader in commercial thorium molten salt reactor development. He has more than 9 years of experience in the field of Thorium-based nuclear energy, particularly in Molten Salt Reactors (MSR), with specific emphasis on the thorium fuel cycle and consequently possesses a unique skillset blending extensive knowledge and experience in both the technical and business aspects, including contributions to the development of the modular subsystem concept for LFTR. Benjamin developed the concept of the ‘Thorium Economy’ and has spoken about it extensively. He has also done studies and consultations on behalf of government and large national corporations regarding the field of thorium energy and MSRs.

**Dr. Tyler J. Brough** is an energy analysis consultant. He is an Assistant Professor of Finance in the Jon M. Huntsman School of Business at Utah State University. Dr. Brough earned a PhD in Finance at the University of Arizona in 2010, an MS in Finance at the University of Illinois Urbana-Champaign in 2004, and a BS in Economics at Brigham Young University in 2000. He teaches Corporate Finance and Derivatives Markets to undergraduates, and Derivatives Markets and Computational Methods to graduate students in the Master of Science in Financial Economics program. He conducts research in empirical market microstructure, applied econometrics, and computational methods. Tyler has previously analyzed the implications of renewable energy policy in Kansas and North Carolina.

Consultant availability is as needed for the successful conclusion of any proposal assessment.
PRIOR EXPERIENCE

Benjamin Soon is one of the few individuals with the technical knowledge and experience to fully understand the thorium energy industry. His relevant prior experience is as follows:

*Experience evaluating project opportunities, with emphasis in the fields of nuclear energy*
  - Evaluation of a national energy development program based on Liquid Fluoride Thorium Reactors (LFTR).
  - Full field (all Gen III+ and IV) advanced nuclear technology comparison and evaluation study for a major national contractor with specific emphasis on thorium fuel cycle reactors.

*Experience assisting emerging technologies to come to market*
  - Co-principal architect of full commercialization strategy for LFTR including implementation methodology of 3-stage plan for sustainable nuclear energy from thorium.

*Experience advising public bodies on creative public/private partnerships*
  - Advised a national research body on advanced nuclear systems, with emphasis on LFTR.
  - Consultant to major national technology consortium on thorium technology development based on Private-Public Partnerships.
ANALYSIS MODEL

Financial Analysis: Market Potential compared to Market Risks
1) Establish the investment’s timeframe and identify all expected relevant costs and cash flows

2) Analyze market potential by calculating
   - Levelized cost of electricity (LCOE): average unit cost of energy over the life of the asset
   - Internal rate of return (IRR): annualized rate of return generated by the project
   - Net Present Value (NPV): the present value of all project costs and cash flows
   Consider the certainty of the projected cash flows, and conduct sensitivity analysis to make findings more robust.

Project Feasibility
Factors needed for immediate project development
   - Manpower needs
   - Core development
   - Core chemistry
   - Materials development
   - Licensing and siting
   - Test facilities

Factors needed for market development
   - Source of U-233 and other key materials
   - Energy infrastructure (example: HVDC lines and transmission infrastructure)

Other key factors
   - Research and development costs
   - Ability to collaborate with national labs
   - Supply chain for component fabrication

Considerations for SCIC Involvement (project-to-client fit)
  - Nature of public-private partnership
  - Existing infrastructure and resources to develop project
  - SCIC-specific benefits

Company-specific Features
Adequate technology background and expertise needed for project
   - Have they clearly defined the technology and supply chain development?
   - Do they have partnership with key agencies to fulfill the supply chain?
   - Are these partnerships in place or just hoped for?

Business experience and successes of the proposed private partner
   - Amount of public engagement completed by principals
     o Conference presentations
     o Papers
Public domain information on expertise related to the field

- Relevant reputation
  - Are principals well-known in this field?
  - How often do the principals’ names show up in the public domain? Length of history?

Prior/current legal actions related to proposed projects or principals

- Any current legal filings
- Any potential legal filings
  - Previous business dealings that went sour, originality of business plan, overall reputation

**Funding Requirements**

Sources of funding for proposed projects (private/public)

- What sources are available?
- Appropriateness of the funding sources
  - Venture capital vs strategic partners
- Motive of public funding
  - Local job creation, developing advanced energy, partnering with national institutions

**Likelihood of Implementation**

Potential marketplace competition

- Competitors in the field
- Competitors’ ability to develop in Utah and nearby states

Appropriateness of public body partnering with a private entity

Strategic pathway to successful execution

- Supply chain
- Go-to-market strategy
- Security and fissile material protection
- Transportation and disposal of nuclear/radioactive material
TIMELINE
Anticipated completion: 5 weeks from date of selection.

COST
Anticipated cost: $12,000. Cost is calculated as $160/hour, anticipating 3 billable hours per business day over the 5-week completion period.

Further analysis can be completed at a cost of $160/hour.

QUALIFICATION SPREADSHEET
Lenaye Harris has not participated in any similar projects in the past five years.
Lenaye Howard Harris
175 South 830 East • Smithfield, UT 84335
(435) 535-1448 • lenayeharris@gmail.com

Education

Master of Science, Utah State University 2013
Major: Financial Economics
“Information Share in Options Markets: The Role of Volume, Volatility, and Earnings Announcements”

Bachelor of Arts, Utah State University 2008
Majors: History; Law and Constitutional Studies
Minor: Mathematics
Summa Cum Laude; Honors in History and in University Studies

Professional Experience

Adjunct Professor, Utah State University 2013-present
ECN 3400 Intro to Global Economic Institutions & Business Environment
FIN 3200 Financial Management
FIN 3400 Corporate Finance
FIN 4410 Financial Institutions
ECN 5600 Financial Economics

Independent Translator, Pohnpeian 2011-present
Translate legal, medical, and general documents from English to Pohnpeian

Subject Matter Expert, Economics and Finance 2015-present
Review textbooks and test banks for accuracy and clarity
Prepare analysis and testimony as an expert economic witness

Business Development and Data Analysis 2015-2016
Develop a business plan for a start-up finance company
Research and meet with potential clients
Python coding to analyze large data sets and provide visual representation of findings

Senate Intern, Utah State Senate 2009
Lyle Hillyard, Executive Appropriations Chair

Publications

Howard, Lenaye. 2010. "Greenock’s Case: A Note on Gender, Race, Class, Politics, and Punishment in Early Virginia." Virginia Magazine of History and Biography. 118, no. 4


Skills

Programming Languages
C++, R, SAS, Python

International Languages
Spanish, Pohnpeian
PROPOSAL FOR:

PROJECT FINANCIAL ANALYST

POTENTIAL THORIUM ENERGY
AND HYDROGEN PLANT
PROJECTS

SEVEN COUNTY INFRASTRUCTURE
COALITION

Idaho National Laboratory

PARADOX SOLUTIONS

ENERGY
FINANCE &
GOVERNMENT
CONSULTING

AUGUST 1, 2017
CODY DEETER
Project Lead - Owner EFG Consulting

Cody has over a dozen years of experience as a municipal advisor and public/private entity consultant. He is a registered municipal advisor through the SEC and MSRB with a FINRA Series 50 Municipal Advisor Representative license. His expertise and experience are described in more detail below and in the attached resume. Cody has worked with many public entities and private companies to find win-win solutions to economic development and project deployment. His unique perspective of public/private partnerships has been developed through practical experience. He understands the risk and reward regimes for both sectors and can successfully help the Coalition make quality decisions based upon quantitative and qualitative data. Cody will dedicate at least 20 to 25 hours per week to this project until complete.

CURTIS WELLS
Paradox Consulting

Curtis has over 15 years of experience as a natural resource developer in the minerals and energy space in the southwest United States. Curtis emphasizes building value through building successful teams and management. As a modern-day prospector, Curtis specializes in recognizing trends, forecasting demand, and seizing opportunity by developing projects and delivering mineral assets to the market. Having spent over 4 years on a public/private partnership with an innovative energy/mining focus, Curtis is eager to apply his experiences and frame of reference to net value for both partners. Curtis will dedicate 15-20 hours per week to this project until complete.

RICHARD BOARDMAN, PH.D.
Idaho National Laboratory

Dr. Richard Boardman oversees the INL Clean Energy Platform for Integrated Energy Systems development. His staff develops computational tools and test facilities supporting the design, assessment, integration, optimization, and control of industry-scale hybrid energy systems. Hybrid energy systems operate in a closely-coupled, dynamic manner to enhance the systems technical, economic, and environmental performance. Boardman is also responsible for coordination of DOE Laboratories, government, universities, regional stakeholders, and industry for this effort. After receiving his doctorate in chemical engineering from Brigham Young University, he worked for Exxon Production Research and Geneva Steel Mill, then joined Idaho National Laboratory in 1990. His personal expertise includes combustion, gasification, synthetic fuels process development, gas cleanup, and atmospheric environmental chemistry.
<table>
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<tr>
<th>Name of Analyst</th>
<th>Year</th>
<th>Type of Project</th>
<th>Client</th>
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<th>Description</th>
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<td>Cody Deeter</td>
<td>2014</td>
<td>Public/Private Partnership</td>
<td>Vineyard Town</td>
<td>Jake McHargue - City Manager</td>
<td>Developed a funding mechanism between the private land owner, the theatre developer, and the Town of Vineyards RDA.</td>
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<tr>
<td>Cody Deeter</td>
<td>2012-2017</td>
<td>Public/Private Partnership</td>
<td>Summit Powder Mountain Development</td>
<td>Greg Mowro - Summit Series</td>
<td>Powder Mountain was a dying resort until the Summit Series purchase this in 2013. Cody assisted with a public/private partnership to develop the horizontal infrastructure to the site and continues to provide support to see the development move toward its mission to create a home of the world renown Summit Series. The application for the Coalition is a) creative finance and b) coordination between business plan for private and goals/resource allocation of public entities.</td>
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<tr>
<td>Cody Deeter</td>
<td>2015-2017</td>
<td>Public/Private Partnership</td>
<td>TCFC (Canyons Ski Resort)</td>
<td>Larry White - Manager</td>
<td>Structuring/consulting on creation and funding of an assessment area and redevelopment project area between Weber County and Summit.</td>
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<tr>
<td>Cody Deeter</td>
<td>2016-2017</td>
<td>Public/Private Partnership</td>
<td>University of Utah Solar Project</td>
<td>Jake Barney - CFO</td>
<td>Structured a financial transaction for Celtic Bank to take tax credits to pull down the overall cost of power to UofU. This includes setting up a new LLC to own the panels, entering into a transaction with Celtic, and monitoring the construction of the solar system.</td>
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<tr>
<td>Cody Deeter</td>
<td>2016-2017</td>
<td>Private Business Evaluation</td>
<td>Hunt Electric</td>
<td>Brock Thayn - Renewable Energy Division Manager</td>
<td>EFG has developed a financial evaluation tool to analyze the benefit of solar for private and public entities including the use of tax credits (or &quot;selling&quot; of tax credits) to pull down overall power costs as part of a long-term energy strategy.</td>
</tr>
</tbody>
</table>

The applicability to the Coalition is the ability to analyze the financial goals of the University, the capabilities of Celtic Bank and it use of tax credits, and the ability to quantify and meet the financial energy needs of the university.
Our team will develop a tool/process to analyze the business/financial potential of projects that come before the Coalition. Our primary objective is to analyze whether the technology is ready for marketability. This approach will then be utilized to analyze the Thorium Project proposed by Alpha Tech Research Corp and the Hydrogen Plant Project proposed by Nikola Motor Company, LLC. Our team has the ability to complete the Hydrogen Project in 25 days or approximately by August 31 as well as the Thorium Project in 75 days or approximately by October 31. Our process will culminate in a succinct report on each project to the Coalition Board along with a recommendation for each project with next steps if the recommendation is to proceed.

The following is a description of the process we will undertake to evaluate each project. The general tool/process utilized is best described in the application to each project.

**Thorium Project**

Potential Marketplace Competition

This evaluation will include understanding the cost per kWh including the full lifecycle cost of the facility. This cost per kWh will then be compared to current and estimated future costs of other energy sources as a means to understand Thorium’s required price points in the market and ultimate viability.

Adequate Funding Needs

The bottleneck for most projects is the ability to acquire financing at reasonable terms. Significant financial due diligence is required by all lenders in order to determine viability. Our team will provide a deep dive into the financial projections including stress-testing of key financial variables. The purpose of this is two-fold: 1) to understand the potential funding available in the market, and 2) to understand the risks to the Coalition as more fully described in a subsequent section below. We will evaluate any potential offers or third-party analysis that may have already been provided to understand the perceived risk by others in the market. Our analysis will also determine what additional costs will need to be borne in order to reach marketability, including marketing costs, product development and/or further research and development, and capital/manufacturing overhead expense.

We will consider the modular nature of this technology which can reduce exposure to the Coalition.

Adequate Technological Background and Expertise

INL with its depth of understanding of technology will evaluate the readiness of the Molten Salt Reactor for marketability. This will include research into the expertise of team members involved with Thorium to ensure there is a comfort level that all necessary questions are being internally addressed by the company.

Market Potential Compared to Market Risks – Public Private Partnership Appropriateness

As described above, part of this section will be a continuation of the full financial analysis and business case for the project. This will include an evaluation of the operation and maintenance costs, the repair and replacement or lifecycle costs, capital expense, debt assumptions, and return thresholds. This analysis will then stress test key variables to determine the breaking point and thus evaluate the likelihood of success. Key variable stress testing will be evaluated against likely market conditions to provide a risk-based analysis for the Coalition.

Other areas of analysis will include the potential financial and reputational exposure to the Coalition as well as potential financial vehicles available to minimize or push off risk if possible. Our team will also provide several risk scenarios to depict what might happen in a public private partnership should problems arise. This might include the impact of private bankruptcy, public assumption of private debt,
HYDROGEN PLANT

Potential Marketplace Competition
This evaluation will include understanding the cost per mile including the full lifecycle cost of the facility and the trucks. This cost per mile will then be compared to current and estimated future costs of other fuel sources such as diesel, gas, natural gas, electric vehicles, and other alternative shipping means. This comparison will help provide a means to understand Nikola’s required price points. In addition, our team will evaluate the market vulnerability or strengths of having fuel stations only in Utah within the nationwide trucking industry. We will evaluate the likelihood of fuel stations in other regions of the nation.

Adequate Funding Needs
It is our understanding that financial review and potential funding evaluation has been provided for this project already. Our team will begin with this information to understand the third-party pros and cons already analyzed. We will then take a deeper dive into the financial projections including stress testing of key financial variables. The purpose of this is two-fold: 1) to understand the potential funding available in the market, and 2) to understand the risks to the Coalition as more fully described in a subsequent section below. Our analysis will also determine what additional costs will need to be borne to reach marketability including marketing costs, product development and/or further research and development, and capital/manufacturing overhead expense.

Adequate Technological Background and Expertise
INL with its depth of understanding of technology will evaluate the readiness of the Hydrogen power plant and vehicles for marketability. This will include research into the expertise of team members involved with Nikola to ensure there is a comfort level that all necessary questions are being internally addressed by the company.

Market Potential Compared to Market Risks – Public Private Partnership Appropriateness
As described above, part of this section will be a continuation of the full financial analysis and business case for the project. This will include an evaluation of the operation and maintenance costs, the repair and replacement or lifecycle costs, capital expense, debt assumptions, and return thresholds. This analysis will then stress test key variables in order to determine the breaking point and thus evaluate the likelihood of success. Key variable stress testing will be evaluated against likely market conditions to provide a risk-based analysis for the Coalition.

Other areas of analysis will include the potential financial and reputational exposure to the Coalition as well as potential financial vehicles available to minimize or push off risk if possible. Our team will also provide several risk scenarios to depict what might happen in a public private partnership should problems arise. This might include the impact of private bankruptcy, public assumption of private debt, public assumption of capital infrastructure, public debt repayment options in low revenue periods, and other pertinent risk-based scenario analysis.

Business Experience of Private Entity
Our team will request and analyze Nikola and all of its partners, associates, and associated business ventures to determine the past business experience of key players. Past performance is a good indicator of risk thresholds for key parties as this project matures.

Evaluation of Principals
Similar to the previous item, our team will analyze the key principals and those with true investment in the project to determine their level of financial, business or technical expertise as well as their level of investment or level of business or personal financial risk in the project. Those with more skin in the
Based upon the scope of work provide above, our team provides the following proposed fee for each project. We propose a fee of $23,500 for the Thorium Project and $17,500 for the Nikola Project.

### Thorium - Molten Salt Reactor

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### Nikola - Hydrogen Plant

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Cody Deeter is the owner of EFG which was established in 2017. The core mission of EFG is to help government and businesses make excellent long-term financial decisions. EFG can bring custom solutions to its clients utilizing its network of strategic engineering, legal, and financial partners.

**WORK HISTORY**

**MARCH 2017 – PRESENT – OWNER OF EFG**

**JANUARY 2015 – PRESENT – ADJUNCT FACULTY – ROMNEY INSTITUTE OF PUBLIC MANAGEMENT WITHIN THE MARriott SCHOOL OF BUSINESS AT BRIGHAM YOUNG UNIVERSITY**

Cody teaches public and non-profit budgeting. He adds “fun” to the class by teaching budget principles and then breaking the students into a mock city council to make “real” decisions.

**APRIL 2005 – MARCH 2017 – VICE PRESIDENT – LEWIS YOUNG ROBERTSON & BURNINGHAM**

While at LYRB, Cody developed and executed long-term financial plans for more than 50 clients including helping clients issue of over $750m in bonds. Cody managed a 7-team group that provided all work product at the firm from 2012-2014. His expertise also included economic development planning and RDA management, user rates, project feasibility analysis, impact fees, and public private partnerships.

**EDUCATION AND LICENSES**

**MSRB – SERIES 50 – MUNICIPAL ADVISOR REPRESENTATIVE**

**MASTERS OF PUBLIC ADMINISTRATION – BRIGHAM YOUNG UNIVERSITY – 2003-2005**

Key internships: Utah State Tax Commission – Economic and Statistics Unit, Internal Auditing
Deeter Consulting – performed annexation study for Holladay City, Fire Stats
Analysis for South Jordan City, Alpine School District Split Analysis

**BACHELOR DEGREE IN POLITICAL SCIENCE – UTAH STATE UNIVERSITY – 1997, 2000-2003**

Key Internships: United States House Natural Resource Committee
Utah House of Representatives

**SERVICE**

**SOUTH AFRICA CAPE TOWN MISSION – LDS CHURCH – 1998-2000**

**FOR FUN**

I love to spend time with family fishing, camping, hiking, playing games, and enjoying the outdoors – especially in my home town of La Sal, San Juan County, Utah. I am a country boy.
COMMUNITY

Grand County Republican Party, Chairman 2015-2017

- Increased Republican voter turnout for the general election from 15th to 1st since the last presidential election (2012).
- Increased Republican voter turnout for the primary from 22nd to 1st

Grand County High School, Varsity Football Coach 2016-Present

Moab City Parks and Recreation, Youth baseball and football coach 2013-2016

REFERENCES

SELMA SIERRA, Former State Director, BLM, Utah Energy Policy, Utah State University
(703) 224 6764

BRUCE ADAMS, San Juan County Commissioner
(435) 459 1331

GAVIN HARRISON, President, Harrison Land Services
(435) 260 1787

JOHN ANDREWS, Legal, SITLA
(801) 243 8611

DON HAMILTON, Owner, Starpoint Enterprises
(435) 650 3866
September 28, 2017

Via Federal Express

Seven County Infrastructure Coalition
c/o Blaisdell, Church & Johnson, LLC
Attn: Michael J. McKee
5995 S. Redwood Road
Salt Lake City, Utah 84123

Re: Response to Request for Qualifications for Project Financial Analysis on Potential Thorium Energy Project

Dear Mr. McKee:

In response to the Seven County Infrastructure Coalition’s Request for Qualifications, Pillsbury Winthrop Shaw Pittman is pleased to submit the attached proposal for an analysis of a potential thorium energy project. Pillsbury’s nuclear energy and public/private partnership practices make us uniquely qualified to provide the analysis that the Coalition is seeking.

Please contact me with any questions.

Sincerely,

[Signature]

Jay E. Silberg
PILLSBURY PROPOSAL TO
SEVEN COUNTY INFRASTRUCTURE COALITION

1. Qualifications

The two Co-Lead Analysts being proposed for the project set forth in the Seven County Infrastructure Coalition are senior partners in the Energy Group of the Pillsbury Winthrop Shaw Pittman law firm. As described in more detail below, each has more than four decades of experience in the nuclear industry. The Firm's Energy Group is oldest and one of the largest nuclear energy legal practices in the world, having been founded in 1960 and currently staffed with some two dozen lawyers and other professionals. The Group's lawyers include a former Commissioner of the U.S. Nuclear Regulatory Commission, degreed nuclear engineers, former attorneys at the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy, and officers in the Nuclear Navy. The Group has represented virtually all U.S. nuclear utilities and many other participants in the U.S. and international nuclear community. Attached is a description of the Firm's nuclear energy practice.

In addition to Pillsbury's unique nuclear energy capabilities, the Firm also has an extensive public-private partnership practice, with some twenty partners across the Firm's West and East Coast offices.

Jay Silberg is one of the Co-Lead Analysts for this proposal. Mr. Silberg, whose resume is attached, has been an attorney with the Firm since 1969 and a partner since 1973, specializing throughout that entire period in nuclear energy law. Prior to joining the Firm, he was an attorney with the Office of the General Counsel of the U.S. Atomic Energy Commission (the predecessor to the U.S. Nuclear Regulatory Commission.) Mr. Silberg has been involved in the development and licensing of many of the nation's nuclear power reactors, serving as the lead counsel for facilities including Susquehanna, Calvert Cliffs, Wolf Creek, Prairie Island, Monticello, Perry, Davis-Besse, Beaver Valley, Point Beach, Kewaunee, and Cook. He has also provided advice on many proposed nuclear power projects, including the Blue Castle project in Emery County. He has also been involved with many generic licensing issues at the NRC, both on behalf of individual nuclear utilities and the industry trade association, the Nuclear Energy Institute. Mr. Silberg has also been the lead licensing attorney for the proposed Private Fuel Storage interim spent fuel storage facility to be located on the Skull Valley Band of the Goshutes reservation.
in Tooele County. Mr. Silberg is a graduate of Amherst College and Harvard Law School.

Charles Peterson, a senior partner in the Firm, is the other Co-Lead Analyst. Mr. Peterson, whose resume is also attached, following graduation from the U.S. Naval Academy, began his career as an officer aboard U.S. Nuclear Navy submarines. He was licensed as a Senior Reactor Operator and Shift Supervisor by the NRC. Mr. Peterson joined the Firm in 2001 and has been involved in the international nuclear power industry and in development of new nuclear reactor technologies. Among his major accomplishments has been represented the United Arab Emirates in establishing their nuclear energy program and negotiating its purchase of four advanced power reactors from Korea. In addition, he has been involved in the potential development of several new reactor designs, including high temperature gas reactors (both prismatic and pebble bed), liquid metal cooled reactors (ARC, 4S, Leadcold), molten salt reactors (IMSR, WAMSIR, Thorcon), as well as more traditional light-water-cooled reactors.

Jeff Gans would be the analyst on public-private partnership issues. He is vice-chair of the Pillsbury's Construction Counseling & Dispute Resolution practice and chair of the Public-Private Partnership team. His practice is focused on advising developers, contractors and financers of complex energy, infrastructure, or commercial projects. He assists clients with the negotiation of the financing, design, and construction contracts that are involved with every complex project. Jeff also has first-chair litigation experience in state and federal courts representing clients with construction disputes, including experience against the federal and state governments and other sovereign entities.

2. Prior Experience

The Firm has had extensive experience in evaluating nuclear reactor technologies and their commercial viabilities. In addition to helping to develop and defend the cost-benefit analyses required of all nuclear reactor projects since the early 1970's and negotiating the contracts to purchase many of those facilities, the Firm has advised its utility clients on the risks and rewards of pursuing nuclear projects in general and specific nuclear technologies in particular, as far back as the competition between the light water reactor and high temperature gas-cooled reactor technologies in the early to mid-1970's.

In recent years, the Firm has been called upon to work with a number of new reactor technologies as they tried to move beyond the conceptual stage. These included the following:
- Toshiba 4S. On behalf of Galena, Alaska, which was pursuing a small nuclear power reactor as its energy supply, we evaluated the Toshiba design concept, evaluated the licensing and financial aspects, and pursued various financing options. When Toshiba purchased Westinghouse, Toshiba stopped development of the 4S and allowed Westinghouse to pursue its IRIS design.

- Advanced Reactor Concepts, L.L.C. (ARC) has assumed the place of the 4S reactor as the leading sodium cooled, metal fueled fast-reactor. Pillsbury assisted in introducing ARC to GE-Hitachi. They have now formed a joint venture that is using the best technology of both reactor designers.

- We are helping Thorcon Power with its 250MWe molten salt reactor. The first units are scheduled to be installed in Indonesia.

- We are also supporting LeadCold Reactors (a Swedish company) in its efforts to construct a lead-cooled reactor at the Chalk River site in Canada.

- We are advising Terrestrial Energy with their IMSR, a liquid-fuel reactor system using low-enriched-uranium fluoride salt. The design is in the Vendor Design Review process in Canada.

- X Energy LLC, another Pillsbury client, has designed a new version of the pebble-bed high temperature gas-cooled reactors were first proposed in 1944, and the X Energy reactor builds upon an heritage of worldwide development and operation. Each reactor will generate approximately 75MWe. Pillsbury has worked with GA Technologies on a larger version of a similar reactor. X Energy is one of the two reactor designs that has been awarded $40 million by in matching funds by DOE over the next five years.

- Pillsbury is also working with Oklo Inc. as Oklo prepares to construct a container-sized, nuclear battery where energy costs exceed 30 cents/kWh, and power is needed at all times. The nuclear battery is a containerized unit that provides over a decade of energy without refueling. The Oklo reactor extracts the power with small heat pipes.

- Another Pillsbury client, Elysium Industries Ltd., has a concept for a Molten Chloride Salt Fast Reactor that can consume the spent nuclear fuel from other reactors.
• TerraPower, LLC's customer, Southern Company, has also been awarded $40 million by in matching funds by DOE over the next five years in order to develop the TerraPower design. TerraPower claims they will enter the "construction phase" in 5 years' time. The Company was founded and funded by Bill Gates.

With respect to public-private partnerships, Mr. Gans and his team have substantial experience advising public bodies on public/private partnerships, including:

• Representing the University of Kansas in pursuing its first public-private partnership, procure new social and traditional infrastructure assets, such as housing facilities and power stations. The Firm provides legal advice on proposed P3 models and structures, drafting and review of agreements between parties.
• Representing a western state (matter is still confidential) regarding a project to be delivered via PPP to supply reliable drinking water to nearby United States government facilities.
• Represented the sponsor and constructor of the $200M University of California Neuroscience Research Center. This was a design-build-operate lease with a public financing structure.
• Represented the construction company of the $490 million, 535,000 square feet Governor George Deukmejian Courthouse in Long Beach, Calif. This was the first social infrastructure project in California and reportedly the first P3 courthouse project in the U.S.
• Counsel to a consortium shortlisted on the University of Massachusetts dormitory project currently under procurement.
• Represented various parties in public-private venture transactions and outsource the involving project development on military lands including military housing, utilities and energy projects.
• Representing the Government of Cyprus on the procurement for a P3 solution for the redevelopment of the Port and Marina of Larnaca and development of the adjacent real estate area.

3. Analysis Model

We would anticipate that the centerpiece of our analysis would involve the status of the Alpha Tech Research technology; the timing, resources and cost for preparing a licensable design; the ability, willingness, cost and
schedule for the U.S. Nuclear Regulatory Commission to review and approve a license application; the infrastructure needed to manufacture and operate a successful new reactor design and the cost and schedule for the availability of that infrastructure.

Pillsbury has some interesting ideas on novel ways to pursue NRC licensing that could lower the cost and potential delays that may result from the current licensing process.

To the extent that sophisticated scientific, technical and engineering arise, we would plan to involve a Technical Advisory Group of outstanding senior nuclear scientists that the Firm has retained to prepare technical reports on small module reactor designs that are seeking funding. The roster of that Group is attached.

We would separately evaluate the public-private partnership models that would be available to maximize the opportunity to implement the Alpha Tech design within the constraints identified in the technology analysis described above.

4. Cost

The Firm would propose to carry out this analysis for a fixed price of $25,000.
<table>
<thead>
<tr>
<th>Analyst/Manager</th>
<th>Year(s)</th>
<th>Project Type/Name/Location</th>
<th>Project Description</th>
<th>Project Cost</th>
<th>Services Provided</th>
<th>Client Reference/phone #</th>
<th>Applicability</th>
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<tbody>
<tr>
<td>Silberg</td>
<td>2009-2017</td>
<td>Nuclear research reactor/Aerostet/ San Ramon, CA</td>
<td>NRC licensing and sale of research reactor, including nuclear-required financing</td>
<td>NRC licensing, contract negotiation</td>
<td>Anthony Nellis, General Counsel, Autoliv ASP, 248-882-0778</td>
<td>NRC licensing</td>
<td>NRC licensing</td>
</tr>
<tr>
<td></td>
<td>2011-present</td>
<td>Nuclear power reactor / Blue Castle Holdings/ Greene County UT</td>
<td>Development of nuclear power reactor project</td>
<td>NRC licensing and project financing advice</td>
<td>Nils Diaz, Chief Strategic Officer, Blue Castle Holdings, 801-717-3080</td>
<td>NRC licensing, project development</td>
<td>n/a</td>
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<td></td>
<td>2014-present</td>
<td>ISFSI/Wolf Creek Generating Station, Burlington KS</td>
<td>Independent spent fuel storage installation</td>
<td>Strategic and NRC licensing advice for ISFSI. (Note that Mr. Silberg has been NRC licensing counsel for Wolf Creek since 1970’s)</td>
<td>Debbie Hendell, General Counsel, Wolf Creek Nuclear Operating Company, 620-364-4065</td>
<td>NRC licensing, strategic planning</td>
<td>n/a</td>
</tr>
<tr>
<td>Peterson</td>
<td>1961-69</td>
<td>Engaged in the construction and operation of nuclear submarines</td>
<td>Chief Engineer for the construction of USS Sculpin, USS Sam Houston and USS John Adams</td>
<td>Over $1B. Engineer officer for 17 patrols.</td>
<td>Capt. Robert Bovey Ret., Advisor to the Sec of Defense, 703.549.0641</td>
<td>Experience in constructing and operating SMRs</td>
<td>n/a</td>
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<td>Analyst/Manager</td>
<td>Year(s)</td>
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<tr>
<td></td>
<td>1973-83</td>
<td>Legal counsel for GE Nuclear Energy</td>
<td>Worked on the sale of nuclear power plants to eleven buyers</td>
<td>Over $10B</td>
<td>Attorney for NSSS supplier</td>
<td>Edward A. Firestone, former GE Nuclear Department legal counsel. 650.327.0277</td>
<td>Experience in contracting for Nuclear Power plants</td>
</tr>
<tr>
<td></td>
<td>2001-06</td>
<td>Construction of nuclear power plants in the US</td>
<td>Lead the legal team working on the Little Willow nuclear power plant in Idaho, participated the legal support for the Victoria County Station in Texas and the Akkuyu plant in Turkey.</td>
<td>Over $10B</td>
<td>EPC contract support</td>
<td>Various</td>
<td>Experience in drafting and negotiating EPC contracts</td>
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<td></td>
<td>2006-present</td>
<td>Construction of Barakah nuclear power plant in UAE</td>
<td>Leader of legal team that drafted and negotiated the purchase of 4 large light-water-cooled reactors</td>
<td>~$30B with nuclear fuel included</td>
<td>Legal support for all functions of the corporation</td>
<td>Dr. Ausaf Husain, CNO for Emirates Nuclear Energy Corporation +971.2.659.5840</td>
<td>Experience in contracting for nuclear power plants</td>
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<tr>
<td>Analyst/Manager</td>
<td>Year(s)</td>
<td>Project Type/Name/Location</td>
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<tr>
<td>Gans</td>
<td>2014-present</td>
<td>Infrastructure/U of Kansas</td>
<td>Deliver student housing, academic, and utility infrastructure improvements and a 35 year O&amp;M agreement.</td>
<td>$350 million design and construction</td>
<td>Lead counsel for KU regarding all project related legal and strategic decisions</td>
<td>Kimberly Grunewald, Associate General Counsel; 785-864-3276</td>
<td>We do not have authority to use this matter in marketing or promotion materials.</td>
</tr>
<tr>
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<td>2017</td>
<td>Water/confidential</td>
<td>Deliver a $150 million potable water project and 20 year O&amp;M agreement.</td>
<td>$125 million design and construction cost</td>
<td>Lead counsel for the State agency required to deliver the asset.</td>
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<td>2012-2015</td>
<td>Commuter Rail Project</td>
<td>Prepare design-build-operate-maintain documents for a $1.8 billion rail project.</td>
<td>$1.8 billion</td>
<td>Consortium co-counsel for DBOM agreements and Maryland law issues.</td>
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</tbody>
</table>
Jay E. Silberg  |  Partner
jay.silberg@pillsburylaw.com

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- Environmental
- Litigation
  - Appellate
- Climate Change & Sustainability

Focus Teams
- Water Resources

Jay Silberg is a partner in the law firm’s Energy practice and is located in the Washington, DC office. He represents electric utility companies, governmental entities, architect-engineer firms, utility groups, nuclear consulting companies, and other organizations involved in nuclear matters. On behalf of these clients, Mr. Silberg has appeared before the Nuclear Regulatory Commission (NRC), the U.S. Department of Energy (DOE), state regulatory commissions, Congress, and the courts. He has extensive experience in all aspects of nuclear law.

Mr. Silberg has participated in numerous proceedings before the NRC involving combined licenses, construction permits, operating licenses, license amendments, and license transfer and decommissioning approvals. Mr. Silberg also represents clients in civil and criminal enforcement proceedings, NRC rulemaking actions, as well as in informal licensing interactions with the NRC technical and legal staff and management. As a consultant, he advised the U.S. Department of State on a light water reactor project and the DOE on license renewal and advanced light water reactor issues. He has handled dozens of judicial appeals, arguing before the U.S. Courts of Appeals for the Second, Sixth, Ninth, Eleventh, Federal and District of Columbia Circuits.

On nuclear waste issues, Mr. Silberg has represented U.S. utilities and industry groups in overseeing the DOE’s implementation of the Nuclear Waste Policy Act; participated in NRC and DOE licensing and rulemaking activities, legislative efforts, policy development, contracting, and litigation and serves as licensing counsel for a number of spent fuel storage projects, including the proposed Private Fuel Storage facility. NRC materials licensees concerned with the production, storage, decommissioning and disposal of nuclear materials, including their export and import, also have relied on Mr. Silberg’s advice. Mr. Silberg has been lead counsel for the electric utilities in the lawsuits to establish and enforce DOE’s obligation to dispose of the nation’s commercial spent nuclear fuel.
Mr. Silberg has participated in numerous nuclear contract negotiations, involving nuclear reactors and components, as well as all aspects of the nuclear fuel cycle. He has also advised his clients on DOE loan guarantees for new nuclear reactors.

Prior to joining the firm, Mr. Silberg served as a lawyer in the U.S. Atomic Energy Commission, Office of the General Counsel, from 1966 to 1969.

In addition to serving on the Lawyers Committee of the Nuclear Energy Institute, Mr. Silberg served as Chair of the Committee on Nuclear Technology and Law of the Association of the Bar of the City of New York. Mr. Silberg frequently lectures on nuclear energy issues and has made presentations to the American Bar Association, the Atomic Energy Licensing and Regulation Conference of the American Law Institute-American Bar Association, the U.S. Chamber of Commerce/Brookings Institution Congressional briefing, the Nuclear Energy Institute Fuel Cycle Forum, the International High-Level Radioactive Waste Management Conference, the National Energy Law and Policy Legal Conference, the Institute for Nuclear Materials Management, and the American Society for Quality Control. He is the author of the published article, "Storage and Disposal of Radioactive Waste."

In May 2005, Mr. Silberg was recognized in the Legal Times, "Leading Lawyers - Ten of the D.C. Area's Top Energy Attorneys in Energy Law: a Practice Focus," as one of the top ten go-to attorneys when the power industry needs counsel and advice and the only nuclear energy lawyer to be listed. Mr. Silberg was referred to as one of "the law's ultimate power players."

Honors & Awards
- Burton Award for Excellence in Legal Writing (2010)

Education
J.D., Harvard Law School, 1966
B.A., Amherst College, 1963, cum laude

Admissions
District of Columbia
Courts
U.S. Supreme Court; U.S. Courts of Appeals for the Second, Third, Sixth, Seventh, Ninth, Tenth, Eleventh, District of Columbia and Federal Circuits; U.S. District Court for the District of Columbia; U.S. Court of Federal Claims; New Jersey Supreme Court

Appellate Cases

Alabama Power Co. v. DOE, 307 F.3d 1300 (11th Cir. 2002)  
American Public Power Ass'n v. Nuclear Regulatory Commission, 990 F.2d 1309 (D.C. Cir. 1993)  
Bull Creek v. NRC, 359 F.3d 538 (D.C. Cir. 2004)  
Bull Creek v. NRC, 360 F.3d 184 (D.C. Cir. 2004)  
Calvert Cliffs' Coordinating Committee, Inc. v. AEC, 449 F.2d 1109 (D.C. Cir. 1971)  
Citizens For a Safe Environment v. Atomic Energy Commission, 489 F.2d 1018 (3d Cir. 1974)  
Coalition for Environment v. Nuclear Regulatory Commission, 796 F.2d 168 (D.C. Cir. 1986)  
Commonwealth of Massachusetts v. United States, 856 F.2d 378 (1st Cir. 1988)  
Commonwealth Edison Co. v. DOE, 877 F.2d 1042 (D.C. Cir. 1999)  
Consolidated Edison Co. of N.Y. v. DOE, 870 F.2d 694 (D.C. Cir. 1989)  
Indiana Michigan Power Co. v. DOE, 88 F.3d 1272 (D.C. Cir. 1996)  
Mid-America Coalition for Energy Alternatives v. Nuclear Regulatory Commission, 12 ERC 1718 (D.C. Cir. 1979)  
National Association of Regulatory Utility Commissioners v. DOE, 851 F.2d 1424 (D.C. Cir. 1988)  
National Association of Regulatory Utility Commissioners v. DOE, 680 F. 3d 819 (D.C.Cir. 2012)  
National Association of Regulatory Utility Commissioners v. DOE, D.C. Cir Nos. 11-1066 and 1068 (pending)  
Nebraska Public Power District v. U.S., 550 F. 3d 1367 (Fed. Cir.) (en banc)  
Nevada v. Watkins, 914 F.2d 1545 (9th Cir. 1990), cert. denied, 111 S. Ct. 1105 (1991)  
Northern States Power Co. v. DOE, No. 94-1457 (D.C. Cir.)  
Ohng Gaudadeh Devia v. NRC, 492 F. 3d. 421 (D.C. Cir. 2007)  
PSEG Nuclear v. U.S., 465 F.3d 1343 (Fed Cir. 2006)  
Riverviewkeeper, Inc. v. Collins, 359 F.3d 156 (2d Cir. 2004)  
Shieldalloy Metallurgical Corp. v. NRC, 624 F. 3d 489 (D.C. Cir. 2010)  
Skull Valley Band of Goshute Indians v. Nielsen, 376 F.3d 1223 (10th Cir. 2004)  
State of Ohio v. Nuclear Regulatory Commission, 814 F. 2d 258 (6th Cir. 1987)
Systems Fuels, Inc. v. U.S., 666 F. 3d 1306 (Fed. Cir. 2012)
Union of Concerned Scientists v. Nuclear Regulatory Commission, 920 F.2d 50 (D.C. Cir. 1990)
Wisconsin Electric Power Co. v. DOE, 778 F.2d 1 (D.C. Cir. 1985)

Representative Speaking Engagements

"Yucca Project Restart, Spent Fuel Storage and Repository Options," INMM Spent Fuel Management Seminar XXIX, 1/13/14

External Publications

What Will be the Lessons of Fukushima?, McCluskey Nuclear Business, Issue 43, Authors: Jay E. Silberg, George Borovas, April 2011


Firm Publications

DOE Issues New "Strategy" for Nuclear Waste Management and Disposal, Authors: Jay E. Silberg, Anne Leidich, 1/18/2013


Seven Years and Counting, Institute of Nuclear Materials Management—Spent Fuel Management Seminar XXII, Authors: Jay E. Silberg, 1/26/2005

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- Litigation
- Climate Change & Sustainability
- International Trade
  - Customs Compliance & Enforcement
  - Economic Sanctions & Embargoes
  - Export & Technology Transfer Controls
  - Foreign Corrupt Practices Act & Global Anti-Corruption
  - International Trade Agreements & Investment Treaties
  - Regulation of Foreign Investment & Industrial Security
  - Trade Remedy Proceedings
- Technology
- Middle East
- Korea
- Global Security Services

Charles Peterson Charles Peterson is a senior partner in the law firm's Energy practice. He concentrates his practice on the international nuclear power industry. Mr. Peterson represents companies in major commercial transactions. He is also an advisor to foreign governments that intend to construct new nuclear power plants. He has lived in the UAE, Saudi Arabia, Japan and several European countries, including an extended period in Russia.

Mr. Peterson has experience in litigation, arbitration and mediation. He recently represented a group of U.S. and European nuclear facility operators in a dispute over the ownership of uranium involving litigation in three countries and arbitration in two additional countries. He was selected to lead a team of 17 lawyers that litigated the issue in the European court of Justice. The matter was finally resolved by the Supreme Administrative Court in Germany in his client's favor.

After graduating from the United States Naval Academy in 1960 with distinction, Mr. Peterson was selected by Admiral Rickover to attend United States Navy nuclear power training at Lawrence Livermore National Laboratory followed by advanced nuclear engineering training at Bettis Atomic Power Laboratory and the United States Navy Submarine School training in New London Connecticut followed
by training at sea on USS Nautilus (SSN571). Lt. Peterson was then assigned to training at the National Reactor Test Station and then the Shippingport Atomic Power Station where he was qualified as senior reactor operator and later as a NRC licensed shift supervisor. His next assignment was as Engineer Officer for commissioning crew of the USS Sculpin (SSN 590), the second of the fast (40 knot) nuclear attack submarines in the United States navy where he participate in patrols in Arctic ocean and Sea of Okhotsk.

His next tour of duty was as Engineer and Construction Project Manager for the construction of USS John Adams (SSBN620). Lt. Peterson participated in the sea trials where the USS Thresher (SSN-593) was lost. He was commendation for developing modifications for USS John Adams that would reduce the risk of another such accident. He later served as Engineer Officer on both the Blue and Gold crew of USS John Adams for 7 patrols in the Arctic Ocean and acted as officer of the deck for the first time a nuclear submarine fired a volley of 16 test missiles from under water. This was followed by an assignment as Engineer officer of USS Sam Houston (SSBN 609) for its first overhaul and 4 Patrols in the Arctic Ocean and in the Mediterranean Sea.

With a recommendation from Admiral Rickover, Cdr. Peterson transferred to the naval reserve and entered Stanford Business School and following that Stanford Law School.

In 1973 Mr. Peterson joined the General Electric Nuclear Power Division, and in 1975 he became legal counsel for the Nuclear Fuel Department. In that capacity, he participated in the sale of nuclear fuel in the United States and 10 foreign countries. In 1979 he was appointed Division Counsel of the General Electric Aircraft Equipment Division, where he was involved in sales of equipment to the United States and foreign navies.

In 1983 Mr. Peterson joined the French Atomic Energy Commission where he worked with Technicatome, which has responsibility for the nuclear power plant on submarines and Cogema, the French nuclear fuel company that became part of AREVA, as the first Executive Vice President of its U.S. subsidiary. He later served as President of Nuexco during the period when Nuexco came to prominence as a leading international nuclear fuel trading company.

Mr. Peterson joined Pillsbury in April 2001.

**United States Navy Experience**

1956-1960 United States Naval Academy; graduated with distinction

1960 Selected by Admiral Rickover to attend United States Navy nuclear power training at Lawrence Livermore National Laboratory

1960 United States Navy Submarine School training in New London Connecticut and training at sea on USS Nautilus (SSN571)

1960 Advanced nuclear engineering training at Bettis Atomic Power Laboratory

1961 NRC Qualified as Senior Reactor Operator at Shippingport Atomic Power Station reactor

1961 NRC Qualified as Shift Supervisor for S1W at Idaho National Reactor
Testing Station; supervised tests at 400% of rated power

1961    Assigned as Engineer Officer for commissioning crew of the USS Sculpin (SSN 590), the second of the fast (40 knot) nuclear attack submarines in the United States navy

1962-1963    Patrols in Arctic ocean and Sea of Okhotsk aboard USS Sculpin

1963    Assigned as Engineer and Construction Project Manager for the construction of USS John Adams (SSBN620)

1963    Participated in the sea trials where the USS Thresher (SSN-593) was lost; commendation for developing modifications for USS John Adams that would reduce the risk of another such accident

1963-1966    Served as Engineer Officer on both the Blue and Gold crew of USS John Adams for patrols in the Arctic ocean; acted as officer of the deck for the first time a nuclear submarine fired a volley of 16 test missiles from under water

1966    Assigned as Engineer officer of USS Sam Houston (SSBN 609) for its first overhaul; commendation for completing the overhaul early and under budget

1966-1968    Patrols in the USS Sam Houston in the Arctic and in the Mediterranean Sea out of Holy Loch, Scotland

1969    Assigned as Submarine Squadron Two engineer

1969    With a recommendation from Admiral Rickover, departed the Navy and entered Stanford University

Honors & Awards
- UK Energy and Infrastructure Team of the Year, Finalist, The Lawyer Awards (2010)
- Deal of the Month, Asian-Counsel (2010)

Education
J.D., Stanford Law School, 1973

M.B.A., Stanford Graduate School of Business, 1971

B.S., United States Naval Academy, 1960
Admissions
State of California
District of Columbia

Courts
Supreme Court of the State of California, District of Columbia Court of Appeals

Affiliations
American Bar Association; American Arbitration Association, National Energy Panel; International Nuclear Lawyers Association; California Bar Association; District of Columbia Bar Association; American Nuclear Society
Jeffrey R. Gans | Partner
jeffrey.gans@pillsburylaw.com

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- Litigation
- Arbitration - U.S. & International
- Corporate Investigations & White Collar Defense
- Real Estate Litigation
- Construction Counseling & Dispute Resolution
- Insurance Recovery & Advisory
  - Construction Insurance
  - Property Damage & Business Interruption
- Real Estate
- Crisis Management
- Public-Private Partnerships
- Real Estate & Construction

Jeffrey Gans, chair of Pillsbury’s Construction Counseling & Dispute Resolution practice and the Public-Private Partnership team, advises owners, developers and contractors on major projects.

Jeff’s counseling, negotiating and litigation skills optimize his clients’ positions in complex engineering, procurement and construction (EPC); design-build; guaranteed maximum price (GMP) and public-private partnership (PPP) projects. Corporations, governments, universities and private developers rely on his broad experience to guide them in energy and commercial construction ventures that often exceed $100 million. Jeffrey also crafts labor agreements, advises on union issues and litigates complex engineering, construction, insurance, fraud, bankruptcy, civil RICO and insurance claims.

Representative Experience

Led the team representing the University of Kansas regarding its first public-private partnership project. The $350 million development includes new student housing, science buildings, student life facilities, and a major utility project.

Represents a nationwide developer of a complex project, drafting and negotiating the design and construction agreements and helping to resolve any related disputes.

Represented a major document storage company in responding to two disasters—a building collapse and a building fire—that resulted in devastating losses.

Professional Highlights

Recipient of Chambers USA Award for Excellence in Construction and recognized by Chambers USA four consecutive years in the Construction-DC category.

Co-Author of Doing Business in the United States, a practical guide covering topics of interest to non-U.S. investors who intend to enter the U.S. market.

Honors & Awards


Super Lawyers (2011 – 2013)

Education

J.D., The Catholic University of America, Columbus School of Law, 1995
magna cum laude

B.A., Political Science, University of Florida, 1989

Admissions

District of Columbia

Virginia

Courts

U.S. Court of Appeals for the 2nd, 4th, Federal and District of Columbia Circuits, U.S. District Court for the District of Columbia and the Eastern and Western Districts of Virginia, U.S. Bankruptcy Court for the Eastern District of Virginia, District of Columbia Court of Appeals

External Publications

Managing Risk in an Ultra-Lean Bid Environment, CMAadvisor, March/April 2011 (Co-authored by Dennis Allen), Author: Jeffrey R. Gans, 03/01/11

Firm Publications


Avoiding Construction Project Failures: 8,000 Romans, 3,000 Greeks, One Lesson, Perspectives on Real Estate Newsletter - Spring 2012, Authors: Jeffrey R. Gans, John A. Fedun, 03/06/12
“Pillsbury houses an impressively broad energy practice, and is a national and global leader in the nuclear area in particular. The jewel in the firm’s crown is its nuclear transactional practice, and its nuclear team represents both public utilities and IPPs, as well as overseas and domestic investors, in a whole host of transactions.” —Chambers
50 Years of Firsts

Pillsbury fields one of the world’s top nuclear energy teams, with the knowledge and historical perspective to help clients take full advantage of developments and opportunities. Our 50-year track record is full of firsts, including:

- First practice devoted to nuclear energy issues
- Representation of the world’s first nuclear power plant project implemented on BOO (build-own-operate) principles
- Leading advisor, first major nuclear complex in the Gulf
- First nuclear plant to obtain license renewal
- First buyer representation in a nuclear plant acquisition
- First new nuclear plant in the U.S. at a greenfield site

We have been involved in virtually every U.S. sale of a nuclear power plant, and have spearheaded the Nuclear Regulatory Commission (NRC) licensing of 50 of these plants—more than any other firm—with a 100 percent success rate. More than half our work is international, representing governments and others on major nuclear procurements and working with inbound clients on investments and regulatory requirements in the U.S. nuclear energy market.

Experience at Every Stage of the Nuclear Facility Life Cycle

- Financing
- Facility design and construction
- Procurement, storage and disposal
- Initial licensing
- Regulatory oversight, including NRC enforcement, investigations and inspection preparation
- License amendment and renewal
- Acquisitions, reorganizations and sales
- Waste management and decommissioning
REPRESENTATIVE MATTERS

Advise and represent the Emirates Nuclear Energy Corporation in developing its internal organization, assisting in the development of the UAE nuclear regulatory structure and nuclear liability insurance regime.

Advising on all phases of structuring, financing and negotiation of key documents for the Akkuyu nuclear power plant being built in Turkey, one of the largest nuclear projects currently under development.

Represent the manufacturer in numerous transactions tied to the development of small modular reactor technology.

Represent utilities on independent spent fuel storage installation license renewals.

Represented an energy producer/transporter in obtaining an early site permit from the NRC; currently representing it on its application to construct and operate new nuclear units at the site.

Advise several foreign governments in the development and implementation of nascent civil nuclear power programs.

Represent a Department of Energy (DOE) contractor in support of negotiations between the U.S. and the Russian Federation.

Assist utilities and vendors in developing and implementing strong safety culture and safety conscious work environment programs.

Represent utilities and nuclear vendors in preventing receipt of and responding to Chilling Effect Letters.

Represent a U.S. company in the negotiation of a contract to process nuclear waste material in Central Asia.

Represent utilities on plant license renewal.

Represent U.S. company in successful NEIL insurance mediation.

Assist nuclear vendors in successfully preparing for and responding to NRC vendor inspections.

Represent two utilities in transitioning recently shut-down plants to decommissioning status.

AWARDS & RANKINGS

Ranked among the leading nuclear law firms (Chambers Global and Chambers USA).


Silver Award for Energy at the International Legal Alliance Summit & Awards in Paris.

“Environmental Firm of the Year” (U.S. News Best Law Firms).

Received more than a dozen “Deal of the Year” awards for energy and project finance transactions since 2002, including projects in North America, Europe, Latin America and Asia.

“Energy Law Firm of the Year” for the United Arab Emirates (Asian-Counsel).

Received nine “Chevron Law Firm Diversity Recognition Awards” for our commitment to diversity and the results we have achieved.
Our Clients

Our clients span the spectrum of nuclear producers and users and include electric, gas and mining companies; financial institutions; governments; owners and operators of nuclear waste facilities; and service providers and vendors.

• Ad Hoc Utilities Group (AHUG)
• Akkuyu NPP JSC
• AKME-engineering JSC
• AREVA NC, Inc./Cogema Mining
• B&W Nuclear Power Generation Group, Inc.
• Babcock & Wilcox mPower, Inc.
• Battelle Memorial Institute
• Bechtel Corporation
• Burns and Roe
• CB&I
• Detroit Edison
• Dominion (Dominion Energy, Virginia Power)
• Duke Energy Corporation
• Electric Power Research Institute (EPRI)
• Emerson Electric Co.
• Emirates Nuclear Energy Corporation (ENEC)
• Engine Systems Inc.
• Entergy Corporation
• Exelon Generation Company
• GE-Hitachi Nuclear Energy Americas, LLC
• Government of the Republic of Korea
• Invensys plc
• ITOCHU Corporation
• KEPCO NF
• King Abdullah City for Atomic and Renewable Energy (K.A.CARE)
• Luminant Generation Company (Ika TXU Corp.)
• Marubeni Corporation
• Mitsubishi Heavy Industries, Ltd. and Mitsubishi Nuclear Energy Systems, Inc.
• Mitsui Corporation
• NAC Kazatomprom JSC
• NextEra Energy Resources; Florida Power & Light
• Nuclear Energy Institute (NEI)
• NUKEM, Inc.
• Progress Energy
• Rolls-Royce
• Shaw AREVA MOX Services, LLC
• Sumitomo Corporation
• Taiwan Power Company
• TENAM Corporation
• Zachry Corporation

“One of the finest nuclear practices in the USA and internationally.”—Chambers Global
The Pillsbury Difference

Technical Knowledge and Experience
It takes an extraordinary amount of technical knowledge and legal experience to provide effective representation in an industry as heavily regulated as nuclear energy. Many of our lawyers hold graduate degrees in engineering and the sciences, and have held relevant positions in the U.S. Navy, electric companies and nuclear facilities. Some have served as counsel to the U.S. NRC, the U.S. DOE, and the Atomic Energy Commission.

An Energy Industry Powerhouse
Pillsbury has created one of the legal industry’s largest and most prominent practices. We have worked on large-scale energy projects and their financing in more than 75 countries on six continents, giving us vast experience in all aspects of the quickly evolving global energy field.

The Leading Edge for International Projects
All signs point to continued, sustained growth in global nuclear projects. Our closely integrated team covers the world’s energy and finance capitals and is backed by an extensive network of host-country law firm contacts, enabling us to provide flexible and efficient legal counsel wherever—and whenever—you need it.
Clients Benefit from Nuclear Sector Experience

Nuclear Energy Transactions
We represent clients and governments in nuclear energy transactional matters around the globe, including government procurement, multiparty agreements, project finance transactions, joint ownership agreements for generation and transmission facilities, fuel procurement and the development and construction of independent power projects. Our work includes complex finance transactions requiring experience in debt and equity financing structures and in commercial, bilateral and multilateral financing agencies.

Nuclear Export Controls
We advise clients on compliance with domestic laws and international agreements that govern the international supply of components, services and fuel for nuclear power stations. Our team counsels clients on international conventions, domestic regimes and contractual provisions that protect against civil liability for nuclear damage. We also guide clients on export compliance training, compliance for foreign nationals and on procedures for addressing potential violations of nuclear export control regulations and for taking corrective action.

Our experience includes developing programs for several major nuclear utilities, engineering and consulting firms, securing multi-government export permits and approvals on behalf of U.S. nuclear utilities and equipment manufacturers for the export of sensitive nuclear technology and equipment, and advising clients on international nuclear liability issues in relation to nuclear-related exports to Europe, Russia, China, India, Japan, Taiwan, South Korea, Canada, South Africa, Argentina and Australia.

Nuclear Litigation
We represent clients in complex energy litigation before state and federal courts, international arbitration tribunals and the NRC. Our clients include most U.S. nuclear utilities and many international companies and governments. We handle lawsuits and arbitrations involving spent fuel storage, nuclear plant construction, steam generators and pricing under enrichment contracts. The firm also litigates matters involving utility equipment suppliers, nuclear waste disposal and nuclear power plant licensing and operations.

New Plants
Pillsbury works with clients to develop strategies for design certification, early site permitting, preparing COL applications and optimizing the COL process, selection of key vendors and contractors, contract negotiation, dispute resolution, transmission capacity and grid issues, managing ITAAC risk and minimizing adjudication risks.

Saving Billions for Nuclear Plants and Their Electricity Customers
For almost 40 years, Pillsbury has been a leading force in the U.S. nuclear energy industry's efforts to develop and implement a national nuclear waste program. After the Obama Administration cancelled the planned Yucca Mountain waste repository in Nevada, Pillsbury convinced the U.S. Court of Appeals for the District of Columbia Circuit in 2013 to stop the government from continuing to collect $750 million per year in fees from our clients—the Nuclear Energy Institute and 15 utilities owning and operating nuclear power plants—for a now nonexistent waste disposal program. The court ordered that the DOE take the required steps to set the nuclear waste fee to zero, which will now save the nuclear utility industry $750 million per year, "so long as the government has no viable alternative to Yucca Mountain."
Advanced Reactor Licensing
We are active in the certification of advanced reactor designs, successfully representing one of the few vendors that obtained NRC certification of an advanced reactor design. We currently represent several manufacturers that are seeking to have their advanced reactor designs certified by the NRC, as well as vendors developing prototype reactors of an advanced design.

License Renewal
Pillsbury remains at the forefront of the nuclear industry’s initiatives to extend the operating life of nuclear power reactors through the renewal of their operating licenses. To date, we have successfully represented the first reactor license renewal and more than half of the succeeding license renewal applications submitted to the NRC.

Facility Regulation
Our lawyers counsel clients on NRC licensing issues and regulatory oversight with respect to nearly forty nuclear units, leveraging our access to contacts within the NRC to facilitate resolution of issues as they occur. We also represent other entities subject to NRC oversight, including fuel equipment and service vendors, contractors, architect-engineers and waste management companies. We advise both licensees and vendors on preparing for significant NRC inspections and recovering from significant regulatory findings. We work with utility groups and industry organizations on such regulatory issues as modification of regulations, development and response to rulemaking petitions, and implementation of new rules.

Power Uprates
We assist clients with increasing the maximum power level at which their commercial nuclear power plants may operate, thereby increasing the economic value of the facility. These power uprates include instrument uncertainty recapture, stretch power and extended uprates. Our team helps clients develop strategies to enhance the NRC licensing process and avoid NRC hearings. Where necessary, we have successfully litigated challenges to power uprate licensing applications.

Nuclear Work Environment and Employment Matters
Pillsbury is at the forefront in assisting clients with developing and maintaining a strong nuclear safety culture and safety conscious work environment. Our focus is on proactive prevention to head issues off before they ever arise. Our services include the following:

- Advise and represent clients on enforcement matters, including regulatory actions and civil, criminal or administrative proceedings
- Assist clients with investigating employee concerns and referred allegations
- Assist in developing "get well" plans that do not impose unnecessary obligations on the licensee, including assisting clients with responding to Chilling Effect Letters and providing training.

Pillsbury is a leader in the prevention and resolution of whistleblower allegations, successfully defending hundreds of claims over the past decade and resolving the majority well before they reach the courts. Few law firms offer as complete a package of prevention, response and defense capabilities as Pillsbury—demonstrating that our greatest value to clients is best measured in the number of claims that simply never develop.

From its roots helping nuclear industry clients address whistleblower allegations, Pillsbury's whistleblower practice has expanded to an interdisciplinary team of lawyers and to include clients in industries as diverse as aviation, construction, health care, technology, education, communications, financial services and insurance.

Lawyers from a cross-section of the firm’s services—Employment, Energy, Environmental, Corporate Litigation—provide clients effective, high-value advice on all aspects of employee protection statutes.
Decommissioning

Pillsbury has advised clients in numerous decommissioning proceedings. Our attorneys have assisted utility clients with developing decommissioning plans, advised on compliance with regulations and advised clients on premature decommissioning of nuclear utilities. We have also represented utility clients in hearings and litigation associated with decommissioning. Our lawyers have represented contractors, including representing a client in negotiating a unique decommissioning agreement. As a result of our representation of decommissioning contractors, we have experience with the commercial aspects of decommissioning.

Waste Management

We are at the forefront in dealing with nuclear spent fuel and nuclear waste storage and disposal issues. We are counsel for Private Fuel Storage LLC (PFS) and represent PFS on its application for a license to construct and operate an independent spent fuel dry storage facility in Utah. We help waste management and transportation companies establish and maintain compliant nuclear waste programs. Our lawyers enable clients to develop additional spent fuel storage capacity at reactor sites, resolve low-level and mixed-waste issues, and transport waste in accordance with regulations.

Public Policy

U.S. members of our team enjoy particularly close ties to legislators and staff members who serve on Congressional committees with jurisdiction over energy, as well as other key Administration offices. Our energy policy experience is comprehensive; for example, we undertook far-reaching policy initiatives and achieved successful outcomes in the Energy Policy Act of 2005. We have produced results in the federal appropriations arena, helping our clients to secure millions in federal funds for energy-related research and development projects.
Climate Change

Anticipating our clients’ needs in this area and the vital link between nuclear power and clean energy, Pillsbury launched one of the first climate change and sustainability practices in the legal arena. As governments around the world re-shape their energy policies, regulate greenhouse gas emissions and help society adjust to the effects of global warming, we monitor and advocate on behalf of our clients on developments relating to renewable energy, greenhouse gas emission regulations and voluntary reduction programs.

Small Modular Reactors

As modular developers race to market, financial sector interest in small reactors is climbing. In tandem with various industry groups and federal agencies, including the Department of Energy, American Nuclear Society and Nuclear Energy Institute, Pillsbury is helping to frame a new area of licensing for evolving NRC approval processes. We represent emerging modular reactor developers in capital-raising activities, strategic alliances and corporate transactions. Our work includes counseling on the strategy for NRC design certification as well as energy security, nuclear liability protection, export compliance and due diligence, and nonproliferation.

About Pillsbury

Pillsbury Winthrop Shaw Pittman LLP is a leading international law firm with offices around the world, and a particular focus on the technology, energy & natural resources, financial services, real estate & construction, and travel & hospitality sectors. Recognized by Financial Times as one of the most innovative law firms, Pillsbury and its lawyers are highly regarded for their forward-thinking approach, their enthusiasm for collaborating across disciplines and their unsurpassed commercial awareness.

Learn More

For more information about our Nuclear Energy practice, please visit us at pillsburylaw.com/nuclear-energy.
Public-Private Partnerships

Pillsbury is one of the nation’s leaders in Public Private Partnerships (P3), having represented public agencies and private entities in the U.S. and internationally.

Our extensive experience with P3s covers many types of projects, including transportation (toll roads, rail and light rail), airports, military housing and other infrastructures, including the first privately financed courthouse in the U.S. and a neuroscience research center.

Altogether, Pillsbury attorneys have handled projects from virtually every sector where P3s have been used. We have a deep and experienced team from which to draw, to satisfy specific client objectives. Our project development lawyers team up regularly with Pillsbury lawyers in other practices to best handle all of the issues related to P3 projects.

Our Capabilities

Pillsbury has attracted clients involved in creating and pursuing P3 projects because of our deep experience, service and creativity. Our attorneys provide end-to-end P3 project services, counseling clients through all aspects of the project, including:

- Project assessment
- Statutory evaluation
- Transaction structuring and planning
- Procurement
- Environmental planning and cleanups (including environmental reviews)
- Financing (including structuring and documentation)
- Negotiation and drafting of project documents
- Construction
- Tax
- Insurance
- Operations and management
- Asset management
- Dispute resolution
- Consolidation and restructuring
P3 Representations

Social Infrastructure

- Counsel to a major research university in pursuing its first public-private partnership to procure new social and traditional infrastructure assets, such as campus parking, student housing facilities and power stations. The firm provides legal advice on proposed P3 models and structures, drafting and reviewing of agreements between parties, and issues that may arise in relation to utilities regulations, labor agreements, tax implications, lease agreements, operation and management agreements and concession agreements.

- Represented the sponsor and constructor of the University of California Neuroscience Research Center. This was a design-build-operate lease with a public financing structure. Pillsbury was able to align the private and public parties’ interests together with bond trustee.

- Represented the construction company for the $490 million, 535,000 square foot Governor George Deukmejian Courthouse in Long Beach, California. This was the first social infrastructure project in California and reportedly the first PPP courthouse project in the U.S. It was a design-build-operate private finance project involving a “performance-based” lease structure over the 35-year term.

- Represented various parties in public-private venture transactions and outsourcings involving project development on military lands, including military housing, utilities and energy projects. Over the past decade, we closed more than $10 billion of military housing transactions and financings, involving more than 50,000 housing units and several thousand apartment units in 15 states and the District of Columbia.

- Represented Texas A&M University System in connection with an RFP by the Biomedical Advanced Research and Development Authority of the U.S. Department of Health & Human Services to establish and maintain facilities for producing pandemic flu vaccine and medical counter-measures for bioterrorist pathogens.

- Counsel to a consortium shortlisted on the UMass Dormitory project currently under procurement in Massachusetts.

Transportation Infrastructure

- Represented Aerostar Airport Holdings in securing approval by the Federal Aviation Administration to lease and operate Luis Muñoz Marin International Airport in San Juan, Puerto Rico at a cost of $2.6 billion over the life of its 40-year lease agreement. The airport, a public-private partnership project, will be the first major airport in the U.S. to be run by a private operator.

- Represented the underwriters to the Portsmouth Gateway Group in connection with the issuance of $237.3 million Treasurer of State of Ohio Tax-Exempt Private Activity Bonds-Series 2015 (Portsmouth Gateway Group (Borrower)) for the Portsmouth Bypass Project, a Public Private Partnership with the Ohio Department of Transportation to build a 16 mile divided highway in Scioto County (Ohio).

- Counsel to the developer on the Presidio Highway Project in California, the state’s first P3 project to move forward under legislation enacted in 2009. Presidio Parkway will replace Doyle Drive, the aging approach to the Golden Gate Bridge used by more than 120,000 vehicles each day. The Presidio Parkway project will improve seismic, structural and traffic safety, as well as integrate the roadway into the national park setting and create additional recreation space.

- Serving as co-counsel to a consortium on its bid for the Purple Line project, a proposed 16 mile light rail line in Maryland extending from Bethesda in Montgomery County to New Carrollton in Prince George’s County. The project involves the design, build, construction, finance, operation and maintaining of the Purple Line through a public-private partnership.

- Represented two financial institutions in connection with the project financing of the Midtown Tunnel in Virginia, a public-private partnership project where Elizabeth River Crossings would finance, build, operate and maintain a new tunnel. The company will also rehabilitate the existing tunnel as well as both of the Downtown Tunnels, as well as extend the Martin Luther King Freeway.

- Represented Globalvia in its bid to design, build, finance, operate and maintain the Jackson Airport Parkway in Mississippi. This project had a TIFIA funding allocation and was designed to be a new toll road with traffic risk.
• Represented Itinere North America in its bid for Segment 1 of the North Tarrant Express project in Texas, which was procured by the Texas Department of Transportation as a DBFOM contract with respect to certain managed lanes (toll), additional open access lanes and associated facilities.

• Represented Keolis and SNCF in the closing of a Commuter Rail Operating Agreement with the Massachusetts Bay Transportation Authority for the operation and management of MBTA’s commuter rail system for a term of eight years.

• Represented the lenders to the Macquarie-led consortium in its bid to acquire the City of Chicago Downtown Parking facilities project.

• Represented the owner and sponsor of the Dulles Greenway toll road from its inception in 1993. Pillsbury helped structure the project and negotiated all the transaction documentation including venture formation, right-of-way acquisition, design-build, financing, and operation and maintenance agreements.

• Represented a financial institution in connection with project bonds issued on behalf of the Autopista Central Toll Road in Santiago, Chile. The 38-mile toll road is the first open road electronic toll road in Latin America. It is also the world’s fourth toll road based on windshield-mounted transponders for identifying the accounts of regular users and camera imaging of license plate numbers to toll those without transponders.

• Represented the administrative agent and bank lenders to the Pocahontas Parkway tollway in Virginia, in connection with the lenders’ “take back the keys” restructuring of debt and equity, and tax structuring for a mix of cross-border, public and private side lenders, including TIFIA.

• Represented the lenders to Xerox affiliate ACS Services in structuring a proposed financing, partially taxable and partially tax exempt, for the ACS Services bid for a design, build, installation, operation and maintenance agreement in connection to a new electronic payment system for cardless fare purchases across the public transportation systems operated by the Washington Metropolitan Area Transit Authority.

• Represented the lenders to one of the shortlisted consortia bidding on the long-term lease and concession for the Alligator Alley toll road in Florida. This transaction involved an appropriation risk analysis.

• Represented a railcar manufacturer in connection with their P3 procurement bid for the first stage of the Eagle project FastTracks plan by the Denver Regional Transit District.
September 29, 2017

Mr. Michael McKee
Seven County Infrastructure Coalition
c/o Blaisdell, Church & Johnson, LLC
5995 South Redwood Rd.
Salt Lake City, Utah 84123

Subject: Response to “Project Financial Analyst on Potential Thorium Energy Project” RFQ for the Seven County Infrastructure Coalition

Dear Mr. McKee:

MPR Associates, Inc. (MPR) is pleased to submit our proposal in response to the subject solicitation for a project financial analyst on potential thorium energy project.

MPR has the integrity, experience, capacity, knowledge, and proven past performance to provide technical, financial, programmatic and public/private partnership expertise to evaluate and provide recommendations on the suitability of technology-focused business proposals. As demonstrated within, MPR has a 50 year history of evaluating nuclear technologies therefore is uniquely qualified for the thorium energy project. Beyond this opportunity MPR has past performance evaluating and/or developing for clients: novel power generating systems, military equipment, consumer products, industrial systems and medical devices. We feel MPR will make a valuable long-term partner to assist the Seven County Infrastructure Coalition evaluate the viability of any technology company under partnership consideration.

We look forward to discussing this proposal related to Alpha Tech’s thorium energy project as well as how we can tailor a methodology for quantitatively evaluating future opportunity to ensure the Seven County Infrastructure Coalition makes smart, strategic partnerships that deliver the socio-economic returns desired for a coalition of this nature.

If you have any questions, or need additional information, please call me at 703-519-0200 or send an e-mail to rdowns@mpr.com.

Sincerely,

[Signature]

Ryan Downs
Vice President of Federal Services

Enclosure
A First Principles Approach to Evaluating Technology-Rich Businesses for Public/Private Partnership

Proposal in Response to

RFP for Project Financial Analyst on Potential Thorium Energy Project

Submitted to

The Seven County Infrastructure Coalition
751 East 100 North
Price, Utah 84501

by

MPR Associates, Inc.
Proposal P17-FE05-1435

September 29, 2017

This proposal – all pages – includes data that shall not be duplicated, used, or disclosed – in whole or in part – for any purpose other than to evaluate this proposal.
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MPR Associates & Team Qualifications

MPR is dedicated to helping our clients achieve success by innovating market-leading technology solutions and processes that focus on sustainable business practices. We consider ourselves strategic partners with our clients, sharing in their perspective and sense of urgency, and we see ourselves as responsible industry leaders. Our culture of cross-disciplinary interaction, research, and knowledge-sharing helps us stay at the forefront of emerging technologies and anticipate trends and innovations. Because we break through difficult technology challenges and work across sectors and disciplines, we have the ability to react and adapt to any type of technology problem effectively.

MPR's proven problem-solving processes consistently yield simple, practical solutions for difficult engineering and program challenges. This is the result of creating a culture that incorporates strategic methodologies, collaboration, interaction, and sharing of expertise throughout the organization. As we explore choices and evaluate potential solutions, we always keep our client's business goals in mind.

MPR provides high quality, high value services to the US Departments of Energy, Defense and Homeland Security, commercial nuclear power, fossil power, renewable energy, and to the medical and consumer products industries. MPR specializes in supporting non-technical owners and investors in defining, planning, overseeing and executing large and complex first-of-a-kind projects, in development engineering activities, and in resolving difficult, mission critical technical problems. Our mission is to help our client's projects succeed.

1.1 MPR Associates Organizational Structure

MPR is an employee owned engineering and project management services company that was founded in 1964 by three senior technical leaders in the Naval Reactors program. The MPR founders developed their careers and approach to engineering and project management in Admiral Rickover's Naval Reactors organization by developing, designing, and building the first nuclear submarines and the first US commercial nuclear reactor at Shippingport. The founders built MPR on the Naval Reactors culture of business integrity, technical innovation, exceptional quality, and engineering excellence - a culture strong to this day.

MPR is organized into three business sectors focusing on the Power Industry, Government Sector, and Product Development. This opportunity for the Seven County Infrastructure Coalition will leverage the expertise from all three of MPR's business sectors.

- MPR’s Power Industry expertise which includes all types of nuclear technology experience is essential in evaluating the unique attributes of the thorium energy project. MPR understands the technical and safety challenges associated with nuclear technology. As mentioned above, MPR was founded by individuals responsible for developing the first nuclear reactor and supporting the first commercial nuclear power plants.
• MPR’s Government Sector expertise is essential in navigating the nuances of public/private partnerships, including evaluating and documenting the tangible and intangible benefits local, state and federal governments expect in committing funds, land, community services and incentives to private enterprises. MPR has over 50 years of experience partnering with governments to identify winning strategies for communities and tax payers.

• MPR’s Product Development expertise is essential in assessing new companies proposing new technologies. The Product Development team routinely assesses technological, market and execution risks for new businesses, often pre-revenue startups. The team develops valuation models that assess investment required, returns of investment and probability of market success based on working with many organization over the past 20 years. The Product Development expertise will be essential in evaluating other technology beyond just the thorium energy project.

MPR has over 230 employees with over 200 engineers and scientists with bachelor, masters and doctorate degrees. The technical staff is organized into project teams based on the skills required for each project. MPR’s project teams are fluid allowing a project to engage anyone in the organization for the optimum amount of time required to address the client’s needs. This arrangement will benefit the Seven County Infrastructure Coalition in a few positive ways:

• Access to every skill, capability and past performance within MPR as any of our technical staff can support your project.

• Project teams are efficiently managed to use fractions of valuable employee’s time to address your needs but the project is not responsible for supporting the employee for the entire duration of the project, the results is best value for the your project.

• Project teams can grow or shrink based on the dynamic nature of projects allowing for surge support if necessary and resulting in efficient execution for the client.

• Evolving project teams that can change as the needs of a project change ensuring the optimum personnel are engaged at the right time in your project.

• Complex mix of technical, managerial, financial, and policy support from one organization to support your multi-faceted challenge.

1.2 Team Qualifications

Below is a brief summary of the key personnel proposed for various roles and phases of the project. As mentioned above, MPR operates with a matrix organization allowing access to all of our technical staff providing the best value. MPR proposes the individuals below based on our understanding of the scope of work. Based on follow-up discussions with the Seven County Infrastructure Coalition it may become evident that other MPR staff will add value to the project and we will socialize them with the Coalition.

A brief summary of proposed personnel highlights relevant to the Coalition is presented below. Full resumes for personnel are provided in 4B.
1.2.1 Ryan Downs – Lead Analyst

Mr. Downs has 20 years of experience working with governments solving challenging programmatic and technical issues. Mr. Downs leads MPR’s Government sector focused on delivering best value to society and the tax payer.

Currently he is working with the Department of Energy related to facilitating public/private relationships for the Domestic Uranium Enrichment Program (Appendix A, Example Project 3) as well developing an Economic Impact Analysis for the State of Alabama (Appendix A, Example Project 1) justifying state-provided incentives to a development company interested in restarting a nuclear power plant in Alabama result in long-term benefits to the state. Also Mr. Downs is supporting West Pharmaceuticals in developing and implementing an innovation program (Appendix A, Example Project 5) focused on a repeatable process for evaluating and valuing emerging technology opportunities balancing investment required, market potential, and technology risks. Aspects of this process are directly applicable to the needs of the Coalition.

Mr. Downs has a MBA from Columbia Business School with a focus on business financial valuation and entrepreneurship. These skills will be particularly valuable in assessing the financial and business viability of organizations interested in partnering with the Coalition.

Mr. Downs has a BS in Mechanical Engineering from Penn State University.
www.linkedin.com/in/ryandowns

1.2.2 Storm Kauffman

Mr. Kauffman has over 40 years of experience related to nuclear power generation, design and safety during his 33 year career working for the US Navy Nuclear Propulsion Program and his time since at MPR. Currently, he leads our Nuclear Technology, Safety and Regulation practice area within our Power Services business sector.

Mr. Kauffman was the head of Reactor Engineering while in the Navy Nuclear Propulsion Program and was the technical lead for obtaining a US Nuclear Regulatory Commission review of the Light Water Breeder Reactor (LWBR) which successfully demonstrated the ability to breed U-233 fuel from thorium. He is also the US DOE Loan Office chief Independent Engineer responsible for assessing Vogtle 3&4 schedule, cost, technical, and licensing concerns (Appendix A, Example Project 8). Recently Mr. Kauffman has led design team for reactor components used in small modular reactors for startup nuclear power plant companies (NuScale, TerraPower and XEnergy) (Appendix A, Example Project 6). He has experience developing and evaluating safety and licensing documentation for new nuclear power plants and companies have received licensing approval from the Nuclear Regulatory Commission for licensing plans developed by Mr. Kauffman. Mr. Kauffman’s experience will be essential in evaluating the technical feasibility and safety of the proposed thorium energy project.

Mr. Kauffman has a MS of Nuclear and Mechanical Engineering from MIT and MBA from the Naval Postgraduate School specializing in defense.
www.linkedin.com/in/storm-kauffman-3442041a
1.2.3 Samuel Steiman

Mr. Steiman has 27 years of experience working with government agencies overseeing large capital intensive nuclear waste cleanup programs and working with nuclear power startup companies bring new nuclear power generation to market. Mr. Steiman leads our Project Services specialty which focuses on large scale project planning, risk qualification, project execution oversight and quantitative decision support.

Currently he is working with an energy developer planning to purchase, complete construction, restart two abandoned nuclear power plants in Alabama (Appendix A, Example Project 2). Mr. Steiman is developing the cost, schedule and risk estimates to complete engineering, finish construction and operate the two, 1,100 MW nuclear reactors. The cost, schedule and risk estimates are used in valuing the investment and determining the economic incentives desired to make the business case feasible for the developer and investors. Mr. Steiman has also worked with three nuclear startup companies (NuScale, TerraPower and XEnergy) (Appendix A, Example Project 6) interested in bringing small modular reactors to market. His efforts have involved quantitative risk based sizing of the reactor plants, as well as developing multi-year program schedules on behalf of the clients to bring their solutions to market.

Mr. Steiman has a BS in Mechanical Engineering from University of Michigan.  
www.linkedin.com/in/samuel-steiman-a814bb20

1.2.4 James Bubb

Mr. Bubb has 18 years of experience related to nuclear, fossil, and renewable power generation planning, and independent review for government and commercial clients.

Mr. Bubb was the lead engineer developing the cost estimate to purchase, complete construction, restart two abandoned nuclear power plants in Alabama (Appendix A, Example Project 2) as well as oversee the Economic Incentives justification for the State of Alabama (Appendix A, Example Project 1). Additionally, Mr. Bubb provides programmatic oversight to Department of Energy Independent Project Reviews focused on determining likelihood of project success for government projects funded with taxpayer dollars.

Mr. Bubb has a BS and MS of Mechanical Engineering from Virginia Polytechnic Institute.  
www.linkedin.com/in/jim-bubb-6671991a

1.2.5 Other Team Members

MPR employs to over 200 other technical staff with varying levels of experience and past performances in all engineering and science disciplines. These employees will be extremely valuable in assessing the thorium energy project and opportunities beyond the thorium energy project using the standardized methodology outlined below.
2 Prior Experience

2.1 Evaluating Project Opportunities

MPR has decades of experience evaluating project opportunities in the nuclear power and non-power, commercial technology sectors. A sampling of the projects are presented in Appendix A with a matrix of the skills and attributes of each project that pertain to this RFP. These include: Nuclear Reactor Technology, Other Non-Nuclear Technology, Budgeting, Cost to Complete, Project Planning, Opportunity Valuation Modeling, Public/Private Cooperation and Meeting Project Deadlines.

2.1.1 Nuclear Reactor Evaluations

MPR has over 50 years of experience evaluating and developing aspects of new nuclear reactor technology. MPR’s founders invented the design for the first pressurized water reactor while working at Naval Reactors in the 1950’s. MPR was founded during the period in the 1960 where they were reviewing and evaluating the designs for the first commercial pressure water reactors (PWRs) and boiling water reactors (BWRs) using uranium fuels. Over the decades MPR has designed, reviewed and/or tested reactor modernization design for operational commercial nuclear reactors.

MPR has formally or informally evaluated many new commercial nuclear reactor and nuclear power plant designs. For example, MPR was involved in the Westinghouse AP1000 concept designs being built in the US and around the world. Currently MPR is working with several Small Modular Reactor (SMR) development companies to develop novel, cost effective, implementable nuclear reactor designs (Appendix A, Example Project 6).

2.1.2 Commercial Technology Evaluations

MPR’s Product Development business continually assesses and vets new product concepts and the businesses that approach MPR. MPR has an internal process it uses to determine the risks to MPR in working new clients, especially if those new clients are startup organization. Additionally MPR independently evaluates the market potential of new product ideas to determine if it is worthy of the investment to bring a new product to market. Typically MPR works on behalf of the technology developer. These same skills and approach will be applied to evaluating opportunities presented to the Coalition.

2.2 Assisting Emerging Technologies Come to Market

MPR partners with our clients and their success is our success. MPR assists nuclear reactor developers and non-nuclear commercial technology developers in bringing their products to market while minimizing risk. MPR typically evaluates client’s business cases to assess the feasibility and realism of business models. These focus on the viability of the technology and
focusing on the engineering of the solution in addition to the financials. In working with our clients during the development stages, MPR is continually monitoring and assessing technology and program (cost and schedule) risks. MPR’s objective is to complete the development phase as quickly, safely and efficiently as possible to minimize cost, schedule and risk. MPR is deploying our proven approach with several new nuclear reactor design companies (Appendix A, Example Project 6), traditional nuclear power plant construction project (Appendix A, Example Project 2), a Government agency developing a 30 year nuclear fuels project (Appendix A, Example Project 3), National Laboratory developing new nuclear fuel for a test reactor (Appendix A, Example Project 7), and a pharmaceuticals packaging company (Appendix A, Example Project 5). All projects involve different core technologies and different needs but MPR has been successful advancing these current multi-year (some multi-decade) projects toward commercialization.

2.3 Advising Public Bodies on Creative Public/Private Partnerships

MPR has diverse experience supporting public entities in different forms of public/private partnerships. MPR is advising a nuclear power plant owners group, which involves public ownership from local municipalities on how to decommission and dispose of the recently retired nuclear power plant (Appendix A, Example Project 4). MPR is assisting the Department of Energy on how to meet strategic uranium stockpile needs by exploring various traditional and non-traditional forms of public/private partnership (Appendix A, Example Project 3). MPR is also working with a nuclear development company to finish construction of an abandoned nuclear power plant. Part of the development approach involves state provided incentives and to make the commercial business case feasible. As part of this program MPR estimated the cost, schedule and effort (jobs) to complete the facility (Appendix A, Example Project 2) and used that information as the basis for an economic impact assessment provided to the state (Appendix A, Example Project 1). This assessment is used by the state to quantify and justify the level of incentives provided to the development company. MPR expects the economic impact analysis to be a key analysis in evaluating the Alpha Tech opportunity or any opportunity proposed to the Coalition.
3 Analysis Model

A successful public/private partnership involves commitment of resources by the public entity and private entity that leaves all parties better as a result of the partnership. First, the resulting public/private entity must be successful and thriving for the public to have the opportunity to benefit. Second, for the public to truly benefit, the value received by the public attributable to the success of the public/private entity must be more than initial value of the commitment by the public entity. Both the private and public entities must expect a positive return on their respective investments for partnership to be mutually beneficial.

3.1 PROPOSED ANALYSIS METHODOLOGY & GENERAL APPLICATION

MPR’s proposed approach involves evaluating several attributes of the partnership investigating: the feasibility of the private entities business operating plan, the development plan to get to market, the private entity’s request of the public entity and the economic impact for the public entity. Although shown linearly in Figure 3-1, these evaluation blocks can be performed in any order or in parallel based on the specific nature of each opportunity. A partnership recommendation can only be achieved if all of evaluation results are sound, therefore the weakest link in this process would be assessed first. The sections below provide insight on the expectations for each evaluation.

The effort required in each of these steps will depend on the technical complexity of the business proposal and the willingness of the private entity to share requested information under a non-disclosure agreement. Models and evaluation provided by the private entity minimize the need for MPR to recreate the models which will reduce the cost of the assessment.

![Proposed Analysis Model Workflow](image)

Figure 3-1. Proposed Analysis Model Workflow
3.1.1 Market Validation

As mentioned above the public/private partnership is only successful if the partnership results in a viable and sustainable private entity, therefore it is prudent for the public entity to independently validate the expected future performance of a private entity seeking a partnership. Standard business model attributes will be evaluated to affirm the private entity business model is valid and can yield sustainable profitable results with sufficient margins in assumptions to weather market downturns or poor assumptions. Ideally the private entity would provide proforma balance sheets and income statements for evaluation, but these can be created as part of the evaluation if not provided. MPR will augment or validate the estimates with market data to ensure the key assumptions that drive viability are robust and the business model is not sensitive to small changes in assumptions. The requested contributions from the public entity are included in the model as these typically aid in reducing operating costs for a period of time.

The example metrics below are used to estimate revenue and profit.

Example metrics:
- Total Addressable Market (TAM)
- Expected Marketshare
- Unit Sale Price
- Unit Production Cost
- Number of Employees
- Selling, General and Administrative Expenses (SG&A)
- Annual Sales and Cost Growth Rates

As part of this phase MPR proposes a company analysis including a review of the founders, legal search related to legal actions, liens and a Dun & Bradstreet search.

Objective: Confirm the private entity is sound and reputable and the business model is viable with a high probability of market success, ensuring the public entity has a high probability to benefit from their investment through years of the private entity operating within the Coalition’s communities.

3.1.2 Development Evaluation

The Development Evaluation considers the effort required to achieve sustainability. For pre-revenue technology startups this may be the technology development to bring a new product to market. For a new power plant this is the effort to design, permit, license, construct, commission and startup the facility such that is it generating power and earning revenue. MPR proposes developing an Integrated, Cost, Schedule, Risk Analysis (iCSRA) to evaluate the risk-weighted estimated cost and schedule to get to the sustainable business modeled in Section 3.1.1. The iCSRA will evaluate the ability of the private entity to achieve development success and model the private entities cash flow to fund the development. The requested contributions from the public entity are included in the model as these typical aid in reducing cost, schedule or risks during the development period.

MPR will investigate the technology design including specific unknowns, risks and challenges which must be overcome to get to market. MPR will involve various technical subject matter experts capable of understanding and investigating such as thorium energy systems, power
generation, or technical consumer product development. These findings feed into the iCSRA and impact the expected range of development cost and development schedule.

**Objective:** Confirm the private entity development plan is viable with a high probability of completing on time and on budget given the technical and programmatic risks that challenge high tech initiatives. Only if the private entity gets to sustainable operations will the public entity have a probability to benefit from their investment.

### 3.1.3 Economic Impact Evaluation

The Economic Impact Evaluation quantifies tangible, intangible, and quantifiable benefits the public entity receives as part of the public/private partnership. As mentioned above, the public/private partnership is only successful if the public and private entities receive value in excess of their investment therefore it is necessary to estimate the return on the public entity’s contribution. MPR uses the Federal Bureau of Economic Analysis (BEA) Regional Industrial Multiplier System II (RIMS II) which uses economic and jobs multipliers to estimate the future impact of new industry in a geographic region. The multipliers are tailored by region and by industry factoring the differing number of jobs or differing salary expectations in different industries the Coalition will be considering. The economic impact of the new private entity in the public entity’s area will be considered the investment “return” to the public entity which is compared to the value of the public entity investment into the public/private partnership. The ratio of the public entity investment return divided by the public entity investment should be greater than one indicating the public entity is receiving more than it is contributing, leading to a good investment. Ideally, the return to the public entity should be significantly more one to account for over optimism in private entity job and revenue expectations which are fundamental inputs into the RIMS II methodology. This analysis is performed using Net Present Values of the future investments and returns thus factoring how the investment and payoff periods are often separated by multiple years.

Additionally these partnership agreements should have “anchor and expansion” clauses discouraging the private entities from leaving Coalition region when they become successful and offer addition incentives for local expansion.

**Objective:** Confirm the expected economic benefit to the public entity exceeds the private entity’s request of the public entity thus making a sound investment for the Coalition.

### 3.1.4 Public Feasibility Evaluation

The Public Feasibility Evaluation assesses the public’s ability to provide the contributions requested by the private entity. As Coalition enters into more public/private partnerships the public entity will have prior commitments of resources such as land, tax abatements, labor training programs. The Coalition likely has finite quantities of each resource it can contribute, so each partnership request will need to be sustainable for the public entity given prior partnerships in its existing portfolio. Ideally, as this program evolves, future partnerships will be easier as the economic returns of earlier partnerships are realized, the communities grow there will be additional ability to enter into more partnerships, a true measure of success for the Coalition.
Objective: Confirm the requested contributions are sustainable for the public entity and the contributions fit among the other commitments contributed to other private entities in prior public/private partnerships.

3.2 APPLICATION TO THORIUM ENERGY PROJECT

MPR understands Alpha Tech is seeking to “site a 30-megawatt test reactor in Utah to produce medical isotopes and other valuable materials” and “for producing electricity.” (Salt Lake Tribune, Aug 14, 2017). Based on research Alpha Tech is a new startup, with two founders with no obvious past experience in developing and commercializing nuclear power projects; therefore MPR believes the process outlined above is extremely important for vetting the opportunity.

3.2.1 Market Validation – Thorium Energy Project

As discussed in Section 3.1.1, Alpha Tech’s business model for the thorium reactor is key to understanding the long term viability of the project and the likelihood of the community benefitting from this project over the next several decades. The estimated revenue split between electricity generation, medical isotope generation and “other valuable materials” will be important to understand as power purchasing agreements for electricity are competitive therefore unit costs for electricity by region are fixed. Most new construction nuclear reactor proforma estimates reviewed by MPR have inflated assumptions of future power unit prices and thus overestimate future revenue and profitability. MPR would also investigate the estimated operating costs to generate the electricity, isotopes and “other valuable materials” where capital reinvestment estimates for maintenance, fuel costs and staffing drive annual operating costs. Finally, MPR would expect to see lower waste handling costs and lower long term waste storage costs as thorium reactors produce lower quantities of less hazardous waste as compared to uranium reactors. As stated above, the objective is to determine the robustness of the operating model and estimate the long-term viability of the Alpha Tech plan. MPR has recent past performance (Appendix A, Example Projects 2, 6 and 8) modeling operating performance of new nuclear development projects.

3.2.2 Development Evaluation – Thorium Energy Project

As discussed in Section 3.1.2, the development path from concept to operations is long and risky and a sound operating model may never be executed because the project did not survive the development stage. Here Alpha Tech’s program schedule and cash flow projections will be critical for assessing success. Alpha Tech will likely need billions of dollars of investment capital to complete the necessary engineering design, Nuclear Regulatory Commission licensing requirements, thorium fuel stability testing, building and operating a proof of concept demonstration reactor, as well as several years of construction and rigorous startup and commissioning testing of the full-scale thorium reactor plant. Each stage has its own unique challenges and risks. Evaluating Alpha Tech’s plans, engineering design, risk register and capital investment table is essential for determining if Alpha Tech’s team is capable of financially and technically surviving this multi-year development effort and achieving operations. MPR would perform an Integrated Cost, Schedule, Risk Analysis to assess the development costs and schedule given major risk elements seen in new nuclear reactor
construction. MPR has recent past performance (Appendix A, Example Projects 2, 6 and 8) evaluating new nuclear reactor construction projects in this development phase.

### 3.2.3 Economic Impact Evaluation – Thorium Energy Project

As discussed in Section 3.1.3, any project may be successful but for the public/private partnership to be successful the public must benefit in excess of the value it contributed to the partnership and Net Present Value of the investment return must be orders of magnitude greater than the Net Present Value of the investment. MPR will quantify the economic value of the public entity’s contributions. MPR assumes the contributions could involve land grants, property tax rebates, subsidized skilled labor training facilities. The return public value will be in increased direct jobs at the new facility as well as indirect and induced jobs in the community. This will lead to additional demand for residential housing, retail and local services. These additional local jobs bring additional income tax revenue and property tax revenue to the state and local communities. Using the Bureau of Economic Analysis Regional Industry Multiplier System II (RIMS II), MPR will estimate the economic value attributed to the new Alpha Tech plant during the various stages of design, construction and operation. Each phase brings different skills and revenue contribution to the community. The Net Present Value of these economic benefits compared to the Net Present Value of the public’s contributions will determine if the opportunity is valuable to the Coalition. Based on Appendix A, Example Project 1, MPR has determined completion of a nuclear power plant provides positive economic impact to a region during the engineering, construction and operating phases. Nuclear power plants have 40 year operating plans that bring high skilled, high paying jobs to a region. These plants also have 5-10 year construction durations which bring thousands of transient skilled labor jobs to the region during the construction duration.

### 3.2.4 Public Feasibility Evaluation – Thorium Energy Project

As discussed in Section 3.1.4, MPR would work with the Coalition to determine if the requests by Alpha Tech for public contributions are feasible given the economic condition of the Coalition or the specific county where the plant will be sited. Without prior knowledge of Alpha Tech’s requests and requests granted other prior public/private partnerships, MPR cannot speculate on whether the Alpha Tech requests are feasible for the public at this time.
Cost & Schedule

MPR proposes this work on the Time & Materials basis.

MPR Associates believes there is a range of possible costs to complete a review of the Alpha Tech public/private partnership opportunity. The amount of information and the quality of information available from Alpha Tech is the key cost driver. Table 4-1 provides examples of pricing based on the quantity and quality of the information provided by Alpha Tech. MPR is interested in discussing this opportunity to understand the information available to the Coalition. MPR will develop more accurate pricing based on the information available. As this is a Time & Material project, the effort may be significantly less than the estimated prices below if it is found early in the evaluation process that the Alpha Tech opportunity is not suitable for partnership.

Table 4-1. Pricing Options Table

<table>
<thead>
<tr>
<th>T&amp;M Price Estimates</th>
<th>Assumptions</th>
<th>MPR Obligations</th>
</tr>
</thead>
</table>
| $25,000             | Alpha Tech provides the following documentation with sufficient quality to review the analysis, estimates and assumptions:  
- Proforma operating models discussed in Section 3.1.1,  
- Development schedule, cost and risk models discussed in Section 3.1.2, and  
- BEA RIMS II Economic Impact Analysis discussed in Section 3.1.3.  
MPR will review the information provided and provide a qualitative review of the opportunity. | Project kickoff/working meeting in Utah to meet with the Coalition and Alpha Tech to discuss the business and review documentation.  
Project closeout meeting in Utah to meet with the Coalition to discuss the results and memo recommendation.  
Report documenting the findings and MPR recommendation for partnership. |
| $110,000            | Alpha Tech provides insufficient documentation to perform the assessment per the methodology in Section 3.1.  
MPR will review the information provided and develop the quantitative models required and provide a quantitative review of the opportunity. | Project kickoff/working meeting in Utah to meet with the Coalition and Alpha Tech to discuss the business and review documentation.  
Project closeout meeting in Utah to meet with the Coalition to discuss the results and memo recommendation.  
Report documenting the methodology, models, findings and MPR recommendation for partnership. |

MPR will complete the written deliverable within 55 days of contract award assuming Alpha Tech information is provided within 5 business days of contract award.
Qualification Spreadsheet
<table>
<thead>
<tr>
<th>Client</th>
<th>Project Name</th>
<th>Example Project Number</th>
<th>Evaluation Criteria</th>
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<tbody>
<tr>
<td>Nuclear Development, LLC</td>
<td>Bellefonte Nuclear Generating Station</td>
<td>1</td>
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<td></td>
<td>Economic Impact Analysis for the State of Alabama</td>
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<td>X</td>
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<td>Nuclear Development, LLC</td>
<td>Bellefonte Nuclear Generating Station</td>
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<td>Cost, Schedule and Risk to Complete Study</td>
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<td>Department of Energy, NNSA</td>
<td>National Nuclear Security Administration</td>
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<td>X</td>
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<td></td>
<td>Domestic Uranium Enrichment Acquisition Planning</td>
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<tr>
<td>SONGS</td>
<td>San Onofre Nuclear Generating Station (SONGS) Restart and Decommissioning Planning</td>
<td>4</td>
<td>X</td>
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<tr>
<td>West Pharmaceuticals</td>
<td>Innovation Pipeline Investment Process Management</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
<td>NuScale, TerraPower, XEnergy</td>
<td>New Nuclear Technology Multiple Small Modular Reactors (SMR) Support Projects</td>
<td>6</td>
<td>X</td>
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<tr>
<td>Idaho National Laboratory</td>
<td>Variable Test Reactor Program Planning and Advanced Test Reactor Support</td>
<td>7</td>
<td>X</td>
</tr>
<tr>
<td>Department of Energy, Loan Guarantee Office</td>
<td>Loan Guarantee Program, Vogtle Units #3 and #4 Lender’s Engineer Oversight</td>
<td>8</td>
<td>X</td>
</tr>
</tbody>
</table>
Example Project 1:
Bellefonte Nuclear Generating Station – Economic Impact Analysis for the State of Alabama
Hollywood, AL

MPR Managers: Ryan Downs, Jim Bubb and Dimitri Lutchenkov

Reference: Frank Haney
Nuclear Development, LLC
frankhaney@flhcompany.com

Project Cost: $13B Year: 2017

Project Description:
Nuclear Development, LLC is purchasing Bellefonte Nuclear Generating Station Units 1 and 2 which were partially completed and abandoned in 1988. Nuclear Development, LLC won the nuclear generating site at auction in 2016. The bid included expectations for state contributions, tax credits and other incentives from the State of Alabama.

Unfinished Bellefonte Nuclear Generating Station Units 1 and 2

MPR Services Description:
MPR developed an economic benefit model of the Bellefonte Nuclear Plant which was submitted to the State of Alabama in an effort to quantify the positive economic benefit completing and operating Bellefonte Nuclear Generating Stations – Units 1 and 2 would have for the State of Alabama. The result of the analysis showed the state’s contributions were conservative and project will generate economic output, jobs and local simulation many times more than the state’s proposed contributions, validating the investment.

The analysis approach:
- Used MPR extensive experience in nuclear design, construction and operations to estimate the critical staffing, scheduling and power plant economics necessary for a credible economic benefit analysis.
- Used Bureau of Economic Analysis (BEA) Regional Input-Output Modeling System (RIMS II) data and methodology specific to a geographic/economic region of interest.
- Forecasts the expected direct, indirect and induced revenue, economic output and jobs during the engineering/planning, construction completion and operating phases.
- Quantitatively demonstrated the net positive economic benefit to the State of Alabama and a measurable return on the state’s investment using industry accepted BEA data and methodology.
- Validated the size and scope of the state’s incentive package which included tax credits and state sponsored training programs.
- Confirmed the public and private contributions were necessary to produce an economically viable solution for Nuclear Development, LLC and for the State of Alabama.

Applicability: This project demonstrates MPR’s analytical approach used to forecast and validate the economic impact of large-scale, nuclear infrastructure projects from a public/government perspective. This analysis is a valuable and necessary piece of the proposed methodology ensuring any proposed project would have quantifiable economic benefit to the region justifying any public effort, contribution or investment.
Example Project 2:
Bellefonte Nuclear Generating Station – Cost, Schedule and Risk to Complete Study
Hollywood, AL

MPR Managers: Sam Steiman, Jim Bubb, Robert Coward

Reference: Frank Haney
Nuclear Development, LLC
frankhaney@fhcompany.com

Project Cost: $13B Year: 2016-2017

Project Description:
[See Example Project 1 above]

MPR Services Description:
MPR developed a Level 1 schedule, cost and risk estimate to
determine the ability to complete the remaining design, remaining
construction, long lead components, startup, commissioning and
transitioning to operation. MPR’s cost, schedule and risk estimates
were used to assess cash flow and external investment
requirements to determine the economic viability of the plan which
informed the Nuclear Development’s investment plan to proceed
and will serve as the basis for external investor valuation.

In this approach:
- MPR interviewed the project leadership to understand the vision and execution plan to ensure
management expectations aligned with documented plans and commitments.
- MPR visited the plant site to walk-down the existing nuclear facility to assess first-hand the
material condition of the nuclear plant and existing high value nuclear systems and equipment.
- MPR reviewed hundreds of nuclear design and nuclear safety-related documents, calculations
and test reports from the seller’s archives to understand the basis of estimate for assets.
- Used MPR extensive experience in nuclear design, construction and operations to estimate the
staffing, scheduling and construction metrics to provide an achievable estimate.
- MPR developed a risk register of key risks which could have material impact of the cost,
schedule and overall success and viability of the project. The risk register will serve as the focus
of activity to maintain cost and schedule prior to operation.
- The cost and schedule estimates are essential for demonstrating to potential private and public
investors that the project team has a firm understanding of the project and its key risk that could
drive cost and schedule overruns if not properly managed.
- The economic incentives offered by the State of Alabama helped offset the huge engineering and
construction costs making this public/private relationship imperative for project success.

Applicability: This project demonstrates MPR’s approach to value an investment opportunity,
including the detailed physical, analytical and personnel due diligence performed in developing cost
and schedule estimates. These estimates directly impact the valid investment decision. This
analysis is a valuable and necessary piece of the proposed methodology ensuring any proposed
project is technically and financially feasible from the owner/operator’s perspective.
Example Project 3:
DOE National Nuclear Security Administration Domestic Uranium Enrichment Acquisition Planning
Location TBD (Managed from DOE HQ, Washington, DC)

MPR Managers: **Ryan Downs**, Jason Gwaltney, Michael Katabara


**Project Description:**
The NNSA is seeking to build a uranium enrichment facility to provide enriched uranium for various National interests. Currently there is no commercially available facility capable of meeting the Government’s unique needs thus the need for the Government to build a facility.

**MPR Services Description:**
MPR is supporting the Director of Domestic Uranium Enrichment to design an acquisition strategy to acquire enrichment uranium at a “future time-certain”. MPR is working with the NNSA and engaging with industry to structure a Government acquisition strategy that optimizes the costs, risks, rewards **between Public and Private entities** to create a win-win strategy where NNSA can receive the desired enriched uranium while the NNSA does not bear the cost for the project in its entirety. The final business arrangement can take many forms from a procurement from a private supplier, to a Government built and operated facility, or a **Public/Private partnership where all parties share in the risk/rewards** associated with the endeavor. All options are currently under consideration.

In this approach:
- MPR processed responses to NNSA’s Request for Information (RFI) where interested businesses proposed existing or novel technical solutions and Public/Private partnership business arrangements to achieve the NNSA enrichment uranium objectives.
- MPR evaluated the RFI responses based on:
  - Technical merit, technical challenges and technology maturity with respect to proposed enrichment technologies
  - Feasibility and realism of proposed development costs and schedules based on technology maturity
  - **Reasonability and symmetry of any prosed Public/Private partnership** focusing on allocation of financial risks and liability and the allocation of success and compensation between the Public and Private entities.
- Future stages of the program will involve in-depth analysis of alternatives of available technology. Here MPR will investigate the technical maturity and business model feasibility of future proposals in detail developing a quantitative approach to differentiate between the solutions.

**Applicability:** This project demonstrates MPR’s approach to value different Public/Private agreements and business structures that involve government and private entities from the perspective of the Public entity. This approach is a valuable and necessary piece of the proposed methodology ensuring that the risk/reward symmetry is fair and reasonably allocated between the Public and Private interests and that the solution will achieve the Public entity’s mission.
Example Project 4:
San Onofre Nuclear Generating Station (SONGS) Restart and Decommissioning Planning
San Diego, CA

<table>
<thead>
<tr>
<th>MPR Managers:</th>
<th>Alex Zarechnak, Don Graf, Alan Keppel, Phil Rush</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference:</td>
<td>San Onofre Nuclear Generating Station</td>
</tr>
<tr>
<td></td>
<td>Thomas Palmisano, VP &amp; Chief Nuclear Officer</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:tompalmisano@sce.com">tompalmisano@sce.com</a></td>
</tr>
<tr>
<td></td>
<td>(949) 368-6575</td>
</tr>
<tr>
<td></td>
<td>Project Cost: $4.4B</td>
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Project Description:
SONGS is a nuclear power plant located on the Pacific coast of California. SONGS is minority owned by the City of Riverside California and formally minority owned by the City of Anaheim, making SONGS a Public/Private partnership. The SONGS facility had a failure of replacement steam generators that proved cost prohibitive and politically challenging to overcome. The plant is currently preparing to be decommissioned after being closed in 2013.

MPR Services Description:
MPR has had a multitude of technical tasks over a period of 20 years in support of SONGS. Throughout these technical tasks MPR had to consider how the recommended solution would be perceived and be reflected upon in a public arena especially given the facility was part owned by public entities. MPR was tasked to review and comment on the options being considered for this new management arrangement to reflect the increased role to be played by the public participants in a Public/Private relationship. In addition, a MPR employee was selected to be the Decommissioning Advisor. In that capacity, he must relate to and be part of the deliberative process for making major management decisions for SONGS that must accommodate the needs of both public and private participants. For example:

- The SONGS used fuel is being stored in stainless steel canisters close by the seaside coast with an un-stress relieved closure weld. In order to remove the residual stresses in the vicinity of the closure weld of the used fuel storage canisters, a process of laser peening was recommended. MPR was involved in the resolution between private interests and public interests regarding financial liability for the laser peening on the production canisters in order to make the local objectors satisfied.
- As part of the original lease agreement between SONGS and the US Navy, it was stipulated that all subterranean structures would be removed upon the return of the property to the US Navy. MPR recommendation to limit the depth of structures to removed in order to minimize the effect on the environment.

Applicability: This project demonstrates MPR’s approach to value different Public/Private agreements and business structures that involve government and private entities from the perspective of the Public entity. This approach is a valuable and necessary piece of the proposed methodology ensuring that the risk/reward symmetry is fair and reasonably allocated between the Public and Private interests and that the solution will achieve the Public entity’s mission.
Example Project 5:
West Pharmaceuticals – Innovation Pipeline Investment Process Management
Exton, PA

MPR Managers: **Ryan Downs**, Eric Claude, Lynessa Erler

| Reference: | John Dinka  
West Pharmaceuticals  
John.Dinka@westpharma.com  
610-594-2933 | Project Cost: $50M | Year: 2013-Present |

Project Description:
West Pharmaceuticals is launching an innovation division to diversify its product offerings pushing the envelope in pharmaceutical packaging, sterilization, filling and automation. This small division is responsible for identifying, developing and valuing new product ideas to spurs West’s next leg of growth.

MPR Services Description:
MPR has developed a method and standardized an approach to capture and disposition innovative ideas developed by West based on market potential, technical risks/benefit, and financial valuation metrics. The analysis balances the investment required, development and commercialization time horizon, revenue potential and probability of technology R&D success. This process is bringing discipline to the previously unstructured process allowing unrelated ideas to be quantitatively evaluated against performance metrics allowing highest potential ideas to receive a disproportionate share of the R&D investment dollars and resources. This new methodology is being refined based on lessons learned and the performance of the innovation portfolio.

The analysis approach:
- Developed a standardized methodology customized for West performance metrics to efficiently collect and disposition ideas with the objective focusing on a short list of high potential new ideas.
- Used the methodology to identify knowledge gaps or risk within each new idea to efficiently and objectively quantify the unknowns.
- Drives activity related to:
  - Customer interest and adoption to size market potential and assess market pricing
  - Fundamental technology risks with the proposed product
  - Manufacturing costs related to anticipated materials and volumes driven by market potential
  - Concept design to assess usability and drive customer interest
- Developed a product valuation for each idea based on the expected revenue, cost to manufacturing, projected sales quantities to compare various ideas in portfolio
- Periodically reevaluates product valuations based on evolving estimates and lessons learned

**Applicability:** This project demonstrates MPR’s ability to manage a partner’s technical project portfolio with an objective methodology that values technical attributes, market demand, risks and financial performance. This approach is a valuable and necessary piece of the proposed methodology ensuring investments and partnerships are properly vetted with objective metrics.
Example Project 6:
New Nuclear Technology – Multiple Small Modular Reactors (SMR) Support Projects
Corvallis, OR, Bellevue, WA, Greenbelt, MD

MPR Managers: Storm Kaufman, Sam Steiman, Jim Bubb, Bob Coward

<table>
<thead>
<tr>
<th>Reference: Various Contacts</th>
<th>Project Cost: Various Multi-Billion Projects</th>
<th>Year: 2010-Present</th>
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**Project Description:**
Several small funded start-ups are attempting to design, qualify and bring to market different concepts for small, scalable, cost-effective, nuclear reactors that can incrementally expand as power demand grows and as capital investment becomes available.

**MPR Services Description:**
MPR has worked with several Small Modular Reactor (SMR) developers in many different stages of development.

MPR has worked with NuScale’s Integrated Pressurized Water Reactor in Corvallis, OR, Terra Power’s liquid sodium-cooled fast reactor in Bellevue, WA, and X-Energy’s Advance Pebble Bed Modular Reactor in Greenbelt, MD over the past several years.

MPR’s experiences include:
- Developed an integrated cost, schedule, risk, cash flow model for a SMR company that optimized the number of reactor modules and the size of each reactor module to improve business/investor performance and mitigate construction and operational risks.
- Provided program management office support to multiple SMR companies developing and managing their program including building initial program budgets, schedule and risk estimates prior to the company hiring its own staff.
- Assumed the role of Engineering Design Manager for several key reactor systems prior to the company hiring its own staff.
- Designed a novel reactor heat exchanger for a SMR company as the company did not have the engineering expertise at that time.
- Prepared licensing documentation for a SMR company to support the initial design package to the Nuclear Regulatory Commission (NRC). The licensing documentation was approved by the NRC.

**Applicability:** This experience demonstrates MPR has the requisite knowledge related to new nuclear reactors, SMRs, assessing fundamentally different approaches in nuclear technologies as well as the challenges of working with start-up organizations. These skills and experiences are a valuable and necessary piece as most of the organizations seeking Seven Counties’ support are likely start-up with steep technical challenges like the SMR companies above.
Example Project 7:  
Idaho National Laboratory – Variable Test Reactor and Advanced Test Reactor Support  
Idaho Falls, ID

**MPR Managers:**  Sam Steiman, Demetri Siachames, Kyle Metzroth

<table>
<thead>
<tr>
<th>Reference:</th>
<th>Project Cost:</th>
<th>Year:</th>
</tr>
</thead>
</table>
| Eric Woolstenhulme  
Idaho National Laboratory  
Battelle Energy Alliance  
eric.woolstenhulme@inl.gov  
(208) 526-4838 | Various Multi-Billion Projects | ATR: 2008-Present  
VTR: 2017-Present |

**Project Description:**
Idaho National Laboratory (INL) operates the Advanced Test Reactor (ATR) which is a DOE facility in operation since 1967. In 2017 INL is beginning evaluation for a new fast flux sodium cooled reactor named the Variable Test Reactor (VTR).

**MPR Services Description:**
MPR has worked with the INL since MPR’s inception. In recent years, MPR has supported INL in ATR modernization and transitioning the reactor from High Enriched Uranium (HEU) fuels to Low Enriched Uranium (LEU) fuel for nuclear non-proliferation concerns. This year INL is considering building a new fast flux reactor at the laboratory and has asked MPR to help plan the 10 year reactor design and acquisition program.

MPR’s experiences include:
- ATR modernization including:
  - Program planning for 2023 HEU to LEU fuel conversion
  - Reviewing, revising ATR analyses and documentation related to the reactors license, safety and design basess.
- VTR project planning including:
  - Defining reactor performance requirements
  - Defining schedule with objective milestones for program funding requirements
  - Future activities will include concept design and component sourcing

**Applicability:** The experience highlights MPR’s ability to oversee and manage multi-year highly technical nuclear modernization and new nuclear facility planning for a government-sponsored laboratory funded using public funds. These skills and experiences are a valuable and necessary piece as most of the organizations seeking Seven Counties’ support are starting from a “clean sheet of paper design.”
Example Project 8:
Department of Energy – Loan Guarantee Program, Vogtle Units #3 and #4
Lender’s Engineer Oversight
Washington, DC and Waynesboro, GA

MPR Managers: Storm Kauffman, David Bergquist and David Schwade

Reference: Markus Popa
Loan Project Office, Department of Energy
Markus.Popahq.doe.gov
202-586-5330

Project Cost: Excess of $14B
Year:
Unit #3: 2009 - 2019
Unit #4: 2009 - 2020

Project Description:
Georgia Power and a consortium of investors are building two new AP1000 nuclear reactors on the Vogtle generating site which has two operating nuclear reactors. The Department of Energy Loan Guarantee Office provided the consortium a multi-billion dollar loan guarantee to underwrite creditors financing the construction. This project represents the public/private dependency required for capital intensive, technically complex, high risk, high reward programs involving government and private industry.

MPR Services Description:
MPR is the Department of Energy’s Loan Guarantee Lender’s Engineer and serves as an independent technical oversight of issues related to technology, design, construction, testing and qualification. MPR reviews and interprets the technical, construction, cost and schedule information provided by the consortium comparing the progress to the plans as justification in meeting the terms of the loan guarantee covenant between the Loan Guarantee Office and the consortium. MPR’s insight and feedback provide quantitative and qualitative support for the decisions of the Loan Guarantee Office and directly impact the decision of the office to support the construction program.

Applicability: The experience highlights MPR’s ability to support a non-technical public entity in evaluating and overseeing progress of a private entity in a capital intensive, technically complex project related to the nuclear industry. These skills and experiences are a valuable and necessary piece as monitoring performance during execution is as important as evaluating a proposal as many large, technically complex projects have robust plans which deviate and fail during execution due to poor management and oversight.

MPR proposes to maintain engagement and oversight on behalf of the public interest through startup and into operations ensuring the public/communities reaps the benefits proposed as part of the public/private agreement.
Resumes
**Ryan P. Downs**

**EXPERIENCE SUMMARY**

Mr. Downs is the Vice President of Federal Services for MPR Associates, overseeing all aspects of MPR's business for the Federal government. Mr. Downs joined MPR in 1997 and has since been involved in a number of projects for the Department of Energy, Department of Defense, Department of Homeland Security and commercial organizations emphasizing program design and program management, financial modeling and forecasting, probabilistic risk analysis, test planning and execution, automated distributed control systems design, electro-mechanical system design, hazards analysis, system delivery for shipyard construction, network design and valve diagnostics.

**ACCOMPLISHMENTS SUMMARY**

**Financial Assessment and Valuation of Startup Opportunities**

Mr. Downs developed the Economic Impact Analysis submitted to the State of Alabama for the Bellefonte Nuclear Generating Station completion program. The analysis used the Bureau of Economic Analysis Regional Industrial Multiplier System II (RIMS II) methodology for estimating the future value to states of new facilities operating in the region.

Mr. Downs developed a method and standardized an approach to capture and disposition innovative ideas developed by a pharmaceutical company based on market potential, technical risks/benefit, and financial valuation metrics. The analysis balances the investment required, development and commercialization time horizon, revenue potential and probability of technology R&D success. This process is bringing discipline to the previously unstructured process allowing unrelated ideas to be quantitatively evaluated against performance metrics allowing highest potential ideas to receive a disproportionate share of the R&D investment dollars and resources.

**Public/Private Partnerships with Government Agencies**

Mr. Downs worked the Department of Energy to identify novel partnership agreements and business relationships to procure enrichment uranium for mission needs. The agreements explored forward purchasing contracts, land grants, inventory swaps to create win-win public/private partnership agreements.

Mr. Downs developed the Bellefonte Nuclear Generating Station Economic Impact Analysis used by Nuclear Development and the State of Alabama to justify the public/private partnership had value to both the public and the private entities.

**MPR Federal Project Leadership and Oversight**

Mr. Downs is responsible for the success of all MPR projects for government entities and actively oversees all Federal projects MPR executes for the Federal government. This includes projects for the Department of Energy, Department of Defense, including the Army Corps of Engineers and the Department of Homeland Security. Mr. Downs follows the technical process, budget and schedule for all programs and contracts ensuring client satisfaction.

Mr. Downs oversees strategic planning, independent reviews, critical design reviews, technical feasibility assessments, as well as cost, schedule and risk assessments for large-scale government capital projects such as the Domestic Uranium Enrichment program for the Department of Energy, Mixed Oxide (MOX) Fuel Fabrication Facility for the Department of Energy, National Bio and Agro Defense Facility (NBAF) for the Department of Homeland Security and the DDG1000 program for the Department of Defense.

Mr. Downs oversees hardware design, qualification and testing for all projects for the Department of Energy and Department of Defense. Example projects include delivery of NOA-1 hardware to the Trans Uranic Waste Facility at Los Alamos National Laboratory and the Nuclear Reactor Compartment Remote Environmental Control Platform for the USS ENTERPRISE (CVN-65) reactor space decommissioning.

**CVN-78 Startup & Commissioning Recovery Planning**

Mr. Downs led the MPR team responsible for a failure analysis of critical ship systems preventing ship sea trials. The technical delays cost affected shipyard profitability and led to negative press. The MPR team ensured the shipyard recovered
optimally, shifting critical path to other activities. (Project details are confidential.)

Design and Delivery of Custom Radiological Control Equipment for Shipyard Use

Mr. Downs led the project team designing, fabricating and delivering several portable, large scale environmental control platforms responsible for controlling radiological contamination during nuclear reactor decommissioning aboard USS ENTERPRISE (CVN-65), the first nuclear aircraft carrier decommissioned. Early delivery of the systems was essential to recovering lost schedule due to prior shipyard delays.

Chilled Water Automation System (CWAS) Management, Development & Testing

Mr. Downs was the CWAS Project Manager responsible for all aspects of the CWAS project. The CWAS program was commercialized and ruggedized. The Smart Valves developed and testing during the DC-ARM program aboard ex-USS SHADWELL. As part of the program, Mr. Downs architected the CWAS device level software which included the Programmable Automated Valve logic and Expansion Tank Flow Sensor logic. The device level software is capable of detecting, isolating, and reconfiguring chilled water system upsets following a casualty. The Smart Valve system provides automatic survivability of the chilled water system ensuring mission capability of the radar and weapons systems. As Project Manager and lead developer, Mr. Downs is responsible for managing CWAS hardware development and software integration. Mr. Downs is responsible for ensuring CWAS hardware, including Smart Valves and Distributed Control Network hardware, meet all first article testing requirements and the MPR designed equipment was delivered on-schedule to support “just-in-time” ship delivery and construction schedules.

CVN-78 Live Fire Test and Evaluation (LFT&E)

Mr. Downs has been MPR’s lead engineer for the support of the CVN-78 LFT&E damage control and firefighting test program managed by NAVSEA 05P14 for four years. The program involves studying and testing aspects of the next generation nuclear aircraft carrier design validating the ship performance and highlighting areas where the Navy performance standards with respect to firefighting and damage recoverability.

As part of the CVN78 LFT&E program Mr. Downs performed ship and system design reviews addressing the vulnerability and recoverability aspects of preliminary ship designs. This effort involved designing and implementing the Large Test Asset test program as well as designing, participating in and observing several shipboard test exercises aboard ex-USS SHADWELL.

Mr. Downs reviewed ship requirement, prepared test requirements, developed and reviewed test plans and test reports ensuring they met to program objectives.

On behalf of NAVSEA, Mr. Downs collaborated with NRL on the design, planning and execution of the CVN78 AFF system risk mitigation testing at Chesapeake Beach Detachment (CBD). The testing ensured the proposed system design met the required firefighting doctrine requirements.

Large Test Asset (ex-USS AMERICA)

Mr. Downs was the test engineer for the hangar bay ship survivability test program on the Navy's first LFT&E Large Test Asset (ex-USS AMERICA) including investigation of full scale weapons effects on aircraft, aircraft fuel systems, and resulting hangar bay fire suppression requirements. The testing informed the design of the CVN-78. Mr. Downs received the Navy Award of Merit for this activity. (Other pertinent details are classified.)

VIRGINIA Class Submarine Fire Hazard Analysis (FHA)

Mr. Downs developed a comprehensive FHA for a sensitive region of the VIRGINIA Class submarine design. The evaluation used probabilistic risk analysis to determine the potential risk of a fire in the specified region of the boat and the resulting impact to the boat structure, crew and mission capability. The FHA considered the submarine design and operation specific doctrine. System and ship ergonomics in combination with human reliability were used to quantitatively assess the safety of the specific region of the submarine and its impact on the rest of the boat. The results of the analysis were presented to the Weapon Systems Explosive Safety Review Board (WESERB).

 Egyptian Damage Control & Firefighting Trainer Evaluation

Mr. Downs was the lead evaluator of the Egyptian Navy's damage control and firefighting training facility in Abu Quir, Egypt. Mr. Downs evaluated the facility design, construction, and operation and recommended facility improvements, doctrine enhancements and training guidance to improve safety and the quality of training. As part of the evaluation Mr. Downs was the first individual to enter the firefighting trainer and extinguish a fire during a live fire scenario.

F-35B Joint Strike Fighter Shipboard Introduction Fire Risk and Safety Lead

Mr. Downs led the fire risk and shipboard safety program for NAVSEA. Mr. Downs was responsible for analysis of fire and safety threats as well as the design and installation of fire and safety risk
mitigating design changes for the LHD-1. Mr. Downs was part of the F-35B/LHD-1 shipboard integration test team during the 14 day sea trials and was responsible for inspecting and rectifying fire protection and safety issues during fight operations during F-35B sorties.

Lithium Battery Storage and Charging Safety Locker Design and Fabrication

Mr. Downs led the MPR team responsible for designing and manufacturing the first Lithium Battery Storage Lockers and Lithium Battery Charging Stations qualified for Navy shipboard use. The lockers leveraged NRL and NAVSEA testing and experiences aboard the ex-USS SHADWELL to inform the performance requirements and design. MPR-designed lockers are installed on several class of Navy ships.

Damage Control Automation for Reduced Manning (DC-ARM)

Mr. Downs participated in manned fire testing focused on assessing the performance of current damage control organizations and optimizing these organizations to complement automated damage control technology aboard ex-USS SHADWELL. The purpose was to highlight deficiencies in the current damage control organizations and test different damage control manning concepts to determine how to efficiently manage damage control scenarios with and without additional damage control automation.

DC-ARM Firemain Smart Valve Design, Development & Testing

Mr. Downs was part of a small team that designed and developed a motor operated valve outfitted with an onboard processor, sensor suite, and actuator. The Smart Valve automatically detects and isolates ruptures in fluid systems without the need for communication between components following the rupture. This Smart Valve operates independently or in conjunction with other Smart Valves, or distribute control systems to provide “Defense-In-Depth.” The Smart Valve development involved peer to peer networking, distributed processing, system level software integration as well as Neuron C programming and software optimization. The MPR Smart Valve was issued US Patent in May 2003. A rigorous test plan was designed and implemented to test the performance of a Smart Valve equipped firemain aboard the ex-USS SHADWELL, the Navy’s Center for Safety and Survivability full-scale test facility.

United States Patent 6,535,827

DC-ARM Supervisory Control System Design, Development & Testing

Mr. Downs was the lead for development of next-generation Navy ship supervisory distributed control system as part of the Navy’s DC-ARM program. The Supervisory Control System is used for automating hull, mechanical and electrical systems during complex damage control evolutions. This work has involved application of state-of-the-art distributed processing, system/network architecting, HMI display development. This project involved interfacing and controlling several ship systems, including a high pressure WaterMist system and a Smart Valve equipped firemain. System vulnerability and recoverability was addressed through a redundant hardware and software architecture that dynamically reallocates processing tasks to all surviving processing location. It was essential to understand the fundamentals of each installed system (i.e. WaterMist) to understand how to automate each component in the system to maximize the effectiveness of the entire distributed control system. The individual installed systems were located on different control networks using various networking protocols. The goal was to successfully integrate and control all of the ships systems through a single distributed survivable control platform to effectively automate a ships response to a casualty, minimizing the required personnel aboard a ship. This system was successfully testing aboard ex-USS SHADWELL demonstrating effective damage control and firefighting can be accomplished while reducing shipboard manning through the implementation of current technology.

CLEARANCE

DOD SECRET / DOD TOP SECRET-ELIGIBLE
DOE Q (IN PROCESS)

EDUCATION

Columbia Business School, Master of Business Administration
Pennsylvania State University, B.S. Mechanical Engineering

MEMBERSHIPS
Tau Beta Pi – National Mechanical Engineering Honor Society
Pi Tau Sigma – National Engineering Honor Society

PAPERS


Over thirty restricted publications for client work at MPR Associates.
Storm Kauffman heads MPR's Nuclear Technology area. He has 45 years of multi-disciplinary experience in nuclear power covering a broad range of topics including engineering, design, construction, alternatives analysis, safety, operations, training, program and personnel management, emergency planning, decommissioning and dismantlement, security, and NRC design and licensing requirements. Mr. Kauffman joined MPR in mid-2008 after retiring as a Senior Executive from the US Department of Energy and Navy, having spent a full, first career with the Naval Nuclear Propulsion Program (NNPP), where he was Director of Reactor Safety followed by Director of Reactor Engineering. He also was Chief of the field office overseeing operation and subsequent initial dismantlement of a navy training reactor. A registered (VA) Professional Engineer, he has an EMBA from the Naval Postgraduate School and an MS in Nuclear Engineering and BS in Mechanical Engineering from MIT.

ACCOMPLISHMENTS SUMMARY

Advanced Reactors
Knowledgeable of varied reactor technologies (current PWRs & BWRs, SFRs, HTGRs, nuclear thermal propulsion). Assisted in developing for EPRI an advanced reactor requirements document. Evaluated feasibility of patented thorium reactor concept. Prepared study of HTGR fuel qualification experience and needs. Assessed relative merits of high temperature reactors for process heat, including licensability, technical challenges, and project cost and schedule certainty. Directed down-select of advanced concepts, leading to initial R&D and development of supercritical CO₂ plant design. Identified safety requirements for a Brayton cycle, fast reactor for NASA use for unmanned spacecraft propulsion. Assessed cooling options. Led interaction with NRC for review of Light Water Breeder Reactor (U233-thorium fuel cycle).

Reactor Design and Manufacturing
Directed NNPP Reactor Engineering - technical & project management of fuel design, qualification, and manufacturing, reactor thermal-hydraulic & structural design, manufacturing, and operation. Responsible for NRC-licensed Category I fuel facilities, including technical criteria and assessing safety/security regulations. Led advanced technology R&D (methods, analysis, and testing) in thermal-hydraulics, structural mechanics, advanced plant concepts (e.g., gas cycles), design by simulation, computational fluid dynamics, and computer code automation. Spearheaded development of statistical design methods. Technical lead for control rod drive mechanism design for small modular reactor. Member of DOE nuclear materials shipping & coordination committees.

Nuclear Regulation
Led and presented engineering/licensing response on key NRC issues (e.g., fuel racks, turbine missile analyses, jet impingement) for design certification for APR1400. Developed licensing strategy to deviate from certain General Design Criteria. Assessed NRC new reactor regulations for applicability to sodium fast reactor (SFR). Licensing advisor to high temperature gas (HTGR) and medical isotope production reactor start-ups. Managed preparation of naval Safety Analysis Reports (SARs). Led effort for NRC technical review of submarine safety analysis. Developed review strategy for next aircraft carrier. Assessed NRC safety requirements' applicability to naval designs. Developed methodology for independent peer review for Canadian Nuclear Safety Commission (CNSC). Led international safety exchange resulting from British reactor safety criteria. Testified to Defense Nuclear Facilities Safety Board. Developed regulatory and safety strategy for space reactor.

Safety Analysis
Directed Reactor Safety & Analysis for NNPP. Established requirements for safety for reactor operations, reactor refueling, and nuclear fuel facilities. Implemented risk-informed in-service inspection. Established approach for design of leakage detection system. Studied options for containment leak rate testing for a SMR.

New Nuclear Construction
Performed project, engineering, schedule, and regulatory assessments of Vogtle, Summer, and NuScale projects. Chief Nuclear Engineer for DOE Independent Engineer assessment of AP1000 and Vogtle project since 2009. Led technical portion of DOE External Independent Review of Hanford Waste Treatment Project and participated in other DOE project construction reviews.

Former Reactor Operator
Licensed operator at MIT-I research reactor. Assisted with conversion to MITR-II design.
Independent Reviews

Civil Construction Reviews
Reviewed building design specifications/drawings for new project. Provided assessment of factors for deciding to modularize construction and its benefits to construction cost and schedule.

Yucca Mountain License Application (LA)
Managed creation of NNPP supplement to LA for pre- and post-closure and briefed CRC staff. Reviewed and critiqued DOE LA. Responsible for both technical content and presentation.

Regulator Liaison
Led briefings/tours for NRC Commissioners, staff, and Advisory Committee on Reactor Safeguards. Provided briefings on specific plant design features and safety practices to NRC and to state/local regulators in 10 states. Justified independent safety review methodology to CNSC.

Fuel/Radioactive Material Shipping Licensing
Developed and led criticality safety approach for new fuel package. Managed preparation, submission and comment resolution for reactor compartment disposal Safety Analysis Reports for Packaging (SARPs) and for naval spent fuel Technical Support Document for disposal in the geologic repository. Assessed plans for Independent Spent Fuel Storage Installation for San Onofre. Performed independent review of criticality, thermal, shielding, and structural analyses for new and spent fuel containers for storage and shipment. Safety and security lead for naval fuel shipment and storage.

Component Engineering
Since 2012, technical lead for design of all safety related valves for SMR. Previously, technical lead for CRDM design.

Severe Accident (SA) Analysis
Managed SA analysis and test program. Assessed BWR containment vent alternatives.

Criticality Analysis
Led team performing new fuel shipping package analysis. Directed criticality analysis for new/spent reactor fuel handling, disposal of fuel in a geologic repository, and lab work. Established criticality safety requirements for new activities and audited compliance with them. Evaluated criticality controls for U233 fuel manufacturing line.

Deactivation and Decommissioning
As head of DOE field office at a training reactor site, planned and drove start of D&D work that led to site free release. Monitored radiological, environmental, and cost performance.

Digital Instrumentation & Control (I&C)
Developed process for specification and procurement of non-safety digital I&C important to plant reliability. As head of reactor safety, established with I&C group the criteria for acceptable use of, and defense in depth for, digital reactor I&C. Performed detailed review of algorithms and human factors. Briefed NRC Chairman and Commissioners and defended approach in focused NRC staff review.

Probabilistic Risk Assessment (PRA)
Managed reconstitution/update of ABWR Design Certification renewal PRA, and justified activities in meetings with the NRC. Improved PRA techniques and conduct of PRAs. Independently reviewed foreign three level PRA. Managed derivation of safety related valve reliability statistics. Led application of PRA methods to Yucca Mt. post-closure criticality analysis. Assisted in probabilistic assessment of safety, operational reliability, and performance. Attended MIT Risk-Informed Operational Decision Management & NRC PRA courses and ANS PRA topical meetings. Taught in-house classes on PRA. Developed plan to assess risk of inadvertent safety feature actuation, reliability of crossing site power lines, and means to reduce risk importance of specific components.

Engineering & Procedure Reviews
Extensive experience in critical review of engineering analyses and operating procedures.

Strategic Planning and Gap Analysis
Led a senior executive team; created original Headquarters Strategic Plan and gap analysis.

TMI Lessons Learned Program
Managed post-TMI technical evaluation program and implementation of lessons learned.

Loss of Coolant Accident Testing & Analysis
Managed and technically reviewed loss of coolant analyses. Drove evolution from Appendix K to best-estimate (Code Scaling, Applicability, & Uncertainty Analysis) methodology, including use of Phenomena Identification and Ranking Tables, scaling analyses, and Test Assessment Matrices to qualify code. Specified and managed multi-million dollar thermal-hydraulic test program. Supervised development of advanced safety analysis code, including cooperative agreement with NRC for user interface development.
Application of Modularization to Construction
Developed assessment and recommendations to modularize construction of a large light water reactor to reduce construction duration.

NASA Liaison
NNP representative to NASA for safety benchmarking, working with founders of Engineering and Safety Center and top NASA managers. Member of Nuclear Cryogenic Propulsion Stage Independent Review Panel.

Environmental Analysis
Assessed cooling technology options and effect on suitable locations for new nuclear plant considering environmental impact and costs, Testified at environmental panel.

Project Management & Budgeting
Managed >700 personnel and an annual budget of >$500 million, including manufacturing contracts of ~$350 million. Led major (>400 million) budget reallocation. Focused cost reduction and LEAN initiatives. Member of DOE Secure Transportation Asset Advisory Board.

Emergency Planning
Emergency Control Center director. Managed reactor accident consequence analyses. Justified emergency planning approach to regulators.

Plant, Operator, & Design Inspections
Participated on Component Design Basis Inspections. Over a 25 year period, led/participated in assessments of new reactor propulsion plant readiness for operation and naval crew proficiency. Evaluated new plant test and design information for compliance with requirements prior to initial operation. Assessed qualification of Prospective Commanding and Executive Officers (PCOs) of nuclear power ships and qualification of operators of safety systems in both oral interviews and written examinations. Judged suitability of nuclear officer candidates.

Operating Reactors Issues
Directed resolution of emergent, time-critical affecting reactor equipment and safety system issues. Oversaw analysis for life extension.

Physical and Cyber Security
Interface for programmatic aspects of security at NRC-licensed Category 1 fuel facilities. Developed physical security requirements for storage of naval fuel and audiited compliance. Participated in reactor site physical security Vulnerability Assessment. Developed cyber security requirements for classified computing environment. Led Cyber-Security Vulnerability Assessment.

Information Technology (IT)
Served as Chief Information Officer and in other management roles. Established IT policies.

Training
Trained junior engineers on commercial safety systems and reactor accidents. Evaluated initial qualification training of Navy operators. Led creation of Reactor Safety Training Manual and training aids. Participated in development, specification, and fielding of simulators. Created, and delivered quarterly, a 35-hour curriculum on reactor safety for PCOs, including training on Three Mile Island and Chernobyl accidents.

Nuclear Power Plant Restart and Retrofit
Assessed adequacy of environmental qualification program for CANDU plant restart. Evaluated turbine rotor compliance with acceptance criteria.

Oral & Written Communications
Made numerous presentations to NRC, DOE, NASA, and others. Wrote and edited many technical reports. College newspaper Editor-in-Chief and Managing Editor.

EDUCATION
Naval Postgraduate School, Monterey, CA (distance learning) – EMBA, 2005
Massachusetts Institute of Technology, Cambridge, MA – MS, Nuclear Engineering, 1975
Massachusetts Institute of Technology, Cambridge, MA – BS, Mechanical Engineering, 1975

MEMBERSHIPS
American Nuclear Society

LICENSES
Professional Engineer, Nuclear, VA (current)
Reactor Operator, MTR-I (expired)

AWARDS
Navy Civilian Distinguished Service Medal
National Nuclear Security Administration Gold Medal

PUBLICATIONS
EXPERIENCE SUMMARY

1999 - present  MPR Associates, Inc.
1995-1998  Ethicon Inc., a Johnson and Johnson Company, Process Engineer
1990-1995  United States Navy, Nuclear Submarine Officer

In his 27-year career, Mr. Steiman has worked on a broad variety of projects in the disciplines of mechanical, electrical, controls and nuclear engineering, developing particular expertise in Project Controls/Project Management and quantitative cost and schedule risk analysis for large capital projects. His diverse experience includes five years in the construction, operation and maintenance of shipboard systems on a nuclear-powered submarine where he was certified as a Chief Engineer by Naval Reactors, three years of process validation and project management experience at a medical device manufacturing plant, and 19 years of engineering and project management/project controls consulting experience in projects for the United States Department of Energy and the nuclear power and medical device/pharmaceutical industries at MPR.

ACCOMPLISHMENTS SUMMARY

Independent (Mega) Project Reviews
Team Leader for an independent assessment of the cost and schedule to complete a partially constructed multi-billion dollar two-unit nuclear power station to support the customer's DOE loan guarantee application.

Team Leader for independent review of a multi-billion dollar change proposal for the DOE Hanford Waste Treatment Plant project. Coordinated efforts of multidisciplinary technical team and cost, schedule and risk subject matter experts, led effort to conduct independent quantitative risk assessment as basis for recommended contingency funding on behalf of DOE Office of Project Management & Assessments.

Advisor/consultant for quantitative schedule risk analysis for a multi-billion dollar two unit new nuclear power station in the U.K. Led MPR's team to review and evaluate critical path construction schedule and project risk register and advise project owners on schedule risk model optimization.

Provided project management and engineering consulting services to the Federal Project Director, Office of Fissile Material Disposition, for the design and construction of a Mixed Oxide Fuel Fabrication Facility. Served as a key member of the DOE team for key project reviews, including final design and Critical Decision (CD)-2/3 cost/performance baseline and construction readiness reviews. Served as the DOE team leader for the CD-2 review of the Primavera integrated project schedule. Participated in critical design reviews and cost/schedule reviews. Led a multidisciplinary team for oversight of the prime contractor for the mechanical, electrical and software design of the facility glovebox process units. Coordinated and conducted quarterly design reviews, including development of agendas, selection of review team members, determination of review scope and products, development of review methodology and criteria, and documentation of review results. Reviewed contractor design deliverables and tracked contractor cost and schedule performance. Provided recommendations to DOE management for improving contractor performance.

Performed an independent assessment of the Calvert Cliffs Unit 3 construction schedule for UniStar Nuclear Energy to assess the maturity of the construction schedule to provide meaningful and defendable critical paths as a basis for determining overall construction duration, and a credible input to the quantitative risk analysis as a basis for determining duration contingency. Analyzed the sensitivity of the overall project duration to changes in the concrete unit rate and identified the point at
which further reductions in unit rate yielded no further benefit to the overall project duration due to other limiting critical paths. Conducted an independent "what-if" analysis to evaluate the reasonableness of the risk analysis performed by the Consortium. Developed an independent risk model that UNE could use for future EPC negotiations to assess the impact of concrete unit rate on the project schedule.

Performed an independent review of the project schedule for the Bellefonte Unit 1 restart effort for Tennessee Valley Authority. Provided TVA with valuable recommendations for schedule improvement to support oversight/management of their EPC contractors and provided criteria and recommendations for a sequence for performing system walkthroughs to fully define the scope of the restart effort.

Provided project management and engineering consulting services to the Office of Fissile Material Disposition, Office of International Programs, for the Russian MOX program. Developed and maintained the Primavera Enterprise integrated project schedule for the BN-600 blanket replacement project and the effort to transition the BN-600 reactor to a hybrid MOX/uranium core.

PMO Support Services
Project Manager and consultant for building the initial PMO for a start-up company designing a sodium cooled fast reactor. Developed the first integrated cost and schedule baseline for Conceptual Design, developed a Level 1 program schedule through commercial operation, and designed and produced performance indicator packages for company monthly reports. Successfully mapped the company's engineering organizational structure into the project controls and financial software systems, promoting effective resource planning and utilization.

Led the effort to develop and implement the full suite of project controls tools and systems for a small modular reactor vendor. Responsibilities included defining the Work Breakdown Structure for all major projects, assisting the engineering leads in defining the scope and labor estimates, building a resource loaded critical path baseline project schedule, implementing a cost control system for earned value management and reporting, preparing all relevant project controls procedures, and performing Monte Carlo based risk analyses to calculate uncertainties in project cost and duration as input to management reserve and contingency calculations.

Project Controls Manager for the licensing, engineering, procurement and construction of two Advanced Boiling Water Reactors for the South Texas Project Nuclear Operating Company. Oversaw of ~20 project controls staff from six different companies, including one international company, in the development and maintenance of the Primavera P6 integrated project schedule. Established the team's first performance measurement baseline and implemented performance indicators to track progress on the multi-$100M annual budget. Implemented the COBRA cost processor for earned value management and performance reporting. Represented the prime contractor in meetings and presentations to the STPNOC executive management as well as the project stakeholders/owners.

Independent cost/risk advisor for U.S nuclear utility's Fukushima Response Program. Developed WBS scope dictionaries and basis of estimates for major Fukushima work at multiple reactor sites, and performed Monte Carlo cost risk/uncertainty analyses to develop contingency and reserve budgets.

Other MPR Experience
Project Manager for a feasibility study to evaluate potential modifications to the Emergency Core Cooling System for the Advanced Test Reactor (ATR) at Idaho National Laboratory. Coordinated and oversaw all engineering activities, including fracture mechanics/structural evaluations and thermal/hydraulic analyses. Maintained the Primavera integrated project schedule and performed earned value reporting against the project baseline.

Project leader for qualification of two digital single loop PID controllers for use in safety-critical applications. Coordinated qualification testing activities including initial baseline testing, seismic testing, electromagnetic compatibility (EMC) testing, and functional-and-challenge testing. Wrote
test procedures and executed test plans to verify controller accuracy and functionality per the published specifications. Resolved EMC susceptibility issues by leading effort to design and qualify EMC filter assemblies for use with the controllers.

Supervised testing of a commercially available programmable logic controller (PLC) for nuclear plant qualification. Tasks included writing and reviewing validation test plans, verification of all PLC input and output parameters per design drawings, initial setup and debugging of the PLC, and coordination and direction of test activities for environmental and seismic qualification testing.

Developed and implemented several design modifications for the instrumentation and control department at an electrical power plant. Tasks included evaluation of instrument uncertainty effects on safety setpoints; preparation of design modification package and post-modification test plan; revision of plant procedures; and direction of installation, post-modification testing and restoration to operability.

Lead engineer for commissioning and validation of an injection molding process for a pharmaceutical implant drug manufacturer. Defined equipment calibration requirements, wrote operating procedures, performed equipment commissioning, and wrote and executed Installation Qualification (IQ), Operational Qualification (OQ) and Performance Qualification (PQ) protocols for all process equipment including injection molding machine, resin dryer, annealing oven and other in-process inspection equipment. Determined product inspection sampling plan for process PQ and conducted statistical analyses to document process capability against performance specifications.

**ETHICON, INC., A JOHNSON AND JOHNSON COMPANY**
Managed capital projects as part of engineering team responsible for installation and operation of $80 million suture sterilization facility. Coordinated project activities of consultants, contractors, and maintenance personnel including budget administration, design calculations, PLC programming, equipment installation and validation.

**UNITED STATES NAVY**
Supervised 11-person shift in operation of a U.S. Navy submarine nuclear power plant. Directed maintenance, repairs and operations of mechanical, electrical and I&C systems during plant start-up, routine operation and plant shut-down periods, including a six-month shipyard new construction period. Certified by Department of Naval Reactors as Chief Engineer of submarine nuclear reactor plant.

Served in key positions in the submarine engineering department, including the Reactor Controls Assistant (responsible for maintenance and calibration of all reactor plant I&C systems, including reactor protection systems and pressure, temperature and nuclear instrumentation) the Chemistry and Radiological Controls Assistant (responsible for monitoring reactor plant radiation levels and maintaining reactor and steam plant chemistry), and the Quality Assurance Officer (responsible for quality oversight of maintenance/repairs on critical propulsion plant and hull integrity systems).

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**EDUCATION**
University of Michigan, B.S. Mechanical Engineering, 1990

**GOVERNMENT CLEARANCE**
DOE/NNSA “Q”
DOD “Secret”

**CERTIFICATIONS**
Registered Professional Engineer, Virginia
EXPERIENCE SUMMARY

Mr. Bubb is experienced with technical evaluations during all phases of energy facilities’ life-cycle, including: project development and preliminary engineering; operational troubleshooting, performance modeling and efficiency improvements; due diligence reviews; root cause investigations; project controls and schedule support; and new technology assessments.

ACCOMPLISHMENTS SUMMARY

Commercial Assessments
Developed an economic benefit analysis of a nuclear facility project that quantified the local and national economic impacts of constructing a proposed $13B nuclear facility.

Performed an Independent Engineer's assessment of the engineering plan to restart Bellefonte nuclear facility. Effort included review of required engineering activities, construction methodologies, licensing activities, EPC execution approaches, and schedule reviewed. The resulting report is a key exhibit for DOE’s review of the project in support of a Loan Guarantee application.

Served as an advisor to the Illinois Commerce Commission for the Taylorville SNG project. The project is a coal-to-SNG facility and associated 500 MW electric power plant. Advised on whether the design is likely to meet the developer's projections for capital cost, operating cost, plant output, and plant reliability.

Served as technical and commercial advisor for technology development of a 250 MW zero-CO2 power cycle. Evaluated the commercial merits of the technology with a financial proforma and advised on technology development plan including schedule and funding requirements.

Advised a nuclear fleet operator on the technical and commercial feasibility of modifying an operating a nuclear power plant to provide cogeneration capability. Evaluated steam cycle impacts and capital costs required to make the modifications, yielding the steam energy pricing needed to make the project commercially attractive.

Developed project pro-forma for cogeneration facility for evaluating various EPC proposals and self-build options.

Developed project pro-forma for paper mill for evaluating various options to provide alternative means of steam delivery.

Managed the development of a financial model for a 400 MW generation and transmission project in Africa to investigate financing alternatives and their impact on the required off-take tariff and financial metrics for debt and equity participants.

Developed a cost model for a gas turbine major maintenance program used to successfully evaluated third party supplied maintenance services and negotiate lower fees for the OEM’s Long Term Service Agreement.

Due Diligence
Provided technical due diligence assessments of 42 different facilities representing over 12,000 MW. Plant designs include: coal, combined-cycle, simple-cycle, diesel, and wind. Due diligence reviews typically include plant condition assessment, expected plant performance, estimated maintenance expenditures, identification of project risks, identification of potential project improvements, Qualified Facilities requirements vetting, critical flaw analysis of contracts and permits, and identification of potential environmental consequences.

Project Management
Project Manager of various multi-disciplinary engineering teams working in the power sector. Responsibilities include: performing and leading engineering evaluations, personnel supervision, technical review and direction setting, client management, proposal development, cost estimating, project scheduling, budget management, distribution of workload, and performance appraisal.
Capital Project Execution
Project Manager of and External Independent Review of the $2B River Corridor Cleanup Project at the Hanford Facility. Advised DOE on the readiness of the project for establishment of a baseline. Advised on technical, cost, and schedule risks.

Led independent review of a multi-billion dollar change proposal for the DOE Hanford Waste Treatment Plant project. Coordinated efforts of multi-disciplinary technical and cost, schedule and risk subject matter experts, led effort to conduct independent quantitative risk assessment as basis for recommended contingency funding on behalf of DOE Office of Project Management & Assessments.

Evaluated the project controls process for the development of a Performance Measurement Baseline of an $8B DOE project. Identified solutions to process challenges and gathered lessons learned from multiple stakeholders within a multi-disciplinary organization.

Using Primavera scheduling tools, developed or enhanced project schedules for: a boiler plant restart project, the development of an energy storage facility, a nuclear plant design program, and a nuclear plant construction project.

Evaluated construction schedules for: a combined-cycle power facility for restart of construction activities after a 4-year suspension of construction, and a DOE construction project. The DOE project also included an evaluation of the Earned Value Management System and contractor's progress reporting methods.

Technology Assessment and Development
Perform a technical market assessment of small-to-medium scale gasification technologies for the US Department of Energy. For ~100 technology vendors the study summarized: technical characteristics, commercial characteristics, identified challenges to further deployment, and made recommendations to the DOE to foster additional growth in the sector.

Provided market analysis and engineering schematics to support the development of a Distributed Generation (DG) product in the commercialization phase. The unit was a 6kW Combined Heat and Power (CHP) generator.

Provided engineering schematics for integration of the unit with existing HVAC structures and interconnection with the local electrical grid. Also provided economic guidance regarding the value case of distributed generation.

Evaluated the technical and market potential for a novel lithographic manufacturing process for use in production of high performance gas turbine components. Identified and quantified value cases based on increased plant performance and reduced maintenance requirements.

Developed a conceptual design and prototype testing plan for a new energy storage technology based on thermal energy storage. Development included system engineering, finite-element heat transfer analyses, materials selection of key components, two-phase thermal-hydraulic analysis, and component parametric testing.

Provided product development support and Owner’s Engineering for a 30 MW Energy Storage Project.

EDUCATION
Virginia Tech, M.S., Mechanical Engineering 1999
Virginia Tech, B.S., Mechanical Engineering 1998 (Magna Cum Laude)

REGISTRATION
Registered Professional Engineer, State of Virginia