



Report No: 14-208
Meeting Date: September 10, 2014

Alameda-Contra Costa Transit District

STAFF REPORT

TO: Operations Committee
AC Transit Board of Directors

FROM: David J. Armijo, General Manager

SUBJECT: Electrolyzer and Buffer Storage System – D4 (Seminary) Hydrogen Fueling Station

ACTION ITEM

RECOMMENDED ACTION(S):

Consider awarding a contract to Linde LLC to provide, install, and commission an electrolyzer and buffer storage system at the Seminary Division Hydrogen Fueling Station.

EXECUTIVE SUMMARY:

The Electrolyzer and Buffer Storage System is the third and final component of the Seminary Energy Station. Project 1701 (Seminary Energy Station), includes the Hydrogen Fueling Station, the installation of a Solid Oxide Fuel Cell (SOFC) powered by landfill gas, and the installation of this electrolyzer which will produce 65 kilograms of hydrogen daily.

This is a competitive proposal procurement. Staff solicited 280 firms, of which 17 were small/local/Disadvantaged Business Enterprises. One firm responded to the solicitation and was evaluated by a three person panel comprised of independent industry experts who were all external to AC Transit.

The evaluation panel reviewed the proposal submitted by Linde and found it to be responsive and responsible and recommended award. The cost proposal submitted by Linde was within five percent of the independent cost estimate and deemed to be fair and reasonable.

The final contract is a firm-fixed price contract valued at \$1,959,595 with a period of performance from the contract award for 42 months. The period of performance includes a six month construction period and a 36 month operations and maintenance period with warranty.

BUDGETARY/FISCAL IMPACT:

Project Funding Summary

Funding Source	Amount
FTA Tigger II	\$1,095,528
FTA Section 5307	\$480,590
PG&E Self Generating Incentive Program Rebate	\$383,477
Total	\$1,959,595

The electrolyzer and buffer storage portion of this project is fully funded by the FTA Tigger II grant and FTA Section 5307, using the PG&E Self Generating Incentive Program rebate as matching funds. In addition to this procurement funding, associated staff time is fully funded by allocations from these same sources.

BACKGROUND/RATIONALE:

Project Description. This project will provide an electrolyzer and buffer storage system that will produce hydrogen using electrical power from our Solid Oxide Fuel Cell (SOFC), which will satisfy the requirements of the FTA Tigger II grant.

Implementation Approach. Staff intends to implement this project with a single contract.

Procurement Type and Timeline. The procurement used for the subject contract is a competitive proposal, price alone not determinative, as defined by FTA Circular 4220.1F Rev.3.

The procurement proceeded according to the timeline in Table 1; the solicitation results are in Table 2.

Table 1. Procurement Timeline.

Action	Date
Board authorization to issue solicitation	Authorization not required in accordance with Board Policy 350, VII.A
Solicitation issued	4/9/2014
Pre-bid conference	No pre-bid conference used in this solicitation
Solicitation closed	5/23/2014
Evaluations complete	7/9/2014

Table 2. Solicitation Results.

Metric	Value
Number of firms solicited	280
Number of disadvantaged business enterprises solicited	17
Number of firms that responded	1
Number of firms determined to be responsive and responsible	1
Number of firms evaluated	1

Evaluation Process and Result. As this is a competitive proposal which considers factors in addition to price, staff convened an evaluation panel comprised of independent industry experts who were all external to AC Transit.

The evaluation panel consisted of:

- Joseph W. Pratt, Ph.D. Sandia National Laboratories
- Roger Nelson, P.E. Exponent Engineering and Consulting
- John Cornish, P.E. Engineering, Procurement & Construction, LLC

Resumes of the evaluation panel members are included in Attachment 1.

The recommended contract is a firm-fixed price with a total value of \$1,959,595 and a period of performance from contract award for 42 months.

During the period of performance, the contract provides for operations and maintenance services for all scheduled and preventative maintenance. Additionally, there is a warranty that will cover all parts and labor for all non-preventative maintenance required. The contractor's performance with regard to the three-year operations and maintenance portion of this contract will be evaluated based on the timely completion of all preventative and scheduled maintenance, as detailed in the manufacturer's preventative maintenance manual, which will be delivered at commissioning.

If the District decides to continue operating the electrolyzer beyond the period of performance of this contract, the District will have the option to exercise a series of seven pre-priced, one-year options to provide operations and maintenance services. Any non-preventative maintenance beyond the period of performance would be subject to an open and competitive procurement based upon the District's procurement policies in effect at that time.

The annual cost of these extended operations and maintenance options, if exercised by the District, would be:

Annual Operations and Maintenance Options

Year 4	\$61,058.40
Year 5	\$62,890.15
Year 6	\$64,776.86
Year 7	\$66,720.16
Year 8	\$68,721.77
Year 9	\$70,783.42
Year 10	\$72,906.92

The evaluation panel reviewed the proposal submitted by Linde and found it to be responsive and responsible and recommended award. The cost proposal submitted by Linde was within five percent of the independent cost estimate, and deemed to be fair and reasonable.

ADVANTAGES/DISADVANTAGES:

There are several advantages to the installation and integration of the electrolyzer into the Oakland Hydrogen Fueling Station. These advantages include:

- Reduction of operating cost of hydrogen fuel for approximately \$48,500 per year.
- Reduction of AC Transit's carbon footprint.
- More efficient use of surplus energy produced by the Solid Oxide Fuel Cell, which is currently net metered back to PG&E.
- Compliance with the Tigger II grants agreement.

There were exceptions noted during the proposal and evaluation process. Staff, through the process of negotiating contract terms and conditions, has been able to resolve all of these exceptions, except for Linde's exception to the liability limitation contract language. Linde proposes to limit its liability to direct damages only with a cap of \$250,000 per occurrence and \$500,000 in the aggregate for the entire term of the contract. It is the District's preference not to have any limitation as to the type or amount of damages.

ALTERNATIVES ANALYSIS:

There is one available alternative; the District could decide not to implement the electrolyzer. Consequences of not implementing the electrolyzer would include:

- Non-compliance issues with the Tigger II grant agreement.
- Lost operational cost savings (purchased hydrogen versus produced hydrogen).
- Lost opportunity to reduce our carbon footprint.

PRIOR RELEVANT BOARD ACTIONS/POLICIES:

GM Memo 09-061b, Resolution No. 09-025 authorizing the General Manager to apply for Federal American Reinvestment and Recovery Act of 2009 funds.

GM Memo 09-129a, Resolution No. 09-029 authorizing the acquisition of hydrogen equipment for D2 and D4 hydrogen stations.

GM Memo 09-297, Authorizing the contract award to Linde for H2 system at D2 and D4 hydrogen stations.

SR 11-117a, Authorizing the General Manager to execute a contract with Bloom Energy for a Solid Oxide Fuel Cell.

SR 13-112, Authorizing the contract award to EPC for the Architectural and Engineering work at the D4 hydrogen station.

SR 14-030, Authorizing the contract award to Roebbelen Construction for the Construction of the D4 hydrogen station.

SR 14-039, D4 (Seminary) Hydrogen Fueling Station Status Briefing

ATTACHMENT(S):

1. Evaluators' resumes.

Department Head Approval: Dennis W. Butler, Acting Chief Planning, Construction & Engineering Officer

Reviewed by: Denise Standridge, Interim General Counsel
James D. Pachan, Chief Operating Officer / Interim Chief Financial Officer
Jon Medwin, Director of Procurement & Materials

Prepared by: Joe Callaway , Sr. Project Manager

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JOSEPH W. PRATT, PH.D.

Sandia National Laboratories
7011 East Ave., Livermore CA
Tel: 925-294-2133; Email: jwpratt@sandia.gov

EDUCATION

Ph.D. in Mechanical and Aerospace Engineering *September 2008*
University of California, Irvine, CA

M.S. in Mechanical and Aerospace Engineering *March 2004*
University of California, Irvine, CA

B.S. in Mechanical Engineering, With Distinction *June 1997*
University of Washington, Seattle, WA

EXPERIENCE

Principal Member of the Technical Staff *January 2014 to present*
Senior Member of the Technical Staff *March 2010 to January 2014*
Sandia National Laboratories/California

- Sandia Technical Lead on the joint Sandia-NREL Hydrogen Fueling Infrastructure Research and Station Technology (H2FIRST) program, working to support and improve hydrogen fueling station rollout.
- Leading a multi-partner industry-government team to design, build, and deploy a 100 kW self-contained hydrogen fuel cell system for auxiliary power supply in ports and on barges (Principal Investigator).
- Designing a hydrogen fuel cell / metal hydride storage retrofit power module for electrically powered forklifts (Principal Investigator, Sandia subcontract).
- Manager of Sandia Hydrogen Program's Market Transformation activities.
- Performed a scoping study for deployment of a hydrogen fuel cell alternative marine power barge to supply commercial cargo ships with electricity while in port (i.e., cold ironing) (Principal Investigator).
- Developed a fully-integrated, multiphysics, multiscale model for gas-to-liquids (Fischer-Tropsch Synthesis) reactors based on fundamental concepts allowing for flexible applicability in future reactor design (Principal Investigator).
- Developed and characterized exothermic reaction mitigation strategies for sodium alanate, a complex metal hydride hydrogen storage material (Principal Investigator).
- Analyzed the market demands and technology gaps for hydrogen storage in the near-term applications of construction equipment, airport ground support equipment, large portable generators, telecom backup stations, consumer electronics, and man-portable/wearable power supplies (Technical Lead).
- Analyzed the feasibility and performance impact of proton exchange membrane fuel cell systems for on-board commercial airplane power generation (Co-Principal Investigator and Technical Lead).
- Supported the experimental design of liquid hydrogen jet plume studies, as related to proper development of applicable codes and standards for hydrogen storage.

Assistant Professor (Tenure Track)

August 2008 to February 2010

University of Michigan – Shanghai Jiao Tong University Joint Institute (UM-SJTU JI)

- Conducted research in alternative energy systems; awarded a RMB 200,000 grant by the National Science Foundation of China for a hardware-in-the-loop experimental study of highly dynamic energy generation and storage systems.
- Developed and taught classes on professional experimental techniques, and designed, built, and managed the UM-SJTU JI Mechanical Engineering Laboratory.
- Effective communication style, clear explanations, and easy-to-understand presentations led to winning 3rd Prize, 2009 Shanghai Jiao Tong University Excellent Teacher Award.

Research Assistant

July 2002 to July 2008

National Fuel Cell Research Center, University of California, Irvine

- Combined first-in-the-world experimental results with computational modeling to discover fundamental electrochemical and mass transfer mechanisms that affect fuel cell performance at low pressure.
- Independently designed, built, and operated a new test facility for high-altitude, high-temperature fuel cells, including all planning and managing of budget and resources.
- Author of several research papers, presentations, and an invention disclosure.

Field Mechanical Engineer

July 1999 to June 2002

Mechanical Engineer

April 1998 to June 1999

Parsons Energy & Chemicals (now WorleyParsons)

- Designed mechanical and fluid systems (air, water, steam, gas, oil, etc.) for large-scale gas turbine combined cycle power plants installed worldwide.
- Responsible for on-site construction, start-up, and testing of the major power plant components (turbines, steam generators, balance of plant mechanical systems).
- Solved design and construction problems in the field, consistently meeting or beating deadlines to keep projects on time and under-budget.
- Interfaced with clients, management, sub-contractors, and craft workers on a daily basis.

PUBLICATIONS

Journal Articles

- Shaw, L., Pratt, J., Klebanoff, L., Johnson, T., Arienti, M., and Moreno, M., "Analysis of H₂ Storage Needs for Early Market 'Man-Portable' Fuel Cell Applications," *International Journal of Hydrogen Energy*, Vol. 38, pp. 2810-2823, 2013.
- Pratt, J. W., Cordaro, J. G., Sartor, G. B., Reeder, C. L., and Dedrick, D. E., "Composite Materials for Hazard Mitigation of Reactive Metal Hydrides," *International Journal of Hydrogen Energy*, Vol. 38, pp. 290-304, 2013.
- Pratt, J. W., Klebanoff, L. E., Munoz-Ramos, K., Akhil, A. A., Curgus, D. B., and Schenkman, B. L., "Proton Exchange Membrane Fuel Cells for Electrical Power Generation On-Board Commercial Airplanes," *Applied Energy*, Vol. 101, pp.776-796, 2013.
- Pratt, J. W., Brouwer, J., and Samuelson, G. S., "Theoretical and Experimental Performance of a Proton Exchange Membrane Fuel Cell at High Altitude Conditions," *Journal of Propulsion and Power*, Vol. 23 (2), 2007.

Reports

- Pratt, J. W. and Harris, A. P., "Vessel Cold-Ironing Using a Barge Mounted PEM Fuel Cell: Project Scoping and Feasibility," Sandia Report SAND2013-0501, 2013.
- Pratt, J. W., "A Fischer-Tropsch Synthesis Reactor Model Framework for Liquid Biofuels Production," Sandia Report SAND2012-7848, 2012.
- George, A., Shaddix, C., Pate, R., Pratt, J., and Dedrick, D., "An Assessment of the Most Promising Technologies for the Production of Renewable Jet Fuel in the United States," Sandia Report SAND2012-2193, 2012.
- Klebanoff, L., Pratt, J., Johnson, T., Arienti, M., Shaw, L., and Moreno, M., "Analysis of H₂ Storage Needs for Early Market Non-motive Fuel Cell Applications," Sandia Report SAND2012-1739, 2012.
- Pratt, J. W., Cordaro, J. G., Sartor, G. B., Reeder, C. L., and Dedrick, D. E., "Composite Materials for Hazard Mitigation of Reactive Metal Hydrides," Sandia Report SAND2012-0902, 2012.
- Pratt, J. W., Klebanoff, L. E., Munoz-Ramos, K., Akhil, A. A., Curgus, D. B., and Schenkman, B. L., "Proton Exchange Membrane Fuel Cells for Electrical Power Generation On-Board Commercial Airplanes," Sandia Report SAND2011-3119, 2011.

Patents and Invention Disclosures

- Pratt, J. W., Narvaez, A. A., Johnson, T. A., and Jensen, C., "Metal hydride storage system," US Provisional Patent Application No. 61/909,767, 2013.
- Pratt, J. W., Brouwer, J., and Samuelson, G. S., "Fuel Cell System for Aircraft Propulsion," Tech ID: 18853 / UC Case: 2004-134-0 Office of Technology Alliances, University of California, Irvine, 2004.

Invited Papers

- Pratt, J. W., Klebanoff, L. E., Munoz-Ramos, K., Akhil, A. A., Curgus, D. B., and Schenkman, B. L., "Proton Exchange Membrane Fuel Cell Systems for Airplane Auxiliary Power," presented at the 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, San Jose, CA, July 14-17, 2013.

Conference Proceedings

- Pratt, J. W., Cordaro, J. G., Sartor, G. B., Reeder, C. L., and Dedrick, D. E., "Composite Materials for Hazard Mitigation of Reactive Metal Hydrides," International Symposium on Metal-Hydrogen Systems 2012 (MH2012), October 21-26, Kyoto, Japan.
- Munoz-Ramos, K., Pratt, J., Klebanoff, L., Akhil, A., Schenkman, B., and Curgus, D., "Electrical Analysis of Proton Exchange Membrane Fuel Cells for Electrical Power Generation On-Board Commercial Airplanes," 2012 IEEE Transportation Electrification Conference and Expo, June 18-20, Dearborn, MI, 2012.
- Pratt, J. W., "Development of a Comprehensive and Flexible Model for Fixed-Bed Fischer-Tropsch Reactors," American Institute of Chemical Engineers Annual Meeting, October 16-12, Minneapolis, MN, 2011.
- Pratt, J. W., Cordaro, J. G., Dedrick, D. E., Kanouff, M. P., and Khalil, Y. F., "Mitigating Strategies for Reactive Solids-Based Hydrogen Storage Systems," American Institute of Chemical Engineers Annual Meeting, October 16-12, Minneapolis, MN, 2011.
- Dedrick, D. E., Cordaro, J. G., Kanouff, M. P., Reeder, C. L., and Pratt, J. W., "Mitigation Technologies for Hydrogen Storage Systems based on Reactive Solids," American

- Institute of Chemical Engineers Annual Meeting, November 8-12, Salt Lake City, UT, 2010.
- Hu, Z. and Pratt, J. W., "The Environmental and Economic Impact of IGCC in China, with Comparison to Alternative Options," ASME 2010 4th International Conference on Energy Sustainability, May 17-22, Phoenix AZ, 2010.
- Pratt, J. W., Shaffer, B. P., Brouwer, J., and Samuelsen, G. S., "Sub-Atmospheric Pressure Solid Oxide Fuel Cell Experimental Setup and Initial Results," 7th Annual International Energy Conversion Engineering Conference, Aug. 2-5, Denver, CO, 2009.
- Tarroja, B., Mueller, F., Pratt, J. W., and Brouwer, J., "Thermodynamic Design Analysis of a Solid Oxide Fuel Cell Gas Turbine Hybrid System for High-Altitude Applications," 7th Annual International Energy Conversion Engineering Conference, Aug. 2-5, Denver, CO, 2009.
- Pratt, J., Brouwer, J., and Samuelsen, G. S., "High Altitude (Sub-Atmospheric Pressure) Performance of a 100 Watt Solid Oxide Fuel Cell Stack," 2006 Fuel Cell Seminar Abstracts, Nov. 13-16, Honolulu, HI, 2006.
- Pratt, J. W., Brouwer, J., and Samuelsen, G. S., "Experimental Performance of an Air-Breathing PEM Fuel Cell at High Altitude Conditions," AIAA paper 2005-953, 43rd AIAA Aerospace Sciences Meeting and Exhibit, Jan. 10-13, Reno, NV, 2005.
- Freeh, J. E., Pratt, J. W., and Brouwer, J., "Development of a Solid-Oxide Fuel Cell / Gas Turbine Hybrid System Model for Aerospace Applications," ASME Paper GT2004-53616, Proceedings of ASME Turbo Expo 2004, June 14-17, Vienna, Austria, 2004.
- Pratt, J., Brouwer, J., and Samuelsen, G. S., "Experimental Evaluation and Computer Simulation of an Air-Breathing PEM Fuel Cell at Aircraft Flight Altitudes," 2003 Fuel Cell Seminar Abstracts, Nov. 3-6, Miami Beach, FL, 2003.

Presentations

- Pratt, J., "Fuel Cell Power for Refrigerated Containers: Towards Cleaner and Cheaper Maritime Power," presented at the Ship Operations Cooperative Program Spring Summit, Galveston, TX, May 13-14, 2014.
- Pratt, J., "Applying Hydrogen and Fuel Cells to Maritime Ports," presented at the California Hydrogen Business Council Spring Summit, Long Beach, CA, May 5, 2014.
- Pratt, J., "Maritime Fuel Cells for Port Emissions Reduction and Fuel Cost Savings," presented at the Fuel Cells and Hydrogen for Maritime and Harbour Applications: Current Status and Future Perspectives in the EU, Venice, Italy, June 14, 2013.
- Pratt, J., "U.S. DOE Fuel Cell Technologies Office Overview of Fuel Cell Power Systems and Hydrogen Infrastructure," presented at the SAE 2013 Aerospace Alternative Fuels and Associated Environmental Impacts Symposium, Brussels, Belgium, June 13-14, 2013.
- Pratt, J. W., Klebanoff, L. E., Munoz-Ramos, K., Akhil, A. A., Curgus, D. B., and Schenkman, B. L., "PEM Fuel Cell Systems for Commercial Airplane Systems Power," CRF Research Highlights Series, December 1, Livermore, CA, 2011.
- Klebanoff, L., Pratt, J., Johnson, T., Moreno, M., and Arienti, M., "Analysis of H₂ Storage Needs for Early Market Non-motive Fuel Cell Applications," 2011 DOE Hydrogen and Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, May 9-13, Arlington, VA, 2011.
- Pratt, J. W., Cordaro, J. G., Reeder, C. L., Kanouff, M. P., Ruvalcaba Jr., I., and Dedrick, D. E., "Composite Materials for Hazard Mitigation of Reactive Metal Hydrides," 2011 DOE

- Hydrogen and Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, May 9-13, Arlington, VA, 2011.
- Pratt, J. W., Klebanoff, L. E., Munoz-Ramos, K., Akhil, A. A., Curgus, D. B., and Schenkman, B. I., "PEM Fuel Cell Systems for Commercial Airplane Systems Power," 2011 DOE Hydrogen and Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, May 9-13, Arlington, VA, 2011.
- Reeder, C. L., Pratt, J. W., Cordaro, J. G., Kanouff, M. P., Bradshaw, R. W., and Dedrick, D. E., "Composite Materials for Solid-State Hydrogen Storage," Sandia Poster SAND2010-4841P, 2010.
- Pratt, J., Klebanoff, L., Curgus, D., and Akhil, A., "Low-Temperature Fuel Cell Systems for Commercial Airplane Auxiliary Power," DOD-DOE Workshop, Aircraft Petroleum use Reduction: Can Fuel Cells be a game changer?, September 30, Washington D.C., 2010.
- Pratt, J., "New Energy Systems for Energy Savings, Reliability, and Pollution Reduction," Pingdingshan Coal Mining Group, February 10, Henan, China, 2009.
- Maclay, J., Pratt, J., and Verma, A., "Solar hydrogen and reversible fuel cells," Arno A. Evers Hydrogen + Fuel Cell Group Exhibit, Hannover Messe, April 24-28, Hannover, Germany, 2006.
- Pratt, J., "Operating Characteristics of Low Pressure (High Altitude) Fuel Cells," 6th International Colloquium on Environmentally Preferred Advanced Power Generation (ICEPAG), Hybrid Fuel Cell Technologies, September 7-8, Irvine, CA, 2005.
- Pratt, J., "NPSS Modeling of Solid Oxide Fuel Cell Systems for Aircraft Applications," NASA Glenn (GRC) Workshop on Modeling and Simulation of Solid Oxide Fuel Cells, April 11, Ohio Aerospace Institute, Cleveland, OH, 2003.

PROFESSIONAL SERVICE AND MEMBERSHIPS

Service

- 2011 International Energy Conversion Engineering Conference (IECEC)
- Co-Topic Area Coordinator, Energy Storage
 - Co-Moderator, Advances in Terrestrial and Aerospace Energy Storage Technology panel
- 2010 IECEC
- Co-Topic Area Coordinator, Energy Storage
 - Co-Moderator, Fuel Cells: Aerospace/Terrestrial Synergies panel
- 2009 IECEC
- Chair, Fuel Cell Advancements and Optimization session
 - Co-Chair, Advanced Energy Storage Concepts and Uses session

Memberships

American Society of Mechanical Engineers, Member, since 1993

SPECIAL SKILLS

Equipment and Hardware

Proficient with data acquisition hardware, signal wiring and conditioning, instrumentation, mass flow meters/controllers, calibration hardware, electrical relays, power supplies, dynamic load/supply devices, heaters, pumps, motors, control valves, high pressure and

explosive gasses, hazardous materials, glovebox, soldering, brazing, power tools, and AC/DC power.

Technical Software

Extensive experience in COMSOL, LabVIEW, Matlab/Simulink, and Design Expert (Design of Experiments); knowledgeable in Chemkin and Solidworks.

Codes and Standards

Working familiarity in applying the ASME B&PV, NEC, NFPA, and OSHA codes.



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Roger Nelson, P.E., LEED AP Manager

Professional Profile

Mr. Roger Nelson is a Manager in Exponent's Construction Consulting practice. Mr. Nelson has over 10 years of experience in the construction domain, and has a strong background in project cost controls, project scheduling, risk analysis, and construction contracting. He has been involved in commercial building through his work for general contractors and gas and electrical transmission line and substation projects with a major utility. His project management experience has ranged from permitting, procurement, quality and safety, subcontract development, scheduling, submittal and RFI reviews, and change order development/negotiation, to project closeout. His graduate research was in the field of green building and sustainability and he remains active in the field, specializing in LEED and green building considerations/impacts for building construction. As an Exponent consultant, he has experience with project management, change order entitlement & valuation, damage analysis, schedule/delay analysis, and engineering audits.

Academic Credentials and Professional Honors

M.S., Construction Engineering and Management, University of Colorado at Boulder, 2004
B.S., Civil Engineering, University of California at Berkeley, 2002

Licenses and Certifications

Registered Professional Engineer, California, # 76435
LEED Accredited Professional

Prior Experience

Project Engineer, Skanska USA Building, 2005–2007

Project Engineer, Mainzeal Property and Construction, Auckland, New Zealand, 2005

Project Engineer Intern, McCarthy Builders Inc., 2004

Student Aide/Civil Engineer, Contra Costa County Public Works, 2002

Project Experience

Industrial

Electrical Transmission Project Management Support Services – Provided coordination with and among client stakeholders as well as vendors, suppliers, agencies, and contractors external to the client regarding work, timing, project issues/resolutions. Managed and maintained Earned Value (EV) tracking for all projects, developed and maintained a detailed project plan, provided financial forecasting to support execution of the work, project schedules resource loaded and maintained in Primavera 6. Supported an iterative monthly process for schedule updates that included interactive communication with, and input from, key project stakeholders. Developed reports consistent with client reporting requirements to facilitate communication. Held monthly schedule progress meetings with representatives from construction, engineering, operations, permitting, materials, etc.

Gas Pipeline Evaluation – Extensive analysis of natural gas transmission network to identify pipeline system components to validate maximum allowable operating pressures (MAOP). Documents reviewed include transmission plats, distribution plats, index drawings, as-built construction drawings, pipeline plan and profile drawings, bills of material, and pressure test records. The purpose was to verify accuracy and completeness, or to identify any issues requiring further resolution to ensure the safe operation of natural gas transmission lines.

Utility Project Portfolio Support – Developed project schedule templates and resource loaded schedules for hundreds of transmission & distribution substation projects system-wide, aided the utilities project managers in creating and updating project schedules, reviewed and refined data gathered from utilities teams, identified and addressed data gaps. Objectives included improved management of engineering labor force, productivity improvements, and improved labor forecasting.

Wastewater Treatment Facility – Analyzed a general contractor delay claim on behalf of the design engineer on a \$104 million wastewater treatment plant in Phoenix, Arizona. Exponent services included as-built schedule development, critical path schedule delay analysis, contractor cost overrun analysis, and procurement/buyout process investigation.

Natural Gas Utility – Performed a system-wide engineering audit of a Northern California natural gas distribution system. The audit scope included personnel interviews of all related maintenance and supervisory staff responsible for gas regulation and emergency valve maintenance, detailed review of statistically relevant records, administration of a skills

assessment exam to all maintenance staff, and field visits to gas regulator stations and emergency valves.

Civil

Wastewater Conveyance Tunnel – Analysis of a \$75MM differing site condition claim on a 13 mile tunnel boring machine (TBM) contract. Services included entitlement review, productivity/delay allocation analysis, evaluation of technical tunneling factors, document management, and project management assistance.

Light Rail Maintenance Facility – Defense of \$12MM claim against design firm for deficient drawings & specifications. Services included change order & RFI causation analysis, settlement damage analysis, and contractual culpability examination.

Commercial

Performing Arts Center –Assisted in the defense of a \$40M design errors & omissions claim against the design architect for cost overruns. Exponent services included change order entitlement & evaluation, contract analysis, schedule analysis, and damages analysis.

Urban Hotel – Performed schedule delay analysis in defense of claim against elevator subcontractor through the examination of project records, baseline schedules, and subsequent schedule updates. Prepared summary of findings, demonstrative slides, and graphics.

Professional Affiliations

- United States Green Building Council—USGBC
- AACE International
- Underground Construction Association of SME



Energy Independence through Hydrogen and Fuel Cells

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JOHN CORNISH, P.E.

CAREER SUMMARY

Engineering and management experience in construction, power and petrochemical projects and hazardous waste site remediation. Design and construction of hydrogen and fuel cell projects, crude oil processing facilities, power plants, and remediation projects. Cornish has over 43 years of hands-on and management responsibility of large cost plus and lump sum design/build projects.

- B.S., Chemical Engineering, 1971, Lehigh University, Bethlehem, Pennsylvania.
- Registered Professional Engineer: California - No. CH 6420, Colorado - No. 17688, Wyoming - No. 6017, Nebraska - No. E8402, New Mexico - No. 13093, Montana - No. 16947.
- WEF, DBF, CURT, SAME, AICHE, CII (past member)

EXPERIENCE RECORD

Jan 2014 to present – Golden State EPC, **President**

Sept 2013 – present – H2 Container Fab, LLC, **President and GM**

April 2003 to present- **EPC (Engineering, Procurement & Construction) President and General Manager**

This growing small business performs full service design, procurement and construction for fuel cell and hydrogen generation projects. Mr. Cornish has established solid relationships within the worldwide hydrogen industry and managed successful projects for universities, industry, municipalities and state and federal agencies involved with hydrogen and fuel cell projects. Clients include NREL, LLNL, ANL, DoD, DoE HQ, National Park Service, Air Products, Air Liquide, Linde and a long list of fuel cell and hydrogen component manufacturers. He is an Adjunct Professor at University of Denver, teaching a graduate engineering class on Fuel Cells and the Hydrogen Economy, and a certified trainer for Hydrogen Basics for First Responders, an 8 hour DoE class.

Recent projects include:

1. Construction and startup of fork lift Hydrogen Fueling Stations for Air Liquide for Coca Cola, Proctor and Gamble and Farmers Market.
2. High pressure testing of hydrogen lines per ANSI B31.12 using EPC's proprietary high pressure booster pump for Basin Electric, Linde at BMW, Walmart, LLNL for numerous other clients across N America.
3. Design and construction of the first public access hydrogen fueling station in Hawaii for ProtonOnsite and TARDAC.
4. Design, construction and O&M of a new public access hydrogen fueling station for Air Products and Chemicals Inc at the SCAQMD HQ in Diamond Bar, Ca.
5. Design and construction support for the two largest hydrogen fueling stations in N. America for AC Transit, one of which includes public access for light duty vehicle refueling and both of which provide bus fueling.

We welcome the opportunity to participate in your hydrogen and fuel cell projects



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6. Teaching a two day hydrogen safety course for national labs, industrial manufacturers, chemical companies and for power companies, chemical companies and fueling stations first responders.
7. Design, construction and startup of a the Xcel Energy Wind2H2 project, which uses 3 electrolyzers (Proton and Teledyne) to convert wind energy into stored high pressure hydrogen which in turn is used to fuel a hydrogen ICE genset to put peak power back on the grid.
8. Infrastructure design, procurement and construction of a solid oxide fuel cell (Accumentrics) and solar system for the National Forest Service,
9. Installation and maintenance of a PEM telecom backup power system (Plug Power) at the Federal Center in Lakewood, Co.
10. Construction completion and startup management for a 30 MMscf hydrogen reformer (Technip) at a local refinery,
11. Design of a hydrogen compression, storage and blending station in India and design of a Bio-reformer based hydrogen fueling station in Italy under a FCH-JU grant.

EPC has also completed design studies and for 20 MW renewable to hydrogen to peak power plant in New Mexico, a hydro to fuel cell design and installation, a design build SOW for a photovoltaic to hydrogen to fuel cell system to recharge electric vehicles on a government campus, a hydro to hydrogen study in Yellowstone National Park, hog manure to hydrogen grant application and renewable firming studies for Mariah Energy Development Corporation, Ellsworth, KS, ,a major wind turbine manufacturer desiring to use hydrogen to increase committed power production from large wind farms. EPC has also consulted and developed infrastructure designs for multiple high temperature fuel cell applications, hydrogen pipelines, vehicle and forklift fueling stations, and waste water treatment plant digester reformation to hydrogen fuel.

EPC also provides maintenance and service for fuel cells, electrolyzers and hydrogen compressors for selected manufacturers.

1983 – 2003 Parsons

Pasadena, CA

1995 – 2003 Vice President, Regional Manager

1. Chevron Richmond Design Construct Manager - Designed 3D CAD models of potential remedial solutions for the Chevron Richmond, Ca. Chemical Plant site and General Hydrogen facility.
2. Stapleton Remediation Project Manager (2000 to August 2002).
3. Western Region Manager, Remediation Project Management Office (2002 April 2003) Responsible for all aspects of remedial construction projects in the western US. Provided executive approval, risk management, and technical oversight for remediation projects.

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4. Denver Region Manager (1993 – 2000) Technical, administrative, business development and financial performance for the Rocky Mountain offices. Managed staff of 350 professionals with P&L responsibility for \$30MM annually.
5. Technical Manager for Remedial Design and Action (1989-1993). Provided corporate QA/QC for design and construction projects, selected remedial technologies, and reviewed drawings and specs for technical adequacy and constructability.
6. Project/Construction Manager (1987-1989). Multiple projects for refineries and chemical plants of up to \$30 million each. Engineer of Record for designs, procurement, and construction oversight, commissioning,
7. Engineering Manager (1984-1986) Endicott Project Responsible for the design, procurement, construction oversight, and startup for the \$1.2 billion offshore oil collection facility in Prudhoe Bay, for Standard Oil of Alaska. Supervised approximately 400 professionals.
8. Startup Superintendent (1983-1984) Saudi Arabian Parsons Limited, Yanbu, Saudi Arabia. Startup and initial O&M of municipal infrastructure facilities at the new city of Madinat Yanbu al Sinaiyah. Overall chemical and mechanical responsibility during startup of steam power plants, gas turbines, heat recovery steam generators, desalination units, acid, caustic, hydrogen plants, and water distribution, industrial and sanitary wastewater, and compost facilities on this 25-year, multi-billion dollar program.

1981-1983 Dynawest Projects Ltd.

Calgary, Alberta. **Project Engineer (PEng)**. Refinery offsites design & construction. Shell refinery in Alberta.

1971-1981 Stone & Webster Engineering Corp

Boston, MA.

Lead Power Engineer (1980-1981). Nuclear, fossil, solar and research power plant design and construction. Notable extraordinary experience was as the lead systems engineer for multiple nuclear and liquid sodium systems on the Clinch River Breeder Reactor Project for Commonwealth Edison and DOE.

PUBLICATIONS/PAPERS

- The Complete Guide to Construction Administration (PSMJ)
- Influence of Potential Soil Contamination on Construction Projects. (CII)
- Environmental Remediation management – 8 Step Process (CII)
- Peer Review of CSD model for future forecourt costs (DOE 2014)

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PERSONAL

Single father of 3 wonderful children
Eagle Scout, Cub Scout Pack Leader,
MS girl's basketball and HS boy's football coach
Sunday School teacher for 18 years, church elder
Homeowners Association VP.

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