OREGON INSTITUTE OF TECHNOLOGY
REQUEST FOR PROPOSALS
GEOTHERMAL POWER PLANT INFRASTRUCTURE

RFP #2012-02 Addendum 3
May 31, 2012

INTRODUCTION

On April 17, 2012, the Oregon Institute of Technology ("OIT") published a Request for Proposals #2012-02 for Geothermal Power Plant Infrastructure Design/Build and Addendum 1 on April 18, 2012, and Addendum 2 on May 11, 2012 ("RFP"). OIT has found that it is in its interest to amend the RFP through the issuance of this Addendum 3. Except as expressly amended below, all other terms and conditions of the original RFP and Addendum shall remain unchanged.

RFP AMENDED SECTIONS

1. Exhibit A – Scope of Work is hereby deleted in its entirety and replaced with the ***Revised 5/31/12* – Exhibit A – Scope of Work**.

END OF ADDENDUM 3

Geothermal Power Plant Infrastructure
RFP #2012-02
***REVISED 5/31/12* - Exhibit A – Scope of Work**

Narrative:

The Oregon Institute of Technology (OIT) is a leader in the field of Renewable Energy. The University's energy strategy maximizes the abundant natural resources available to the campus. A geothermal reservoir beneath the Klamath Basin supplies hot water for over 600 geothermal wells. OIT currently utilizes three geothermal wells for space heating and power generation purposes. In 2009 the University drilled an additional geothermal well to expand its electrical power generation capabilities. The successful proposer to this RFP will design and construct the final phase of our current geothermal power generation plan.

In this Scope of Work, any reference to Design/Builder, or Proposer shall mean the selected Proposer as a result of the RFP.

Work to Date

Work to date includes the drilling of geothermal supply well #7 in 2009. Well #7 produces 2,500 gpm at 194°F. The installation of a utility corridor between supply well #7 and the university's power generation facilities was also completed. The utility corridor consists of a 12" insulated fiberglass pipe, a 5" electrical conduit and a 1" data conduit. Also completed is the drilling of an injection well for the power plant's effluent. The utility corridor that connects the power plant to the injection well has been designed and will be constructed under a separate contract.

Statement of Work:

The Electrical Generators (1 MW and 0.75MW) are being designed, built and delivered to the Klamath Falls campus by Johnson Controls Inc. (JCI). The design/build work described in this RFP is for the final design and construction work needed to complete the development, installation, and begin operation of a 1.75 MW geothermal electrical power generation facility on the Klamath Falls campus of OIT.

Johnson Controls Inc. will provide the power generators, cooling towers, and all associated piping between the units. The successful Proposer to this RFP will develop the necessary infrastructure and assemble the power generator under the direction of JCI technicians and as described in the Delineation of Responsibilities section. Refer to drawings G100, M100 and E100.

Specifically, the design/build work to be completed by the successful Proposer will include the following components:

Electrical Engineering and Construction

- Electrical interconnection design at Large Power Plant
- Electrical interconnection to grid

- Electrical Interconnection agreement with electrical utility provider. BacGen Technologies is conducting the interconnection application process on behalf of the University.
- Electrical connection design at Geothermal Well head #7
- Coordination of Interconnection design with local utility
- Power Plant Building electrical distribution design in relation to the power generator
- Well #7 Pump House electrical distribution design
- Verification of variable frequency drive (VFD) compatibility
- Direct Digital Controls ("DDC") (Well head, Power Plants), and Injection Well (if needed)
- Electrical metering for production well #7
- Metering plan (in conjunction with System West Engineers)
- Design and construction of the upgrade or replacement of OIT-owned transformer that transforms the generator output with the 480 V side of the campus
- Other special provisions requested by PacifiCorp as a result of the System Impact study and/or the Facilities Study outcome, if any

- **Mechanical Engineering and Construction**
  - Pipe connections at injection well #3
  - Pipe connections to existing power generation facility
  - Pipe connections at Large Power Plant
  - Pipe connections at Geothermal Well head #7
  - Connect domestic water piping for cooling towers and potable use
  - Fire suppression system for Power Plant structure (If required by code)
  - Building ventilation system design (Designed in conjunction with JCI)
  - Containment facility for spare refrigerant. This facility will need to be constructed with capacity for both geothermal power generation facilities
  - Floor drains within Power plant facility
- **Structural Engineering and Construction**
  - Design and construct foundation and structure for Power Plant building. Building to be a pre-fabricated steel building designed for Klamath Falls seismic, wind, and snow loads
  - Design and construct foundation and slab for Cooling Towers
  - Design and construct foundation and structure for Well #7 pump house. The pump-house will be a wood framed structure with metal cladding to match exterior of power plant. The building will have a removable end for access to the well pump assembly.
  - Design and install pipe support system within Power Plant building
- **Civil Engineering and Construction**
  - Geotechnical Engineering for foundation design (Power Plant building and Cooling Towers)
  - Thrust blocks at pipe connections and elbows
  - Utility corridor between existing inlet and outlet pipelines and Power Plants
  - Domestic water distribution systems

- **Site Preparation:** Site clearing, grading and backfill to provide suitable site for new Power Plant Building and cooling tower foundations. Provide grading and storm drainage as required by local code or planning authority. Design and construct a gravel parking area per requirements of local building and planning authority. Design and construct the fire access road to meet requirements of local fire department. OIT Grounds department will complete esthetic landscaping.
- **Notes:**
    - All design work to meet specifications from JCI
    - All work to conform to latest versions of IBC and NEC

Building Design Requirements and Characteristics

- **Minimum building dimensions and clearances:**
    - Minimum inside clear dimensions for Power Plant Building will be 70 feet long x 40 feet wide.
- **Height requirements/restrictions:**
    - Minimum inside clearance to Power Plant Building is 30 feet.
- **Dimensions and Weight of Power Generator(s):**
    - Overall Unit Dimensions are 20 feet long x 28 feet wide x 21 feet high.
    - The overall operating weight of the Power Generator is 220,000 lbs.
- **Requirements for vibration dampers:**
    - Power Generator assembly will consist of five major sections (2-heat exchanger sections, 2-driveline sections, and 1-electrical control center section). The two heat exchanger sections will be directly anchored to the foundation with vibration isolation at each load point. The two drivelines will be skid mounted on a structural steel base. Each driveline base should be anchored to the foundation with vibration isolation at each load point. The electrical control center should be anchored directly to a concrete housekeeping pad without vibration isolation. JCI will provide vibration isolation requirements to the successful Proposer.
- **Foundation Requirements for the Power Generator and Electrical/Mechanical Equipment:**
    - A structural foundation will be provided for the Power Generator based on operating weight of the major sections, applicable seismic loads, geotechnical report requirements, and other applicable structural loads. The overall operating weight of the Power Generator is 220,000 lbs. The foundation shall be reinforced and isolated from the building slab with vibration isolation material. Condenser water pump pads shall be a minimum of 8 inch thick, sized 4 inches larger than each pump, reinforced, and doweled into the building slab. Electrical equipment pads shall be a minimum of 4 inch thick, sized 4 inches larger than each piece of equipment, reinforced, and doweled into the building slab. Mechanical filtration equipment pads shall be a minimum of 4 inches thick, sized 4 inches larger than each piece of equipment, reinforced, and doweled into the building slab. Equipment foundation and pad concrete shall be 4000 psi design.
- **Roll-up door requirements and dimensions:**
    - Provide one (1) 12 ft. wide x 20 ft. high rollup door to allow equipment removal and heat exchanger tube removal.

- **Orientation of inlet and outlet piping:**
    - Geothermal hot water supply/return and condenser water supply/return piping connections will be on one side of Power Generator assembly. A layout drawing with piping connection locations will be furnished by JCI to the successful Proposer.
- **Electrical one-line diagram:**
    - See attached one-line diagram E100 for reference. Electrical distribution equipment shall support a power plant up to 1.75 MW generation capacity with appropriate run factors with flexibility to utilize a smaller production capacity depending upon to-be-determined site conditions. Additional electrical characteristics specific to the generation equipment utilized will be provided by JCI. The attached one-line is not an indication of what equipment is being provided by JCI and equipment configuration/ratings are subject to change. Route of power plant electrical shall be underground/slab to the extent possible.
- **Signal Plan:**
    - Control system drawings will be furnished by JCI to the successful proposer.
- **Ventilation requirements:**
    - Provide 13,100 cfm emergency refrigerant removal exhaust system in accordance with ASHRAE 15 requirements based on 17,000 lbs. of refrigerant. In addition, a normal ventilation system should be provided to limit the room temperature rise to 15^0F taking into account all equipment and piping heat rejection loads within the room. JCI will furnish equipment heat rejection loads (not equipment) to the successful proposer.
- **Maintenance access requirements:**
    - Provide 5 feet of service clearance around the entire Power Generator assembly. Provide 17 feet of service clearance at one end of the evaporator and condenser heat exchangers for tube removal. Provide 4 feet of clearance in front of electrical equipment or as required by the NEC. Provide 3 feet of clearance around mechanical equipment.
- **Refrigerant storage requirements:**
    - JCI will furnish 1700 lbs. of refrigerant in cylinder(s) that will be stored adjacent the Power Generator Building.
- **Additional infrastructure requirements :**
    - Provide seven (7) floor drains within the room, typically near each piece of mechanical equipment (Power generator - 2, condenser water pumps -1, non-chemical treatment system - 1, tower filtration system - 1, geothermal hot water strainer - 1, backflow preventer -1).
    - Air-compressor

Cooling Tower Foundation

- **Weight of Cooling Tower(s):**
    - Cooling Tower will consist of four (4) tower cells at 46,500 lbs. operating weight each for a total operating weight of 186,000 lbs.

- **Dimensions of foundation:**
    - Cooling Tower foundation should be a minimum of 4 feet larger on all sides than the new 4-cell cooling tower. The overall dimension of the tower is 57.5 feet long x 24 feet wide. The slab dimension should be a minimum of 65.5 feet long x 32 feet wide. The Cooling tower should be located a minimum of six (6) feet above the Power Plant Building finished floor elevation. See cooling tower info below for height requirements. Tower should be supported above the slab with concrete piers or structural steel support frame. Cooling tower foundation and structural supports should be designed based on the cooling tower operating weight, applicable seismic loads, and per the requirements of the geotechnical report.
- **Minimum separation from Power Plant:**
    - Separation between cooling tower and Power Plant building should be a minimum of 18 feet.
- **Infrastructure Requirements:**
    - 100 gpm make-up water and drain piping; geothermal hot water piping for tower basin freeze protection; electrical feeders between tower fan VFD's (remote mounted inside of Power Plant Building), disconnects, and tower fans; control wiring and conduit between new Metasys main control panel inside of Power Plant Building and cooling tower control panel and any control devices.
- **Maintenance access requirements:**
    - Provide 4 feet of clearance around the cooling tower for service access. The cooling tower should be supported above the slab to provide 3 feet of service access to the bottom of the tower.
- **Anchoring design:**
    - Anchorage design will be in accordance with cooling tower manufacturer's recommendations and seismic code requirements. JCI will furnish cooling tower data sheets to the successful proposer.

Additional Proposer Responsibilities:

- **Hot Water Supply Piping:** Provide 12-inch underground geothermal hot water piping from production well #7 to within 100 feet of the new geothermal Power Plant Building. The Proposer will extend the 12-inch underground geothermal piping to the new Power Plant Building for connection with power plant Module.
- **Electrical Conductors:** Proposer responsible for the interconnection relay (Sweitzer Engineering Laboratories – SEL relay recommended) and enclosure. OIT will conduct the application and submission of the interconnection agreement with PacifiCorp. Proposer will provide the geothermal power plant main distribution panel and 480-volt electrical service from the new geothermal power plant main distribution panel to the existing 1000 KVA transformer. Conductors to be sized and installed by Proposer per latest NEC and local code requirements.
- **Equipment Piping/Electrical System Installation:** Provide the installation of all JCI furnished equipment, piping systems, and electrical systems associated with the geothermal power plant (refer to drawings G100, M100 and E100). Proposer shall submit to OIT a complete set of installation drawings based on JCI scope of work

requirements. Upon approval of installation drawings, Proposer will coordinate all material requirements with JCI Project Manager.

DELINEATION OF RESPONSIBILITIES

Johnson Controls' Responsibilities

- **Mechanical Equipment and Piping Systems:** Provide geothermal power plant mechanical equipment and piping systems as detailed on Drawings G100 and M100. All JCI furnished equipment and mechanical systems to be installed by Proposer
- **Geothermal Power Plant Module:** The new module will include evaporator, condenser, refrigerant pump, turbine generator, and control system skid mounted (20ft.L x 28 ft. W x 18' H approximate dimensions). New unit to be mounted on reinforced concrete foundation (provided by Proposer) with vibration isolation per code requirements and Johnson Controls recommendations.
- **Cooling Tower:** A new 7,900 gpm cooling tower designed for local codes. Tower to be provided with manufacturer provided access platforms, ladders and handrails. Tower shall have galvanized steel casing, structure, and access platform gratings. Hot Water and cold water basins to be stainless steel. Tower shall be mounted on reinforced concrete foundation provided by Proposer. Foundation elevation to be 6 feet above the condenser water pump suction elevation to provide required NPSH. Cooling tower cells shall be provided with heated condenser water to maintain 35°F basin temperatures for freeze protection.
- **Condenser Water pumps:** Two new 4000 gpm condenser water pumps to be installed in equipment room. Pumps to be mounted on reinforced concrete foundations doweled into the equipment room slab floor (by Proposer). Pumps to be connected to condenser water supply piping from cooling tower outlet. Each pump to be provided with suction butterfly valve, suction flex connector, discharge flex connector, discharge simplex basket strainer, discharge triple-duty valve. Provide pressure gauge assembly across suction and discharge piping.
- **Hot Water Piping:** New 12-inch geothermal hot water supply and hot water return piping will connect to Proposer-provided connection in equipment room. New field-insulated geothermal hot water supply and return piping will connect to the pre-insulated piping at the floor and will extend to the new geothermal power plant module. New interior geothermal hot water supply and return piping will be standard weight steel pipe fiberglass insulation/PVC jacketing (JCI furnished/Proposer installed). Piping will connect to the module with inlet/outlet butterfly valves, pressure gauges, thermometers and pressure transmitters (connected to module control system).
- **Condenser Water Piping:** New 20-inch condenser water supply and return piping will be connected to the new module with inlet/outlet butterfly valves, pressure gauges, thermometers and temperature/pressure transmitters (connected to control system). New 20-inch condenser water supply piping will be routed from the condenser water pumps to the new Module inlet connection. New 20-inch condenser water return piping shall be routed from the Module outlet connection to the new cooling tower outside the building. New 12-inch supply and return piping will extend from the 20-inch headers to connect to

tower cell inlets/outlets with butterfly valves. Tower cells inlets/outlets will also be provided with 12-inch isolation valves.

- **Exterior Piping:** New condenser water piping, make-up water piping and basin-heated condenser water piping outside the building to be insulated, heat traced and provided with aluminum jacketing. JCI will furnish pipe insulation, heat traced systems, and aluminum jacketing. The Proposer shall install insulation, heat tracing, and aluminum jacketing per JCI design requirements.
- **Water Filtration:** Provide geothermal hot water filtration and condenser water filtration and treatment as required for new geothermal power plant module.
- **Backflow Preventer:** Provide reduced pressure backflow preventer and connect to OIT water connection.
- **Ventilation:** ASHRAE 15 Ventilation package, including refrigerant monitor, SCBA, and 9000 cfm ventilation system for temperature control and emergency refrigerant removal.
- **Heat Exchanger:** The cooling tower basin heating system will be served from geothermal hot water piping serving the building heating hot water and domestic hot water systems. It is assumed that the building hot water and domestic hot water systems will be served from the Heat Exchanger Building to heat condenser water for tower basin heating.
- **Water Metering:** Provide metering of condenser water, geothermal water to module, and make-up water to tower system.
- **Water Treatment:** Provide non-chemical based water treatment system for cooling tower condenser water system.
- **Test and balance:** Provide test and balance of geothermal and condenser water systems, as well as geothermal power plant equipment room HVAC systems.
- **Electrical Feeders:** Furnish electrical equipment and electrical systems as detailed on drawings G100 (reference for equipment layout only) and E100. JCI will also provide Arc-Flash calculations. All JCI furnished equipment and electrical systems to be installed by Proposer.
- **Electrical Metering:** Provide electrical metering of generator output and input to power plant module ancillary equipment, including cooling tower, condenser water pumps, oil pumps and refrigerant pumps. Metering will be connected to the campus communication network for remote viewing and logging.
- **Energy Management System:** Geothermal Power plant energy management system (EMS) to control cooling tower, condenser water pumps, VFDs, temperature sensors, and control valves based on Module requirements. New geothermal power plant building EMS control shall be connected to the campus communication network in the Heat Exchanger building to allow for remote monitoring and control by OIT. The new EMS system design shall be customized to OIT monitoring and control requirements. Johnson Controls will provide continued support with local service personnel.
- **Utility Coordination:** JCI will work with OIT, Proposer and PacifiCorp as part of the interconnection agreement. JCI will provide all necessary engineering, calculations and equipment data related to the power generation Module for interconnection to the campus and utility electrical distribution system.
- **Commissioning:** All new mechanical and electrical equipment shall be commissioned and a commissioning report submitted to OIT.

- **JCI Project Manager:** JCI will provide a project manager that will coordinate with OIT and the Proposer.

Appendix:
Drawing G100
Drawing M100
Drawing E100
JCI equipment specifications