GEOTHERMAL HEATING AND COOLING
EQUIPMENT QUALIFICATIONS AND INSTALLTION GUIDANCE
APS RENEWABLE ENERGY INCENTIVE PROGRAM

Systems receiving incentives under this program must be installed according to manufacturers' recommendations and generally accepted industry standards. Requirements not specified in this program, but which are applicable under this program, include, but are not limited to, the following:

- The project must comply with all applicable local, state, and federal regulations.
- Installations must meet applicable governmental statutes, codes, ordinances, and accepted engineering and installation practices.
- Systems must be permitted with and pass inspection by the Authority Having Jurisdiction (AHJ) over construction projects in the Participant's locale, or, if the site is not governed by an AHJ, the Participant must provide a certification in lieu of AHJ clearance.
- APS may request copies of any documents to assure compliance with government, institutional, or DE program requirements that are either explicitly or implicitly described by this program.
- APS may request/require construction/as-built drawings of the system.

All major components of the DE system must be new and must not have been previously placed in service in any other location or for any other application. A DE system purchased more than 180 days before the date that APS receives the reservation request will not be considered "new" under this program. APS may consider exceptions to this timeframe when justified by the Participant in writing. The DE system must also comply with the technology specific criteria detailed below. When some technology-specific criteria reference third party standards, the requirements of those standards are fully applicable when referenced as part of technology specific criteria.

The following standards or standard development bodies are referenced as part of the technology specific criteria:

- The Active Solar Heating Systems Design Manual developed by the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. ("ASHRAE") in cooperation with the Solar Energy Industries Association ("SEIA") and the ACES Research and Management Foundation (the "Design Manual").
- The Underwriters Laboratory ("UL").

Where the equipment qualifications detailed below are required for program participation, the technology specific installation guidance is provided to program participants to convey information on installation and operation practices that are most likely to achieve the DE

system's designed output. The requirements described herein are not intended as engineering recommendations, services, or technical advice. Engineering recommendations, design, and performance data will be provided to the Participant by their supplier, installer, or professional advisor. Although installation guidance is not currently mandated for a project to receive an incentive, it does reflect both industry and utility concurrence on those practices that are important for a technology to best achieve the designed output. APS reserves the right to modify equipment qualifications and/or installation guidance if APS becomes aware that such qualifications or guidance results in unsafe conditions, provides inappropriate results for our customer, or is inconsistent with program objectives.

Equipment Qualifications

- A complete Energy Savings & Designed Output (ES&D) report must be submitted by the contractor and approved by APS prior to the installation.
- Equipment must be UL approved and meet the applicable Air Conditioning and Refrigeration Institute (ARI) Performance Certifications.
- Equipment must meet the following minimum efficiency requirements:
    - Closed Loop: 14.1 EER 3.3 COP
    - Open Loop: 16.2 EER 3.6 COP
- ES&D calculations will be based on the actual building envelope. In the case of existing building and system retrofits, savings will be based on the proposed system(s) vs. the existing system(s) (EER differential), and new construction will be based on the proposed system (s) vs. code requirement for new construction (EER differential).

Installation Guidance

- Ground loop systems must be installed by a contractor who holds a current International Ground Source Heat Pump Association (IGSHPA) certification.
- Wells must be permitted and drilled by a State of Arizona certified contractor.
- Contractors must hold a valid North American Technician Excellence (NATE), National Comfort Institute (NCI), National Balancing Institute (NBI) or Building Performance Institute (BPI) certification.
- All systems should be designed (sized) and installed in accordance to the Air Conditioning Contractors of America (ACCA) Quality Installation Specifications and Standards.
- The operational life must be supported by a planned maintenance or equipment replacement schedule.

Total Project Costs

- Total projects costs will include costs associated with the installation of the core geothermal system. Costs will not include supply and return duct work, upgraded air filtering or air quality systems, humidifying or dehumidifying systems, radiant flooring systems, or in the cases where open loop may be used, any system costs beyond the basic heat exchangers, cooling towers, and/or core reservoirs.