



## Standards for Solar Hot Water Installations

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1. These standards supplement the Mechanical Systems Design Standards already in place for APS wherever additional standards are necessary for hot water systems that include solar thermal energy.
2. Solar Hot Water Systems (SHWS) shall have two available sources of heat: solar thermal panels and a fuel-based backup source. Controls will be designed to exclusively use solar thermal whenever adequate temperatures are available to supplant the fuel-based heat source.
3. Solar thermal panels used in SHWS shall be of the flat plate variety with an internal “harp” configuration (i.e., not serpentine). External header piping shall be minimized by choice of panel manufacturer and model. (Other technologies may be considered with prior APS approval.)
4. Panels shall be protected from overheating by a combination of controls and design. Overheat protection shall be operable during a power outage. The preferred forms of overheat protection meeting these requirements are: (1) self-cooling collectors; or (2) drain back systems. The chosen overheat protection mechanism shall require minimal maintenance.
5. The target solar fraction (the fraction of total annual hot water heating energy provided by solar energy) shall be a minimum of 50%. Higher solar fractions are preferred. Solar fractions should be verifiable with actual system performance at all times.
6. SHWS will have energy and temperature measurement technology to facilitate maintenance of the system and validate system performance. Control technology shall allow for on-site and web-based monitoring, either stand-alone or through the site’s Building Automation System (BAS). Remote control of system components and real-time, trended data are desirable.
7. Instruction manuals for all major system components and for the system as a whole shall be provided, specifically including instructions on the control technology and how to monitor system performance.
8. SHWS installations shall be accompanied by training of staff responsible for monitoring and maintaining the system.
9. SHWS installations should include opportunities for students attending APS to learn about the system and the associated science through a combination of teaching materials and training of teachers or other APS staff as appropriate. The materials and training may be provided by the system designer, installer, and/or controls manufacturer.