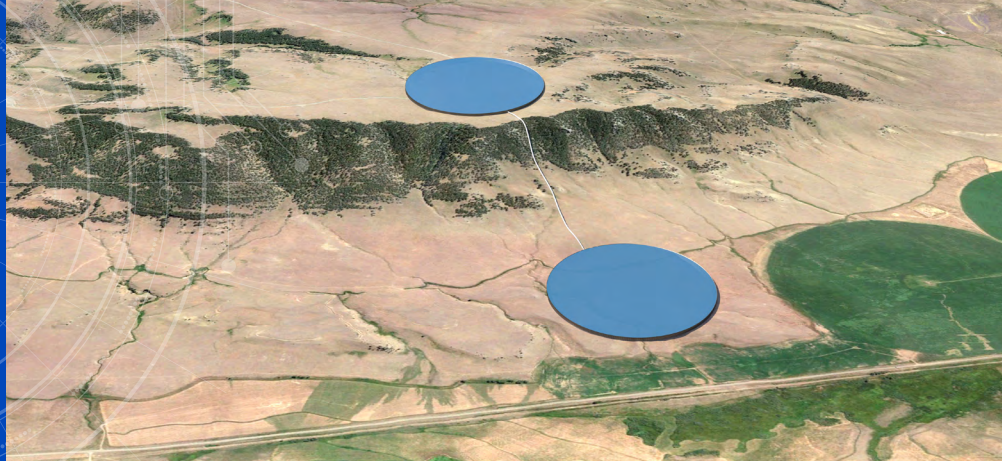
SwRI®

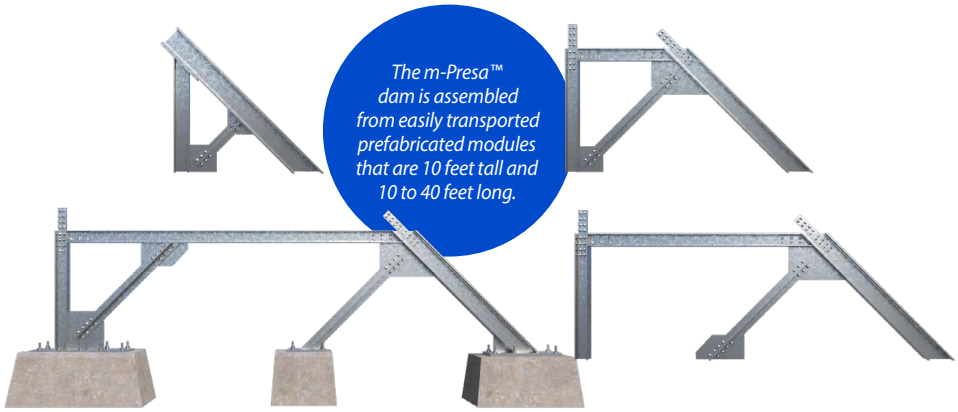
Southwest Research Institute



m-Presa™ Modular Steel Buttress Dam System

Southwest Research Institute® (SwRI®) has developed the m-Presa™ modular structural steel buttress dam system for grid-scale energy storage using closed-loop pumped storage hydropower (PSH). Modular steel buttress dams can reduce construction cost by one-third and decrease construction time by one-half compared to concrete and earth-filled dams.

SwRI developed m-Presa to accelerate the deployment of closed-loop PSH units where both the upper and lower sites can accommodate reservoirs on relatively flat terrain, such as caprock mesas with level tops, steep side slopes, and gently sloped valley floors.

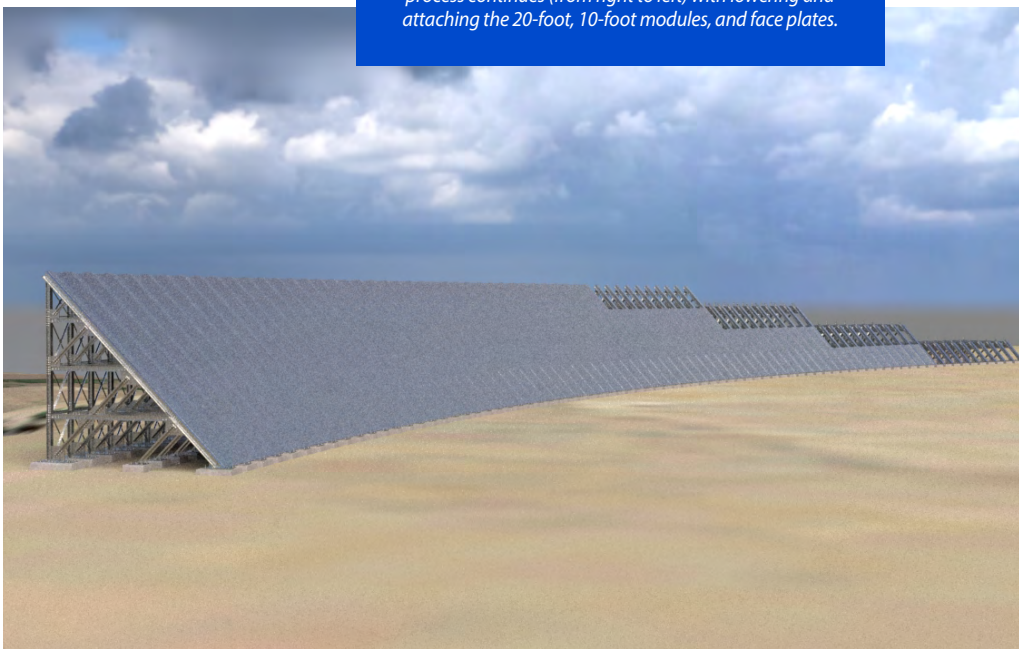


The m-Presa™ dam is assembled from easily transported prefabricated modules that are 10 feet tall and 10 to 40 feet long.

Construction & Operation

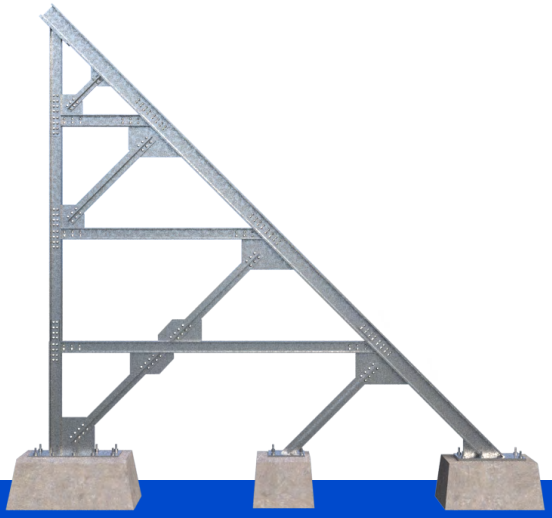
- All prefabricated structural members can be transported to the site on standard flatbed or lowboy trailers, to allow rapid modular construction of 10- to 40-foot-high buttress dams that can enclose a wide range of surface areas and water volumes.
- Structural elements of the m-Presa system are assembled on site using common heavy construction equipment to erect the buttress framework, which is then clad with cylindrically curved steel plates.
- Reservoir site preparation includes grading, leveling, and setting concrete pedestals with anchors to support the loads transferred by the buttresses.
- After the dam has been erected, the heel of the dam is encased in reinforced concrete and the reservoir face and base are lined with a plastic liner and an integrated drainage system to control seepage.
- The configuration of emergency spillways and outlet works depends on local climatology, hydrology, and the structural properties of the host rock.
- The m-Presa system uses strong, long-lived steel buttress dams to create water impoundments that can store thousands of megawatt-hours of energy to supply power during periods of peak demand and provide ancillary services for grid stability.

For a 40-foot-tall m-Presa™ dam, the erection starts with bolting several 40-foot modules to concrete pedestals (far right), then bolting 30-foot modules to the underlying 40-foot modules and attaching metal face plates. The erection process continues (from right to left) with lowering and attaching the 20-foot, 10-foot modules, and face plates.

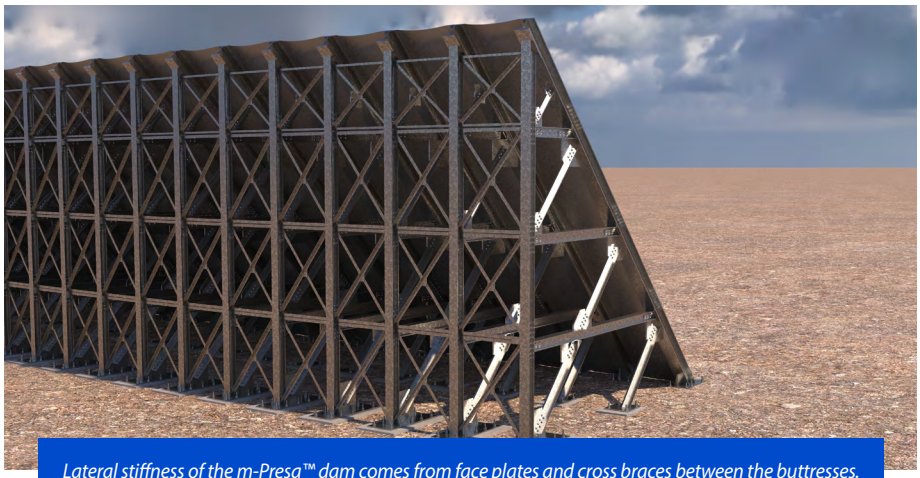


Advantages

- A PSH unit using the m-Presa system can be constructed in less than half the time needed for traditional PSH units that use earthen embankment or concrete dams to impound water.
- Reducing the time between project initiation and revenue generation makes PSH more attractive than other solutions to manage huge daily swings in solar generation, such as gas peaking plants or shorter-lived battery energy storage systems.
- The m-Presa design could reduce construction costs to $1,500 per kW-installed capacity, making PSH competitive with other long-term energy storage modes.
- SwRI's m-Presa system can be custom-designed for specific locations and site-specific challenges, including wind and seismic conditions.



The load from the filled reservoir is transferred to the foundation through the steel buttresses assembled from stacking and connecting the 40-, 30-, 20-, and 10-foot m-Presa™ modules.



Lateral stiffness of the m-Presa™ dam comes from face plates and cross braces between the buttresses.

We welcome your inquiries.
For more information, please contact:

Gordon W. Wittmeyer, Ph.D.

Senior Scientist
210.522.5082
gordon.wittmeyer@swri.org

Biswajit Dasgupta, Ph.D.

Staff Engineer
210.522.6815
biswajit.dasgupta@swri.org

Geoscience & Engineering Department
Chemistry & Chemical Engineering Division

ged.swri.org

Designed & printed by SwRI MPS 18-1023 JCN 270595 tp