KEY POINT: Energy use associated with pretreatment activities largely depends on source water quality and type of pretreatment process used (e.g. conventional filtration vs. membrane pretreatment).

SUMMARY OF ISSUES

- The quality of source water largely determines the extent of pretreatment and associated energy consumption.
- Membrane pretreatment processes typically require more energy than conventional media filtration pretreatment.

STRATEGIES

- Subsurface seawater intakes, aquatic filter barriers, and deep ocean water intakes can provide better water quality and greatly reduce the need for pretreatment (and associated energy demands).
- Continuous rapid mixing and flocculation mixing, backwash pumps and airwash blowers account for the majority of energy use for conventional pretreatment systems. Granular media filtration systems (a conventional pretreatment process) require a limited amount of power to remove particulates in the source water. Large seawater RO desal plants typically include gravity granular filtration pretreatment processes. These systems require less than 0.2 kWh/kgal (0.05 kWh/m³) of source water (Voutchkov 2008).
- For MF/UF pretreatment systems, major power requirements include pumping the feed water through the feed strainers, filtrate pumps used to draw the water through the hollow membrane fibers, backwash pumps, and air-scour blowers or compressors. Depending on the type of the membrane system (pressure or vacuum-driven), typical energy use associated with membrane pretreatment is 4 to 6 times higher (0.8-1.6 kwh/kgal, or 0.2 to 0.4 kWh/m³) than the energy use associated with gravity granular media filters.
**BENEFITS & COSTS**

Care should be taken to account for the trade-offs between capital and operating costs for different pretreatment systems. For example, the increase in the capital costs and energy consumption of a system with membrane pretreatment process compared to a conventional pretreatment process is relatively high. The significant benefit of the UF/MF-based pretreatment is realized through reduced fouling propensity of desal membranes, and consequently reduced operating costs and overall energy consumption.

**ADDITIONAL RESOURCES**