

**WRDC Power Sector Water Demand Forecast Method
February 2011**

Methodology Concepts

1. Complexity. A simple forecast approach is warranted.
2. Population. Linkage with the population committee's forecast is desirable.
3. Range of Projections. "Higher" and "lower" forecasts were developed.
4. Key Energy Statistic. Energy production per capita (statistically distinct from energy consumption per capita).
5. State Wide Forecast. Qualitative assessments regarding "Energy Production Per Person" and "Electric Power Plant Water Consumption Per Unit of Energy" are fundamental to projections for 2035, 2060 and 2110.
6. Counties & Groundwater Basin Forecasts. The percentage of total 2010 Arizona power plant water consumption that occurs in each county and groundwater basin was calculated and an accounting for Western Arizona solar projects was factored into the development of projections for 2035, 2060 and 2110.

State Forecast

	Statistic	Unit of Measurement	2010	2035	2060	2110
1	Population	People	6.6 Million	10.5 Million	13.3 Million	18.3 Million
2	Energy Production Per Person	mwh/person	18.5			
3	Total Projected Energy Production	mwh	122 Million mwh			
4	Electric Power Plant Water Consumption Per Unit of Energy	Gallons/mwh	613			
5	Total Electric Power Plant Water Consumption	Acre Feet	229,510 AF			

2010 Values

- Population = Population Committee's mid level forecast
- Total Projected Energy Production = Latest EIA data for Arizona (2008) adjusted for 2010
- Energy Production Per Person = 122 million mwh / 6.6 million people = 18.5 mwh/person
- Electric Power Plant Water Consumption Per Unit of Energy = average of the APS, SRP and TEP values for the years 2000-2009
- Total Electric Power Plant Water Consumption = 122 million mwh * 613 gallons/mwh = 229,510 acre feet

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Scenario A

Lower Power Plant Water Consumption Forecast

Modest Increase: Energy Production Per Person

Significant Decrease: Power Plant Water Consumption Per Unit of Energy

	Target Year	Energy Production Per Person		Power Plant Water Consumption Per Unit of Energy	
1	2035	<ul style="list-style-type: none"> • Energy production in Arizona is strongly correlated with energy consumption in Arizona • Energy efficiency and renewable energy requirements, plus demand management advancements result in a need for fewer power plants that consume water • While advancements in new / other consumer uses of electricity do not occur, electric vehicle load becomes significant • Power plants are built for consumers in other states 	0%	<ul style="list-style-type: none"> • Energy efficiency and renewable energy requirements reduce power plant water consumption • Some older power plants retire • All new power plants utilize dry or hybrid cooling technologies 	-20%
2	2060	<ul style="list-style-type: none"> • Increased reliance on electric vehicles • Advancements in new / other consumer uses of electricity occur 	+5%	<ul style="list-style-type: none"> • Same as 2035 plus • Climate concerns drive power plant water conservation 	-10%
3	2110	<ul style="list-style-type: none"> • Increased reliance on electric vehicles 	+3%	<ul style="list-style-type: none"> • Same as 2035 plus • Climate concerns drive power plant water conservation 	-20%

± % change equals percent change relative to the prior target year

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Scenario B

Higher Power Plant Water Consumption Forecast

Sustained Increase: Energy Production Per Person

Delayed Decrease: Power Plant Water Consumption Per Unit of Energy

	Target Year	Energy Production Per Person		Power Plant Water Consumption Per Unit of Energy	
1	2035	<ul style="list-style-type: none"> • Other states become increasingly parochial about use of state resources – Arizona entities withdraw from out-of-state power plants and replace those resources inside Arizona • Relative to today, more power plants are located in Arizona to meet electric needs in other states • Energy production in Arizona is strongly correlated with energy consumption in Arizona • Advancements in known technologies serve to increase energy production intensity (e.g. electric vehicles, high speed electric trains) • Innovation continues - advancements in “unknown” technologies serve to increase energy production intensity • U.S. economy improves – a greater number of people demand more energy intensive appliances and devices 	+10%	<ul style="list-style-type: none"> • Increased power plants in Arizona result in increased water consumption • While some new power plants utilize dry or hybrid cooling technologies, electric vehicle and train advancements prompt the need for more base loaded electric generating capability that utilize comparable levels of water consumption 	0%
2	2060	<ul style="list-style-type: none"> • Same as 2035 	+10%	<ul style="list-style-type: none"> • Significant power plant retirements occur • A majority of new power plants utilize dry or hybrid cooling technologies 	-10%
3	2110	<ul style="list-style-type: none"> • Same as 2035 	+10%	<ul style="list-style-type: none"> • Same as 2060 	-20%

± % change equals percent change relative to the prior target year