

California Department of Water Resources 2014 Water-Energy Grant Program

Mojave Water Agency Turf Replacement Conservation Incentive Program

Attachment 2:

Water and Energy Savings and Green
House Gas Calculations



Attachment 2: WEGHG

Water, energy, and greenhouse gas (GHG) savings estimated for the proposed Program are as follows:

Water Savings:

The Program targets removal of 2,000,000 square feet of turf. The 2005 Southern Nevada Water Authority's (SNWA) Xeriscape Conversion Study shows an average annual water savings of 55.8 gal/ft² by converting grass to a water smart landscape (http://www.snwa.com/html/cons_wsl_xeriscape.html). Audited water bills of previous Mojave Water Agency program participants show similar results. The average evapotranspiration and rainfall in the Mojave Integrated Regional Water Management (IRWM) Region are 70 and 3-5 inches per year, respectively, which are similar to the conditions in the SNWA service area at the time of the 2005 Study. The Program water savings are therefore calculated with a standard coefficient of 55.8 gal/ft² of turf replaced.

With the implementation of the proposed Program, water would be imported from the State Water Project (SWP) via the Pearblossom Pumping Plant and distributed through the R-Cubed Pipeline (R³) and the Johnson Valley Pump (JVP) Station. An estimated 90% of the imported water would be used in areas served by the R³ Pipeline and the remaining 10% of imported water would be pumped through the JVP.

Annual in-system and imported water savings due to turf removal:

- $2,000,000 \text{ ft}^2 \times 55.8 \frac{\text{gal}}{\text{ft}^2} = 111,600,000 \text{ gal} = \mathbf{111.60 \text{ MG/yr}}$
 - $111.60 \frac{\text{MG}}{\text{yr}} \times 3.07 \frac{\text{AF}}{\text{MG}} = 343 \text{ AF}$
- R³: $343 \text{ AF} \times 0.90 = 309 \text{ AF/yr}$
- JVP: $343 \times 0.10 = 34 \text{ AF/yr}$

Lifetime in-system and imported water savings:

- $111.60 \frac{\text{MG}}{\text{yr}} \times 10 \text{ yrs} = \mathbf{1,116 \text{ MG}}$

Energy Savings:

Energy savings are calculated from the water saved. Average annual energy intensities of the proposed systems are 1,000 kilowatt-hours per acre-foot (kWh/AF) for the R³ Pipeline and 500 kWh/AF for JVP, as provided by Southern California Edison cost and power usage tracking tables. Examples of energy intensities per month can be seen below in Table 2-1 and Table 2-2. The energy intensity for water imported through Pearblossom Pumping Plant is 4,432 kWh/AF



as shown in Table 6 of the application guidelines.

Table 2-1: Monthly Energy Intensities (kWh/AF) for Johnson Valley Pump Station (2013/2013)

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Avg
-	424	456	509	494	439	427	475	457	427	436	470	418

Table 2-2: Monthly Energy Intensities (kWh/AF) for R³ Pipeline (2013/2014)

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Avg
1,050	832	1,198	850	1,048	1,176	945	632	1,908	1,046	1,155	996	1,070

Annual in-system energy savings by proposed Program:

- R³: $309 \text{ AF} \times 1000 \frac{\text{kWh}}{\text{AF}} = 309,000 \frac{\text{kWh}}{\text{yr}}$
- JVP: $34 \text{ AF} \times 500 \frac{\text{kWh}}{\text{AF}} = 17,000 \frac{\text{kWh}}{\text{yr}}$
- Total annual in-system energy savings: **326,000 kWh/yr**

Annual imported energy savings:

- $343 \text{ AF} \times 4,432 \frac{\text{kWh}}{\text{AF}} = 1,520,176 \frac{\text{kWh}}{\text{yr}}$

Annual Total (In-system plus Imported):

- **1,846,176 kWh/yr**

Lifetime in-system and imported energy savings:

- $1,846,176 \frac{\text{kWh}}{\text{yr}} \times 10 \text{yr} = 18,846,176 \text{ kWh}$

GHG Savings:

GHG savings can be calculated using the energy savings calculations. A local total-output emission rate is unavailable for the Region; therefore the annual total-output statewide emission rate of 0.278 kg CO₂e/kWh is used, as recommended by DWR in the 2014 Water-Energy Grant Program Guidelines and Proposal Solicitation Package (U. S. Environmental Protection Agency Emissions and Generation Resource Integrated Database for the CAMX sub-region).

- In-system GHG emission reduction:
 - $326,000 \frac{\text{kWh}}{\text{yr}} \times 0.278 \text{ kg} \frac{\text{CO}_2\text{e}}{\text{kWh}} = 90,628 \text{ kg CO}_2\text{e}$
- Imported GHG emissions reduction:



- $1,520,176 \frac{kWh}{yr} \times 0.278 \frac{kg\ CO_2e}{kWh} = 422,609 \text{ kg } CO_2e/yr$
- Annual Total GHG emissions reduction (In-system plus Imported): **513,237 kg CO₂e/yr**
- Lifetime GHG emissions reduction: $513,237 \frac{kg\ CO_2e}{yr} \times 10 \text{ yr} = \mathbf{5,132,370 \text{ kg } CO_2e}$