

Model Equations

	Variable Name	Units	Variable Equation
1.	Annual Rate of Population Increase	1/year	[(2000,-0.2)-(2050,4)],(2000,0.027),(2005,0.0115), (2010,0.0376),(2015,0.0174),(2016,0.011),(2017,0.0096), (2018,0.0087),(2019,0.0081),(2020,0.0091),(2025,0.0077), (2030,0.006),(2035,0.0039),(2040,0.0018),(2050,-0.0012))
2.	Average Population	million people	5.473
3.	Average Total Energy Produced from Natural Gas Burnt per capita per annum	kWh/(year*million people)	Total Energy Produced from Natural Gas Burnt per annum/Average Population
4.	Average Total Energy Required for Food System per annum	kWh/year	203400
5.	Average Total Energy Required for Food System per capita per annum	kWh/(year*million people)	Average Total Energy Required for Food System per annum/Average Population
6.	Average Total Household Consumption of Energy per annum	Mwh/year	6.91858e+06*(1-Household Efforts to Reduce Consumption of Resources)
7.	Average Total Household Consumption of Energy per million people per annum	Mwh/year	(Average Total Household Consumption of Energy per annum/Average Population)*Population
8.	Average Total Household Consumption of	million gallon/million people/year	13788.5*(1-Household Efforts to Reduce Consumption of Resources)

	Water per million people per annum		
9.	Average Total Water Required for Food System per annum	litres/year	1.67714e+06
10.	Average Total Water Required for Food System per capita per annum	litres/(year*million people)	Average Total Water Required for Food System per annum/Average Population
11.	Average Water Supply Needed per capita per annum	million gallon/(year*million people)	(Treated NEWater per annum+Imported Water per annum+Desalinated Water per annum)/Average Population
12.	Consumption of Energy for Food System	Mwh/year	Total Energy Required for Food System per annum/kWh to Mwh Conversion Rate
13.	Consumption of Energy for Food System per annum	Mwh/year	Consumption of Energy for Food System
14.	Consumption of Energy for Water Treatment System	Mwh/year	Total Energy Required for Water Treatment System per annum
15.	Consumption of Energy for Water Treatment System per annum	Mwh/year	Consumption of Energy for Water Treatment System
16.	Consumption of Water for Energy System per annum	million gallon/year	Distribution of Water for Energy Production
17.	Consumption of Water for Food System per annum	million gallon/year	Distribution of Water for Food System

18.	Desalinated Water per annum	million gallon/year	47450
19.	Distribution of Water for Energy Production	million gallon/year	"Total Water Required for Energy Production System per annum."
20.	Distribution of Water for Food System	million gallon/year	Total Water Required for Food System per annum/Litres to Million Gallons Conversion Rate
21.	Energy Consumed for Desalination of Water per annum	Mwh/year	Desalinated Water per annum*Energy Consumed per million gallon of Water Desalinated
22.	Energy Consumed for Distribution of Water per annum	Mwh/year	(Distribution of Water for Energy Production+Distribution of Water for Food System)*Energy Consumed per million gallon of Water Distributed
23.	Energy Consumed for Treatment of NEWater per annum	Mwh/year	Treated NEWater per annum*Energy Consumed per million gallon of NEWater Treated
24.	Energy Consumed per million gallon of NEWater Treated	Mwh/million gallon	6.24593
25.	Energy Consumed per million gallon of Water Desalinated	Mwh/million gallon	13.2489
26.	Energy Consumed per million gallon of Water Distributed	Mwh/million gallon	0.946353
27.	"Energy Consumption per annum for Food System, Water System and Households"	Mwh	INTEG (Consumption of Energy for Food System per annum+Consumption of Energy for Water Treatment System per annum+Household Consumption of Energy per annum, 0)
28.	Energy Production	Mwh/year	(Average Total Energy Produced from Natural Gas Burnt per capita per annum*Population)/kWh to Mwh Conversion Rate

29.	Energy Resources	Mwh	INTEG (Energy Production-Consumption of Energy for Food System-Consumption of Energy for Water Treatment System-Household Consumption of Energy, 1.39211e+07)
30.	FINAL TIME	year	2050
31.	Household Consumption of Energy	Mwh/year	Average Total Household Consumption of Energy per million people per annum
32.	Household Consumption of Energy per annum	Mwh/year	Household Consumption of Energy
33.	Household Consumption of Water	million gallon/year	Total Household Consumption of Water per annum
34.	Household Consumption of Water per annum	million gallon/year	Household Consumption of Water
35.	Household Efforts to Reduce Consumption of Resources	Dmnl	Increments to Public Education on Environmental Conservation
36.	Imported Water per annum	million gallon/year	91250
37.	Increments to Public Education on Environmental Conservation	Dmnl	0
38.	INITIAL TIME	year	2000
39.	kWh to Mwh Conversion Rate	kWh/Mwh	1000
40.	Litres to Million Gallons Conversion Rate	litres/million gallon	3.78541e+06
41.	Multiplier for Time	1/year	1

42.	PopIncFr	1/year	Annual Rate of Population Increase(Year Count)
43.	Population	million people	INTEG (Population Growth, 4.028)
44.	Population Growth	million people/year	Population*PopIncFr
45.	Purified Water from Treatment Facilities	million gallon	INTEG (Total Water Supply-(Distribution of Water for Energy Production+Distribution of Water for Food System+Household Consumption of Water), 158503)
46.	Rate of Water Consumed per Mwh of Energy Produced from Natural Gas	million gallon/Mwh	0.000198129
47.	SAVEPER	year [0,?]	TIME STEP
48.	TIME STEP	year [0,?]	1
49.	Total Energy Produced from Natural Gas Burnt per annum	kWh/year	8.78934e+10
50.	Total Energy Required for Food System per annum	kWh/year	Population*Average Total Energy Required for Food System per capita per annum
β1.	Total Energy Required for Water Treatment System per annum	Mwh/year	((Energy Consumed for Distribution of Water per annum+Energy Consumed for Treatment of NEWater per annum+Energy Consumed for Desalination of Water per annum)/Average Population)*Population
52.	Total Household Consumption of Water per annum	million gallon/year	Average Total Household Consumption of Water per million people per annum*Population
53.	"Total Water Required for Energy Production System per annum."	million gallon/year	Energy Production*Rate of Water Consumed per Mwh of Energy Produced from Natural Gas
54.	Total Water Required for Food System per annum	litres/year	Average Total Water Required for Food System per capita per annum*Population

55.	Total Water Supply	million gallon/year	Total Water Supply per annum
56.	Total Water Supply per annum	million gallon/year	Average Water Supply Needed per capita per annum*Population
57.	Treated NEWater per annum	million gallon/year	63266.7
58.	"Water Consumption per annum for Food System, Energy System and Households"	million gallon	INTEG (Consumption of Water for Energy System per annum+Consumption of Water for Food System per annum+Household Consumption of Water per annum, 0)
59.	Year Count	1	Time*Multiplier for Time