Model Equations

	Variable Name	Units	Variable Equation
1.	Annual Rate of	1/year	[(2000,-0.2)-(2050,4)],(2000,0.027),(2005,0.0115),
	Population Increase		(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	kWh/(year*million people)	Total Energy Produced from Natural Gas Burnt per annum/Average
	Produced from		Population
	Natural Gas Burnt per		
	capita per annum		
4.	Average Total Energy	kWh/year	203400
	Required for Food		
	System per annum		
5.	Average Total Energy	kWh/(year*million people)	Average Total Energy Required for Food System per annum/Average
	Required for Food		Population
	System per capita per		
	annum		
6.	Average Total	Mwh/year	6.91858e+06*(1-Household Efforts to Reduce Consumption of Resources)
	Household		•
	Consumption of		
	Energy per annum		
7.	Average Total	Mwh/year	(Average Total Household Consumption of Energy per annum/Average
	Household		Population)*Population
	Consumption of		
	Energy per million		
	people per annum		
8.	Average Total	million gallon/million	13788.5*(1-Household Efforts to Reduce Consumption of Resources)
	Household	people/year	,
	Consumption of		

	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	million gallon/year	47450
16.	annum	million gallon/year	47430
19.	Distribution of Water	million cellen/mass	"Total Water Required for Energy Production System per annum."
19.		million gallon/year	Total water Required for Energy Production System per annum.
20	for Energy Production	-11:	T-177 - D - 10 - 10
20.	Distribution of Water	million gallon/year	Total Water Required for Food System per annum/Litres to Million Gallons
	for Food System		Conversion Rate
21.	Energy Consumed for	Mwh/year	Desalinated Water per annum*Energy Consumed per million gallon of Water
	Desalination of Water		Desalinated
	per annum		
22.	Energy Consumed for	Mwh/year	(Distribution of Water for Energy Production+Distribution of Water for Food
	Distribution of Water		System)*Energy Consumed per million gallon of Water Distributed
	per annum		
23.	Energy Consumed for	Mwh/year	Treated NEWater per annum*Energy Consumed per million gallon of
	Treatment of		NEWater Treated
	NEWater per annum		
24.	Energy Consumed per	Mwh/million gallon	6.24593
	million gallon of	J 8	
	NEWater Treated		
25.	Energy Consumed per	Mwh/million gallon	13.2489
	million gallon of	5	
	Water Desalinated		
26.	Energy Consumed per	Mwh/million gallon	0.946353
	million gallon of		
	Water Distributed		
27.	"Energy Consumption	Mwh	INTEG (Consumption of Energy for Food System per annum+Consumption
21.	per annum for Food	NIWII	of Energy for Water Treatment System per annum+Household Consumption
	System, Water System		of Energy per annum, 0)
	and Households"		of Energy per annum, o)
20		24.14	(4 T. 17 P. 1 16 N. 10 P. (
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 32. Household Consumption of Energy per annum Household Consumption of Energy per annum 33. Household Consumption of Water Total Household Consumption of Water per annum 34. Household Consumption of Water per annum 35. Household Consumption of Water per annum Household Consumption of Water per annum 36. Household Consumption of Water per annum Household Consumption of Water per annum 37. Household Consumption of Water per annum Household Consumption of Water per annum 38. Household Consumption of Water per annum Household Consumption of Water per annum 39. Household Consumption of Water per annum Household Consumption of Water per annum 39. Household Consumption of Water per annum Household Consumption of Water per annum 39. Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water per annum Household Consumption of Water Household Consumption Household Con				
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30. FINAL TIME				
31. Household Consumption of Energy Mwh/year Average Total Household Consumption of Energy per million people per annum				
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32. Household Consumption of Energy per annum Household Consumption of Energy per annum 33. Household Consumption of Water 34. Household Consumption of Water per annum 35. Household Efforts to Reduce Consumption		Consumption of		annum
Consumption of Energy per annum 33. Household Consumption of Water 34. Household Consumption of Water per annum 35. Household Efforts to Reduce Consumption 36. Household Efforts to Reduce Consumption 37. Household Efforts to Reduce Consumption 38. Household Efforts to Reduce Consumption 39. Household Efforts to Reduce Consumption 30. Household Efforts to Reduce Consumption		Energy		
Energy per annum 33. Household Consumption of Water 34. Household Consumption of Water Per annum 35. Household Efforts to Reduce Consumption Below Per Annum Total Household Consumption of Water Per annum Household Consumption of Water Per annum Increments to Public Education on Environmental Conservation	32.	Household	Mwh/year	Household Consumption of Energy
33. Household million gallon/year Total Household Consumption of Water per annum		Consumption of		
Consumption of Water 34. Household million gallon/year Household Consumption of Water Consumption of Water per annum 35. Household Efforts to Reduce Consumption Increments to Public Education on Environmental Conservation		Energy per annum		
Consumption of Water 34. Household million gallon/year Household Consumption of Water Consumption of Water per annum 35. Household Efforts to Reduce Consumption Increments to Public Education on Environmental Conservation	33.	Household	million gallon/year	Total Household Consumption of Water per annum
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Consumption of Water per annum 35. Household Efforts to Reduce Consumption Consumption Increments to Public Education on Environmental Conservation		Water		
Consumption of Water per annum 35. Household Efforts to Reduce Consumption Consumption Increments to Public Education on Environmental Conservation	34.	Household	million gallon/year	Household Consumption of Water
Water per annum 35. Household Efforts to Reduce Consumption Increments to Public Education on Environmental Conservation		Consumption of		·
Reduce Consumption				
	35.	Household Efforts to	Dmnl	Increments to Public Education on Environmental Conservation
		Reduce Consumption		
36. Imported Water per million gallon/year 91250	36.	Imported Water per	million gallon/year	91250
annum		annum		
37. Increments to Public Dmnl 0	37.	Increments to Public	Dmnl	0
Education on		Education on		
Environmental		Environmental		
Conservation		Conservation		
38. INITIAL TIME year 2000	38.	INITIAL TIME	year	2000
39. kWh to Mwh kWh/Mwh 1000	39.	kWh to Mwh	kWh/Mwh	1000
Conversion Rate		Conversion Rate		
40. Litres to Million litres/million gallon 3.78541e+06	40.	Litres to Million	litres/million gallon	3.78541e+06
Gallons Conversion		Gallons Conversion		
Rate		Rate		
41. Multiplier for Time 1/year 1	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	million gallon	INTEG (Total Water Supply-(Distribution of Water for Energy
	Treatment Facilities		Production+Distribution of Water for Food System+Household Consumption
			of Water), 158503)
46.	Rate of Water	million gallon/Mwh	0.000198129
	Consumed per Mwh	_	
	of Energy Produced		
	from Natural Gas		
47.	SAVEPER	year [0,?]	TIME STEP
48.	TIME STEP	year [0,?]	1
49.	Total Energy	kWh/year	8.78934e+10
	Produced from	_	
	Natural Gas Burnt per		
	annum		
50.	Total Energy	kWh/year	Population*Average Total Energy Required for Food System per capita per
	Required for Food		annum
	System per annum		
δ1.	Total Energy	Mwh/year	((Energy Consumed for Distribution of Water per annum+Energy Consumed
1	Required for Water		for Treatment of NEWater per annum+Energy Consumed for Desalination of
	Treatment System per		Water per annum)/Average Population)*Population
	annum		
52.	Total Household	million gallon/year	Average Total Household Consumption of Water per million people per
	Consumption of		annum*Population
	Water per annum		
53.	"Total Water Required	million gallon/year	Energy Production*Rate of Water Consumed per Mwh of Energy Produced
	for Energy Production		from Natural Gas
	System per annum."		
54.	Total Water Required	litres/year	Average Total Water Required for Food System per capita per
	for Food System per		annum*Population
	annum		

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