

ETI Energy Scenario Tool User Guide

About the ETI Energy Scenario Tool

The ETI Energy Scenario Tool is an Excel-based scenario model that calculates the cost of electricity for custom generation profiles. This tool is intended to model scenarios in Hawaii and other islands.

Data Entry Screens

Scenario Details

The Scenario Details screen serves as the main menu for the Scenario Tool and the starting point for using the tool. On this screen, users can create a new scenario, copy and modify an existing scenario, review an existing scenario, and delete scenarios.

O SCENAR					
NAVIGATION	Current Scenario: Scenario B				
🔊 Main Menu	Instructions: The first step on the Scena scenario, the user must provide a uniqu	ario Details screen is to select a new or exis ue scenario name. If working with a previo	sting scenario to open using the text b usly saved scenario, select the scena	oxes, drop down menus, and butto rio from the "Existing Scenarios" lis	ns at the top of the form. If creating a new at, then click the button with the action you want
Shared Resources	to perform. The "Copy Scenario" featur Scenario" button opens all data from th existing scenario is copied or opened f	re creates an identical copy of the selected e existing scenario, which can then be mo or review, all of its associated data will pop.	scenario, which is then given a unique dified and saved. The "Rename Scer ulate on all data entry screens. Finally	e name. The copy can then be fur nario" button can be used to modify , the "Delete Scenario" button rem	thered modified and saved. The "Review y the name of the selected scenario. When an noves the entire scenario, including all data
Baseline Inputs	entry on the subsequent tabs, from the saving the Excel file.	Scenario Tool. This deletion is permanen	t. However, if any undesired changes	are made in the tool, they can be	recovered by closing the Scenario Tool without
Resource Potential	Create a New Scenario:	Existing Scena	rios: Scenario B	•	
Capacity Factors	Crea	te New Scenario	Copy Scenario	Rename Scenario	
Renewable Generation Projects			Review Scenario	Delete Scenario	
Non-Renewable Generation	Current Scenario: Scenario B	evering the user they extend herein data ab	autilia assassis inclusion the second	is author data that the second is up	a last adited and the spanning duration. The
Financial Data	scenario duration entered here is found modeled in the scenario. Each scenar	ational for Scenario Tool calculations, but is comprised of one to five locations, ead	it can be adjusted later in the data en ch of which represents a distinct electri	try process if needed. The next se c arid. Users must specific the au	ction of data entry is for the locations being antity of locations and name each location
🕥 Scenario Dashboard	before entering scenario data. After en Scenario Information	tering the data in this section, click the "Sa	ve Scenario Inputs® button.	-	
	Scenario Author:				
	Date Last Edited:	3/23/2015			
	Scenario Duration (years):	16			



Step 1: Create, Copy, or Open a Scenario

The first step on the Scenario Details screen is to select a new or existing scenario to open using the text boxes, drop down menus, and buttons at the top of the form. If creating a new scenario, the user must provide a unique scenario name. If working with a previously saved scenario, select the scenario from the "Existing Scenarios" list, then click the button with the action you want to perform. The "Copy Scenario" feature creates an identical copy of the selected scenario, which is then given a unique name. The copy can then be further modified and saved. The "Review Scenario" button opens all data from the existing scenario, which can then be modified and saved. The "Rename Scenario" button can be used to modify the name of the selected scenario. When an existing scenario is copied or opened for review, all of its associated data will populate on all data entry screens. Finally, the "Delete Scenario" button removes the entire scenario, including all data entry on the subsequent tabs, from the Scenario Tool. This deletion is permanent. However, if any undesired change is made in the tool, it can be recovered by closing the Scenario Tool without saving the Excel file and then reopening the saved file.

and all and a second a factor of a	a subscript of the second second set in a time of the second	and the state will an avoid the second	u saveu. The Rename Scen	ario" button can be used	5 mouny the name of the selected	scenario. When an
entry on the subsequent tab saving the Excel file.	s, from the Scenario Tool. This	deletion is permanent. Howev	er, if any undesired changes	are made in the tool, they	can be recovered by closing the S	Scenario Tool without
Create a New Scenario:		Existing Scenarios:	Scenario B	-		
Create a New Scenario:	Create New Scenario	Existing Scenarios:	Scenario B Copy Scenario	Rename Scenario		

Figure 2: Create, Copy, or Open a Scenario

Step 2: Scenario Information

After creating, copying, or opening a scenario, the user then enters basic data about the scenario, including:

- Scenario author
- Date that the scenario was last edited
- Scenario duration

The scenario duration entered here is foundational for Scenario Tool calculations, but can be adjusted later in the data entry process if needed. The next section of data entry is for the locations being modeled in the scenario. Each scenario is comprised of one to five locations, each one must represent a distinct electric grid. Users must specify the quantity of locations and name each location before entering scenario data. For each location, the user must also enter spinning reserves, which are added to total demand, the clean energy target for the end of the scenario, and the renewable portfolio standard (RPS) target for the end of the scenario. **In the Scenario Tool, clean energy is defined as the combination of renewable energy generation and reductions in demand due to energy efficiency.** Clean energy and renewable portfolio standard targets must also be entered for the overall scenario. After entering the data in this section, click the "Save Scenario Inputs" button.

Current Scenario: Sce After creating, copying, or op scenario duration entered he modeled in the scenario. Ea before entering scenario dat	enario B sening a scenario, the user then ente ere is foundational for Scenario Tool ach scenario is comprised of one to f ta. After entering the data in this sect	ers basic data about the scer calculations, but it can be au ive locations, each of which i tion, click the "Save Scenario	nario, including the scenar djusted later in the data en represents a distinct electr o Inputs" button.	io author, date that the scenario try process if needed. The nex ic grid. Users must specific the	o was last edited, and the scenario duration It section of data entry is for the locations be a quantity of locations and name each locat
Scenario Information					
Scenario Author:					
Date Last Edited:	3/23/2015				
Scenario Duration (years):	16				
Location Information			1	and Locations	1
	Location Name	Spinning Reserves (%)	Clean Energy Target in 2030 (%)	Renewable Portfolio Standard Target in 2030 (%)	
Location 1	Oahu	10%	70%	30%]
Location 2	Hawaii	10%	70%	30%	
Location 3	Kauai	10%	70%	30%	
Location 4	Maui	10%	70%	30%	
Location 5			XIIIIIIIIIIIIIIIIIIIIIII		
Scenario Totals		X	70%	30%	

Figure 3: Scenario Information

Step 3: Energy Resources

The next step is to designate the energy resources being used in the scenario. The Scenario Tool can be used to model both renewable and non-renewable generation, and the user can pick energy resources from a suggested list or enter custom energy resources. Renewable and non-



While scenario energy resources can be adjusted in the scenario data entry process, modifying the list of energy resources after beginning to enter data is <u>not recommended</u> as the Scenario Tool can take up to a few minutes to make this change when saving. renewable custom energy resources can be used in the Scenario Tool, and they can also be used to model generation that is shared across multiple locations. Custom energy resources from previously saved scenarios are also available, and they can be selected using the combo boxes at the bottom of the screen. After selecting energy resources to be used for the scenario, click the "Set Scenario Energy Types" button to save.

Figure 4: Energy Resources

Shared Resources

The Scenario Tool allows for an energy resource to be shared by multiple locations or grids, for example, to model a cable project connecting two islands. Only custom energy resources can be modeled as shared resources.

Shared Resources Data Entry:

If the scenario does not contain any custom energy resources, then this tab can be skipped. For scenarios that model custom energy resources, the list of all custom energy resources, both renewable and non-renewable, will appear in this table. For each resource, specify whether the resource is shared or not. Shared energy resources can be allocated to up to three locations within the scenario. For each shared energy resource, select the locations where it is used and the allocation to each location. Generation quantities are entered separately for each location, and this allocation is used in energy cost calculations.

After entering data, click the "Save" button before proceeding to the next screen.

If the scenario does not contain between islands. For scenarios the resource is shared or not. Si each location. Generation quan	o B any custom energy res that model custom ener hared energy resources titles are entered separ	ources, then this tab can be ergy resources, the list of all s can be allocated to up to th ately for location, and this al	skipped. Shared res custom energy resou pree locations within the location is used in en	ources can be used to rces, both renewable a ne scenario. For each s ergy cost calculations.	nodel generation that i and non-renewable, will shared energy resource,	is used by multiple gric appear in this table. Fo select the locations wh	ls, such as when a cal or each resource, spec pere it is used and the Save	ole is used ify whether allocation to Next
Shared Resources In Sc		Location 1	Allocation to	Location 2	Allocation to	Location 3	Allocation to	Total
Custom Energy Resource	Snared Resource?	LUCATION	Location	LOCATION Z	LOCATION Z	Location J	Location J	Allocatio

Figure 5: Shared Resources



Baseline Inputs

The data entered on this tab is used to calculate the total demand at each location and for the scenario as a whole. Baseline data includes three types of demand data: projected electricity demand, energy efficiency and electric vehicle demand forecast. <u>Projected electricity demand data provides the foundation for demand calculations, and energy efficiency is modeled as a reduction in that demand</u>. Electric vehicle forecast data is an optional input that can be used to model demand in addition to projected electricity demand due to electric vehicle charging in the scenario.

Baseline Data Entry:

The "Data Completion Summary" at the top of the screen shows data that has been saved for the scenario for each location and each baseline data type. If data is missing for a location and baseline data type pair in the table, then the table will show either a red or yellow circle. Red circles indicate data has been partially entered but is still missing. Yellow circles indicate data has not been entered. If all required data has been entered for the location and baseline data type combination, then the table will show the value entered for 2014.

The data entered on this tab is used to cal projected electricity demand, energy effici and energy efficiency is modeled as a red electricity demand due to electric vehicles each location and each baseline data typ circles show where data has been partially location and baseline data type combinal	lculate the total deman iency and electric vehic luction in that demand. is in the scenario. The " e. If data is missing for y entered but is still mik tion, then the table will s	d at each location and fi cle demand forecast. Pr Electric vehicle forecast Data Completion Summ ra location and baseling ssing. Yellow circles sh show the value entered	or the scenario as a wi ojected electricity den st data is an option inp ary" at the top of the s adat type pair in the wwhere data has not for 2014.	hole. Baseline hand data provi out that can be u screen shows da table, then the t t been entered.	lata includes three types of demand data: les the foundation for demand calculations, sed to model demand in addition to projected ta that has been saved for the scenario for able will show either a red or yellow circle. Red If all required data has been entered for the
Data Completion Summary					
Data Inputs Check	Oahu	Hawaii	Kauai	Maui	Кеу
Projected Electricity Demand	7,500,000	1,171,000	560,640	1,336,485	: Data Not Entered
Energy Efficiency	1,224,210	211,699	51,647	208,234	O: Data Missing
Electric Vehicle Forecast (ontional)		100 0 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0		10000	

Figure 6: Data Completion Summary for Baseline Inputs

Baseline data is entered by location for each of the three types of demand. First, choose a location from the "Select a location" drop down menu, then select the baseline type using the radio buttons below.

Energy efficiency data can be entered as total megawatt hours (MWh) or as a percentage of projected electricity demand. Select which mode to use using the radio buttons to the right of the baseline data type selection box.



	Select a location:	Oahu						
	Select baseline type:	Baseline Data Projected C Energy Ef	Electricity D	emand	Energy Efficiency MWh Percentage c	Options of projected demand		
		C Electric Ve	ehicle Foreca	st	Percentage:]	
	Copy Baseline Dat	a from existing sr	cenario:	Select a Scena	ario 💌	Copy Inputs		
Projected Ele	ectricity Demand (N	IWh) at Oahu (location	1 of 4)				
Units of Measu	ire							
O Gigawatt	Hours (GWh)	Jawatt Hours (MWh)	ОM	illion British Therm	al Units (MMBtu)			
Current Demai	1d	Apply percent:	age increase	over scenario dura	ation			
Year 2014	Value (MVVn)	Descentage:		00/				
2014	1,500,000	Fercentage.		0.18				
Demand Projec	tions							
Voar								
icai	Value (MWh)	Year	Valu	e (MWh)	Year	Value (MWh)	Save	
2015	Value (MWh) 7,669,000	Year 2025	Valu	e (MWh) 9,007,000	Year 2035	Value (MWh)	Save	
2015	Value (MWh) 7,669,000 7,906,000	Year 2025 2026	Valu	e (MWh) 9,007,000 9,099,000	Year 2035 2036	Value (MWh)	Save	
2015 2016 2017	Value (MWh) 7,669,000 7,906,000 8,029,000	Year 2025 2026 2027	Valu	e (MWh) 9,007,000 9,099,000 9,192,000	Year 2035 2036 2037	Value (MWh)	Save	
2015 2016 2017 2018	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000	Year 2025 2026 2027 2028	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000	Year 2035 2036 2037 2038	Value (MWh)	Save	
2015 2016 2017 2018 2019	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000 8,285,000	Year 2025 2026 2027 2028 2029	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000 9,382,000	Year 2035 2036 2037 2038 2039	Value (MWh)	Save	
2015 2016 2017 2018 2019 2020	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000 8,285,000 8,434,000	Year 2025 2026 2027 2028 2029 2030	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000 9,382,000 9,478,000	Year 2035 2036 2037 2038 2039 2040	Value (MWh)	Save	
2015 2016 2017 2018 2019 2020 2021	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000 8,285,000 8,434,000 8,538,000	Year 2025 2026 2027 2028 2029 2030 2031	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000 9,382,000 9,478,000	Year 2035 2036 2037 2038 2039 2040 2041	Value (MWh)	Save	
2015 2016 2017 2018 2019 2020 2021 2022	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000 8,285,000 8,434,000 8,538,000 8,660,000	Year 2025 2026 2027 2028 2029 2030 2031 2031	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000 9,382,000 9,478,000	Year 2035 2036 2037 2038 2039 2040 2041 2041	Value (MWh)	Save	
2015 2016 2017 2018 2019 2020 2021 2022 2023	Value (MWh) 7,669,000 7,906,000 8,029,000 8,131,000 8,285,000 8,434,000 8,538,000 8,660,000 8,778,000	Year 2025 2026 2027 2028 2029 2030 2031 2032 2033	Valu	e (MWh) 9,007,000 9,099,000 9,192,000 9,287,000 9,382,000 9,478,000	Year 2035 2036 2037 2038 2039 2040 2041 2041 2042 2043	Value (MWh)	Save	

Figure 7: Baseline Inputs Data Entry

Baseline data can also be copied from previously saved scenarios using the "Copy Baseline Data from existing scenario" menu. This list of scenarios includes scenarios with locations that match the selected location. Copying data will duplicate all baseline data from the previously saved scenario.

After selecting a location and baseline data type, enter the data values in the lower portion of the screen. Data can be entered using gigawatt hours (GWh), megawatt hours (MWh), or millions of British thermal units (MMBTU). Baseline data can also be automatically increased over the duration of the scenario using the "Apply percentage increase over scenario" check box and accompanying percentage data field below. This will apply the percentage to the value entered for 2014, increasing by the percentage for each year of the scenario.

Resource Potential Inputs

Resource potential is the maximum generation level that theoretically could be installed for each energy resource, in megawatts. For example, the resource potential of a location with strong winds would have a higher resource potential for onshore wind than a location with moderate winds. In the Scenario Tool, resource potentials must be set for each location and energy resource combination, and they serve as an error check for capacity of renewable energy projects. The user should enter data for resource potential before adding generation projects to the scenario to avoid receiving error messages further on. The tool will not allow a scenario to go over the resource potential set for each generation technology, however, it is acceptable to fall under the maximum generation level for each resource type.

On the Resource Potential screen, the Data Completion Summary displays all of the resource potential data for the scenario. To enter data, select a location using the drop down menu, and any saved data for that location will populate in the table. Data can also be copied from previously saved scenarios that include the same location.



Current Scenario: Scenario B

Currently viewing data for Oahu (location 1 of 4)

Resource potential is the maximum power that could theoretically be installed for each energy resource. For example, the resource potential of a location with strong winds would have a higher resource potential for onshore wind than a location with low winds. In the Scenario Tool, resource potentials must be set for each location and energy resource combination, and they serve as an error check for capacity of renewable energy projects. The user should enter data for resource potential before adding generation projects to the scenario to avoid receiving error messages further on. On the Resource Potential screen, the Data Completion Summary displays all of the resource potential data for the scenario. To enter data, select a location using the drop down menu, and any saved data for that location will populate in the table. Data can also be copied from previously saved scenarios that include the same location.

Data Completion Sun	nmary			
Energy Resource (MW)	Oahu	Hawaii	Kauai	Maui
Biomass	200	200	200	100
Onshore Wind	1000	1000	1000	1000
Offshore Wind	100	100	100	1000
Geothermal	100	100	100	400
Hydro	100	100	100	400
Solar - residential roofs	2000	2000	2000	2000
Solar - commercial roofs	3000	3000	3000	4000
Solar - utility scale	4000	4000	4000	4000
Municipal Solid Waste	500	500	500	100
Ocean Energy	1000	1000	1000	100
Biodiesel	5000	5000	5000	1000
Lanai Winds	1000	500	1000	1000
Diesel Fuel	100000	100000	10000	100000



Figure 8: Resource Potential Data Completion Summary

Persource Potential Date						
Resource Fotential Data	a Entry					
To enter data, select a location u	ising the drop do	wn menu, and a	ny saved data for that locati	ion will popula	te in the table. I	Data can also be copied
from previously saved scenarios	that include the	same location.				
Select a Location: Oahu	-					View Data Sources
Copy Resource Retential Inputs	from on Existing	Sconario:	Connecto D Testino	Conv	Inputo	
Copy Resource Potential inputs i	Ironn an Existing	Scenano. j	Scenario B Testing	Copy	inputs	
Units of Measure						
 Gigawatts (GW) Meg 	gawatts (MW)	Million British The	ermal Units per Hour (MMBtus/ł	hr)		
		Deseures	1			
	Resource	Dotontial	Save	Next		
Resource Type P	Potential (MW)	Source				
Biomass	200		1			
Onshore Wind	1000]			
Offshore Wind	100]			
Geothermal	100]			
Hydro	100					
Solar - residential roofs	2000					
Solar - commercial roofs	3000					
Solar - utility scale	4000					
Municipal Solid Waste	500					
Ocean Energy	1000					
Biodiesel	5000					
Lanai Winds	1000					
Diesel Fuel	100000					



Capacity Factor Inputs

Capacity factors represent the maximum electric output a plant can generate under specific conditions, and these inputs are used to account for variations in generation profiles across technologies. For intermittent resources, such as solar or wind, these inputs are especially vital. In the Scenario Tool, capacity factors are percentages applied to the nameplate capacity of generation projects which are added into the tool on the next tab.

The data completion summary table displays the 2014 values for all energy resources at the locations in the scenario



and will show where capacity factor data is missing. To enter capacity factor data, first select a location, then select an energy resource using the radio buttons and drop down menus below. After selecting a location and energy resource combination, the table will populate with any previously saved data.

Current Scenario: Scenario B

Currently viewing data for Oahu (location 1 of

entry viewing data	for Oanu (loc	auon i oi 4)			
Capacity factors represe	ent the portion of	time that a resource	is generating, an	d these inputs a	are used to account for variations in generation profiles a
technologies. For intern	nittent resources,	such as solar or wir	nd, these inputs a	re especially vit	al. In the Scenario Tool, capacity factors are assumed to
averages, and they are a	applied to a 365	day, 24 hour/day tirr	ne frame when ca	lculating annua	I generation. The data completion summary table displa
values for all energy res	ources at the loc	ations in the scenar	io and will show w	here capacity fa	actor data is missing. To enter capacity factor data, first s
location, then select an e	energy resource	using the radio butt	ons and drop dow	n menus below	v. After selecting a location and energy resource combin
table will populate with a	any previously sa	ved data.			
Data Completion	0				
Data Completion	Summary	1	1		
Energy Resource	Oahu	Hawaii	Kauai	Maui	Кеу
Biomass	80.0%	80.0%	80.0%	80.0%	Oata Not Entered
Onshore Wind	40.0%	40.0%	40.0%	40.0%	O: Data Missing
Offshore Wind	40.0%	40.0%	40.0%	40.0%	
Geothermal	90.0%	90.0%	90.0%	90.0%	
Hydro	50.0%	50.0%	50.0%	50.0%	
Solar - residential roofs	17.3%	17.3%	17.3%	17.3%	
Solar - commercial roo	17.3%	17.3%	17.3%	17.3%	
Solar - utility scale	22.7%	22.7%	22.7%	22.7%	
Municipal Solid Waste	70.0%	70.0%	70.0%	70.0%	
Ocean Energy	20.0%	20.0%	20.0%	20.0%	
Biodiesel	95.0%	95.0%	95.0%	95.0%	
Lanai Winds	42.0%	42.0%	42.0%	42.0%	
Diesel Fuel	100.0%	100.0%	100.0%	100.0%	

Figure 10: Capacity Factor Inputs Data Completion Summary

- Use default capacity factors for ALL energy resources at the selected location this checkbox applies default capacity factors from the tool to each generation technology
- Use default capacity factors for this energy resource at the selected location this checkbox applies a default capacity factor for the particular energy resource for the specified location only
- Use constant capacity factor over scenario duration this checkbox allows the user to input on capacity factor and then copy it for every year in the scenario



Select a	Location: Oahu	and an		default cana	city factors f	or ALL energy reso	rces at the selected lo	ration	onu to All Logations
			Use	default capa	acity factors f	or this energy reso	irce at the selected loc	ation	opy to All Locations
			Use	constant ca	pacity factor	over scenario durat	on		View Data Sources
Select	Enerav Resource		, 000	constant ca	puerey ruceor				View Data Sources
OF	ossil Fuel Energy Resou	rces	Renewable E	Energy Resou	irces				
Г	Diesel Fuel	•	Biomass						
Jurren	itly viewing data	a for Oanu	(location 1 o	ot 4)	_				
Copy fac	tors from an existing	scenario: s	elect a Scenario		Cop	by Inputs			
Current	Vear				_				
	rear								
Year	Factor								
Year 2014	Factor 80.0%								
Year 2014 Year	Factor 80.0%	Year	Factor	Year	Factor	Sava	Nort		
Year 2014 Year 2015	Factor 80.0%	Year 2025	Factor 80.0%	Year 2035	Factor	Save	Next		
Year 2014 Year 2015 2016	Factor 80.0% Factor 80.0% 80.0%	Year 2025 2026	Factor 80.0% 80.0%	Year 2035 2036	Factor	Save	Next		
Year 2014 Year 2015 2016 2017	Factor 80.0% Factor 80.0% 80.0% 80.0%	Year 2025 2026 2027	Factor 80.0% 80.0% 80.0%	Year 2035 2036 2037	Factor	Save	Next		
Year 2014 Year 2015 2016 2017 2018	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028	Factor 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038	Factor	Save	Next		
Year 2014 Year 2015 2015 2016 2017 2018 2019	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028 2029	Factor 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038 2039	Factor	Save	Next		
Year 2014 2015 2015 2016 2017 2018 2019 2020	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028 2029 2030	Factor 80.0% 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038 2039 2040	Factor	Save	Next		
Year Year 2014 Year 2015 2015 2016 2017 2018 2019 2020 2021	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028 2029 2030	Factor 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038 2039 2040	Factor	Save	Next		
Year 2014 2015 2015 2016 2017 2018 2019 2020 2021 2022 2022	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028 2029 2030 2031 2032	Factor 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038 2039 2040 2041 2042	Factor	Save	Next		
Year Year 2014 2014 Year 2015 2016 2017 2018 2019 2020 2020 2021 2022 2023 2023	Factor 80.0% Factor 80.0% 80.0% 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2025 2026 2027 2028 2029 2030 2031 2032 2033	Factor 80.0% 80.0% 80.0% 80.0% 80.0% 80.0%	Year 2035 2036 2037 2038 2039 2040 2041 2042	Factor	Save	Next		

Figure 11: Capacity Factor Inputs Data Entry

Renewable Generation Project Inputs

The next step in scenario data entry is to enter renewable generation project information. Projects are added to the scenario one-by-one using the "Add Generation Project" button, and more projects can be added or deleted at any point. Project data is used to calculate renewable electricity supply and costs for the scenario. To enter renewable energy project data, assign the project a name and select the energy resource that the projects uses. Then, specify the year the project came online and the nameplate capacity. This capacity will be adjusted using the appropriate capacity factor for the selected location. The Scenario Tool allows for an optional, one-time increase in project installed capacity during the scenario to model project renovations or expansions, and this can be added using the "Year Capacity Added" and "Added Capacity" fields. The last three fields in the renewable energy project data table are read-only but show data that is used for calculations. The "Annual Generation" column shows the amount of energy produced by each project based on the total capacity and capacity factor for the associated energy resource at that location.



Current Scenario: Scenario B

The next step in scenario data entry is to enter renew Project data is used to calculate renewable electricit projects uses. Then, specify the year the project can Tool allows for an optional, one-time increase in cap Capacity" fields. The last three fields in the renewab energy produced by each project based on the total Residential and commercial solar capacity can also	vable generation project in y supply and costs for the s ne online and the namepla acity during the scenario to le energy project data tabi capacity and capacity facto be modeled as increased	formation. cenario. T te capacity model pro e are read- or for the as increment	Projects are added to the o enter renewable energy /. This capacity will be ac oject renovations or expa- only but show data that i ssociated energy resource ally over the scenario du	e scenario one-, y project data, djusted using the nsions, and this s used for calcu e at that location ration using the	by-one, and more ssign the project. e appropriate cap can be added us ations. The "Ann 1. table at the botton	projects can be a name and sele acity factor for the ing the "Year Ca ual Generation" m of this page.	added and dei ect the energy r e selected loca apacity Added" column shows	leted as necessary. esource that the tion. The Scenario and "Added the amount of		
Currently viewing data for Oahu (location	n 1 of 4)									
Select a Location: Oahu	•									
Copy Renewable Generation Project Inputs from an Existing Scenario: Select a Scenario 💽 Copy Inputs										
Units of Measure										
O Gigwasts (GW) Megawatts (MW) Million British Thermal Units per Hours (MMBtu/hr)										
Renewable Energy Generation P	roiect Data for Oah	u				Add	Generation	Toject		
 ,	,	Veer		Veer Canadity	Added Canaaity	Total Canaaitu	Eviating	Annual]	
Project Name	Energy Resource	Online	Capacity (MW)	Added	(MW)	(MW)	Planned	Generation (MWh)		
Campbell Industrial Park Generation Station	Biodiesel	2009	6		0	6	Existing	49,932	Delete Project	
H Power	Municipal Solid Waste	1990	46	2012	27	73	Existing	447,636	Delete Project	
Honua Technologies	Municipal Solid Waste	2013	7	2020	6	13	Existing	79,716	Delete Project	
First Wind Kahuku Wind Farm	Onshore Wind	2011	30		0	30	Existing	105,120	Delete Project	
First Wind Kawailoa	Onshore Wind	2012	69		0	69	Existing	241,776	Delete Project	
Kalaeloa Solar Power I	Solar - utility scale	2015	5		0	5	Planned	9,943	Delete Project	
Kalaeloa Solar Power II	Solar - utility scale	2013	5		0	5	Existing	9,943	Delete Project	
Kapolei Sustainable Energy Park	Solar - utility scale	2012	1		0	1	Existing	1,989	Delete Project	
IC Sunshine	Solar - utility scale	2013	5		0	5	Existing	9,943	Delete Project	
Kalaeloa Renewable Energy Park	Solar - utility scale	2015	5		0	5	Planned	9,943	Delete Project	
Kalaeloa Home Lands Solar	Solar - utility scale	2014	5		0	5	Existing	9,943	Delete Project	
Caste and Cooke Soalr Farm - Mililani South	Solar - utility scale	2010	20		0	20	Existing	39,770	Delete Project	
Residential Solar	Solar - residential roofs	2030	0		0	0	Planned	-	Delete Project	
Commercial Solar	Solar - commercial roofs	2030	0		0	0	Planned	-	Delete Project	
Lanai/Molokai Wind	Onshore Wind	2015	117	2020	117	234	Planned	819,936	Delete Project	
Lanai Wind	Onshore Wind	2025	116			116	Planned	406,464	Delete Project	

Figure 12: Renewable Generation Project Inputs

The Scenario Tool also allows for incremental increases of residential solar and commercial solar generation. For these two energy resources, the user can input the total generation capacity on an annual basis. These capacities are included in the total installed generation capacity calculations, and residential and commercial solar generation can also be modeled as projects. The same cost factors are applied to this annual increase in generation capacity and to solar generation that is modeled as projects. Users can also use the "Automatically increase to meet target" option to model a linear increase in generation capacity over the scenario duration from the "Starting Capacity" to the "Target Capacity" in the final year of the scenario duration.



Figure 13: Residential and Commercial Solar Generation



Non-Renewable Generation Inputs

Unlike renewable generation, non-renewable generation is modeled as the total amount of generation rather than as projects. This allows the tool to show the decrease in necessary non-renewable generation over the scenario as renewable generation projects are added.

current Scenario: Scenario B Unlike renewable generation, non-renewable generation is modeled as a total amount of generation rather than as projects. This allows the tool to show the decrease in necessary non- renewable generation over the scenario as renewable generation projects are added. On this tab, enter the total non-renewable generation capacity and the distribution among non- renewable energy types in the two tables below. Data Completion Summary								
Non-Renewable Generation	Oahu	Hawaii	Kauai	Maui	Кеу			
Total Demand in 2030	7,339,297	1,226,401	537,491	1,206,328	Oata Not Entered			
Renewable Supply in 2030	2,446,642	697,506	291,858	534,439	O: Data Missing			
Non-Renewable Supply in 2030	4,892,655	528,895	245,633	671,889				
Unmet Demand in 2030	Demand Met	Demand Met	Demand Met	Demand Met				

Figure 14: Non-Renewable Generation Data Completion Summary

On the Non-Renewable Generation input screen, data is entered in two tables that capture the total amount of all non-renewable generation capacity and the distribution of that capacity across fuel types, respectively. In the "Non-Renewable Generation over Scenario Duration" table, the user enters the total combined amount of nonrenewable generation at each location in the scenario. The user can change the units of measure for this table using the radio buttons above the table.

The user can also use the "Use Non-Renewable Generation to meet demand" checkbox to automatically calculate the difference between annual electricity demand and supply met by renewable generation projects. The tool then enters this difference into the annual capacity fields in the table. In order to use this feature, capacity factor data must be entered for the non-renewable energy resources. If renewable generation projects or capacity factor data is changed after using this feature, the amount of non-renewable generation needed to meet demand may change, and the user can check this box again to rerun the autofill calculations.

Non-Renewable Generation Capacity

On the Non-Renewable Generation input screen, data is entered in two tables that capture the tot across fuel types, respectively. In the "Non-Renewable Generation over Scenario Duration" table location in the scenario. The user can change the units of measure for this table using the radio meet demand" checkbox to automatically calculate the amount difference between annual dema difference into the annual capacity fields in the table. In order to use this feature, capacity factor or projects or capacity factor data is changed after using this feature, the amount of non-renewable g again to rerun the autoful calculations.

rrent Non-Renewa	ble Generation					
	Non-Renewable					
	Generation					
Year	Capacity (MW)	Use Non-Renewable Generation				
2014	679	N	leet Demand			
	Non-Renewable		Non-Renewable			
n-Renewable Gene	eration over Scenario Duratio	on				
	Generation		Generation Canacit			
Year	Capacity (MW)	Year	(MW)			
2015	634	2025	58			
2015 2016	634	2025	58			
2015 2016 2017	634 656 658	2025 2026 2027	58			
2015 2016 2017 2018	634 656 658 660	2025 2026 2027 2028	58 57 57 57			
2015 2016 2017 2018 2019	634 656 658 660 669	2025 2026 2027 2028 2029	58 57 57 57 57 57			
2015 2016 2017 2018 2019 2020	634 656 658 660 669 624	2025 2026 2027 2028 2029 2030	58 57 57 57 57 56 56 56			
2015 2016 2017 2018 2019 2020 2021	634 656 660 669 624 625	2025 2026 2027 2028 2029 2030 2031	58 57 57 57 57 57 56 56			
2015 2016 2017 2018 2019 2020 2021 2022	634 656 668 660 669 624 625 625	2025 2026 2027 2028 2029 2030 2031 2032	58 57 57 57 56 56 55			
2015 2016 2017 2018 2019 2020 2021 2022 2022 2023	634 666 668 660 669 624 625 628 628	2025 2026 2027 2028 2029 2030 2031 2032 2033	58 57 57 57 57 56 55			

Figure 15: Non-Renewable Generation Data Entry, Generation Capacity



The second table on for non-renewable generation data is the "Non-Renewable Energy Distribution" table on the lower half of the screen. For each type of non-renewable generation, the percentage of the total allocation to that type must be entered, and the total must equal 100%. This data is required to calculate the amount of each type of fuel used in the scenario and the cost of each type of non-renewable generation. The Scenario Tool allows for a change in the distribution over the length of the scenario. The "Use constant distribution over scenario duration" checkbox above this table can also be checked to speed up data entry and use the same distribution for each year of the scenario.

	Non-Renewable Ene The second table on for no the percentage of non-rene each type of non-renewabl checkbox above this table	ergy Distribution on-renewable generation d ewable capacity, not total c le generation. The Scenar e can also be used to speed	Vise constant distribution over scenario duration lata is the "Non-Renewable Energy Distribution" table on the lower half of the screen. For each type of non-renewable generation, apacity, must be entered. This data is required to calculate the amount of each type of fuel used in the scenario and the cost of io Tool allows for a change in the distribution over the length of the scenario. The "User constant distribution over scenario duration" d up data entry and use the same distribution for each year of the scenario.
	Year	Diesel Fuel	
	2014	100%	
	2015	100%	
	2016	100%	
	2017	100%	
	2018	100%	
	2019	100%	
	2020	100%	
	2021	100%	
	2022	100%	
	2023	100%	
	2024	100%	
	2025	100%	
	2026	100%	
	2027	100%	
	2028	100%	
	2029	100%	
	2030	100%	
	2031		
	2032		
	2033		
_		******	

Figure 16: Non-Renewable Generation Data Entry, Energy Distribution

Financial Inputs

Scenario energy costs are calculated for renewable generation, fuel-based generation, energy efficiency, and grid upgrade investments, and all financial data for these four categories is entered on the Financial Inputs screen. Similar to the other data entry screens, financial data is entered for each location in the scenario individually. However, once data for a single location has been entered, that data can be copied to the other locations in the scenario using the "Copy Financial Inputs to All Locations" button.

Scenario energy costs are calculate four categories is entered on the Fi However, once data for a single loc button.	ed for nanci ation	renewable g ial Inputs scre has been en	enera en. S tered	tion, fuel-basi Similar to the c that data can	ed gen other da be cop	eration, energ ta entry scree bied to the othe	y eff ns, f er lo	iciency, and gr inancial data is cations in the s	d upgrade investm entered for each lo cenario using the "	ents, and all financial data for these ocation in the scenario individually. 'Copy Financial Inputs to All Locations"
Data Completion Summa	y	-								
Energy Resource	Oa	ihu	Haw	aii	Kauai		Ma	ui		Key
Biomass	\$	6,100,000	\$	6,100,000	\$	6,100,000	\$	6,100,000		Oata Not Entered
Onshore Wind	\$	3,100,000	\$	3,100,000	\$	3,100,000	\$	3,100,000		O: Data Missing
Offshore Wind	\$	3,100,000	\$	3,100,000	\$	3,100,000	\$	3,100,000		
Geothermal	\$	5,300,000	\$	5,300,000	\$	5,300,000	\$	5,300,000		
Hydro	\$	3,600,000	\$	3,600,000	\$	3,600,000	\$	3,600,000		
Solar - residential roofs	\$	5,800,000	\$	5,800,000	\$	5,800,000	\$	5,800,000		
Solar - commercial roofs	\$	5,000,000	\$	5,000,000	\$	5,000,000	\$	5,000,000		
Solar - utility scale	\$	4,100,000	\$	4,100,000	\$	4,100,000	\$	4,100,000		
Municipal Solid Waste	\$	9,900,000	\$	9,900,000	\$	9,900,000	\$	9,900,000		
Ocean Energy	\$	10,000,000	\$	10,000,000	\$	10,000,000	\$	10,000,000		
Biodiesel	\$	-	\$	-	\$	-	\$	-		
Lanai Winds	\$	3,100,000	\$	3,100,000	\$	3,100,000	\$	3,100,000		
Diesel Fuel	\$	-	\$	-	S	-	S	-		

Figure 17: Financial Inputs Data Completion Summary



Financial data for renewable energy investments is entered based on a per megawatt basis. For each type of renewable energy in the scenario, the user should enter the capital cost and annual operations and maintenance costs based on the cost per megawatt of installed capacity. These costs are then applied to the total amount of installed capacity based on the projects entered for each renewable energy resource type. Useful life data is also required for each type of energy resource. Next, there are four data elements used to calculate the cost of financing renewable energy investments: the debt to equity ratio, cost of equity, interest rate, and loan duration.

					View Data	Sources	Sav	e	Next	
Renewable Energy Financial Data Financial data for renewable energy investments is entered based on per megawatt costs. For each type of renewable energy in the scenario, the user should enter the capital cost and annual operations and maintenance costs based on the cost per megawatt of installed capacity. These costs are then applied to the total amount of installed capacity based on the projects entered for each renewable energy resource type. Useful life data is also entered for each type of energy resource. Next, there are four data elements used to calculate the cost of financing renewable energy investments: the debt to equity ratio, cost of equity, interest rate, and loan duration.										
Energy Resource	Default or Custom	Capital Cost (\$/MW)	Annual O&M Cost (\$/MW)	Useful Life	Debt to Equity Ratio	Cost of Equit	ty (%)	Interest Rate	Loan Duration (years)	
Biomass	Custom	\$6,100,000	\$713,700	25	0.7	10%		7%	12	
Onshore Wind	Custom	\$3,100,000	\$62,000	20	0.75	10%		7%	20	
Offshore Wind	Custom	\$3,100,000	\$62,000	20	0.75	10%		7%	20	
Geothermal	Custom	\$5,300,000	\$413,400	30	0.5	10%		7%	15	
Hydro	Custom	\$3,600,000	\$39,600	50	0.7	10%		7%	13	
Solar - residential roofs	Custom	\$5,800,000	\$58,000	25	0.75	10%		7%	10	
Solar - commercial roofs	Custom	\$5,000,000	\$50,000	25	0.75	10%		7%	10	
Solar - utility scale	Custom	\$4,100,000	\$41,000	25	0.75	10%		7%	20	
Municipal Solid Waste	Custom	\$9,900,000	\$603,900	40	0.7	10%		7%	14	
Ocean Energy	Custom	\$10,000,000	\$300,000	25	0.7	10%		7%	10	
Biodiesel	Custom	\$0	\$72,244	40	0.7	10%		7%	15	
Lanai Winds	Custom	\$3,100,000	\$62,000	20	0.75	10%		7%	20	

Figure 18: Financial Inputs Data Entry, Renewable Energy Financial Data

The next category of costs on the financial inputs screen is fuel data. The fuel costs entered here are used to calculate the total cost of fuel consumption for the scenario. This category includes non-renewable energy, such as fossil fuels, and fuel costs for renewable fuel types, including biodiesel and biogas. Users should not include the cost of fuel in the operations and maintenance cost for biodiesel and biogas if also entering a separate cost of fuel to avoid double-counting.

For fuel costs, the user must enter:

Energy Resource

Biodiesel

Diesel Fuel

- 1. Units of measure for each fuel type, either barrels or cubic feet, and the fuel consumption, which should be entered based on how many units of measure are required to produce one megawatt hour of energy for that energy resource type,
- 2. Fuel cost, as a cost per the unit of measure selected for the energy resource type,

Measure

Gallons

Gallons

Custom

Custom

Custom

3. Optional fuel escalation percentage if the cost of the fuel is predicted to increase over the scenario duration, which is applied to each year of the analysis and results in a compounding increase in fuel price.

Fuel Data							
The next category of costs on the final category includes non-renewable enerallows modeling of both project invest entering a fuel cost in order to avoid of consumption, which should be entere the user should enter the fuel cost, as if the cost of the fuel is oredired to him.	ncial inputs scre ergy, such as fos tment costs and louble counting. ad based on how a cost per the u crease over the s	en is fuel data. The sil fuels, and fuel co ongoing fuel costs, For fuel costs, the many units of mea- nit of measure sele congrin duration	e fuel costs entered he costs for renewable fue and users should no user must enter the u isure are required to j cted for the energy re This escalation perce	ere are used to calc el types, including b t include the cost of nits of measure for oroduce one megav source type. Finally ntare is applied to	ulate the total fuel cons iodiesel and biogas. F fuel in the operations a each fuel type, either b watt hour of energy for f y, the user can apply at each year of the analys	sumption for the scenario. This for biodiesel and biogas, this and maintenance cost if also narrels or cubic feet, and the fuel that energy resource type. Next, n option fuel escalation percenta is and results in a compounding	ge
increase in fuel price.			nne ecoaranen peree		aan your or the analys	ie and recalle in a competitioning	
			* Fuel consumption in	Fuel Units of Measur	e/MWh produced, **Cost	of fuel in \$/Fuel Unit of Measure	
	Default or	Fuel Unit of			Fuel Escalation %		

Fuel Consumption*

Figure 19: Financial Inputs Data Entry, Fuel Data

Fuel Cost**

\$602.03

\$126.07

(Optional)

0%

1%



The third category of costs captured on the financial inputs screen is for energy efficiency. **Costs for energy efficiency are entered as a cost per megawatt hour of avoided demand**, and they can be entered for each year of the scenario in order to model a change in energy efficiency upgrades over time. The user can also apply the same cost to each year of the analysis using the "Use constant cost of energy efficiency in scenario" check box above the table.



Figure 20: Financial Inputs Data Entry, Energy Efficiency

The fourth and final financial data type entered on this screen is for investments in grid upgrades. These costs are modeled as flat additional costs incurred each year of the scenario. A portion of these costs is included in the total cost of electricity per kilowatt hour on the scenario dashboard.



Figure 21: Financial Inputs Data Entry, Investments in Grid Upgrades

Scenario Dashboard

The scenario dashboard displays the status of data entry for the scenario and shows output metrics. All information on this screen is read-only and shows data that has been entered and saved previously. In the top right corner of the screen, the "Data Requirements" table shows the status of data entry for the scenario – red circles in the table indicate missing data, yellow circles indicate incomplete data. The first table on the scenario dashboard shows the scenario start year and duration for reference, and the second table shows the scenario clean energy and renewable portfolio standard



targets for each location and for the scenario overall as well as the actual percentage for each.

The scenario dashboard can also be used to export scenario reports, which are explained in more detail in the next section.

Scenario Infor	mation		Data Requirements Chec	k	Scenario Reports	
Scenario Start Year	2014	Baseline Data	•	Data Complete	Export Scenario Inputs	
Scenario Duration	16	Resource Potential	•	Data Complete	Report	
		Capacity Factors	•	Data Complete		
		Generation Projects	•	Data Complete	Export Scenario Outputs	
		Financial Data	•	Data Complete	Report	
		Scenario Targets	•	Data Complete		
Scenario Energy Targets					Scenario Energy Costs for Scenario Totals	
		Clean Energy Actual	Renewable Portfolio	Renewable Portfolio	Scenario Investments	
Scenario Targets	Clean Energy Target (%)	(%)	Standard Target (%)	Standard Actual (%)	Renewable Energy Investments (Planned Projects)	\$ 3,070,189,255
Scenario Target: Oahu	70%	45%	30%	22%	Energy Efficiency Investments	\$ 2,893,287,139
Scenario Target: Hawaii	70%	71%	30%	47%	Grid Upgrade Investments	\$ -
Scenario Target: Kauai	70%	63%	30%	41%	Total Energy Investments	\$ 5,963,476,393
	70%	58%	30%	34%	Other Scenario Energy Costs	
Scenario Target: Maui					Renewable Energy costs (Existing projects)	\$ 6,543,695,036
Scenario Target: Maui Scenario Target:					Non Renewable Energy Costs	C 14 000 250 022
Scenario Target: Maui Scenario Target: Scenario Total Target	70%	50%	30%	27%	Non-Reliewable Energy Costs	0 14,050,250,055
Scenario Target: Maui Scenario Target: Scenario Total Target	70%	50%	30%	27%	Total Other Scenario Energy Costs	\$ 21,433,953,069

Figure 22: Scenario Dashboard

Below the Scenario Targets table is a drop-down menu that controls the view of the tables below it. This menu allows the output metrics to be viewed as Scenario Totals or as an individual view for each location. The Electricity Demand and Supply table shows the projected demand, energy efficiency, non-renewable generation supply, renewable generation supply, percentage of clean energy, percentage of renewable energy, and any unmet demand for the selected location or scenario total. If there is unmet demand, the user should either add more renewable generation projects or increase the amount of non-renewable generation. The next table shows supply and cost outputs for each of the energy resource types in the scenario.

View Scenario Totals or Results fo	r a Location:	Scenario Totals				Total Scenario Energy Cos	its	\$ 38,750,484,332		
Currently Viewing Outputs Data	for Scenario To	als								
Electricity Demand and Supply		Distribution by	Energy Resource							
Electricity Demand	Scenario Totals (MWh)	Energy Type	Energy Resource	Total Installed Capacity in 2030 (MW)	Supply in 2030 (MWh)	Total Scenario Supply (2014-2030) (MWh)	Percentage of Total Supply (%)	Percentage of Total Resource Potential (%)	Fotal Scenario Energy Cost (Planned and Existing Projects)	Cost per kWh (¢/kWh)
Projected Demand	206,203,160	Renewable	Biomass	64	449,914	7,368,211	4%	4%	\$ 1,350,178,441	18.32
Energy Efficiency	47,430,937	Renewable	Onshore Wind	553	1,935,960	25,570,440	19%	18%	\$ 3,336,781,875	13.05
Fossil Fuel Energy Supply	117,595,771	Renewable	Offshore Wind	-		-	0%	0%	s -	
Renewable Energy Supply	57,391,627	Renewable	Geothermal	38	299,592	5,093,064	3%	5%	\$ 612,289,567	12.02
Total Supply	222,418,334	Renewable	Hydro	32	137,970	2,345,490	1%	1%	\$ 142,155,972	6.06
Clean Energy %	51%	Renewable	Solar - residential roofs	38	95,475	810,782	1%	1%	\$ 297,888,000	36.74
Renewable Energy %	28%	Renewable	Solar - commercial roofs	135	337,952	2,874,866	3%	2%	\$ 910,560,000	31.67
Avoided Fossil Fuel Consumption (MWI	12,333,356	Renewable	Solar - utility scale	70	139,793	2,355,998	1%	1%	\$ 568,348,560	24.12
Avoided Fossil Fuel Cost	\$ 2,721,015,902	Renewable	Municipal Solid Waste	101	619,332	10,123,932	6%	5%	\$ 2,176,323,435	21.50
Unmet Demand	Demand Met	Renewable	Ocean Energy	-	1000 C 100 - 00	-	0%	0%	s -	
		Renewable	Biodiesel	6	49,932	848,844	0%	0%	\$ 518,398,441	61.07
Add Generation	Projecus)	Renewable	Lanai Winds			-	0%	0%	s -	
		Non-Renewable	Diesel Fuel	552	6,281,484	117,595,771	61%	0%	\$ 25,944,272,903	22.06
			Grid Upgrade Investments			-	N/A	N/A	s -	0.00
			Total Supply	1,588	10,347,404	174,987,398	100%	0%	\$ 35,857,197,193	20.49

Figure 23: Scenario Dashboard

Below all of these two tables are two charts that display the energy distribution for the scenario and the amount of total supply over the duration of the scenario. The pie chart, which shows the distribution of energy types for the final year of the scenario, can be viewed for all energy types, renewable energy only, or non-renewable energy only using the radio buttons above it. In the area chart, energy efficiency is displayed as having a negative impact on demand.





Figure 24: Scenario Dashboard Charts

The final table on the scenario dashboard shows more detailed financial outputs for the scenario. As with the other tables on the dashboard, this table can be viewed for the entire scenario or for an individual location using the drop down menu towards the top of the screen. This table shows supply and cost outputs, separated by new projects and existing projects.

Financial Details for Scenario	Totals								
Energy Type	Energy Resource	Supply in 2030 from new projects (MWh)	Total Supply in 2030 (MWh)	Total Scenario Supply (2014-2030) (MWh)	Inv	estment in New Projects	Cost of Existing Projects	Total Scenario Cost	Cost per kWh (¢/kWh)
Renewable	Biomass	140,160	449,914	7,368,211	\$	420,616,337	\$ 929,562,104	\$ 1,350,178,441	18.32¢
Renewable	Onshore Wind	1,226,400	1,935,960	25,570,440	\$	2,113,798,473	\$ 1,222,983,402	\$ 3,336,781,875	13.05¢
Renewable	Offshore Wind	-	-	-	\$	-	s -	\$ -	
Renewable	Geothermal	-	299,592	5,093,064	\$	-	\$ 612,289,567	\$ 612,289,567	12.02¢
Renewable	Hydro	-	137,970	2,345,490	\$	-	\$ 142,155,972	\$ 142,155,972	6.06¢
Renewable	Solar - residential roofs	-	28,794	242,477	\$	-	s -	\$ 89,088,000	36.74¢
Renewable	Solar - commercial roofs	-	309,158	2,589,955	\$	-	s -	\$ 820,320,000	31.67¢
Renewable	Solar - utility scale	20,482	139,793	2,355,998	\$	83,271,553	\$ 485,077,007	\$ 568,348,560	24.12¢
Renewable	Municipal Solid Waste	128,772	619,332	10,123,932	\$	452,502,892	\$ 1,723,820,543	\$ 2,176,323,435	21.50¢
Renewable	Ocean Energy	-	-	-	\$	-	s -	\$ -	
Renewable	Biodiesel	-	49,932	848,844	\$	-	\$ 518,398,441	\$ 518,398,441	61.07¢
Renewable	Lanai Winds	-	-	-	\$	-	s -	\$ -	
Non-Renewable	Diesel Fuel		6,339,072	118,111,034	\$	-	\$ 14,890,258,033	\$ 14,890,258,033	12.61¢
	Grid Upgrade Investments			-	\$	-	s -	\$ -	0.00¢
	Total Supply	1,515,814	10,309,517	174,649,446	\$	3,070,189,255	\$ 20,524,545,069	\$ 24,504,142,324	14.03¢

Figure 25: Scenario Dashboard, Financial Details

Reports

The Scenario Tool produces two reports for completed scenarios so that users can output key input and output metrics. Both of these reports can be generated from the Scenario Dashboard using the buttons on the top, right hand side of the screen. The scenario reports are separate Excel files, and they are saved to the same folder location as the Scenario Tool. These reports allow the user to capture key input and output metrics and share the results of their scenarios.





Figure 26: Scenario Report Buttons

Scenario Inputs Report

The Scenario Inputs Report shows the input data entered by the user on all tabs. Inputs are shown in the order in which they are entered in the Scenario Tool, and they include whether default or custom data was used, where available.

The Scenario Inputs Report includes the following tables:

- Scenario Information
- Scenario Locations
- Energy Resources
- Baseline Inputs
- Resource Potential Inputs
- Capacity Factor Inputs
- Generation Project Inputs (separate table for each location)
- Residential Solar and Commercial Data
- Non-Renewable Generation Inputs
- Financial Inputs (separate table for each location)
- Energy Efficiency Inputs
- Grid Upgrade Investment Data

cenario ID	16							
icenacio Name	Scenario B							
icenario Author	Kiran							
Jate Laste Edited	1/5/2015							
sumber of Locations	4							
cenario Duration	16							
cenario Locations	Location Name	Clean Target	Renewable Target					
ocation 1 Name	Oahu	0.1	0.7					
ocation 2 Name	Hawaii	0.1	0.7	3				
ocation 3 Name	Kauai	0.1	0.7					
ocation 3 Name ocation 4 Name	Kausi Maul	0.1	0.7	-				
ocation 3 Name ocation 4 Name	Kaual Maul	0.1	0.7		frankting to	A Barranki ana	Location 9	attent
ocation 3 Name ocation 4 Name Energy Resources Insource Type	Kauai Maui Resource Name	0.1 0.1 Shated Resource	0.7 0.7	Allocation	Location 2	Allocation	Location 3	Allocatio
ocation 3 Name ocation 4 Name Energy Resources Insource Type Ienewable	Kauai Maui Resource Name Biomass	0.1 0.1 Shated Resource No	0.7 0.7	Allocation N/A	Location 2 N/A	Allocation N/A	Location 3	Allocatio N/A
ocation 3 Name ocation 4 Name inergy Resources esource Type energable energable esourchis	Kaual Maul Resource Name Biomoss Onshore Wind Offshore Wind	0.1 0.1 Shared Resource No No	0.7 0.7 Execution 1 N/A N/A	Allocation N/A N/A	Location 2 N/A N/A	Allocation N/A N/A	Location 3 N/A N/A	Allocatio N/A N/A
ocation 3 Name ocation 4 Name Inergy Resources Insource Type Iconewable Iconewable Iconewable Iconewable	Kaual Maul Resource Name Biomass Onshore Wind Offshore Wind Geothermal	0.1 0.1 Shared Resource No No No	0.7 0.7 Location I N/A N/A N/A	Allocation N/A N/A N/A	Location 2 N/A N/A N/A	Allocation N/A N/A N/A	Location 3 N/A N/A N/A	Alliseati N/A N/A N/A
ocation 3 Name ocation 4 Name Energy Resources Insource Type Innewable Innewable Innewable Innewable Innewable	Kaual Maul Resource Name Biomoss Onshore Wind Offshore Wind Geothermal Hodro	0.1 0.1 Shared Resource No No No	0.7 0.7 1.nontion 1 N/A N/A N/A N/A	Allocation N/A N/A N/A N/A	Location 2 N/A N/A N/A N/A	Almostion N/A N/A N/A N/A	Location 3 N/A N/A N/A N/A N/A	Alliseată N/A N/A N/A N/A
ocation 3 Name ocation 8 Name Inergy Resources Insource Type tenewable tenewable tenewable tenewable tenewable tenewable	Kaual Maul Resource Name Biomoss Onshore Wind Offshore Wind Offshore Wind Geothermal Hydro Solar - residential ron	0.1 0.1 Shared Resource No No No No	0.7 0.7 N/A N/A N/A N/A N/A	Allocation N/A N/A N/A N/A N/A	Exerction 2 N/A N/A N/A N/A N/A	Affrontion N/A N/A N/A N/A N/A	Location 3 N/A N/A N/A N/A N/A	Allicent3 N/A N/A N/A N/A N/A
ocation 3 Name ocation 3 Name Energy Resources insource Type innovable tenewable tenewable innovable innovable innovable innovable	Kauai Maui Biomoso Chishore Wind Offshore Wind Geothermal Hydro Solar - residential roo	0.1 0.1 Shared Resource No No No No No	0.7 0.7 N/A N/A N/A N/A N/A N/A N/A	Allocation N/A N/A N/A N/A N/A N/A N/A	Essation 2 N/A N/A N/A N/A N/A N/A	Allocation N/A N/A N/A N/A N/A N/A	Location 5 N/A N/A N/A N/A N/A N/A	Allicenti N/A N/A N/A N/A N/A N/A N/A
ocation 3 Name ocation 4 Name Energy Resources Energy Res	Kaual Maul Resource Name Biomass Orshore Wind Ofshore Wind Geothermal Hydro Solar - residential noo Solar - trisidential noo Solar - trisidential noo	0.1 0.1 Shared Resource No No No No No No No	0.7 0.7 N/A N/A N/A N/A N/A N/A N/A	Allocation N/A N/A N/A N/A N/A N/A N/A N/A	Location 2 N/A N/A N/A N/A N/A N/A N/A	Allocation N/A N/A N/A N/A N/A N/A N/A	Invation 3 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	Allocatio N/A N/A N/A N/A N/A N/A N/A N/A

Figure 27: Scenario Inputs Report



Scenario Outputs Report

The Scenario Outputs Report displays the Distribution by Energy Resource from the Scenario Dashboard, with a tab for Scenario Totals and individual tabs for each location. The Energy Distribution and Generated Supply charts are also included in the Scenario Outputs Report.

Scenario ID	16
Scenario Name	Scenario B
Scenario Author	Kiran
Date Laste Edited	1/5/2015
Number of Locations	4
Scenario Duration	16

Scenario Locations	Location Name	Clean Target	Renewable Target
Location 1 Name	Oahu	0.1	0.7
Location 2 Name	Hawaii	0.1	0.7
Location 3 Name	Kauai	0.1	0.7
Location 4 Name	Maui	0.1	0.7

Energy Type	Energy Resource	Supply in 2030 (MWh)	Total Scenario Supply (2014- 2030) (MWb)	Percentage of Total Supply (%)	Percentage of Total Resource Potential (%)	Total Scenario Energy Cost (Planned and Existing Projects)	Cost per kWh (c/kWh)
Renewable	Biomass	449,914	7.368.211	4%	4%	\$1.350.178.441	18.32¢
Renewable	Onshore Wind	1,935,960	25,570,440	19%	18%	\$3,336,781,875	13.05¢
Renewable	Offshore Wind	-	-	0%	0%	\$0	
Renewable	Geothermal	299,592	5,093,064	3%	5%	\$612,289,567	12.02¢
Renewable	Hydro	137,970	2,345,490	1%	1%	\$142,155,972	6.06¢
Renewable	Solar - residential roo	28,794	242,477	0%	0%	\$89,088,000	36.74¢
Renewable	Solar - commercial roo	309,158	2,589,955	3%	1%	\$820,320,000	31.67¢
Renewable	Solar - utility scale	139,793	2,355,998	1%	1%	\$568,348,560	24.12¢
Renewable	Municipal Solid Waste	619,332	10,123,932	6%	5%	\$2,176,323,435	21.50¢
Renewable	Ocean Energy	-	-	0%	0%	\$0	
Renewable	Biodiesel	49,932	848,844	0%	0%	\$518,398,441	61.07¢
Renewable	Lanai Winds	-	-	0%	0%	\$0	
Non-Renewable	Diesel Fuel	6,339,072	118,111,034	61%	0%	\$14,890,258,033	12.61¢
	Grid Upgrade Investme	ents	-	N/A	N/A	\$0	0.00¢
	Total Supply	10,309,517	174,649,446	100%	0%	\$24,504,142,324	14.03¢

Figure 28: Scenario Outputs Report



Figure 29: Scenario Outputs Report



Calculations

Demand

Electricity demand is calculated as the sum of projected electricity demand and electric vehicle demand, less the avoided demand caused by energy efficiency. Demand is calculated separately for each location in the scenario.

Annual Scenario Demand $= \sum_{\substack{Locations \\ - Energy Efficiency}} (Projected Electricity Demand + Electric Vehicle Demand$

Supply

Electricity supply is calculated for each energy resource in the scenario using the total installed capacity and location-specific capacity factor.

Annual Electricity Supply
=
$$\sum$$
 Capacity Factor_{Energy Resource} × Installed Capacity_{Energy Resource}

Electricity Cost

Electricity costs are calculated for both new and existing generation in the Scenario Tool, and they include the capital cost, annual operations and maintenance cost, debt service cost, cost of equity, and fuel cost (if applicable). Since non-renewable energy is not modeled at the project level in the Scenario Tool, non-renewable energy costs only include the cost of fuel over the scenario.

Annual Electricity Cost

= Installed Capacity × (Capital Cost $(^{1}/_{Useful Life} + Debt$ to Equity Ratio × Interest Rate × $(^{Loan Duration}/_{Useful Life}) + (1 - Debt$ to Equity Ratio) × Cost of Equity) + Annual Operations & Maintenance Cost + Fuel Consumption × Cost of Fuel × Escalation $%^{t-2014}$)

