

Hybrid2 Worksheet

Project Name:
 Date:
 Time step: (min)

Load Data

Load description
 AC Primary Time Series
 Time series data
 Time step (min)
 Code for fluctuations Standard deviation in file
 Constant variability
 Constant standard deviation

AC Deferrable
 Name
 Load type Block average Running average

AC Optional
 Name
 Load duration (h)

AC Primary Matrix
 Name
 Time step (min)
 Constant variability
 Daily pattern

1 <input style="width: 50px; height: 15px;" type="text"/>	13 <input style="width: 50px; height: 15px;" type="text"/>	Monthly Pattern	1 <input style="width: 50px; height: 15px;" type="text"/>
2 <input style="width: 50px; height: 15px;" type="text"/>	14 <input style="width: 50px; height: 15px;" type="text"/>		2 <input style="width: 50px; height: 15px;" type="text"/>
3 <input style="width: 50px; height: 15px;" type="text"/>	15 <input style="width: 50px; height: 15px;" type="text"/>		3 <input style="width: 50px; height: 15px;" type="text"/>
4 <input style="width: 50px; height: 15px;" type="text"/>	16 <input style="width: 50px; height: 15px;" type="text"/>		4 <input style="width: 50px; height: 15px;" type="text"/>
5 <input style="width: 50px; height: 15px;" type="text"/>	17 <input style="width: 50px; height: 15px;" type="text"/>		5 <input style="width: 50px; height: 15px;" type="text"/>
6 <input style="width: 50px; height: 15px;" type="text"/>	18 <input style="width: 50px; height: 15px;" type="text"/>		6 <input style="width: 50px; height: 15px;" type="text"/>
7 <input style="width: 50px; height: 15px;" type="text"/>	19 <input style="width: 50px; height: 15px;" type="text"/>		7 <input style="width: 50px; height: 15px;" type="text"/>
8 <input style="width: 50px; height: 15px;" type="text"/>	20 <input style="width: 50px; height: 15px;" type="text"/>		8 <input style="width: 50px; height: 15px;" type="text"/>
9 <input style="width: 50px; height: 15px;" type="text"/>	21 <input style="width: 50px; height: 15px;" type="text"/>		9 <input style="width: 50px; height: 15px;" type="text"/>
10 <input style="width: 50px; height: 15px;" type="text"/>	22 <input style="width: 50px; height: 15px;" type="text"/>		10 <input style="width: 50px; height: 15px;" type="text"/>
11 <input style="width: 50px; height: 15px;" type="text"/>	23 <input style="width: 50px; height: 15px;" type="text"/>		11 <input style="width: 50px; height: 15px;" type="text"/>
12 <input style="width: 50px; height: 15px;" type="text"/>	24 <input style="width: 50px; height: 15px;" type="text"/>		12 <input style="width: 50px; height: 15px;" type="text"/>

DC Primary Time Series
 Time series data
 Time step (min)
 Code for fluctuations Standard deviation in file
 Constant variability
 Constant standard deviation

DC Deferrable
 Name
 Load type Block average Running average

DC Optional
 Name
 Load duration (h)

DC Primary Matrix

Name

Time step

 (min)

Constant variability

Daily pattern

		13	Monthly Pattern	1
1	<input type="text"/>	<input type="text"/>		<input type="text"/>
2	<input type="text"/>	<input type="text"/>		<input type="text"/>
3	<input type="text"/>	<input type="text"/>		<input type="text"/>
4	<input type="text"/>	<input type="text"/>		<input type="text"/>
5	<input type="text"/>	<input type="text"/>		<input type="text"/>
6	<input type="text"/>	<input type="text"/>		<input type="text"/>
7	<input type="text"/>	<input type="text"/>		<input type="text"/>
8	<input type="text"/>	<input type="text"/>		<input type="text"/>
9	<input type="text"/>	<input type="text"/>		<input type="text"/>
10	<input type="text"/>	<input type="text"/>		<input type="text"/>
11	<input type="text"/>	<input type="text"/>		<input type="text"/>
12	<input type="text"/>	<input type="text"/>		<input type="text"/>

Site/Resource Data

Site description

Wind Speed

Time series data

Time step

 (min)

Anemometer height

 (m)

Code for fluctuations

Standard deviation in file

Constant variability

Units of wind speed

Metric

English

Wind speed scale factor

Power law exponent

Reference length scale

 (m)

Reference wind speed

 (m/s)

Nominal turbulence intensity

Air density model

Adiabatic lapse rate

Ideal gas law

Density ratio

Insolation

Time series data

Insolation units

Metric

English

Data time format

Standard time

Solar time

Time step

 (min)

Latitude

 (deg,min)

Longitude

 (deg,min)

Additional time correction

 (h)

Initial Julian day of data

Ground reflectivity

 (%)

Temperature

Time series data

Temperature units

Metric

English

Time step

 (min)

Power System

Power system description

AC Wind Turbine Subsystem

Scale factor

Spacing (m)

Response factor

Avg. O&M cost (\$)

AC Wind Turbine Component

	Turbine 1	Turbine 2	Turbine 3	Turbine 4	Turbine 5
Wind Turbine	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Quantity	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rated power, kW	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hub height, m	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost domestic, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost international, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Tower capital cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Installation cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

AC PV Array Module

Description

of PV Modules in Parallel

of PV Modules in Series

PV Array Efficiency (%)

Rack/Tracker capital cost (\$)

Array installation cost (\$)

Maximum power point tracker Yes No

MPPT efficiency (%)

MPPT cost (\$)

Tracking options Fixed slope
 Horizontal E/W daily adjustment
 Horizontal E/W tracking
 Horizontal N/S tracking
 Tilted N/S tracking
 Two axis tracking

PV array slope (deg)

PV array azimuth (deg)

AC PV Module

Description

PV module temperature (degC)

Solar insolation SRC (W/m²)

Short circuit current (A)

Open circuit voltage (V)

Maximum power point voltage (V)

Maximum power point current (I)

Number cells in series

PV module area (m²)

I_{sc} temperature coefficient (degC)

Capital cost (\$)

Useful life (yr)

V_{oc} temperature coefficient (V/degC)

Cell material band gap (eV)

Ambient temperature NOC (degC)

Solar insolation NOC (W/m²)
 PV module temperature NOC (degC)

AC Diesel Subsystem

	Diesel 1	Diesel 2	Diesel 3	Diesel 4	Diesel 5
Diesel description	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Quantity	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rated power, kW	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
No load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Full load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Balance of plant cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Synchronous Condenser

Fixed AC bus loss (kW)

Dump Load

Description

Rated power (kW)

Capital cost (\$)

Installation cost (\$)

Life (yr)

DC Wind Turbine Subsystem

Scale factor

Spacing (m)

Response factor

Avg. O&M cost (\$)

DC Wind Turbine Component

	Turbine 1	Turbine 2	Turbine 3	Turbine 4	Turbine 5
Wind Turbine	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Quantity	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rated power, kW	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hub height, m	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost domestic, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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Overhaul cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

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Description

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Rack/Tracker capital cost (\$)

Array installation cost (\$)

Maximum power point tracker Yes No

MPPT efficiency (%)

MPPT cost (\$)

Tracking options Fixed slope
 Horizontal E/W daily adjustment
 Horizontal E/W tracking

Horizontal N/S tracking
 Tilted N/S tracking
 Two axis tracking

PV array slope (deg)
 PV array azimuth (deg)

DC PV Module

Description

PV module temperature (degC)
 Solar insolation SRC (W/m²)
 Short circuit current (A)
 Open circuit voltage (V)
 Maximum power point voltage (V)
 Maximum power point current (I)
 Number cells in series
 PV module area (m²)
 I_{sc} temperature coefficient (degC)
 Capital cost (\$)
 Useful life (yr)
 V_{oc} temperature coefficient (V/degC)
 Cell material band gap (eV)
 Ambient temperature NOC (degC)
 Solar insolation NOC (W/m²)
 PV module temperature NOC (degC)

DC Diesel Subsystem

	Diesel 1	Diesel 2	Diesel 3	Diesel 4	Diesel 5
Diesel description	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Quantity	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rated power, kW	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
No load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Full load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Balance of plant cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Battery

Battery bank description

of batteries in series

of batteries in parallel

Bank scale factor

Initial capacity of bank (%SOC)
 Bank installation cost (\$)
 Battery description

Nominal voltage (V)
 Nominal capacity (Ah)
 Charge rate limit (A/Ah remaining)
 Capital cost (\$)
 O&M cost (\$)

Power Conversion

Rotary converter

Rated power (kW)
 Inverter no-load loss (kW)

Inverter full-load efficiency (%)
 Rectifier no-load loss (kW)
 Rectifier full-load efficiency (%)
 Capital cost (\$)
 Installation cost (\$)
 Life (yr)

Bi-directional inverter

Rated power (kW)
 Inverter no-load loss (kW)
 Inverter full-load efficiency (%)
 Rectifier no-load loss (kW)
 Rectifier full-load efficiency (%)
 Capital cost (\$)
 Installation cost (\$)
 Life (yr)

Operational mode Switched Parallel

Inverter

No-load loss (kW)
 Full-load efficiency (%)
 Capital cost (\$)
 Installation cost (\$)
 Life (yr)

Operational mode Switched Parallel

Rectifier

No-load loss (kW)
 Full-load efficiency (%)
 Capital cost (\$)
 Installation cost (\$)
 Life (yr)

Coupled Diesel

Diesel description
 Rated power (kW)
 No fuel consumption (L/hr)
 Full load fuel consumption (L/hr)
 Capital cost (\$)
 Balance of plant cost (\$)
 Overhaul cost (\$)
 Overhaul period (\$)

Dispatch Strategy
 Traditional power smoothing
 Load following
 Cycle charge
 Battery/Renewable power system
 Genset/Renewable system control
 Other

Base Case

Allowed diesel shutdown All All but one
 Diesel dispatch order Computer optimized Prescribed by user
 Minimum diesel run time, h

	Diesel 1	Diesel 2	Diesel 3	Diesel 4	Diesel 5
Diesel description	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Quantity	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Rated power, kW	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
No load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Full load fuel consumption, L/hr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Capital cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Balance of plant cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Overhaul period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Economics

Description

Component Cost

Wind Turbine

Overhaul parameters	Turbine 1	Turbine 2	Turbine 3	Turbine 4	Turbine 5
Cost, \$	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Period, yr	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Wind turbine O&M cost	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	AC	DC			
Domestic turbine cost	<input type="text"/>	<input type="text"/>	(\$)		
International turbine cost	<input type="text"/>	<input type="text"/>	(\$)		
Tower cost	<input type="text"/>	<input type="text"/>	(\$)		
Installation cost	<input type="text"/>	<input type="text"/>	(\$)		

PV Array

Capital cost	<input type="text"/>	(\$)
Installation cost, no MPPT	<input type="text"/>	(\$)
PV rack or tracker cost	<input type="text"/>	(\$)
MPPT cost	<input type="text"/>	(\$)
PV module life	<input type="text"/>	(\$)

Diesel

Average O&M cost, \$	<input type="text"/>
Total capital cost	Hybrid <input type="text"/> Base Case <input type="text"/> (\$)
Balance of plant cost	<input type="text"/> (\$)
Overhaul parameters	Diesel 1 Diesel 2 Diesel 3 Diesel 4 Diesel 5
Cost, \$	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Period, yr	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

Dump Load

Capital cost	<input type="text"/> (\$)
Installation cost	<input type="text"/> (\$)
Life	<input type="text"/> (yr)

Battery

Capital cost	<input type="text"/> (\$)
Installation cost	<input type="text"/> (\$)
Maintenance cost	<input type="text"/> (%/yr)

Power Converter

Capital cost	<input type="text"/>	(\$)
Installation cost	<input type="text"/>	(\$)
Life	<input type="text"/>	(yr)

System Costs

Classification	New system	Retrofit
Diesel fuel cost	<input type="text"/> (\$/l)	
System financial life	<input type="text"/> (yr)	
Balance of system cost	<input type="text"/> (\$)	
Cost of optional load equip.	<input type="text"/> (\$)	
Cost of distrib. enhancement	<input type="text"/> (\$)	
Installation overhead cost	<input type="text"/> (\$)	
Total import tariffs	<input type="text"/> (\$)	
Total shipping cost	<input type="text"/> (\$)	

	Hybrid	Base case
System O&M cost, \$	<input type="text"/>	<input type="text"/>
System administration cost, \$	<input type="text"/>	<input type="text"/>

Economic Parameters

Salvage value of equipment	<input type="text"/> (\$)
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Financial

General inflation rate	<input type="text"/> (%/yr)
Discount rate	<input type="text"/> (%/yr)
Fuel inflation rate	<input type="text"/> (%/yr)

Loan

Loan interest rate	<input type="text"/> (%/yr)
Loan period	<input type="text"/> (yr)
Grace period	<input type="text"/> (yr)
Down payment	<input type="text"/> (fraction)

Price of Power

Primary load	<input type="text"/> (\$/kWh)
Deferrable load	<input type="text"/> (\$/kWh)
Optional load	<input type="text"/> (\$/kWh)

Taxation

Corporate tax rate	<input type="text"/> (%)
Renewable tax incentive	<input type="text"/> (\$/kWh)
Equip. depreciation time	<input type="text"/> (yr)