

Final de Energías Renovables

Energía Solar Fotovoltaica

Energía eólica

CANDEIAS
Sebastián

Aplicación de la energía solar fotovoltaica y eólica

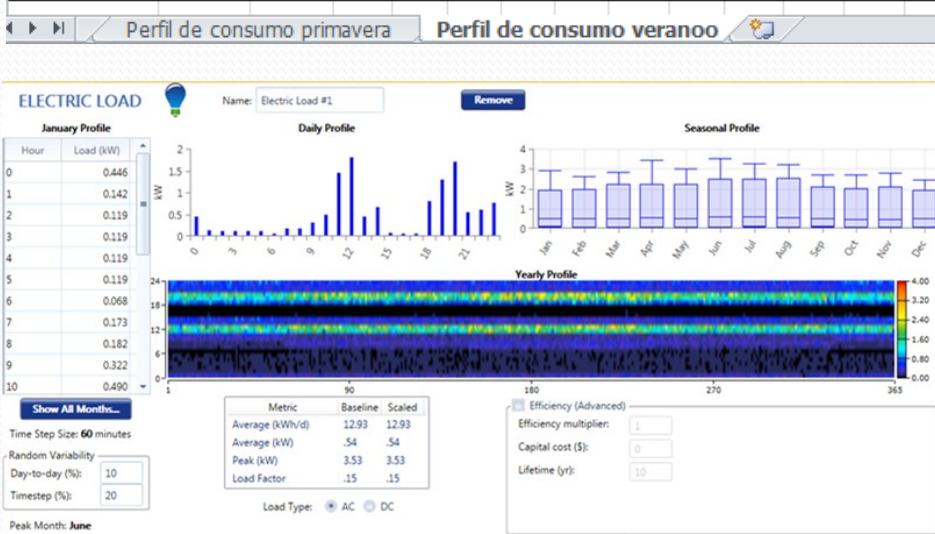


Localización del proyecto



Procedimiento de Cálculo en HOMER

Artefacto	Potencia [W]	Cantidad	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Heladera con freezer	200	1	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	
Microondas	1000	1												0.08	0.08								0.08	0.08			
Lavarrropas semiautom	400	1										0.58								0.58							
Horno Eléctrico	2000	1											0.50	0.50							0.50	0.50					
Campana de extracción	200	1											0.20	0.20							0.20	0.20					
Batidora	250	1										0.05					0.05			0.05			0.05				
Lámparas LED	8	2																									
Televisor	150	1								0.30	0.30			1.00	1.00					0.50	1.00	1.00	1.00	0.70			
PC de escritorio	400	1								0.50	1.00	0.50	0.20								0.50			0.80	0.10		
Lámpara LED	8	1																					0.50	1.00	1.00		
Router/módem	50	1							0.30	0.30	0.30	0.30									0.50	0.30	0.30	0.30	1.00	0.30	
Reloj	2	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Ventiladores	100	3											0.50	0.50	0.50							0.50	0.50	0.50	0.50		
Bomba elevadora	400	1												0.60												0.60	
Plancha	1000	1																			0.50						
Secador Centrífugo	450	1																			0.50						
Lámparas LED	8	2	0.05	0.05	0.05	0.05	0.05	0.20															0.20	0.10	0.10	0.05	
Afeitadora	15	1						0.17																			
Notebooks	40	3							0.80	0.50											0.70	0.80	0.50	0.50			
Veladores	10	3	0.05	0.05	0.05	0.05	0.05																			0.10	
Lámparas LED	8	3																						0.80	0.80	0.10	
Celulares/carga batería	5	4	1.00																							1.00	
Luminarias LED	11	5	1.00	1.00	1.00	1.00	1.00																	1.00	1.00	1.00	
Aspiradora	1200	1														0.50											
arga demandada por hora [KW]			0.142	0.119	0.119	0.119	0.119	0.119	0.068	0.173	0.182	0.322	0.490	1.452	1.805	0.445	0.662	0.075	0.062	0.062	0.800	1.286	1.713	0.540	0.604	0.771	0.771



Yearly Load Data												
Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	0.446	0.446	0.377	0.377	0.377	0.375	0.375	0.375	0.375	0.377	0.377	0.446
1	0.142	0.142	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.142
2	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
3	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
4	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
5	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
6	0.068	0.068	0.106	0.106	0.106	0.135	0.135	0.135	0.106	0.106	0.106	0.068
7	0.173	0.234	0.234	0.234	0.234	0.302	0.302	0.302	0.218	0.218	0.218	0.173
8	0.182	0.182	0.390	0.390	0.390	0.446	0.446	0.446	0.382	0.382	0.382	0.182
9	0.322	0.322	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.262	0.322
10	0.490	0.490	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.490
11	1.452	1.452	1.512	1.512	1.512	1.722	1.722	1.722	1.412	1.412	1.412	1.452
12	1.805	1.805	1.937	1.937	1.937	2.167	2.167	2.167	1.837	1.837	1.837	1.805
13	0.445	0.445	0.312	0.312	0.312	0.332	0.332	0.332	0.312	0.312	0.312	0.445
14	0.662	0.662	0.542	0.542	0.542	0.422	0.422	0.422	0.542	0.542	0.542	0.662
15	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
16	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
17	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
18	0.800	0.800	0.775	0.775	0.775	0.816	0.816	0.816	0.800	0.800	0.800	0.800
19	1.286	1.286	1.702	1.702	1.702	1.981	1.981	1.981	1.596	1.596	1.596	1.286
20	1.713	1.713	2.009	2.009	2.271	2.271	2.271	2.271	1.901	1.901	1.901	1.713
21	0.540	0.540	0.478	0.478	0.478	0.482	0.482	0.482	0.478	0.478	0.478	0.540
22	0.604	0.604	0.473	0.473	0.473	0.484	0.484	0.484	0.473	0.473	0.473	0.604
23	0.771	0.771	0.621	0.621	0.621	0.629	0.629	0.629	0.621	0.621	0.621	0.771

Resultados de Planillas Excel

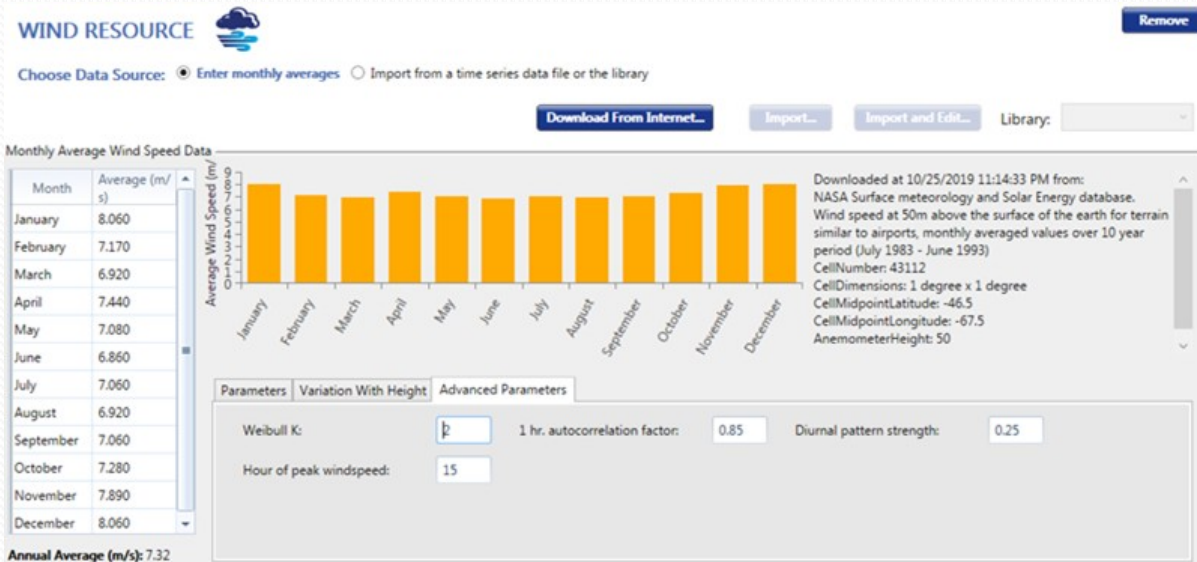
MES	Nº DIAS	HPS (sobre plano inclinado óptimo)	CE= PM* TU	ES	NP=CE*FS / (PPP*HPS* ES) a 60°	NB
ENERO	31	6.87684522	6287.96667	0.6992	5.01	13.56
FEBRERO	28	6.29289815	6287.96667	0.6992	5.48	13.56
MARZO	31	5.27728712	6409.3	0.6992	6.66	13.82
ABRIL	30	4.47556786	6409.3	0.6992	7.85	13.82
MAYO	31	3.62855901	6409.3	0.6992	9.68	13.82
JUNIO	30	3.27545715	6956.975	0.6992	11.64	15.00
JULIO	31	3.54909707	6956.975	0.6992	10.75	15.00
AGOSTO	31	4.20180986	6956.975	0.6992	9.08	15.00
SEPTIEMBRE	30	4.80870564	6202.6	0.6992	7.07	13.38
OCTUBRE	31	5.6226388	6202.6	0.6992	6.05	13.38
NOVIEMBRE	30	6.50746769	6202.6	0.6992	5.23	13.38
DICIEMBRE	31	6.97547436	6287.96667	0.6992	4.94	13.56

Resultados de Planillas Excel

Mes	(I) $\langle V \rangle$ [m/s]	(II) Promedio Mensual [kWh]	(III) Promedio Diario [kWh]
Enero	6.51	131.44	4.24
Febrero	5.79	110.00	3.93
Marzo	5.59	103.98	3.35
Abril	6.01	116.51	3.88
Mayo	5.72	107.83	3.48
Junio	5.54	102.53	3.42
Julio	5.70	107.35	3.46
Agosto	5.59	103.98	3.35
Setiembre	5.70	107.35	3.58
Octubre	5.88	112.65	3.63
Noviembre	6.37	127.35	4.24
Diciembre	6.51	131.44	4.24

CANTIDAD	DESCRIPCION	Precio Unitario	Precio Total	IVA 21% incluido	\$ A PAGAR c/IVA incl.
3	AEROGENERADORES EOLUX	180000.00	540000.00	0.00	540000.00
3	TORRES TIPO RETICULADO 12m	70000.00	210000.00	0.00	210000.00
3	MONTAJES-CABLES-BASES	25000.00	75000.00	0.00	75000.00
60	MTS totales CABLEADO EXTERIOR SINTENAX	396.00	23760.00	0.00	23760.00
12	KAISE KBL122000 AGM	26731.00	320772.00	0.00	320772.00
1	Enertik ICB-5K- 48	73306.00	73306.00	0.00	73306.00
3	FLETES, INSTALACION Y GASTOS ADMIN.	20000.00	60000.00	0.00	60000.00
TOTAL CON IMPUESTOS					1302838.00

Procedimiento de Cálculo en HOMER



Procedimiento de Cálculo en HOMER

PV

Name: Generic flat plate PV

Abbreviation: PV

Remove

Properties

Name: **Generic flat plate PV**

Abbreviation: **PV**

Panel Type: **Flat plate**

Rated Capacity (kW): **3.6**

Manufacturer: **Generic**

www.homerenergy.com

Notes:
This is a generic PV system.

Costs

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
0.300	\$206.20	\$206.20	\$5.00

Click here to add new item

Multiplier: ⬅ ⬅ ⬅

Site Specific Input

Lifetime (years): 25.00 ⬅

Derating Factor (%): 80.00 ⬅

Capacity Optimization

HOMER Optimizer™

Search Space

Size (kW)

0

1.2

2.4

3.6

Electrical Bus: AC DC

Copy To Library

WIND TURBINE

Name: Generic 1 kW

Abbreviation: G1

Remove

Properties

Name: **Generic 1 kW**

Abbreviation: **G1**

Rated Capacity (kW): **1**

Manufacturer: **Generic**

Costs

Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	\$2,857.14	\$2,857.14	\$50.00

Click here to add new item

Multiplier: ⬅ ⬅ ⬅

Site Specific Input

Lifetime (years): 20.00 ⬅

Hub Height (m): 12.00 ⬅ Consider ambient temperature effects?

Quantity Optimization

HOMER Optimizer™

Search Space

Quantity

0

1

2

3

Electrical Bus: AC DC

Power Curve | Turbine Losses | Maintenance

Wind Speed (m/s)	Power Output (kW)
0	0
3	0
4	0.02
5	0.04
6	0.09

Wind Turbine Power Curve

CONTROLLER

Name: HOMER Cycle Charging

Abbreviation: CC

Remove

CAPABILITIES

Component	Min Qty	Max Qty	Bus
Generator	0	20	AcDc
Storage	0	10	DC
PV	0	10	AcDc
WindTurbine	0	2	AcDc
Converter	0	1	AcDc
Boiler	0	1	Thermal
Hydroelectric	0	1	AcDc
Hydrokinetic	0	1	AcDc
Reformer	0	1	Hydrogen
Electrolyzer	0	1	AcDc
HydrogenTan	0	1	Hydrogen

Controller

Capital (\$): \$176.00

Replacement (\$): \$176.00

O&M (\$/year): \$5.00

Lifetime time (years): 25.00 More...

Apply Setpoint State of Charge (%):

Allow diesel-off Operation

Allow generators to operate simultaneously

Allow systems with generator capacity less than peak load

Procedimiento de Cálculo en HOMER

STORAGE

Name: Trojan J200-RE Abbreviation: J200-RE

Properties

Kinetic Battery Model
 Nominal Voltage (V): 12
 Nominal Capacity (kWh): 2.71
 Maximum Capacity (Ah): 226
 Capacity Ratio: 0.49
 Rate Constant (1/hr): 0.376
 Roundtrip efficiency (%): 80
 Maximum Charge Current (A): 40
 Maximum Discharge Current (A): 300
 Maximum Charge Rate (A/Ah): 1

Batteries	Quantity	Capital (\$)	Replacement (\$)	O&M (\$/year)
1	1	\$425.00	\$425.00	\$5.00

Lifetime: throughput (kWh): 2,172.00

Quantity Optimization
 HOMER Optimizer™
 Search Space

Site Specific Input
 String Size: 4 Voltage: 48.0 V
 Initial State of Charge (%): 100.00
 Minimum State of Charge (%): 60.00

CONSTRAINTS

Maximum annual capacity shortage (%): 10.00
 Minimum renewable fraction (%): 70.00
 Operating Reserve

As a percentage of load
 Load in current time step (%): 10.00
 Annual peak load (%): 0.00

As a percentage renewable output
 Solar power output (%): 50.00
 Wind power output (%): 50.00

CONVERTER

Name: System Converter Abbreviation: Convert

Properties

Name: System Converter
 Abbreviation: Converter
www.homerenergy.com
 Notes:
 This is a generic system converter.

Capacity (kW)	Capital (\$)	Replacement (\$)	O&M (\$/year)
5	\$1,164.00	\$1,164.00	\$5.00

Capacity Optimization
 HOMER Optimizer™
 Search Space

Multiplier:

Generic
homerenergy.com
 Andy Kruse
sales@homerenergy.com
 +(1) 720-565-4046
 HOMER Energy
 1790 30th St, Suite 100
 Boulder, CO 80301 USA

HOMER ENERGY

Inverter Input
 Lifetime (years): 15.00
 Efficiency (%): 92.00
 Parallel with AC generator?

Rectifier Input
 Relative Capacity (%): 100.00
 Efficiency (%): 92.00

ADVANCED GRID

Name: Grid Abbreviation: Grid

Simple Rates Real Time Rates Scheduled Rates Grid Extension

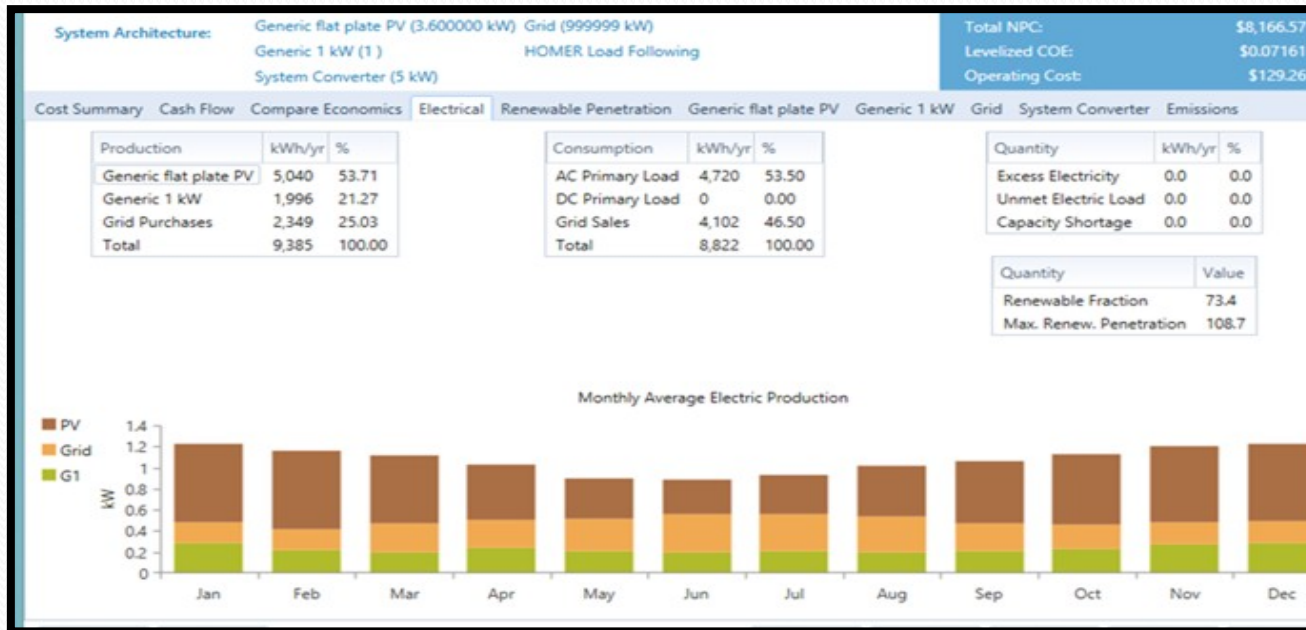
Parameters Emissions

Simple Rates

Grid Power Price (\$/kWh): 0.058
 Grid Net Excess Price (\$/kWh): 0.029

Net Metering
 Net purchases calculated monthly.
 Net purchases calculated annually.

Resultados



RESULTS

Sensitivity Cases
 Left Click on a sensitivity case to see its Optimization Results.

Sensitivity	Architecture							Cost			
Electric Load #1 Scaled Average (kWh/d)	PV (kW)	G1	J200-RE	Grid (kW)	Converter (kW)	Dispatch	COE (\$)	NPC (\$)	Operating cost (\$)	Initial (\$)	
12.9317832	3.60	1		999,999	5.00	LF	\$0.0716	\$8,167	\$129.26	\$6,496	
15.52	2.40	2		999,999	5.00	LF	\$0.0910	\$11,267	\$211.91	\$8,520	

Optimization Results
 Left Double Click on a particular system to see its detailed Simulation Results.

Architecture							Cost				System
PV (kW)	G1	J200-RE	Grid (kW)	Converter (kW)	Dispatch	COE (\$)	NPC (\$)	Operating cost (\$)	Initial capital (\$)	Ren Frac (%)	
3.60	1		999,999	5.00	LF	\$0.0716	\$8,167	\$129.26	\$6,496	73	
3.60	1	4	999,999	5.00	LF	\$0.0853	\$9,728	\$118.55	\$8,196	73	

Quantity	Value	Units
Carbon Dioxide	-1,107.91	kg/yr
Carbon Monoxide	0.00	kg/yr
Unburned Hydrocarbons	0.00	kg/yr
Particulate Matter	0.00	kg/yr
Sulfur Dioxide	-4.80	kg/yr
Nitrogen Oxides	-2.35	kg/yr

Comparación de los Resultados

Demanda Energética [kWh/día]		Resultado "1"	Resultado "2"	Resultado "3"	Resultado "4"	
12.93	NPC (US\$)	\$8167	\$9728	\$14559	\$16120	
	% Energía Renovable	73%	73%	85%	85%	
	% Energía vendida a la red	46.5%	46.5%	60.45%	60.45%	
	% Exceso de electricidad	Nulo	Nulo	Despreciable	Despreciable	
	Emisiones reducidas (kg/año)	CO ₂	1107.91	1107.91	3412.15	3412.15
		SO ₂	4.80	4.80	14.79	14.79
		NO _x	2.35	2.35	7.23	7.23
15.52	NPC (US\$)	\$11267	\$12829	\$14913	\$16474	
	% Energía Renovable	71%	71%	81%	81%	
	% Energía vendida a la red	40.85%	40.85%	54.57%	54.57%	
	% Exceso de electricidad	Nulo	Nulo	Despreciable	Despreciable	
	Emisiones reducidas (kg/año)	CO ₂	694.42	694.42	2815.10	2815.10
		SO ₂	3.01	3.01	12.20	12.20
		NO _x	1.47	1.47	5.97	5.97

Análisis de Sensibilidad

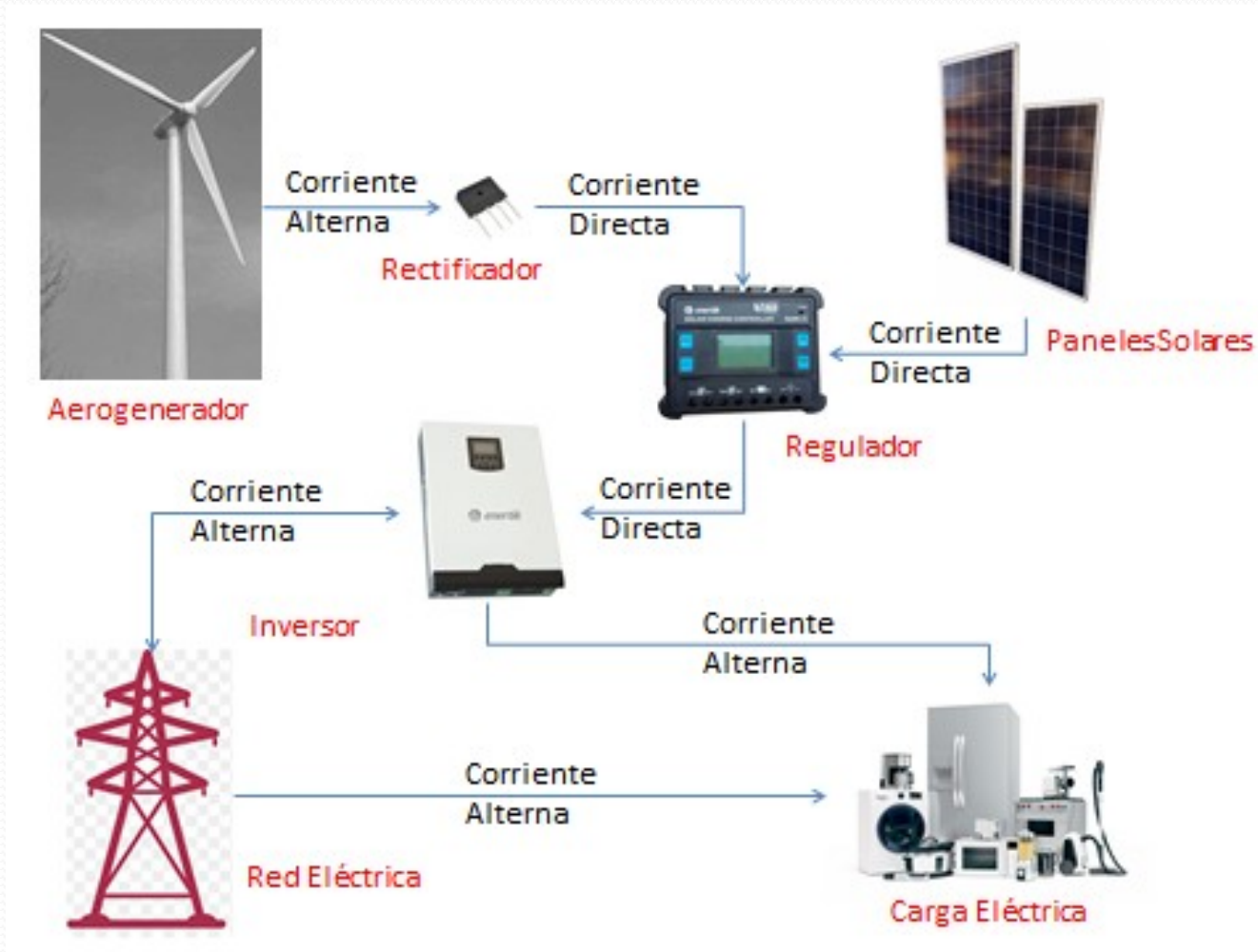
Tipo de sensibilidad		Sensibilidad de "1" (%)	Sensibilidad de "2" (%)	Sensibilidad de "3" (%)	Sensibilidad de "4" (%)
Aumento del 20% de la demanda	NPC (US\$)	38%	32%	2.5%	2.2%
	%Renovable	2% (73 a 71)	2% (73 a 71)	4% (85 a 81)	4% (85 a 81)
	Emisiones (-)	37%	37%	17.5%	17.5%
Aumento del 20% en los precios	NPC	20%	20%	20%	20%
	%Renovable	Insensible	Insensible	Insensible	Insensible
	Emisiones (-)	Insensible	Insensible	Insensible	Insensible
Baja del 10% de disponibilidad del recurso	NPC	46%	38%	4.8%	4.3%
	%Renovable	2% (73 a 75)	2% (73 a 75)	5% (85 a 80)	5% (85 a 80)
	Emisiones (-)	23%	23%	34.5%	34.5%

Conclusiones

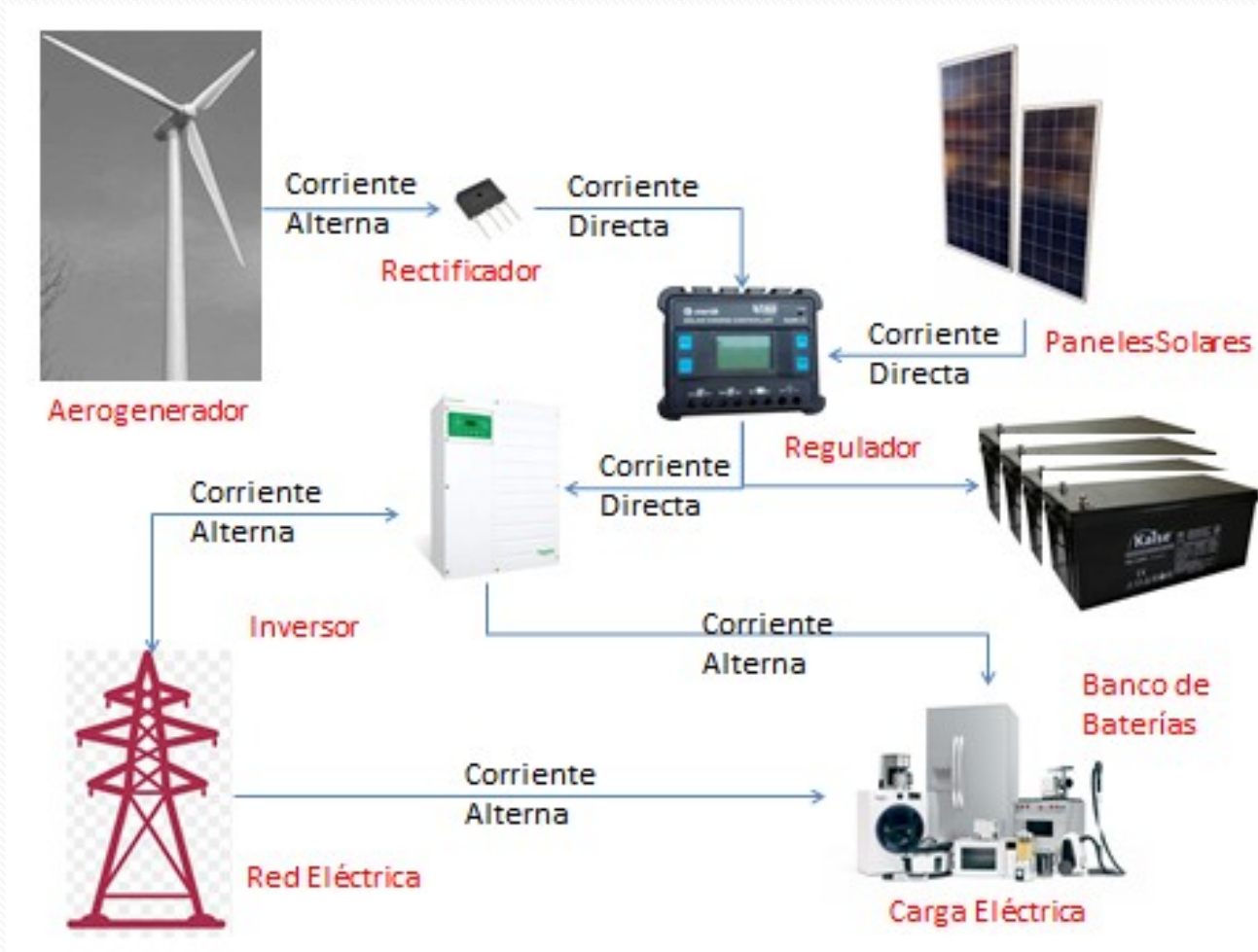
- Todas las posibles soluciones son convenientes según las circunstancias.
- ¿Cuándo y por qué “1”?
- ¿Cuándo y por qué “2”?
- ¿Cuándo y por qué “4”?
- ¿Cuándo y por qué “3”?



Diagramas de Flujo del sistema



Diagramas de Flujo del sistema



GRACIAS POR SU ATENCIÓN

