

microGrid



ALPHATRON

Systems for stand-alone power grids

- AC-coupled solar systems
- Island grid systems



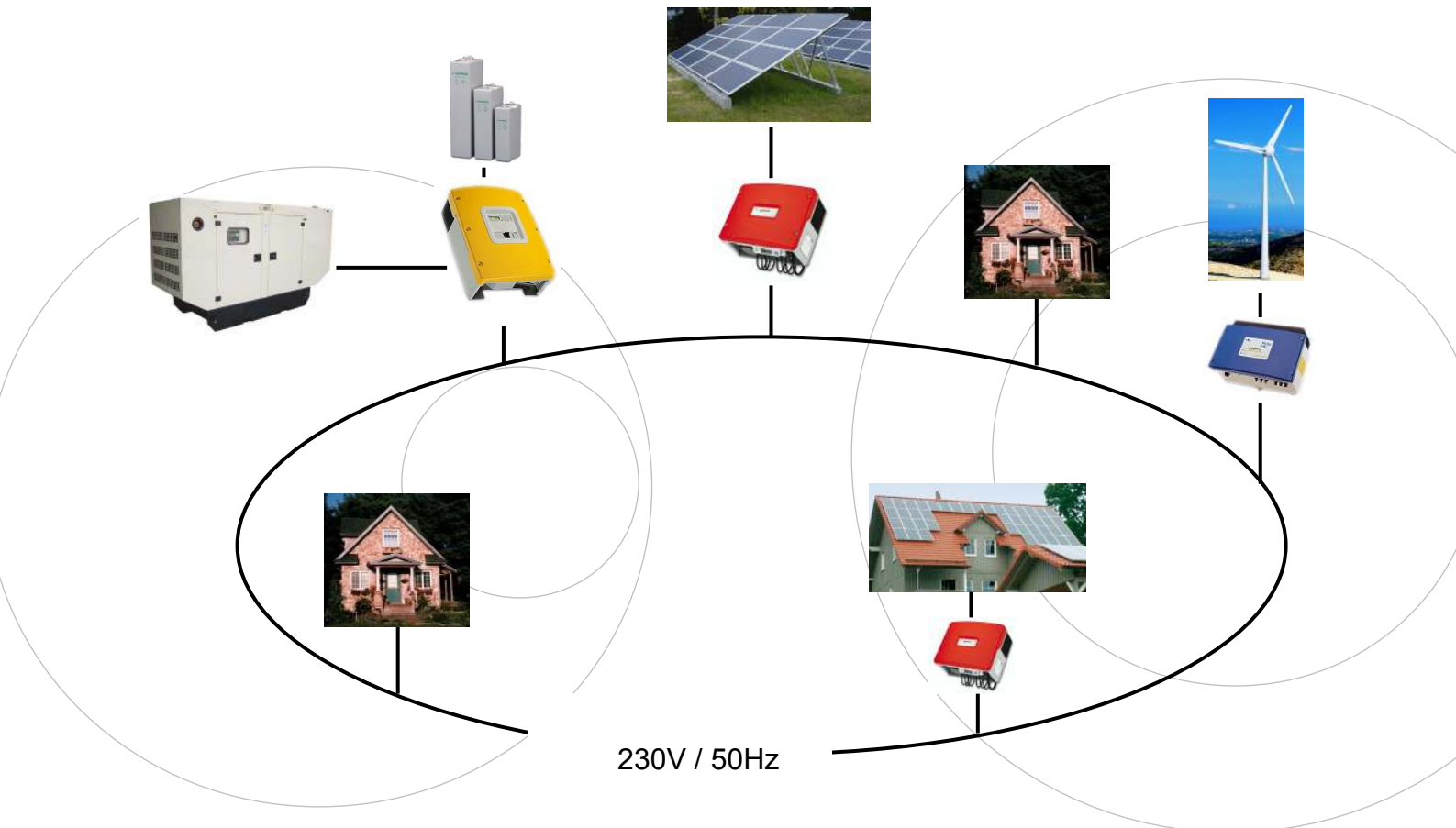
microGrid

Unlike solar home systems that are designed to power a single home or batch, Alpatron microGrids are designed to easily expand by including multiple homes and/or multiple generation sources.

The difference between solar home systems (such as the Alpatron solarPak) and a microGrid, is in the way the system components are connected together. In a solar home system, the different generation sources and inverters are connected together on the DC (battery) side. This limits the distance that components can be

placed apart and it also limits the way in which the system can be expanded.

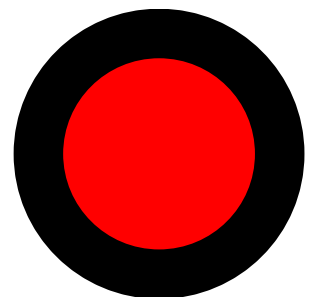
Drawing on technology developed for grid-connected PV systems, in an Alpatron microGrid, the generation sources, battery and loads (consumers) are all connected together on the ac-side. This is called ac-coupling. Unlike DC-power, AC-power is uniform and standardized. Normal ac-reticulation can be used and different sources such as PV, wind, hydro, multiple battery banks etc. can all be integrated into one microGrid.



Alpatron microGrid systems are the best choice of power source for the following applications:

- Power systems for communities or sites with multiple dwellings
- Power systems with more than one source of generation (Solar, wind, hydro etc.)
- Power systems with large distance between source and consumer (e.g. wind turbine on hill)
- Off-grid PV solar systems with more than 1kWp PV solar array

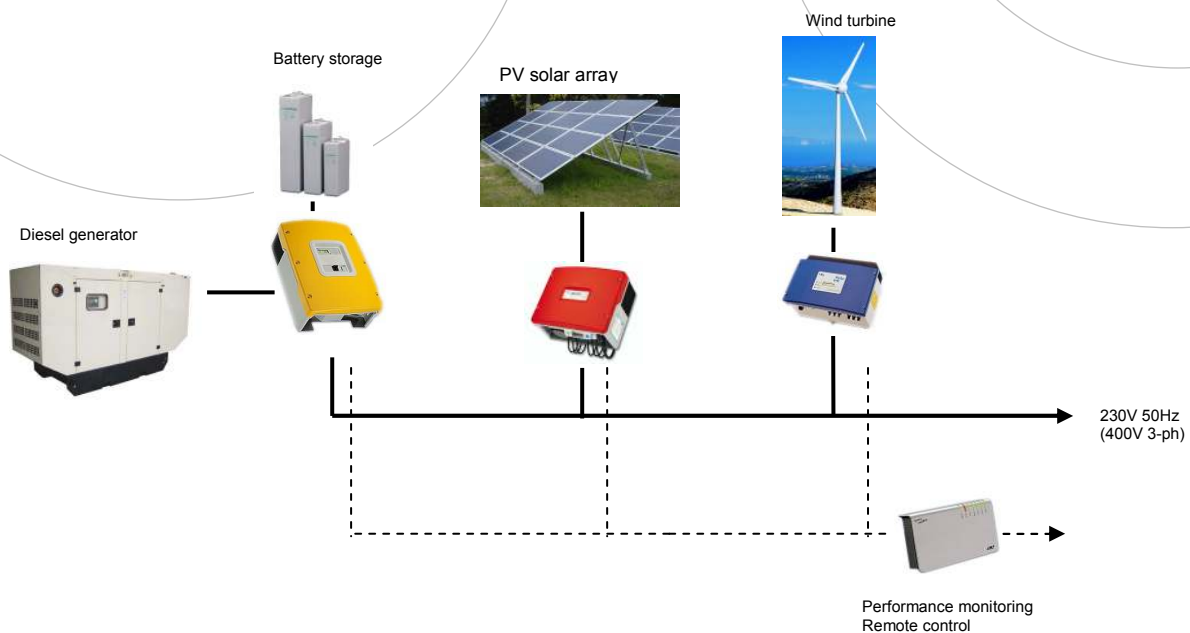
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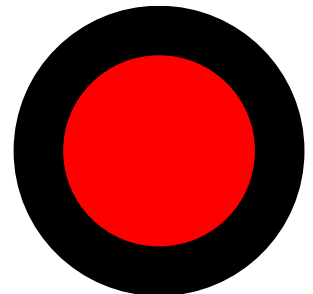
Advantages of microGrid ac-coupling

The main advantages of microGrid ac-coupling are:

- **Natural sharing of resources.** Much like the public grid, within a microGrid, there will be diversification between the connected consumers. The more users are connected to the microGrid, the bigger the advantage of diversification. Less equipment will be required for the same power requirement when the consumers are connected to a microGrid as compared to powering each consumer with e.g. a solar home system.
- **Easy expansion.** Additional consumers, additional generation sources and additional battery capacity can be easily added to a microGrid at any time. The microGrid can grow as e.g. the village grows.
- **Power transmission over long distance.** Because system components are connected together on the ac-side, they can be further apart from each other without the need for heavy DC cables. Standard reticulation techniques such as step-up transformers can be used to transmit power over even greater distances.
- **Easy incorporation of multiple generation sources.** Because the microGrid uses grid-tie technology, different sources such as PV solar, wind, hydro and diesel can all be connected to the system using standard grid-tie inverters.
- **High efficiency.** In a microGrid, PV solar (wind / hydro) power is directly converted into ac-power at very high efficiency (up to 98%). So power can flow directly from source to consumer. This in contrast to solar home systems where PV solar (wind) power is first converted to dc-battery charge voltages and then back again to ac-power for the consumer.
- **High yield.** Using state of the art technology such as string inverters with high voltage string arrays (minimizing cable losses) and Maximum Power Point tracking, ensure that the maximum possible is taken out of the connected PV / wind / hydro generator.
- **Longer battery life.** In a microGrid, there is always one and one only controller that is "in charge" of the battery charging process. This in contrast to solar home systems where multiple controllers follow their own charging regime (e.g. PV controller, wind controller, ac-charger etc.)
- **Easy expansion of battery capacity.** Old and new batteries should not be mixed. If battery capacity needs to be increased in a solar home system, this means the complete battery bank must be replaced. In a multi-cluster microGrid, additional battery capacity can be connected to the system by adding clusters, thus increasing the total storage capacity in the microGrid system without making the old battery bank obsolete.



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microGrid core system

The core of a microGrid is the bi-directional inverter system that creates the ac-power grid to which the energy sources are coupled using grid-tie inverters. The battery inverter also controls the battery charging process and starts and stops the diesel generator.

The microGrid core is selected for the required type (1- or 3-phase) and power requirement. Each microGrid is supplied including all installation materials, cabling and control- and over current devices.

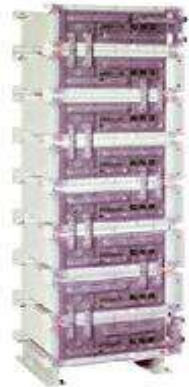
microGrid	P_cont. [kW]	P_1min [kW]	Phase	Max Generator [A]	Battery [V]	Battery Banks
MG-2.2	2.2	3.8	1ph	25	24	1
MG-4.4	4.4	7.6	1ph	50	24	1
MG-6.6	6.6	11.4	1ph / 3ph	75 / 3 x 25	24	1
MG-5.0	5	8.4	1ph	56	48	1
MG-10.0	10	16.8	1ph	112	48	1
MG-15.0	15	25.2	1ph / 3ph	168 / 3 x 56	48	1
MG-MC-2	30	50.4	3ph	3 x 80	48	2
MG-MC-3	45	75.6	3ph	3 x 125	48	3
MG-MC-4	60	100.8	3ph	3 x 160	48	4

microGrid Core System Options

MG-GEN	Configuration for inclusion of a diesel generator in the system
MG-GEN-BYPASS	Manual AC-Bypass selector
MG-LS	External load shedding
MG-IP	Internet Protocol enabling of microGrid core system

Energy storage

One or more battery banks provide energy storage in a microGrid system. Battery banks with flooded, GEL or AGM deep cycle batteries are available. Each bank is supplied with battery cell interconnects and regulatory signs. The AGM types are supplied in a stackable battery rack; the flooded types are supplied including acid resistant outer trays. Contact Alpatron for assistance with calculating storage requirements



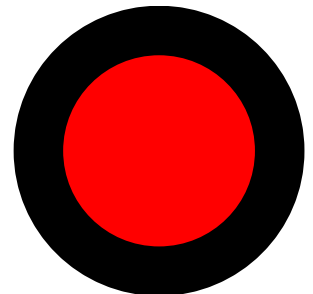
AGM	Type	Voltage	Cells	C100 [Ah]	E [kWh]	D x W x H [mm]	Weight
BAT0124601	AGM	24	12	600	14.4	600 x 780 x 434	432
BAT0124721	AGM	24	12	720	17.3	600 x 894 x 434	506
BAT0124152	AGM	24	12	1500	36.0	670 x 851 x 872	2432
BAT0148601	AGM	48	24	600	28.8	600 x 780 x 868	864
BAT0148721	AGM	48	24	720	34.6	600 x 894 x 868	1012
BAT0148152	AGM	48	24	1500	72.0	670 x 851 x 1744	4864

Flooded	Type	Voltage	Cells	C100 [Ah]	E [kWh]	D x W x H [mm]	Weight
BAT0224671	Flooded	24	4	670	16.1	530 x 850 x 570	320
BAT0224831	Flooded	24	4	830	19.9	530 x 850 x 570	440
BAT0224102	Flooded	24	4	1080	25.9	530 x 1040 x 570	572
BAT0224162	Flooded	24	6	1600	38.4	370 x 1850 x 630	720
BAT0248671	Flooded	48	8	670	32.2	850 x 1060 x 570	640
BAT0248831	Flooded	48	8	830	39.8	850 x 1060 x 570	880
BAT0248102	Flooded	48	8	1080	51.8	1040 x 1060 x 570	1144
BAT0248162	Flooded	48	12	1600	76.8	740 x 1850 x 630	1440

GEL	Type	Voltage	Cells	C100 [Ah]	E [kWh]	D x W x H [mm]	Weight
BAT0324601	GEL	24	12	600	14.4	210 x 2040 x 515	576
BAT0324721	GEL	24	12	720	17.3	210 x 1800 x 690	685
BAT0324122	GEL	24	12	1200	28.8	235 x 2580 x 690	1128
BAT0348601	GEL	48	24	600	28.8	420 x 2040 x 515	1152
BAT0348721	GEL	48	24	720	34.6	420 x 1800 x 690	1370
BAT0348122	GEL	48	24	1200	57.6	470 x 2580 x 690	2256

Contact Alpatron for alternative battery bank options

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Energy Sources



gridPak renewable energy generator

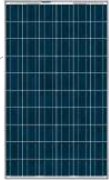
One or more gridPak generators can be connected to the microGrid to provide energy input. There are gridPak for PV solar generators, wind generators and hydro generators. gridPak include a grid-tie inverter to couple the energy source to the microGrid and are supplied including all installation materials, cabling, mounting and control and over-current devices. See our gridPak brochure for further details on gridPak options. Contact Alpatron for assistance with sizing your generation sources and a resource assessment.

PVL Laminates				PV Array	Inverter	Roof dim.		Akl June	Akl Dec
gridPak	strings	string length	# modules	[Wp]	Model	h [m]	w [m]	[kWh/d]	[kWh/d]
GP-PVL68-13	1	13	13	884	SB1100	3	6.5	2.5	4.4
GP-PVL68-20	2	10	20	1360	SB1100	3	10	3.8	6.8
GP-PVL68-28	2	14	28	1904	SB1700	3	14	5.4	9.5
GP-PVL68-40	2	20	40	2720	SB2500	3	20	7.9	13.8
GP-PVL136-14	2	7	14	1904	SB1700	5.6	7	5.4	9.5
GP-PVL136-20	2	10	20	2720	SB2500	5.6	10	7.9	13.8
GP-PVL136-32	4	8	32	4352	SB3800	5.6	16	12.6	22.1
GP-PVL136-50	5	10	50	6800	SMC6000A	5.6	25	19.9	34.9



Framed Crystalline				PV Array	Inverter	PV Area	Akl June	Akl Dec
gridPak	strings	string length	# modules	[Wp]	Model	m2	[kWh/d]	[kWh/d]
GP-REC220AE-6	1	6	6	1320	SB1200	9.9	3.6	6.3
GP-REC220AE-9	1	9	9	1980	SB1700	14.85	5.4	9.4
GP-REC220AE-12	1	12	12	2640	SB2500	19.8	7.1	12.5
GP-REC220AE-14	1	14	14	3080	SB3000TL	23.1	8.5	14.9
GP-REC220AE-24	4	6	24	5280	SB5000TL	39.6	14.3	25.0

* Yield calculations are for Auckland, North facing roof at 45° and are based on mathematical models and historic weather data. Performance may vary. Additional packages / sizes are available, contact Alpatron for more information



Wind Turbine

Our Gusto 2.0 wind turbine can be coupled direct to a microGrid to provide energy from the wind. The turbine uses sealed bearings and sealed alternator for virtually maintenance free operation. See our Gusto brochure for details. Contact Alpatron for a site evaluation of the wind resource.



Wind Turbine	Blades	Diameter	Output	Turbine	Inverter	Mast	6 m/s	10 m/s
				[W]	Model	[m]	[kWh/d]	[kWh/d]
WT-G2-230	3	3.2	230 Vac	1900	WB1700	6.5 / 13	8.8	28.7

Diesel Generator

Incorporating a diesel generator in a microGrid reduces the energy storage requirement and can make the resulting system more cost effective and reliable. Start and stop of the diesel can be controlled by the microGrid core system, which also controls the amount of power drawn of the diesel, ensuring maximum efficiency from the generator and extending generator life.



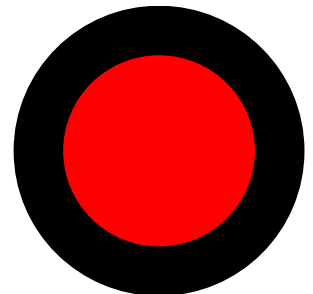
Diesel Generators	Power kVA	Output	Phase	Engine	Cylinders	RPM	L x W x H [mm]	Weight [kg]
GEN-3000-6	6	230 V	1	Yanmar	1	3000	1050 x 620 x 830	205
GEN-3000-9	9	230 V	1	Ruggerini	2	3000	930 x 555 x 800	190
GEN-1500-9	9.1	230 V	1	Yanmar	3	1500	1475 x 750 x 1050	632
GEN-1500-13	14.3 / 13.8	230 V / 400 V	1 / 3	Yanmar	3	1500	1475 x 750 x 1050	691
GEN-1500-20	19 / 22	230 V / 400 V	1 / 3	Yanmar	4	1500	1920 x 900 x 1230	759

Additional generator models are available, contact Alpatron for alternative options

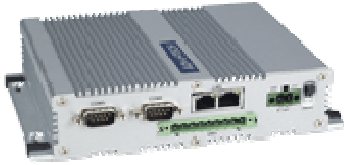
Generator Options

MG-GEN-AUTO	Option that enables the generator to be automatically started and stopped by the microGrid
MG-GEN-DS	External diesel storage tank

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Monitoring and Control

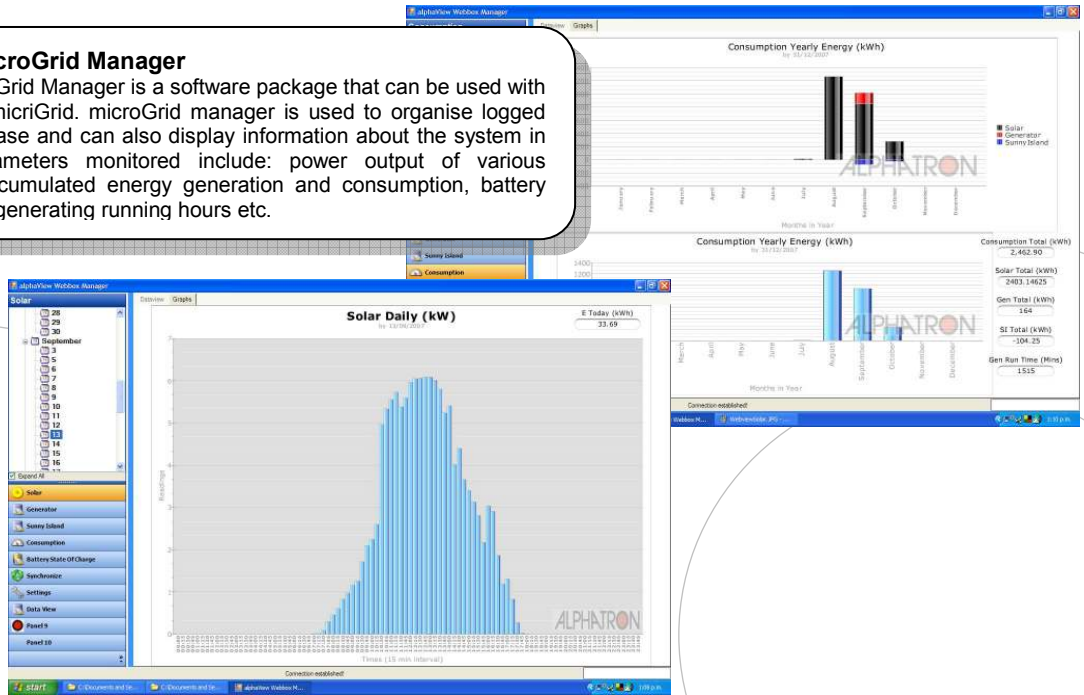


System Monitoring and Control

With the microGrid Internet Protocol option, Alphatron microGrid are fully internet protocol enabled for monitoring and control via Ethernet. This allows the user to monitor and control the system via either a private network or via the internet. Applications are available for data logging, for plant control, for public display and for website interfacing.

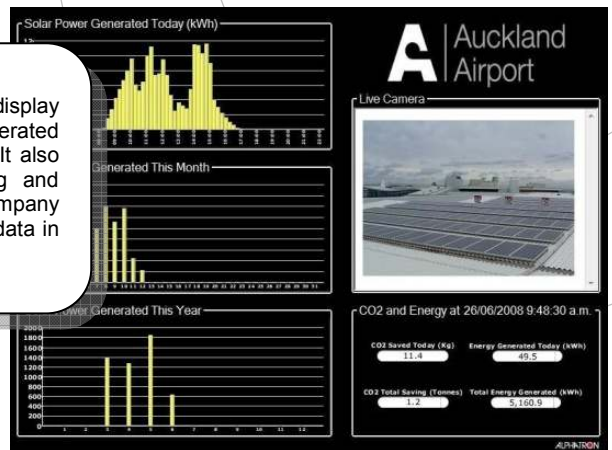
alphaView microGrid Manager

alphaView microGrid Manager is a software package that can be used with an IP enabled microGrid. microGrid manager is used to organise logged data in a data base and can also display information about the system in real time. Parameters monitored include: power output of various components, accumulated energy generation and consumption, battery state of charge, generating running hours etc.



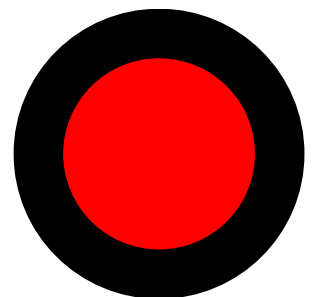
alphaView microGrid Public Display Package

The alphaView public display package has been designed to display performance data on large LCD screens. Data such as power generated and CO₂-e emissions avoided can be presented in clear graphs. It also enables internet access to the system for remote monitoring and maintenance and can be used for presentation of the data via company website. The alphaView system further implements logging of the data in a searchable windows database. The alphaView display can be customized to user specifications



MG-IP	Internet Protocol enabling of microGrid core system. Includes IP hub and data logger and inverter comms ports
AV-MGM	alphaView microGrid Manager software package. Requires MG-IP to be installed
AV-PDP	alphaView Public Display Package. Includes software and industrial computer to drive display. Requires MG-IP to be installed
MG-IP-S	Sensor option to add solar irradiation, ambient temperature and module temperature to logged data
MG-IP-W	Anemometer. Requires MG-IP and MG-IP-S to be installed

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Request for Quote

microGrid Dimensioning Questionnaire and RFQ

Customer information

Name _____
 Address _____
 Phone _____
 E-mail _____

Site Data

Location _____ Roof Cladding _____
 Address _____ Roof Orientation _____
 _____ Roof Pitch _____
 _____ Roof Dimensions _____ (h x w)

Load Data

	Daily	Summer	Winter	Annual
Energy	_____ kWh/d	_____ kWh/d	_____ kWh/d	_____ kWh/a
Nominal load	_____ kW	_____ kW	_____ kW	_____ kW
Max load	_____ kW	_____ kW	_____ kW	_____ kW
Min load	_____ kW	_____ kW	_____ kW	_____ kW

System

Generation Sources		Configuration		Performance	
Diesel Generator	Yes / No	<input type="checkbox"/> 1-phase	<input type="checkbox"/> 3-phase	Generator Start	Auto / Manual
PV Solar	Yes / No	Load Shedding	Yes / No	Days of Autonomy	_____ days
Wind	Yes / No	Manual bypass	Yes / No	IP Enabled	Yes / No
Hydro	Yes / No				

Services Required

Load Assessment System Design Commissioning
 Resource Assessment Installation Maintenance Contract

Comments

