Anga hono fika’i lahi e fiema’u faka’uhila

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TALATEU

Ke fa’u mo fokotu’u ha sisitemi fo’ou ‘oku ‘ikai ngata pe hono fili ngaahi kongokonga, ka kuo pau ke ne fakalato fiema’u faka’uhila ‘a e tokotaha fiema’u ‘uhila.

‘I he ta’emalava ‘a e sisitemi, ‘oku tupunga ia mei he ta’emalava ‘a e kongokonga ka ‘e foki pe ki hono fakakaukau’I mo fa’u (design)

Kapau ‘e ‘ikai ma’u e fiema’u ‘a e tokotaha ‘uhila ta ‘oku fakaoli e sisitemi

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Ma’u’angaivi fakapotopoto(efficiency)

- Ke tau ‘ilo e ma’u’angaivi fakapotopoto kuo pau ke ma’u ia mei he tokohataha mo e tafa’aki fiema’u.

Fakatata:

i. fakafetongi ‘aki e me’angaue faka’api ‘oku ‘ikai ke fakamole faka’uhila fakapotopoto e fakapotopoto;

ii. Fetongi e incandescent light bulbs with ‘aki e LED lights;

iii. Kai si’isi’ ange laptop he tesitop;

iv. Faka’aonga’I e flat-screen TVs kae tuku atu e ngaahi TV motu’a.

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UTA FAKA'UHILA (FIKA'I E MA'UANGAIVI)

- Koe paoa faka'uhila 'oku ha'u ia mei he puha'uhila (dc) pe fou he inveta 'ai ia 'oku ne 'omai e 230V 50 Hz ac (South Pacific). Ko e ivi faka'uhila 'oku fua angamaheni ia he Watt-hours (Wh) pe kilowatt hours (kWh).
- Ke tau ma'u 'a e ivi faka'uhila faka'aho te tau liunga'aki e paoa e me'a ngaue ko ia e lahi e taimi 'e ngaue'aki 'I he houa. Ko e ola 'e ma'u ia he (Wh) pe koeha e lahi e 'uhila 'e ngaue'aki he 'aho.

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UTA FAKA'UHILA (FIKA'I E MA'UANGAIVI)

- Me'angaue faka'uhila faka'api 'e ac pe'e dc. Ke fika'i e ma'u'angaivi 'e fai pe fakatatau ki he fa'ahinga. Fakatata he tepile 1 mo e 2.
- Kuopau ke femahino'aki lelei mo e tokotaha 'oku ne faka'aonga'i e 'uhila(end-user). Fa'a tonounou ngaahi sisitemi, 'ikai koe'uhi ko e ngaahi naunau fokotu'u pe ko e sisitemi kuo fokotu'u, KA KOE TOKOTAHA MA'U IVI 'UHILA NA'E TUI IA 'E LAHI ANGE IVI FAKA'UHI TE NE MA'U.

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KOEHA ‘OKU TOE FIKA’I AI E IVI KE FAKA’AONGA’I?

- Kapau ‘e ‘ikai fakakakato ha fika’i fakalelei mo tonu e ‘uhila ‘e ngaue’aki ko e sisitemi ‘e to nounou ‘e ne fua fatongia pea hala mo e ‘amanaki.

KOEHA ‘OKU TOE FIKA’I AI E IVI KE FAKA’AONGA’I?

- ‘E malava pe he to lalo e sisitemi (undersized) pea hoko ai ‘o ‘ikai ke holo e mo’ui e puha’uhila hange ko ia ne fa’u ki ai, ‘e hoko ai he fakamole ke fetongi ‘ehe tokotaha ma’u ‘uhila. (Customer not happy ☹)
- Kapau leva ‘e si’isi’i e uta kae lahi e mafai faka’uhila e sisitemi ‘e totongi ‘e mamafa ange e sisitemi pea lahi ai e me’a ‘e totongi. (Customer not happy ☹)

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KOEHA ‘OKU TOE FIKA’I AI E IVI KE FAKA’AONGA’I?

- Ka loto mamahi e totaha ma’u ‘uhila ‘e ‘ikai te ne ‘ave ha ongoongolelei ma’au!

- ‘I hono fakapapau’i hono fika’i fakalelei e uta te ne ‘oatu e faingamalie ke ke ‘ilo ai e ngata’anga e sisitemi kimu’a pea fakatau.

KOEHA ‘OKU TOE FIKA’I AI E IVI KE FAKA’AONGA’I?

- FA’A TO NOUNOU E SISITEMI LAHI KO E ‘IKAI LAVA ‘EHE SISITEMI ‘O FUA E FIEMA’U FAKA’UHILA ‘O E TOKOTAHA FIEMA’U ‘UHILA.

KOEHA E WATT? PE KOEHA E WATT HOUR?

Malaho pe ‘e ta’emahino ki he tokotaha fiema’u ‘uhila ‘a e ‘uhinga e Watts mo e Watt-hrs pe ko e pehe ko e sisitemi ‘oku ne ‘omai e 10kWh ‘I he ‘aho ‘oku fu’u mamafa ange ia he 5kWh he ‘aho.

Na’a mo ‘e tau pehe ke nau ‘ilo ‘a e kehekehe ‘I he vaha’a ‘o e 1 kW mo e 2kW ki he me’a ngaue pe koeha kuo tau fili ai ha sistemi ke ngaue’i e haiane 2kW kae ‘ikai ko e 2kW a/c.

FAKAMATALA'I HE LEA 'E NGALI MAHINO ANGE

$$$Pa'anga$$$

FIKA'I E UTA: FOUNGA 'E UA

1. Ngue'aki e *data logg*er ke lekooti e lahi e 'uhila kuo faka'aonga'i 'i ha taimi.

   Fiema'u pe ka 'e fiema'u ha me'angaue mamafa ke ne fakahoko e naue ko eni.

2. Lekooti Manuolo pe.

   'Ikai ke tonupasika ka 'e lava pe ke fakakakato 'I ha 'aho pe taha.

NGAAHI FAKAMATALA ANGAMAHENI ENI FU'U FIEMA'U:

- Volota per phase (V)
- Lahi e 'uhila per phase (A)
- Paoa factor per phase
- Real Power (kW)
- Apparent Power (kVA)
- Energy over a period of time (kWh)
- Maximum Demand
- Time
- Date

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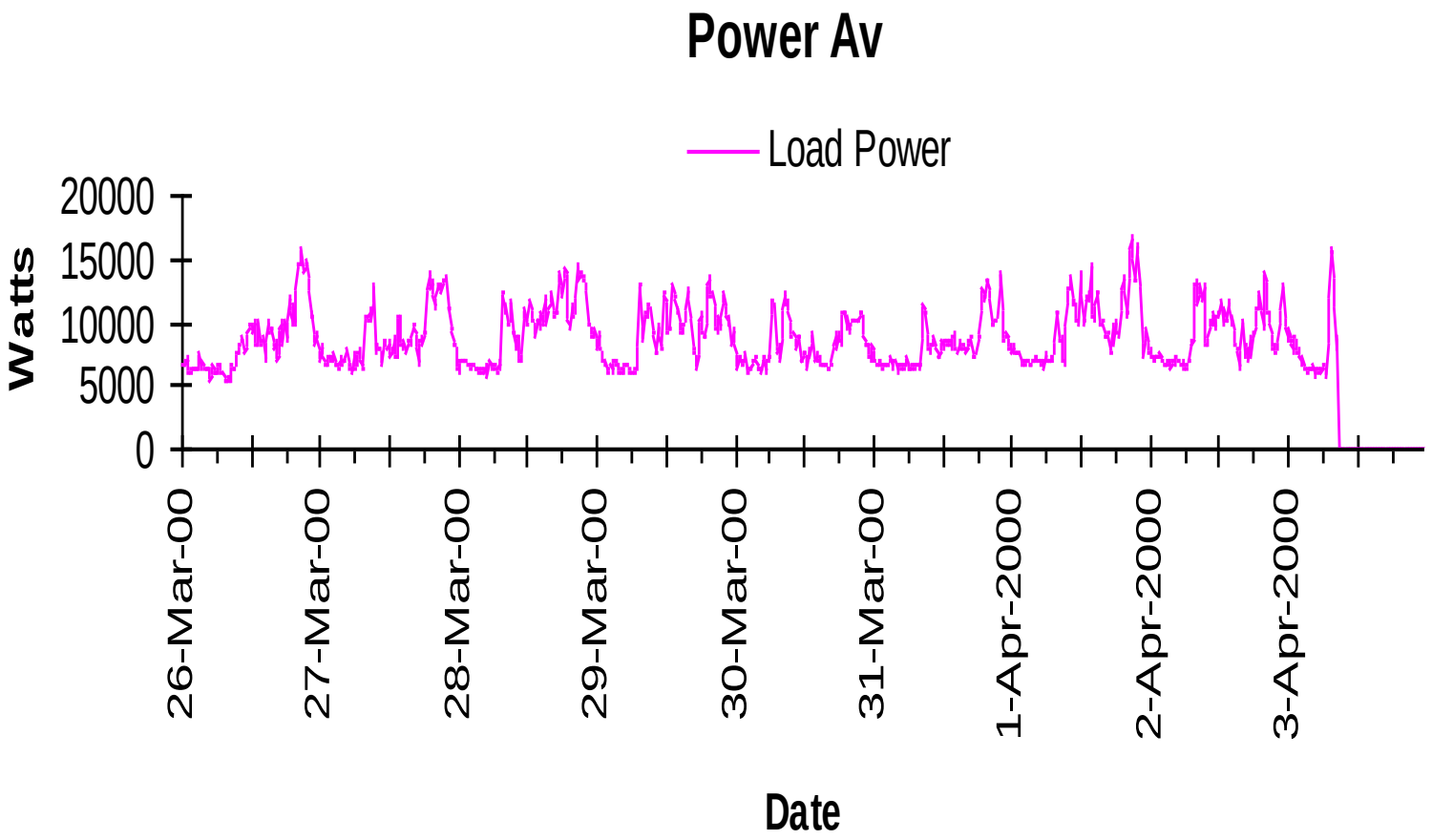
EXAMPLE: AVERAGE INSTANTANEOUS POWER FOR A SCHOOL



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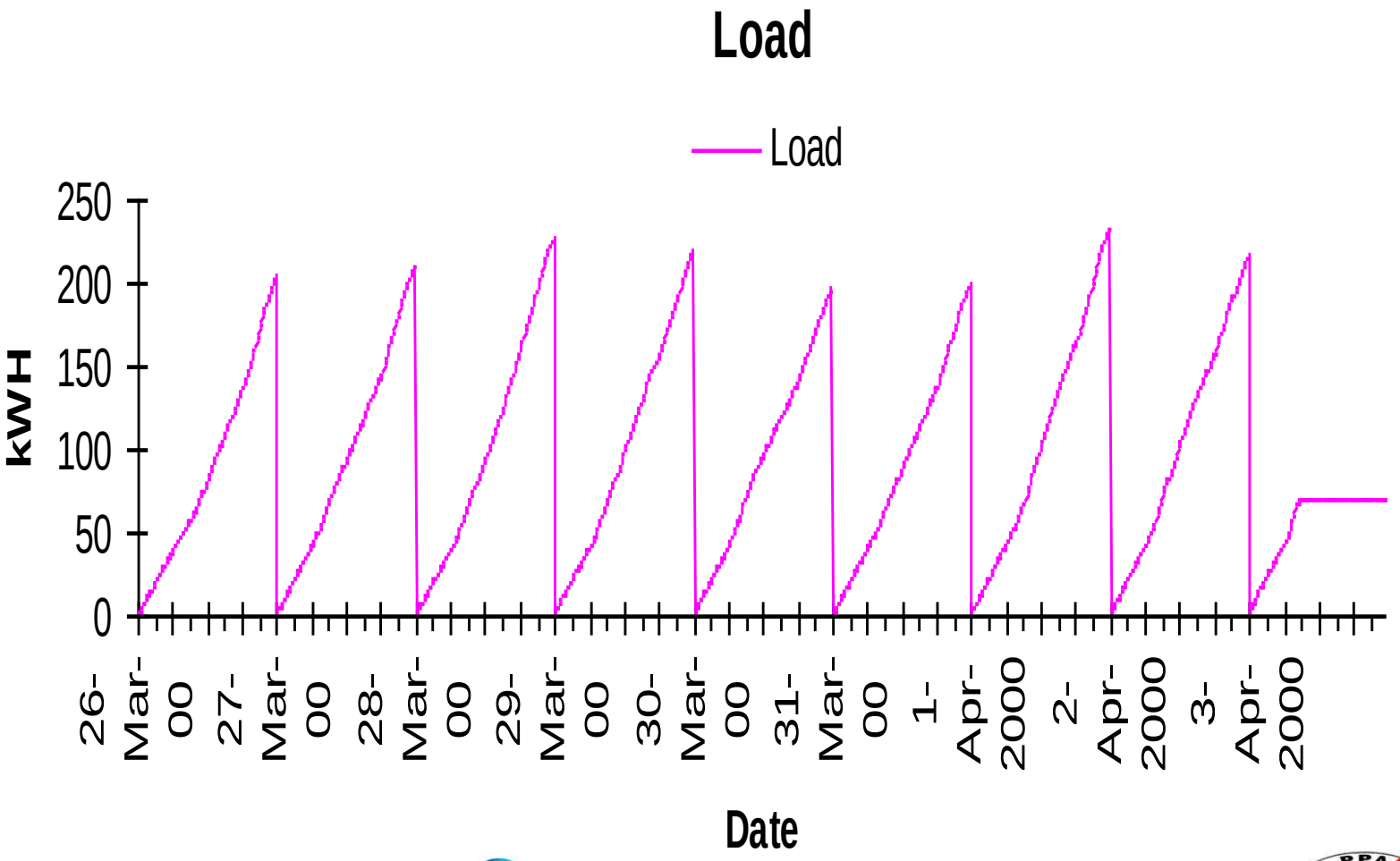
DAILY ENERGY (LOAD) IN CUMULATIVE kWh



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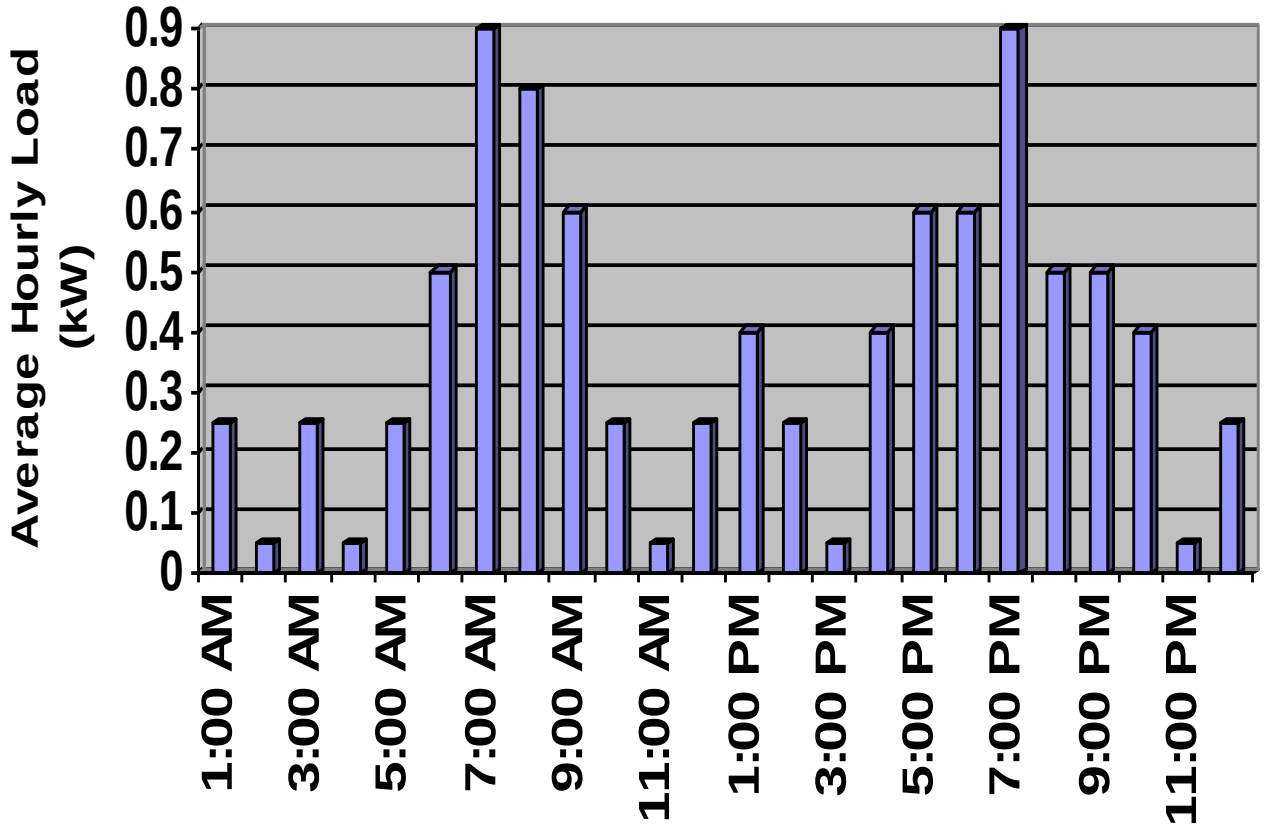
HOURLY LOAD PROFILE AS A BAR CHART



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PROBLEMS WITH CONTINUOUS MONITORING

- Sites are often remote and costly to access
- Someone must go, install and retrieve the equipment
- Hire or purchase of the equipment
- Time spent analysing data
- You must manually include additional loads that are to be installed after the solar power is available

- **WHO PAYS?**

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Monitoring

- It is practical for large sites like hotels and villages

- Not usually practical for a single household.

WHY MANUAL LOAD ASSESSMENT?

- The system is for a new site so there is no use yet;
- The site is very remote and it would be too expensive to install and retrieve the monitoring equipment
- Nobody will pay for monitoring
- The load is likely to change from that seen now

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NGAAHI FAKA'AONGA'I E MA'U'ANGIVI

UTA FAKAMA'U'ANGA IVI	KO E MA'U'ANGAIVI 'OKU HANGA KI AI	TOE FAKAMATALA KEHE
Vai mafana		
'Ea fakamokomoko		
'Aisi		
Maama		
Me'a kumi		
Naunau ki he peito		
Me'angaue kehe		
Pamu vai		
Toe me'a ngaue kehe		
???		

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FAKAFETAULAKI E MA'U'ANGA IVI

- 'Oku tau 'i he taimi 'oku holoholo mamalie pe mahu'inga naunau solar ka 'oku kei mamafa ange pe ia he ma'uangaivi angamaheni kae'oleva ke a'u ki ha taimi kuo lakai he'e solo e ngaahi ma'u'angaivi kehe.
- Fakatata, 'oku kei lelei ange pe ke ngaue'aki 'uhila angamaheni ki he ki he sitou 'uhila he paiomes (biomass), kerosene or LPG ki he kumi.

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EXAMPLE- From Australian Standard

TYPICAL ENERGY SERVICES AND ENERGY SOURCE SELECTION

Energy service	Energy source	Comments
Water heating	Solar + gas boosting	Most appropriate energy source Minimum environmental impact Lowest cost at remote site
Space heating	Energy efficient house design, wood heating	Most appropriate energy source Lowest cost
Space cooling	Energy efficient house design	
Refrigeration	Electric (d.c.)	d.c. chosen for efficiency reasons
Lighting	Electric (d.c.)	Preference for fluorescent lamps. Some incandescent lamps for low use areas
Cooking	Gas stove, some electric appliances (e.g. microwave oven)	Only available option Efficiency produces lowest energy requirements Lowest system cost
Cleaning, entertainment, kitchen appliances, office equipment	Efficient electric	Only available option Efficiency produces lowest energy requirements Lowest system cost
Power tools	Electric	Only available option
Water pumping	Efficient electric	Lowest cost
Water and waste treatment	None	

Source: AS/NZS 4509.2: 2010

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FIKA'I 'O E UTA FAKA'UHILA

- 'Oku ta'emalava ke tau ma'u ha fo'i tali tonu pe taha ki he uta fakalukufua – 'oku lava ke fakataha'i he taimi 'e taha pea tau toki ma'u ai hono fkaofiofi. Ko ia ai ko hono fika'I 'o e uta fakalukufua 'oku 'ikai ho ha ngaue faingofua ka 'oku fiema'u ha taimi ke ako mo fakahoko.
- 'I he'etau fokotu'u ha mahu'inga hala 'e malave ke fu'u ma'olalo e iniveta pea nofo fakapo'uli ai e kasitoma pe koe 'ova tesaini pea fakamole lahi e taha ma'u 'uhila.

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Appliance	Paoa W	Power Factor	TANAKI KI HE UTA FAKALUKUFUA VA	Surge Factor	Contribution to Surge Demand		
					Potential	Design	
‘Uhila e peito	20	0.8	25	1	25	25	on
‘Uhila e lotofale	15	0.8	18.75	1	18.75	18.75	on
Lokimohe 1 Lights	15	0.8	18.75	1	18.75	18.75	on
Lokimohe 2 Lights	15	0.8	18.75	1	18.75	18.75	on
TV							allowed to be on
Stereo							Allowed to be on --but could be left out
Komipiuta	150	0.8	187.5	2	375	375	On a lot
Mikoloueivi	1000	0.8	1250	1	1250	1250	Only allowing for the Microwave- it and iron are largest—will not allow for Microwave and Iron and awshing machine
Aisi mokomoko	150	0.8	187.5	4	750	750	No control- turns on when required
Aisi momoko	150	0.8	187.5	4	750	187.5	Though freezer could be on--habve not assume it surges as same time as fridge or pump--that is only allowed for 2 motor surges at once
Pamu vai	350	0.7	500	6	3000	3000	No control—this could come on any time tap is turned on
Haiane	1000	1		1			Not to be operated when microwave or washing machine is on.
Misini fo	200	0.7		4			
MAXIMUM DEMAND			2393.75				Allowing 10% Inverter approx 2.6kVA
DESIGN SURGE DEMAND					6206.25		
DESIGN SURGE DEMAND						5643.75	Surge 5.6kVA

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UNDERTAKING MANAGEMENT INITIATIVES

- Daylight sensors on lighting circuits for exterior lights
- Timers on power and lighting circuits
- Circuits breakers sized to limit the maximum demand from a building
- Certain loads that only operate when the generator is operating
- Motion or heat sensors for lighting in rooms when occupied
- Lights generally on separate switches, so many lights do not always go on at once

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THREE PHASE LOAD MANAGEMENT

- It is common, though not always the best design choice, for any system requiring an inverter or generator larger than 15 - 20kW to be a three-phase system
- In three-phase systems, the system designer will need to ensure that as far as possible the loads are balanced across the 3 phases
- Although unbalanced or low loads do not cause any damage to a inverter or gen-set, there is the potential for overloading one of the phases and causing problems, even an inverter shut-down.

THREE PHASE LOAD MANAGEMENT

- The designer will need to determine all the loads and then list which loads are in each of the three phases
- Care must therefore be taken by the end user to ensure that the three phase inverter can meet the peak demand and potential surge demand for each phase on a continuing basis.


The End
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