Check out <u>www.CENTURIONSOLAR.co.za</u> and register to be upgraded in the next 14 days. If you have a compatabile system and agree to the small R49.99 subscription fee, we will be contacting you shortly for the upgrade.

ICC IS NOW OFFICIALY SMH! (and free to upgrade for ALL existing ICC users) 🔚

A year and a half in the making, we are proud to present you with the long awaited SMH, short for Solar Management Hub.

Without further a due, let's jump straight into the benefits and features:

		Transferre	SMH Desktop (1	WORKE NOT	
Dashboard	Inverter	Battery	Overview	Settings	Logs
02/06/2021	Get Logs				
Event Time	User Name	Event Description	Event Details		
02/06/2021 12:05:01	1999 911 01 91 01 9	Logoff			
02/06/2021 12:04:19		Inverter event	Warning Fixed : Utility Po	wer Failure	
02/06/2021 12:04:06		Inverter event	Warning : Utility Power F		
02/06/2021 11:49:18	System	System Switch	Switch Mode : Switched		
02/06/2021 11:48:49	admin	Manual Switch Mode	Switch Mode Requested	: To SBU mode.	
02/06/2021 11:48:15	admin	Inverter Updated	Bulk charging voltage (C	.V. voltage) (V) set : 53.1	
02/06/2021 11:48:10	admin	Inverter Updated	Float charging voltage ()		
02/06/2021 11:48:02	admin	Logon			
02/06/2021 11:38:51	System	Inverter event	Fault : Battery Voltage to	oo high.	
02/06/2021 11:38:51	System	Inverter event	Fault : Inverter Fault		
02/06/2021 11:33:21	admin	Logoff			
02/06/2021 11:33:11	admin	Manual Switch Mode	Switch Mode Requested	: To SBU mode.	
02/06/2021 11:32:47	System	System Switch	Switch Mode : Switched	to Grid	
02/06/2021 11:32:43	admin	Manual Switch Mode	Switch Mode Requested	: To USB / UTI mode.	
02/06/2021 11:32:32	admin	Device Handler event	Schedule Handler Starte	ed	
02/06/2021 11:32:29	admin	Device Handler event	Schedule Handler Stopp	ed	
02/06/2021 11:32:22	admin	Logon			
02/06/2021 11:27:17	admin	Logoff			
02/06/2021 11:19:07	admin	Manual Switch Mode	Switch Mode Requested	: To USB / UTI mode.	
02/06/2021 11:17:23	admin	Manual Switch Mode	Switch Mode Requested	: To USB / UTI mode.	
02/06/2021 11:17:01	admin	Logon			
02/06/2021 10:02:06	System	Inverter event	Warning Fixed : Utility Po	wer Failure	
02/06/2021 10:00:54	System	Inverter event	Warning : Utility Power F	ailure.	
02/06/2021 08:05:55	maxie	Inverter Updated	Inverter 1 Charger sour	ce priority : Solar Only	
02/06/2021 08:05:52	maxie	Inverter Updated	Output source priority s	et : SBU	
02/06/2021 08:05:46	System	System Switch	Switch Mode : Switched	to Solar / Battery	
02/06/2021 08:05:41	maxie	Inverter Updated	Output source priority s	et : SBU	
02/06/2021 08:05:25	maxie	Logon			
02/06/2021 05:24:39	maxie	Logoff			
02/06/2021 05:24:23	maxie	Inverter Updated	Inverter 1 Charger sour	ce priority : Solar Only	
02/06/2021 05:24:11	maxie	Logon			
02/06/2021 05:22:06	maxie	Logoff			
02/06/2021 05:21:33	maxie	Save Settings			

Probably one of the most important features of SMH is the absolute and total accountability and security architecture on which the entire product rests. Not only did we incorporate end-to-end multi-layer encryption in everything we do, but we also made sure that there will be no more finger-pointing from clients claiming they did nothing wrong but can't explain why the settings were changed.

Literally EVERYTHING happening in the system is logged. Even when a non-user related event like Utility Failure occurs, it will still show that the System-user recorded the event. Every Inverter change is recorded as well. From enabling the backlight to configuring the maximum charge rate per inverter and more. Everything is catalogued and can easily be recalled, should the need for it arise.

There is also an ever-present status bar right at the bottom of the SMH client, showing the Operating Mode, the logged in User, as well as the Command Status from the inverter.

	 Battery	₹ Grid				Inverter				
	Battery Watts - 18.1 W	Grid Watts - 2666 W		Inverter Vo	lts - 229.9 V					
	Battery SOC - 100 %	Grid Volts - 231.1 V		Inverter a	lemps - 0 A					
	Battery Volts - 53.22 V	Grid Amps - 0 A		Inverter Terr	perature-0 °C					
	Battery Amps - 0.34 A	Grid kWh: Used - 0.445 kWh		Inverter Freq	ency - 49.9 Hz					
	Solar/Battery Watts - 0 W	Grid kWh Imported - 0.445 kWh		System E	ficiency - 0					
	Solar/Battery kWh Used - 0.001 kWh	Grid kWh Exported - 0 kWh	Batt 🛢	PV 🜉	Grid 🕺	Load 🏠				
	#	Grid Frequency - 49.9 Hz	18.1 w	0 w	2666 w	2666 w				
	PV Watts - 0 W	↑ Lost								
	Max PV (Today) - 0 W	Load Percentage - 52 %								
	Max PV (Last Hour) - 0 W	Load Watts - 2666 W								
	PV kWh Produced - 0 kWh	Total kWh Used - 0.445 kWh								
	Average PV Volts - 0 V	Maximum Load (Today) - 2722 W								
	Average PV Amps - 0 A	Maximum Load (Last Hour) - 2722 W								
SOLAR SYSTEM DEVICE	5									
	Air conditioner	Geyter		Floor	llights					
	*	ي. م		Fundame						
	Pool	Kettle		Underflo	or Heating					
	۲. ۲	a		ہ ع	5 S					

Another big feature is full home automation capability. We can speak to all MQTT based systems like OpenHAB, Home Assistant, etc, which will allow you to configure switching based on load, eskom availability and more.

	Username
installer	maxie
maxie	Password
	Retype Password
	J. User Type
	User
Select User	Update User

A user-management module is also included, allowing installers to create lesser-privileged accounts for their clients, further ensuring that no change happens without showing what changed and who changed it.



Battery Time To 209 27:08

There is a completely new desktop client that runs on the Pi, where everything has a tooltip. If you don't know what something means, simply hover your mouse over it and a popup with an explanation will appear to help you along the way. Among the data you are used to, we have also included a field for "Battery Time to x%" and "Battery Time to 100%". If you use a compatible battery, we will calculate an approximate runtime based on the load to get to the configured % SOC (when running in battery mode). This is brilliant for load shedding, as it will indicate when to start using electricity more sparingly in order to extend the runtime.



The entire product can also be white-labelled for orders of 10 or more new Pi's, allowing the installer to sell "his own monitoring solution" as part of his installations.



On the other side of the discharging calculations, the Battery time to 100% will give you an indication of how long the battery bank will take to fully charge according to the current charge rate, which again is very useful to determine if the batteries will be full by the time the next "eskom se push" comes up to spoil your day. All of the calculations mentioned above are done using Peukerts law, and even take things like the battery inefficiency (adjustable per battery), etc into account in order to be as accurate as possible.



SMH also boasts a modular design technology, using something we call handlers. Effectively they are a set of instructions, calculations and commonly used tasks, grouped together in order to share those across different inverters, batteries, etc. This design also makes the system a lot more stable and easier to troubleshoot in the event that something goes wrong, as each handler can be investigated and interrogated individually.

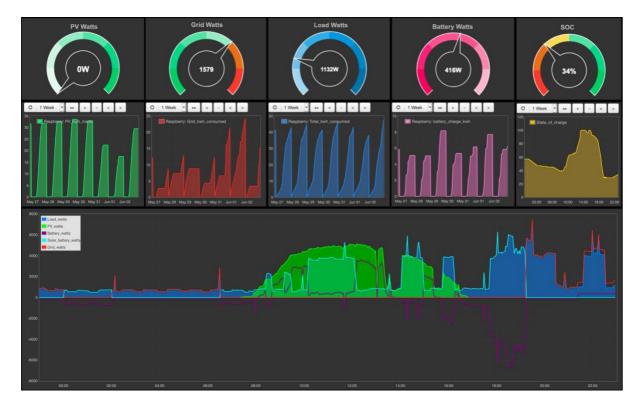
Using handlers also allow us to look at what information an inverter gives, and then capture the math to work out all the system totals, etc in something called the **Inverter handler**. This means that the work to add an inverter was only done once, so all we do from there is to get the protocol document for any new inverter and add the unique commands to get the information required by the handler to operate. The handler takes care of the rest. This allows for a rapid development cycle and also ensure that we can stay current with more inverters, more often.

ashboard	Inverter	Battery	Overview	v Settin	gs Log	s 👘	
ack Totals							
Total Size	(AH) 92.00	AH Used 105.82 Mid Point		emaining AH 486.18 bits	Amps Watts	-19.24	Time to 20%
-	31.00	00.00		49.70		956.80	-
ack Detail							
Number	1	2	3	4	5	6	7
Volts	49.71	49.73	49.73	49.73	49.72	49.74	49.72
Amps	-02.44	-02.42	-02.39	-02.43	-02.46	-02.32	-02.46
Watts	-121.39	-120.24	-118.77	-120.93	-122.41	-115.59	-122.37
Temp	23.00	23.00	23.00	22.00	23.00	23.00	22.00
SOC	81.00	82.00	83.00	82.00	81.00	83.00	82.00
Status	Dischg	Dischg	Dischg	Dischg	Dischg	Dischg	Dischg
Cycles	360	349	344	351	364	344	355
АН	74.00	74.00	74.00	74.00	74.00	74.00	74.00
Serial No.	PPTAH02139105489	PPTAH02139105494	PPTAH02139105499	PPTAH02139105390	PPTAH02139105496	PPTAH02139105269	PPTAH02139105495
Fault Code	None	None	None	None	None	None	None
(-						-

The same thing was done with the **battery handler**, so to add batteries and inverters will technically take us longer to test in the field than it takes us to add it into SMH ;). If you are using a compatible BMS, we will also constantly monitor the communication with the hardware, and perform a full recovery procedure, should anything go wrong. SMH was built from the ground up with a completely rewritten USB subsystem, not using the original (but now completely daft and deprecated) intelligent customised coding (ICC) "hidraw" usb version that so many others have used in the past. It turns out it wasn't so intelligent to use that after all... lol!

We also monitor the individual serial numbers of each battery, together with its fault code, so if anything does go wrong, it will report on the exact serial number of the battery acting up, allowing the installer to collect the correct equipment for repair.

The cycles per battery make it easy to determine which battery is more likely to reach end of life before the rest, allowing you to plan your next battery expense in advance. Combined with the ability to run different sized batteries together in one bank, it also made sense to determine the AH rating of each battery, further allowing the installer to see how slow / fast the different sized batteries are charging or discharging.

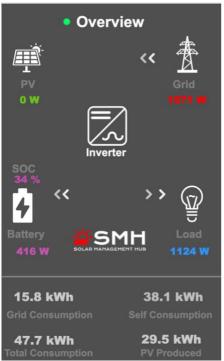


As far as the **cloud handler** is concerned, we had to make extra sure that the data coming from the pi is stored in a reliable way, seeing as people rely on that to make very important decisions about the operation of their systems.

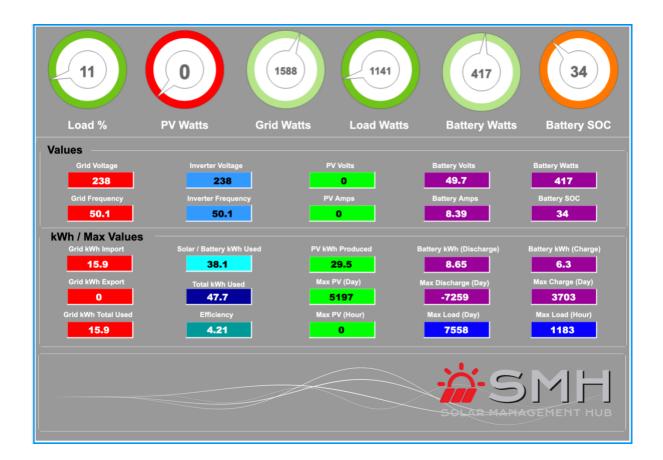
Warranty claims are often approved or denied based on the values recorded by the system. The cloud handler also constantly monitors the connection from the Pi to the cloud portal, so in the event that the Pi loses internet connectivity, it will cache the data coming from the inverter in the database until it can detect a stable connection to the server again, and then upload it to centurionsolar.co.za/smh retrospectively.

This means that as long as the Pi has power, it will record what's happening, and that data cannot be lost. To that end, we had to rewrite the back-end in order to give every SMH user new dashboards, showing the real-time value of the most important metrics, as well as a weekly summary of each of those, together with a beautifully created live dashboard that combines all the energy flows in an easy to understand fashion.

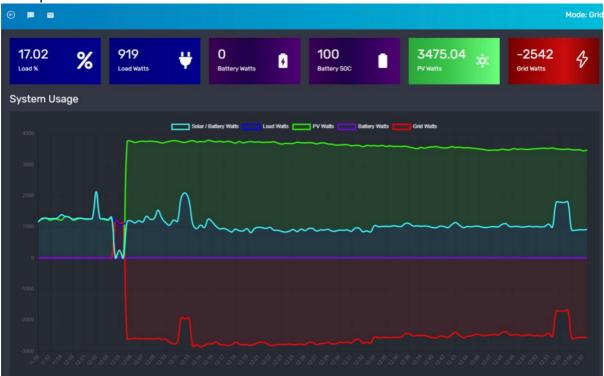
We also took your eyes into account, and designed all the dashboards to be in dark mode with soft pastel colours, which not only makes them easier to see and read, but also reduces energy consumption. Check out a live version here: <u>Analytics dashboard</u>



There is also a brand new cellphone desktop, designed to simply be saved as a shortcut on your phone. Simply opening it up will show you how energy is being consumed in your system at that moment in a very easy to understand, elegant and clean manner. A live version of this can be seen here: <u>Cellphone Dashboard</u>



There is also a lightweight version of the SMH Desktop running in the cloud portal, to allow the installer in the field to gain some more technical information about the system, should it be required.



As if all the above cloud portal detail is not enough to keep you entertained, we have also included a web app, allowing something with a much stronger processor than the pi (like your desktop or cellphone) to render beautiful graphics coming from the pi in real-time. At the moment this is accessed on the same local network as the pi, but it can also optionally be accessed from anywhere in the world without any fancy port forwarding or router configuration required. This means you can have a constant display running at your office or home, showcasing your system in an ever-updating, beautiful manner. The web app is also responsive, meaning that it will scale dynamically to fit on a cellphone, all the way up to an 82" television automatically.



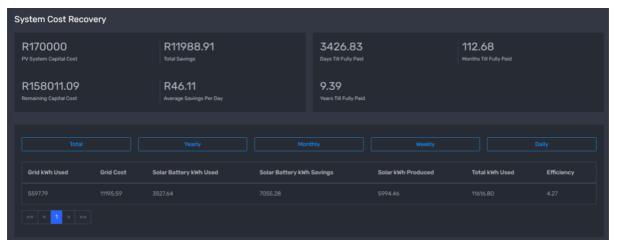
All the values one would expect to see are gathered from the system and displayed in the same vibrant, easy to read and understand fashion.

Inverter Totals		×				
243.2 Grid Voltage	\$	50 Grid Frequency		*	5.19 Grid Kilh Used	4
243.2 Inverter Voltage	\$	50 Inverter Frequency		*	9 Inverter Total Load Watts	¥
295.15 Average PV Volts	4	5.85 Average PV Amps		:ộ:	3452.85 PV Watts	:ộ:
Inverter Detail						
Grid Watts			-2517			

Individual inverter performance (up to 9 supported inverters) are shown, together with the totals produced by all of them.

Stack Totals											
200 Total Size (Ah)	88	0 Ah Used		8-	200 Remainin		8+	0 Amps	¥	 Time to 20%	0+
100 soc	•	0 Mid Point		~	50.5 Volts		8	0 Watts	\$	 Time to 100%	•
Stack Detail											
Number	Volts A	Imps	Watts	Temp	SOC	Status	Cycles	АН	Serial No.		Fault Code

There is a dedicated page for the batteries, which again shows the totals at the top, and then the individual battery details at the bottom.



Lastly, there is also a full analytics engine, showing you what the system cost to put in, what your daily savings are (based on your usage), together with how long it will take to recoup the money spent on the system. You can also look at the data that make up these figures for every day, week, month or year.

SMH D	esktop (SMH001) – 🗖 🗙
Dashboard Inverter Battery Overvie	w Settings Logs
Inverter / PV / Cost Inverter Type	Battery Battery Monitoring Type Battery Max Charge Watts
Axpert Max Parallel Y Inverter Settings Schedule	Pylontech BMS
Capital Cost	Number of Battery Packs Battery Max Discharge Watts 8 10000 Battery Size (AH) Time To (%) 1200 1200
0000	
Alerting SMTP Server SMTP Username	Cloud Emoncms Server
	https://centurionsolar.co.za/smh/ Clear Buffer
SMTP Port SMTP Password	Emonems API Key
587	d0768644696a9c0a7db3523adba6254e
Send From	
Alert via E-Mail Test Email	
Send To	
Use SSL to Connect	
Telegram Bot Token	Post Emoncms Data
1743371121:AAGNPvXQLmUOVkQTT5anH4rz71DhV6j0lUc145 Telegram Chat Id	
-1001245235206000	Handler Control
	Stop All Handlers Start All Handlers
Alert via Telegram 🗹 Alert on Warnings	Stop Inverter Device Handler Start Inverter Device Handler
Licensing / Upgrade System Name System Status	Stop Battery Device Handler Start Battery Device Handler
System Name System Status SMH001 Active	Stop Cloud Handler Start Cloud Handler
	Stop Alert Handler Start Alert Handler
System Identification @VRQOORGK34AC0AD768F7C9F50FAFE85E4C7B83CE	Stop Schedule Handler Start Schedule Handler
Subscription Status Subscription End Date Check License Evaluation 10-06-2021	Auto Start All Handlers
License Bought Yes	Update Password Save Settings Logoff
Mode : Solar / Battery User : maxie	Command Status : Idle

Looking at the settings page, you can see that we have a multitude of options available.



There is a fully integrated Telegram communication system, allowing you to get notified of any warning or fault in your system in near sub-second response time. Never again will you have loadshedding without your system informing you about it. Once the utility power is restored, the system will automatically inform you that the utility failure has been resolved.

Number Name Name Output Name Output reading / Encode Image Image Image Fault / Encod Description Allet Va Telegram / E Mail Netty Nature Image Image Stand / Encode Image Image Nature Image Image <t< th=""><th>Dashboard</th><th>Inverter</th><th>Battery</th><th>Overview</th><th>Settings</th><th>Logs</th><th></th><th></th></t<>	Dashboard	Inverter	Battery	Overview	Settings	Logs		
Aut / Error Description Alert via Tielegram / E-Mall Not Used NOU Used								
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Bus Over Image: Software Pailure Image: Software Pailure Bus Software Pailure Image: Software Pailure Image: Software Pailure Over Failure Image: Software Pailure Image: Software Pailure Over Failure Image: Software Pailure Image: Software Pailure Over Failure Image: Software Pailure Image: Software Pailure Image: Software Pailure Image: Software Pailure Image: Software Pailure Image: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image: Software Pailure Image: Software Pailure Over Josep: Software Pailure Image	Not Used							
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Battery Voltage too low </td <td>Bus Over</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td>	Bus Over				1			
Ublip Peaker Finiture Image Image OVY Short Image Image Inverter Voltage too low Image Image Inverter Voltage too low Image Image Inverter Voltage too low Image Image Fan Lockd Image Image Battery Voltage too low Image Image Overcharge Image Image Battery Voltage too low Image Image Overcharge Image Image Battery Voltage too low Image Image Overcharge Image Image Battery Voltage too low Image Image Overfoad Image Image Battery Voltage too low Image Image Image Image Image Image Image Image Battery Voltage too low Image Image Image Image Image Image Image Image Battery Voltage too low Image	Bus Under							
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Fan Lacked Battery Voltage too low Cvercharge Battery Voltage too low Battery Voltage too low Cvercharge Cvercharge Cver Cvercharge Sver Cvercharge Sver Cvercharge Sver Cvercharge Sver Cvercharge Sver Cvercharges Faliole Cver	Inverter Voltage to	oo high						
Battery Volkage too high Image: Comparison of the comparison o		ure too high						
Battery Voltage too low Overcharge Battery under shutdown Battery under shutdown Battery under shutdown Battery dersting Overload Battery dersting Inverter Software failure Inverter Software failure Open Oz Voltage Over Battery Open Current Sensor Failed Dever Und Power Und Notage too high Notage too high Notage too fault								
Overfunge Image: Constraint of the constrain	Battery Voltage to	oo high			5	2		
Battery under shuddown Battery under shuddown Overlaad Overlaad Georom Rukt Inverter Over Current Inverter Saftware Fallure Open Oc Vattage Over Battery Saftware Faller Open Oc Vattage Over Battery Saftware Faller Open Oc Vattage Over Battery Saftware Faller Open Saftware Faller Open Saftware Faller Open Saftware Saftware Faller Open Saftware Saft	Battery Voltage to	wol ow						
Battery derating	Overcharge				5			
Overfand Ø Ø Eeprom fault Ø 0 Inverter Over Current Ø 0 Inverter Software faultre Ø 0 Inverter Software faultre Ø 0 Open OC Voltage Over Ø 0 Battery Open Ø 0 Current Sonsor Falled Ø 0 Battery Open Ø 0 Voltage too high Ø 0 NV Obserd fault Ø 0	Battery under she	utdown						
Eeprom Ruik Invertera Over Current Invertera Software Falure Invertera Software Falure Open DC Voltage Over Battery Open Battery Open Battery Open Battery Soft Power Lunt Power Lunt PV Voltage tos high	Battery derating							
Inverter Over Current Immethy Immethy Inverter Self Inser Immethy Immethy Inverter Self Inser Immethy Immethy Open Dr. Voltage Over Immethy Immethy Battery Open Immethy Immethy Current Sensor Faled Immethy Immethy Battery Open Immethy Immethy Power Linnt Immethy Immethy VPY Overget Sault Immethy Immethy	Overload				5	1		
inverter Software failure inverter Software failure inverter Software failure Open DC Voltage Over Battery Open Current Sensor Failed Battery Open Pewer Lint PV Voltage too high MPT overload fault								
Inverter Sell Test failure	Inverter Over Cur	rent			5			
Open DC Voltage Over	Inverter Software	failure						
Battery Open	Inverter Self Test	failure						
Current Sensor Faled	Open DC Voltage	Over						
Battery Short	Battery Open							
Power Limit	Current Sensor F	ailed						
PV Voltage too high	Battery Short							
MPPT overload fault	Power Limit							
MPPT overload warning								
	MPPT overload wa	arning						-
Save Close							A CONTRACTOR OF THE OWNER.	
						nand Status : Idle		

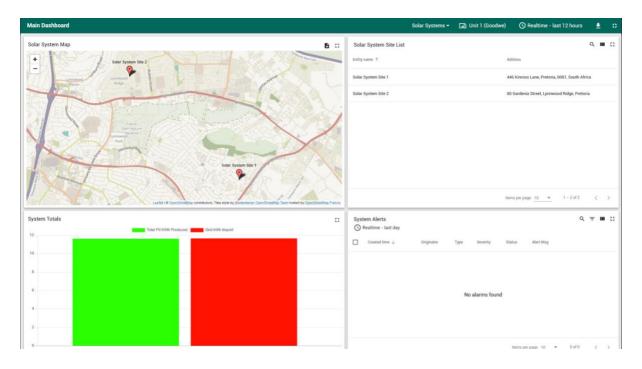
You can also configure which alerts make sense to you or not, tailoring them to your unique requirements. If your system has sub-alerts (sometimes referred to as Parallel alerts like error 80 for CANbus or 69 for Battery comms), those can be configured as well. Alerts can be sent to an email address and/or Telegram or just to the notify window on the dashboard, which will flash when you log in to let you know that something is wrong.

	Notificat	tions	
Notification Time	Message		
31/05/2021 22:22:15	Warning Fixed : Utility Power Failure		
02/06/2021 20:23:03	Warning Fixed : Utility Power Failure		
02/06/2021 18:00:21	Warning : Utility Power Failure.		
02/06/2021 00:00:56	Connection to Battery restored.		
02/06/2021 00:00:40	Connection to Battery lost.		
01/06/2021 20:11:38	Warning Fixed : Utility Power Failure		
01/06/2021 18:00:04	Warning : Utility Power Failure.		
01/06/2021 12:04:54	Fault Fixed : Overload		
01/06/2021 12:04:38	Fault : Overload.		
01/06/2021 00:00:54	Connection to Battery restored.		
01/06/2021 00:00:38	Connection to Battery lost.		
			ų
	Clear Notifications	Cancel	

When alerts are set to be shown as notifications, the user will be presented with a flashing icon on the SMH desktop, from where they can click to see the errors and then clear the log.

			SMH Desktop	o (Maxie Karl)			_ = ×
Dashboard	Inverter	Battery	Overview	Settings	Logs		
Axpert 5 (450 VOC							
Per Inverter Settings		Select Inverter					
	Inverter <mark>1</mark> 🄶	Select Inverter	Curre	nt selected inverter : 1			
Charger source	e priority Solar Onl	Y	Apply		ent (A) 60	 ✓ Apply 	[
Outpu	ut Mode Parallel O	utput		Max AC charging curre	ent (A) 40	Apply	
Global Settings							
		Apply			Overload bypass	 Apply 	
	Backligh	Apply	LCD screen	return to default display sc		Apply	1
01	verload auto restart	Apply		All inverters must conne	ct to PV as PV OK	Apply	1
Over tempe	erature auto restart	Apply			ar power balance	 Apply 	1
Beeps while prima	ary source interrupt	Apply					
Output source	priority SBU	×	Apply	Back to charge volta	age (V) 46	Apply	_
Batte	ry Type User	×	Apply	Back to discharge volta	ige (V) 50	Y Apply	
Output frequer	ncy (Hz) 50	~	Apply	Output Volt	age (V) 230	 Apply]
AC Input	Range Applianc	e Y	Apply				
					- 100		_
	oltage (C.V. voltage)		Apply	Battery cut-off volta	ige (V) 45.5	Apply Apply	
Flo	bat charging voltage	e (V) 53.1 🗘	Apply				
							Close
Mode : Solar / Batte	ery Use	er : admin		Command Stat	us : Settings receiv	ed.	

Every feature that watchpower support have been meticulously re-created with the same look and feel you are used to. For multiple inverters you simply have to select which one you want to alter, and the system will request its data. Once received, you can adjust the settings in question, and move on to the next inverter.



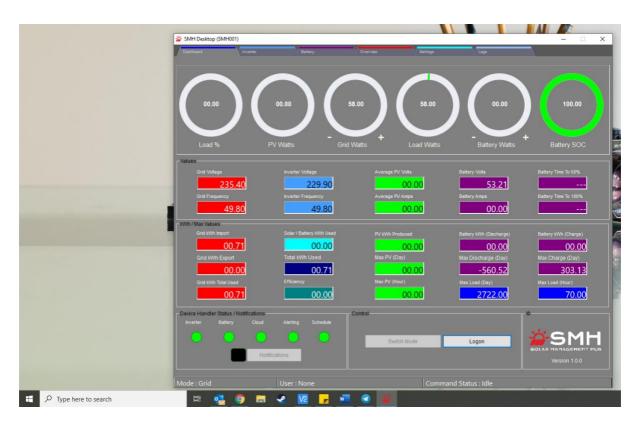
Finally, we also cater for enterprise customers, whereby the pi's they buy from us can be configured to post all their data to an enterprise portal, allowing the client to drill down all the way from a geographical map with hundreds of systems, to the specific system in question. Customisable alerting with enterprise alert acknowledgement and call resolution ensure that all systems can be monitored at the blink of an eye, even in a geographically dispersed environment.

Main Dashboard > Solar System Site 1					Solar Systems -	LoO Unit 1 (Goodwe)	C Realtime - la	ast 12 hours	±	5	#
Solar Site Units									۹	m	:
Entity name 🛧		Grid Watts			Load Watts						
Unit 1 (Goodwe)		-2366.0			974.0						
							Items per page: 10	- 1-1of1	<	; ;	>
Total kWh Used	60	Total lauk tread	Solar	Site Alerts				Q,	7 M	B	
Solar Battery kWh Used Grid kWh Import	-	Total kWh Used	() Re	altime - last day							
		15.98 kWh		Created time \downarrow	Originator	Type Severity	Status Ale	rt Msg			
		Solar/ Battery kwh Used									
		5.66 kWh				No alarms found					
		Grid kWh Import									
		11.66 kWh					Items per page: 10	▼ 0 of 0	<	()	>

Once selected, a specific system will so an overview of its own data, from where the user can drill down even more to see the real-time performance data of the actual inverter:

Main Dashboard > Solar System S	ite 1 > Unit 1 (Goodwe)			Solar Systems - 🚺 Entities	🛇 Realtime - last 12 hours 👲 🛟
System Overview			08.00 09:00		: 120 130
LOAD % 18 0 700	Load Watts 989.00	System Efficiency 2.14	Daily PV kWh made	Daily Sol/Bat kWh us 5.65	Daily Total kWh used
Grid Volts 244.00	Grid Freq 49.92	Grid Watts -2352.00	Daily Grid kWh Imp 11.66	Daily Grid kWh Exp 7.03	Daily Grid kWh Used 4.63
Inverter Volts 244.00	Inverter Freq 49.91	Inverter Watts 9.00	Avg PV Volts 297.80	Avg PV Amps 5.60	PV Watts 3331.26

Apart from displaying real-time values, the system also records everything, allowing the user to select anything from the last minute to the last year or more.



To further assist users that don't know how to operate things like VNC or Anydesk properly, we decided to make a Windows, Linux and MacOS client that connects to the Pi over the network and run as a native app. This means that the Pi is configured once, and after that the client can simply click the shortcut on his desktop to open the client for his respective operating system and start seeing the values, etc. Multiple instances of the client can also

connect at the same time, making it perfect for a permanent display in the living room, with another for use in the study for instance.



Below is a screenshot of the MacOS client:

In closing: All the screenshots, cloud dashboards, enterprise dashboards, home automation, web app, local client, etc all run from a single pi. As you probably saw, we don't do any graphics directly on the Pi, but rather offload that to the cloud, web apps, etc. This not only allow us to do SO MUCH MORE with the data, but also ensures that the pi runs cool, as the average CPU consumption to do all of the above is only about 8 to 15% on a Raspberry Pi3b. On a Pi4 this comes down even more.

There will be a R49.99 subscription per month to help pay for all the services offered, our dedicated support people, further development, cloud servers, etc, but once you take everything above into account, I am sure you will agree that it's really not a lot to ask for all of this, and as mentioned, if you are an existing ICC user (regardless of where you bought it originally), you can register to be upgraded to SMH for free, and just pay the subscription from there.