



K L C B T
KRUGER LOWVELD CHAMBER
BUSINESS AND TOURISM

Presents



TKS Solar Group

Going off-grid the smart way



Andre Anderson
Solar Engineering Specialist
082 474 9087
andre@tkS.co.za
www.tks.co.za

TKS Solar Group



1. Current status of the national power grid
2. Microgrids of the future (50kW to 10MW)
3. Process and technology to become grid independent

1. Current status of the national power grid



4 biggest grid challenges

1. Load Shedding
2. Energy Availability Factor (EAF)
3. Infrastructure
4. Tariffs

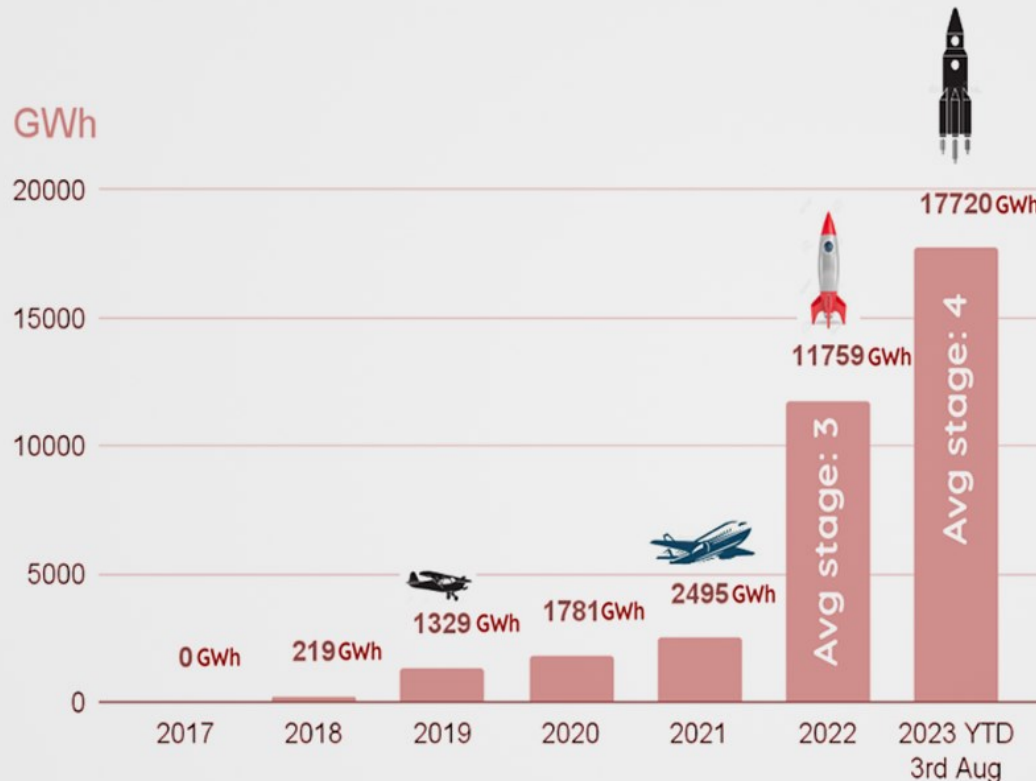
1. Current status of the national power grid - Load Shedding

Load Shedding Outlook: A Glimpse into the Future

Load shedding is projected by Energy Expert Matthew Cruise to increase over the next 5 years. Cruise points out that there has already been a 50% increase in load shedding in 2023 compared to the previous year.



Load shedding in 2023 is already 50% more than 2022's total



In **2023** we have **already** experienced **50% more** load shedding in GWh than in **2022** combined!

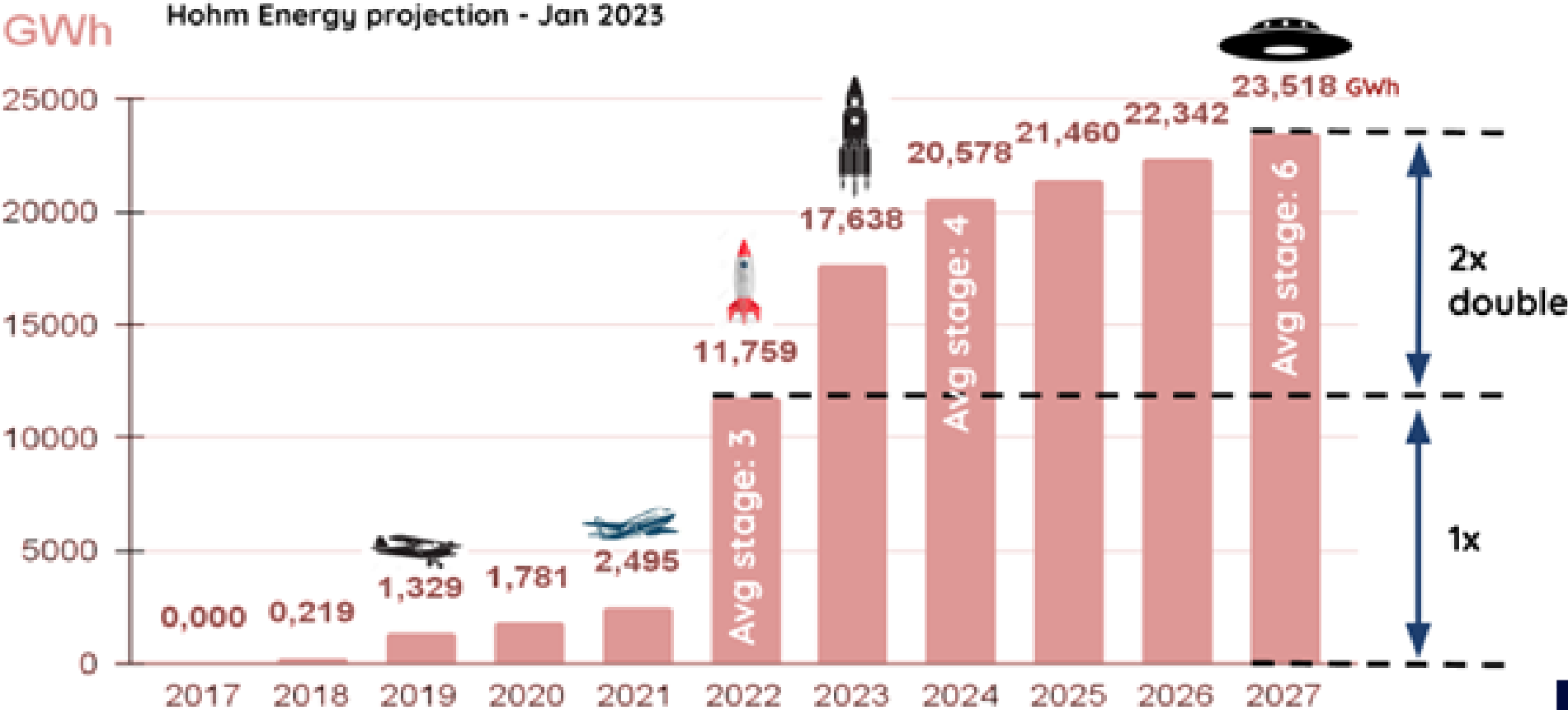
GWh (Gigawatt hours) measures the volume of electricity that is load-shed

For example:
1 hour of stage 1 = 1 GWh
1 hour of stage 6 = 6 GWh

Source data: Eskomsepush data and Hohm Energy calculations; updated 3rd Aug 2023

1. Current status of the national power grid - Load Shedding

Loadshedding is projected to double over the next 5 years



1. Current status of the national power grid - Load Shedding

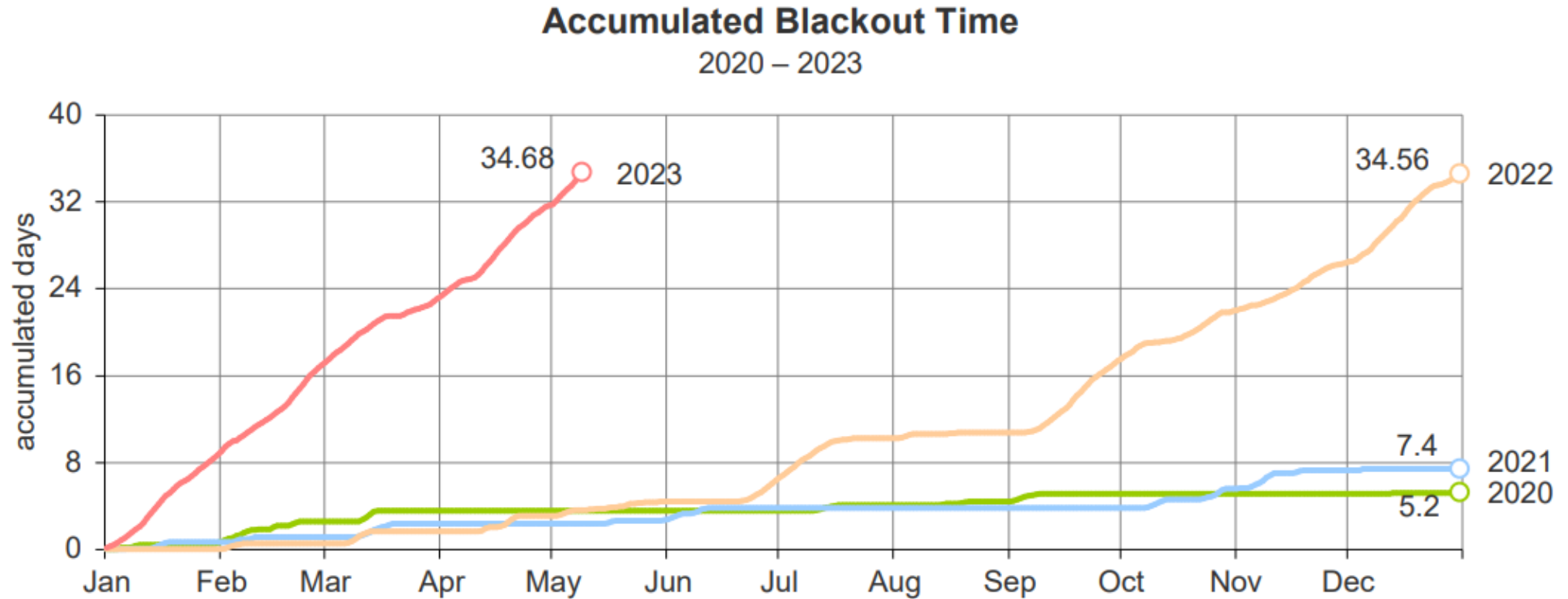


FIGURE 1: The 2022 record of 829.4 blackout hours (34.56 accumulated days) was surpassed on 9 May 2023. South Africa spent 9.5% of 2022 and to date, 26.9% of 2023 without utility power.

1. Current status of the national power grid - EAF

Declining EAF trend continues into 2022, to an average of 58.1%

The weekly EAF hit a new low of 48.6% (first year that it dropped below 50%)

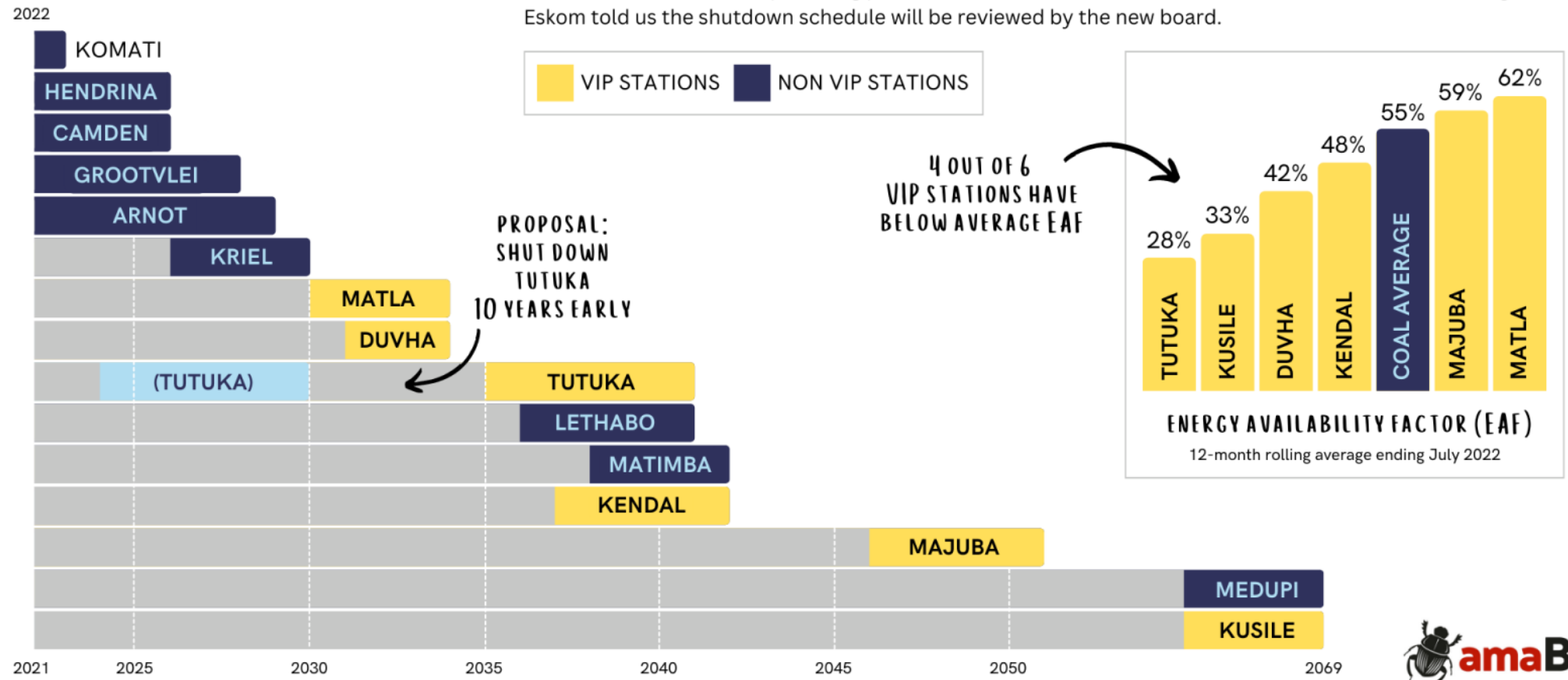


37% drop over 6 years

1. Current status of the national power grid - EAF

Shutting down of the coal fleet:

Eskom wants to shut down 9 coal-fired power stations by 2035, slightly more ambitious than government's official plan to shut down 8 by 2035. The VIP stations (yellow) have been earmarked for extra maintenance. These stations should keep running post-2030 but have some of the worst EAF numbers in the fleet (right). Eskom told us the shutdown schedule will be reviewed by the new board.



1. Current status of the national power grid - Infrastructure

Eskom's 14,000km headache

Eskom needs to build 14,000 km of transmission lines over the next decade.

However, South Africa simply does not have the capacity to undertake an infrastructure project of this size — even if the money can be found. Costing an estimated R372 billion.

The country will have to more than triple its current output to meet the demand for grid capacity by 2030.

The utility has said it will need an additional R100 billion in the 2025 financial year to execute its transmission development plan. This amount will increase annually to R170 billion in 2029.

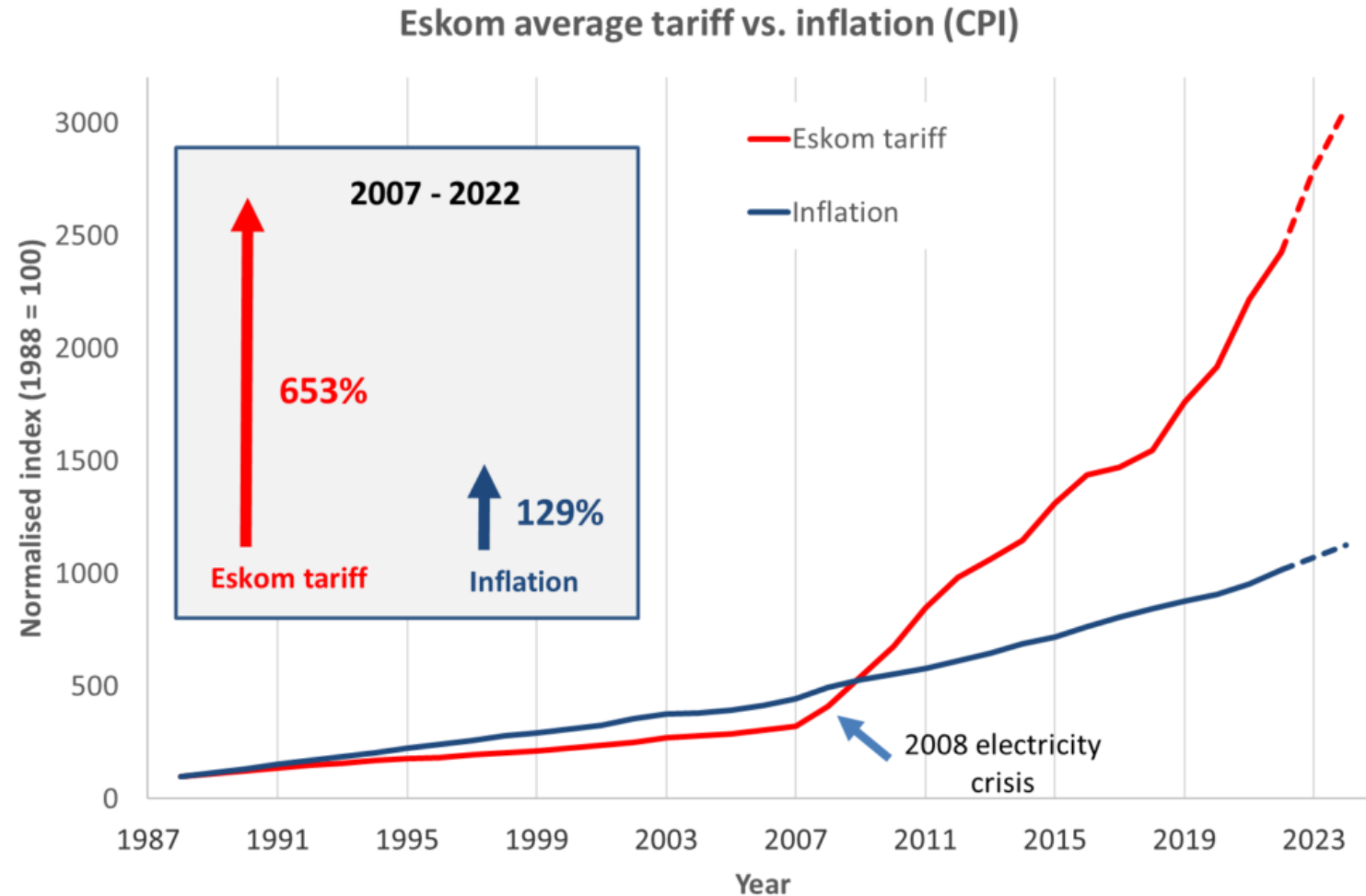
Of particular concern is that the provinces with the best resources are the Cape provinces, while those with the best infrastructure are in the country's northeast.

To complete this flip, South Africa must build 2,300 km of transmission lines per annum. Currently, the country only builds 200 km of lines a year.

The maximum length of transmission lines built annually was 1,800 km in the 1990s.



1. Current status of the national power grid - Tariff's



1. Current status of the national power grid - Tariff's

The National Energy Regulator of South Africa (Nersa) says when it approved Eskom's electricity tariff increases of 18.65% for 2023 and 12.74% for 2024, it considered the dilemma of the poor

When South Africans do have electricity, they will be expected to fork out a lot more to make use of it in the future.

The National Energy Regulator of South Africa (Nersa) has granted ailing state-owned power utility Eskom's tariff increase of a 31.4% electricity tariff hike over the next two years.

The increase is six times higher than the rate of inflation.

Apart from the country's worst energy crisis in history, consumers are facing an uphill battle, having to contend with high interest rates, fuel price increases and inflation.

Eskom believed that the decision made by NERSA for 2023/24 and 2024/25 of an 18.65% and 12.7% increase respectively, in conjunction with the debt relief that the Minister of Finance announced in February, would place the utility in a much better financial position.

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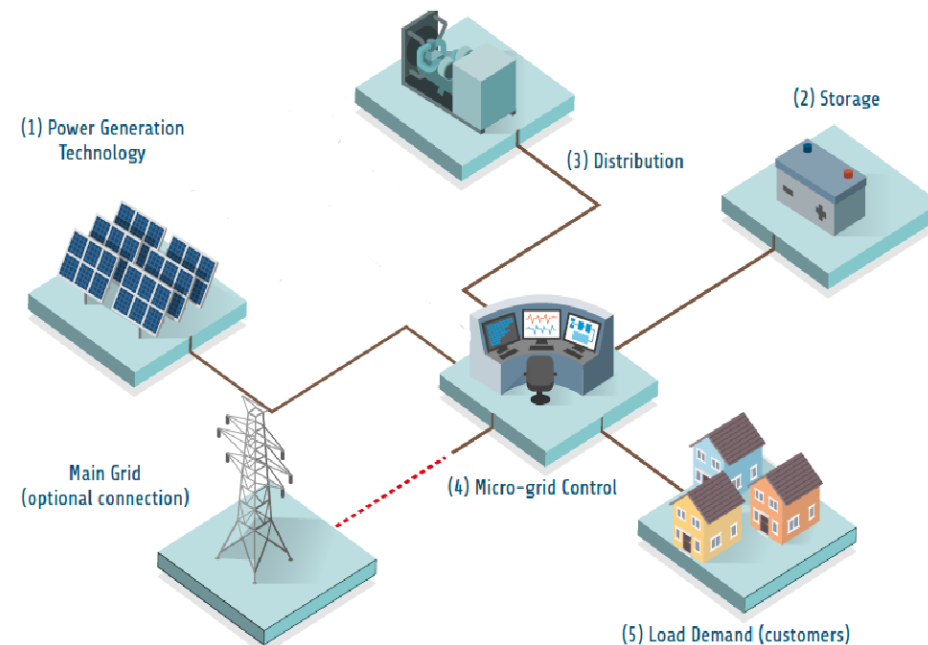
Microgrids

2. Microgrids of the future (50kW to 10MW)

A microgrid is a localized and independent energy system that can generate, store, and distribute electricity to a specific area or facility, separate from the national grid.

Microgrids are designed to provide **more reliable and resilient power supply**, increase energy efficiency, and, in most cases, incorporate renewable energy sources. They can operate in grid-tie mode, or Off Grid, where they operate independently from the main grid.

Figure 1: Micro-grid components Adapted from [5]



SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.

2. Microgrids of the future (50kW to 10MW)

	Item	Description
1	Definition	A localized and independent energy system that generates, stores, and distributes electricity
2	Generation Sources	Includes solar panels, Hybrid Inverters, Storage units, wind turbines, generators, combined heat and power systems, Hydrogen
3	Energy Storage	Typically includes energy storage systems like batteries for balancing supply and demand
4	Control Systems	Advanced control systems coordinate generation, storage, and distribution for optimal operation
5	Resilience	Enhances power supply resilience, especially during grid outages or disruptions
6	Integration of Renewables	Often incorporates renewable energy sources to reduce emissions and fossil fuel reliance
7	Economic Benefits	Reduces energy costs and improves energy efficiency, potentially offering economic advantages
8	Environmental Benefits	Tends to use cleaner energy sources, reducing greenhouse gas emissions and transmission needs
9	Applications	Unlimited off grid applications

2. Microgrids of the future (50kW to 10MW)

The New Energy Landscape



2. Microgrids of the future (50kW to 10MW)

Microgrids Solve for Integrated Outcomes

Schneider Electric empowers business leaders to make wise choices at the intersection between energy smartly acquired, locally produced and efficiently consumed to accelerate business performance.



Cost

- Lower / More Predictable Energy Costs
- Energy / Fuel Source Arbitrage
- Flexibility drives savings / incremental revenue



Sustainability

- Reduce carbon footprint
- Improve brand image
- Attract / Service carbon sensitive customers



Resilience

- Serve loads during times of grid instability
- Shelter in place for employees / customers
- Protect power sensitive / critical assets from poor power quality

SOLAR ENERGY

Andre Anderson

Solar Engineering Specialist

M: +27 (82) 474 9087

E: andre@tk.co.za

**Advanced
Solar Specialist**

**Schneider
Electric**



Energy Master Plan

Your long term partners for renewables

Utility Scale, Grid-tie Commercial, Off-Grid & Back-up

World's #1 Solar Solutions



SolarXpert™

**Schneider
Electric** | the global specialist
in energy management

TKS Solar Engineering

Trackos

TKS Microgrid Solutions

*Your mindset is the most affordable tool
to improve energy efficiency*



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Who is Schneider Electric

We are your
long term partner for solar



Schneider Electric is an energy management & automation specialist

Schneider Electric brands well-known for quality and reliability

You can guarantee that Schneider Electric will be around when you need us – in 10 years, 15 years or 20 years

Schneider Electric is a leading player in Solar



Trackos Solar Engineering

Why



&



- Premium microgrid solutions
- Best after-sales support
- National footprint with strong infrastructure
- Supported by the best industry leaders
- Approved by mainstream banks
- Proven track record

- #1 in Microgrid Integration
- #1 Supply chain by Gardner
- Ranked 421 Fortune Top 500
- 115 years in South Africa
- Renown for quality and reliability

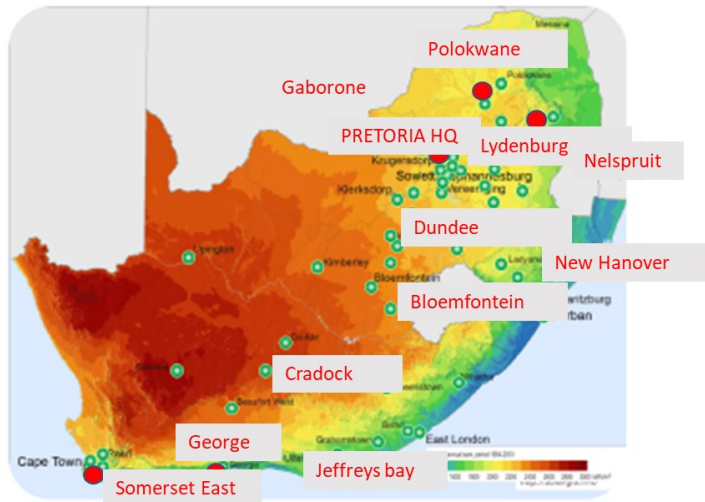
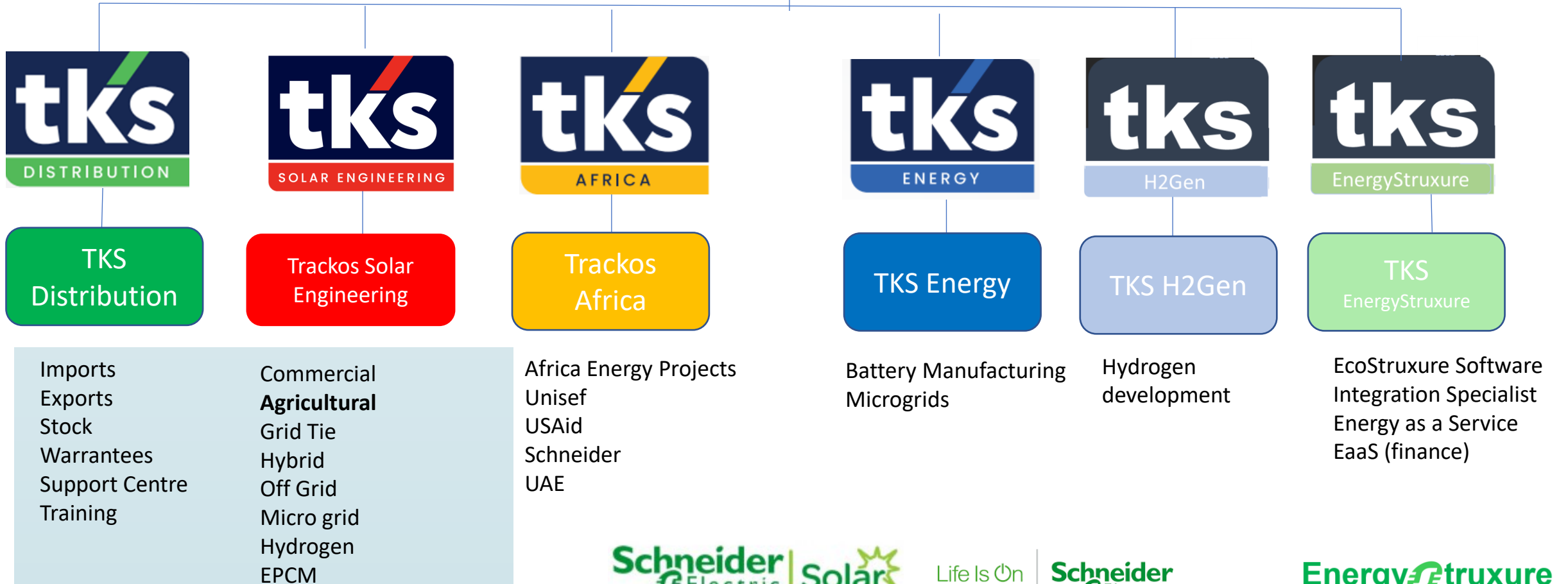


Chart 1-1. The Guidehouse Insights Leaderboard Grid



Schneider Electric – TKS partnership



TKS Microgrid Solutions - Finance

Accredited with all major banks



Energy  truxure

Energy as a Service (EaaS)

Upgrade electrical infrastructure and enhance sustainability with microgrids funded via Energy as a Service.

No upfront cost





1. Environmental Responsibility

- Reducing harmful practices:** Decreasing pollution, greenhouse gas emissions, the use of single-use plastics, water consumption, and general waste
- Regulating energy consumption:** Increasing reliance on renewables, sustainable resources, and recycled or partially recycled materials
- Offsetting negative environmental impact:** Planting trees, funding research, and donating to related causes

2. Ethical Responsibility

Ethical responsibility is concerned with ensuring our organization is operating in a fair and ethical manner. We aim to practice ethical behavior through fair treatment of all stakeholders, including leadership, investors, employees, suppliers, and customers.

3. Philanthropic Responsibility

Our business aim to actively make the world and society a better place.

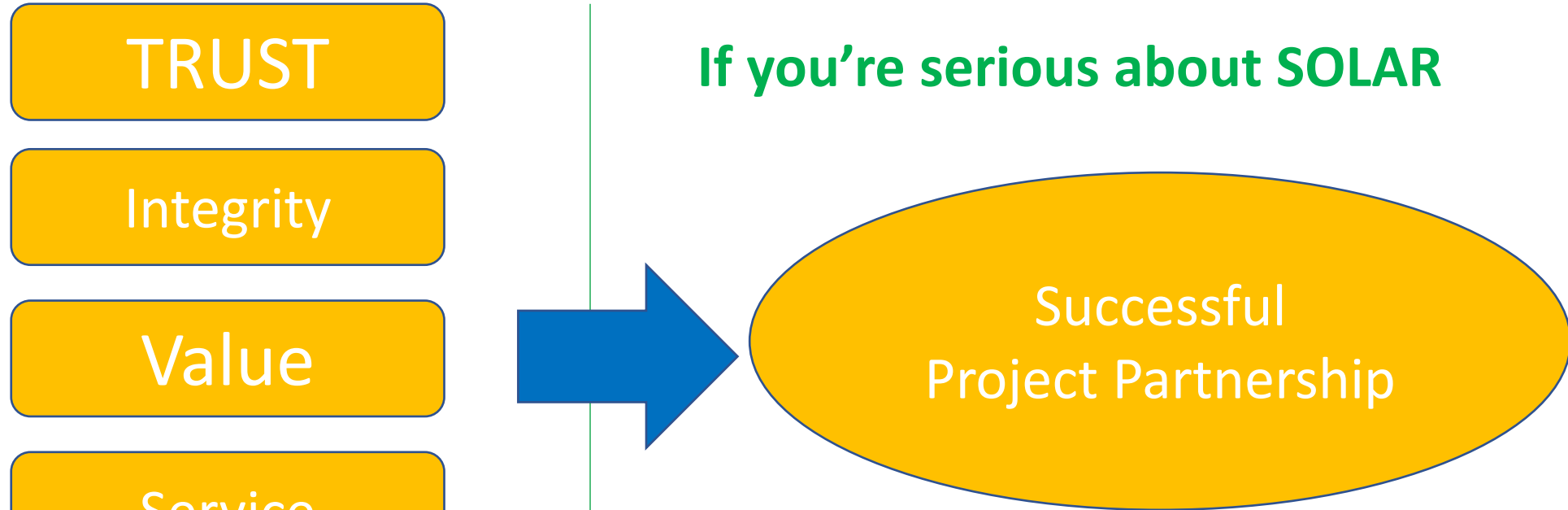
4. Economic Responsibility

We back all of our financial decisions and our commitment to do good. The end goal isn't just to maximize profits, but also to make sure our business operations positively impact the environment, people, and society.

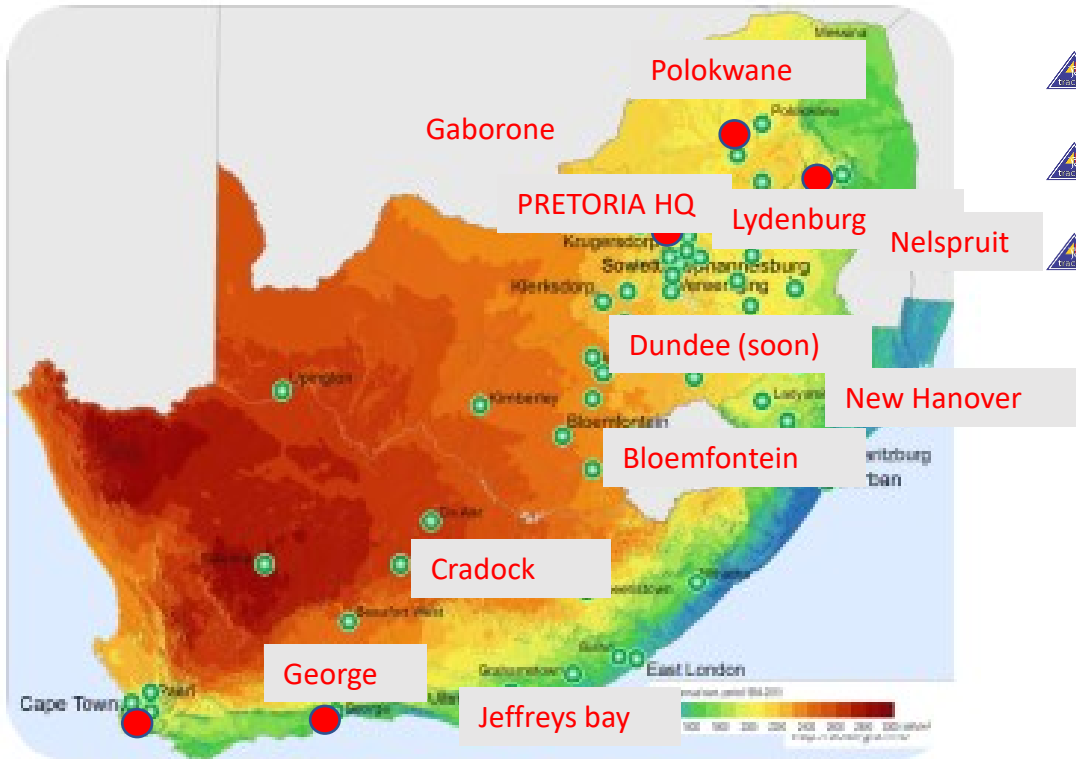
TKS Social Development – NPO Program



Who is TKS Solar Engineering

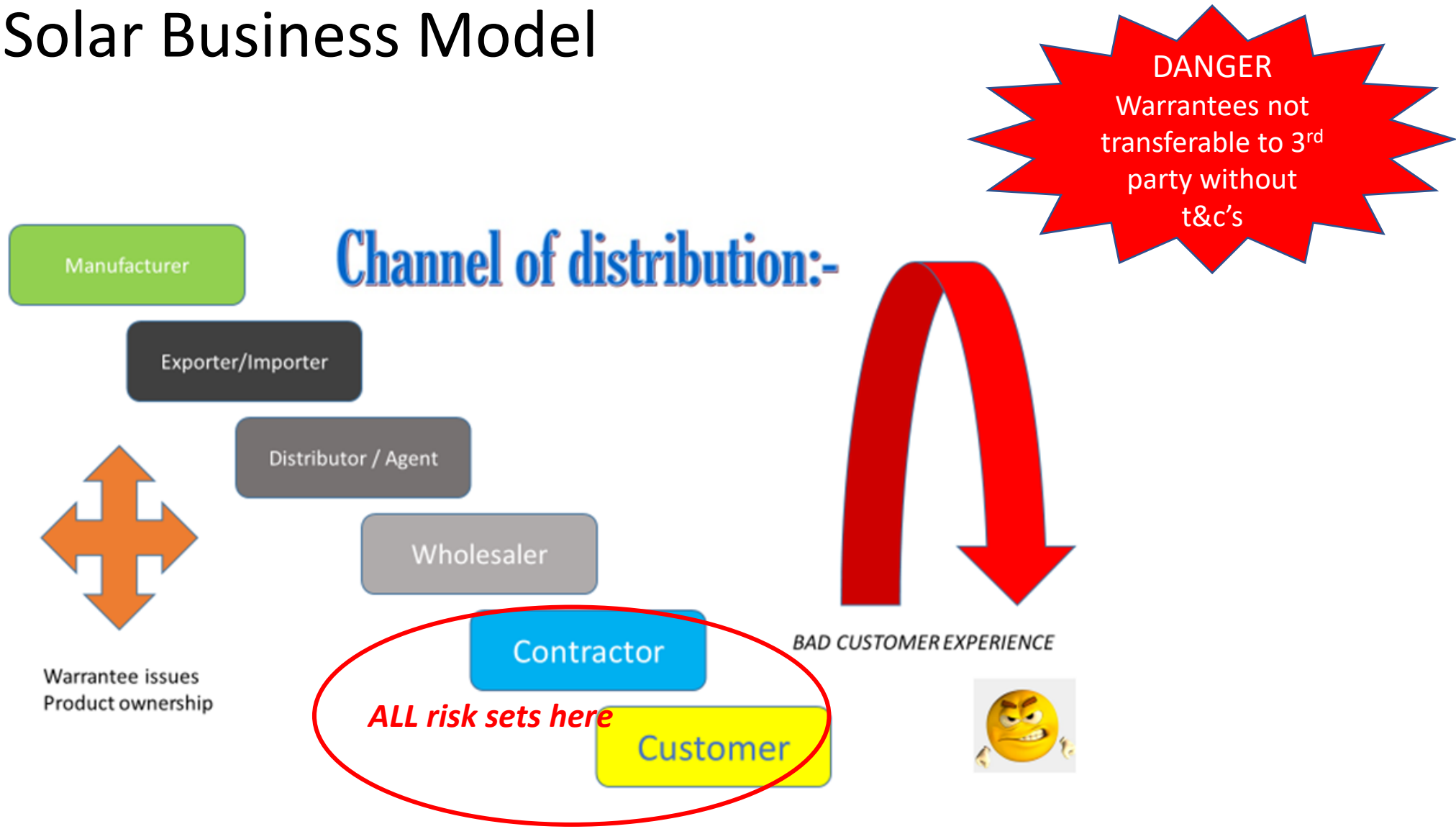


Taking Africa's Energy to the next level..



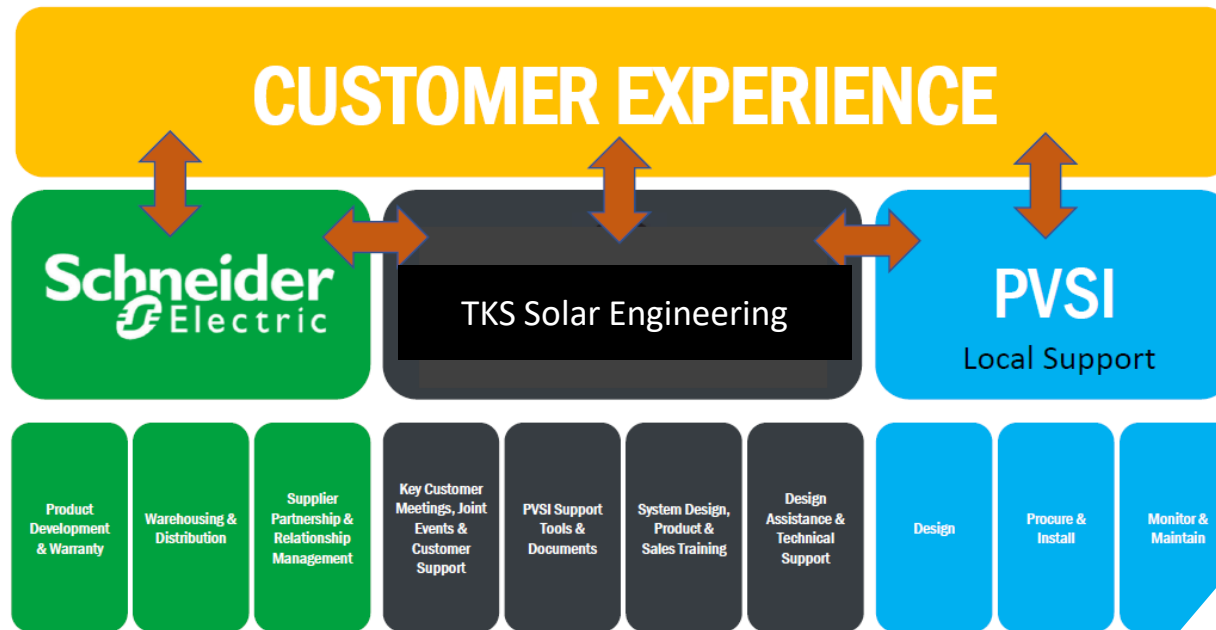
- ▲ Highest SE partnership
- ▲ Largest PVSI network
- ▲ EPCM Partner of choice
- ▲ Proven solutions delivering:
 - ▲ A diversified energy portfolio
 - ▲ Capped energy costs
 - ▲ Levelised cost of electricity (LCOE)
 - ▲ Competitive costs vs. fossil fuels
 - ▲ Bankable solutions
 - ▲ Maximum value
 - ▲ Optimised efficiencies
 - ▲ Minimised risk

Standard Solar Business Model



TKS - Schneider Solar Business model

The value of the PARTNERSHIP is KEY to our success!



TKS Solar Group

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Service Offering

EPC:

- Unique Engineering, Design & Consulting
 - Procurement
 - Construction

Expertise:

- Solar PV Solutions (grid tie, hybrid, off grid)
 - Green Hydrogen Solutions
 - Electric vehicle charging stations
- Power Control System PCS / Batteries BESS

Operations & Maintenance:

- Maintenance
- Management
 - Monitoring

Insurance:

- Hollard Insurance Co
- Specially formulated for renewables



Finance:

- Outright Purchasing (CAPEX)
- Finance Options with all major Banks
- Lease to Own / Energy as a Service (EaaS)
- Power Purchase Agreements (PPA)
- Supply Chain Management

Agreements:

Guaranteed Performance Agreements

Net Metering:

- Wheeling and Banking



Development:

Energy Master Plan





We understand Africa



Distribution & sales

Training Centre

Technical Support/Service Centre

National Call Centre

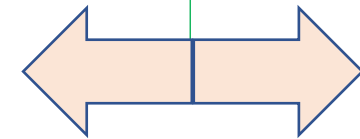
Marketing

Logistics

Warranties & RMA



Local Stock Supply

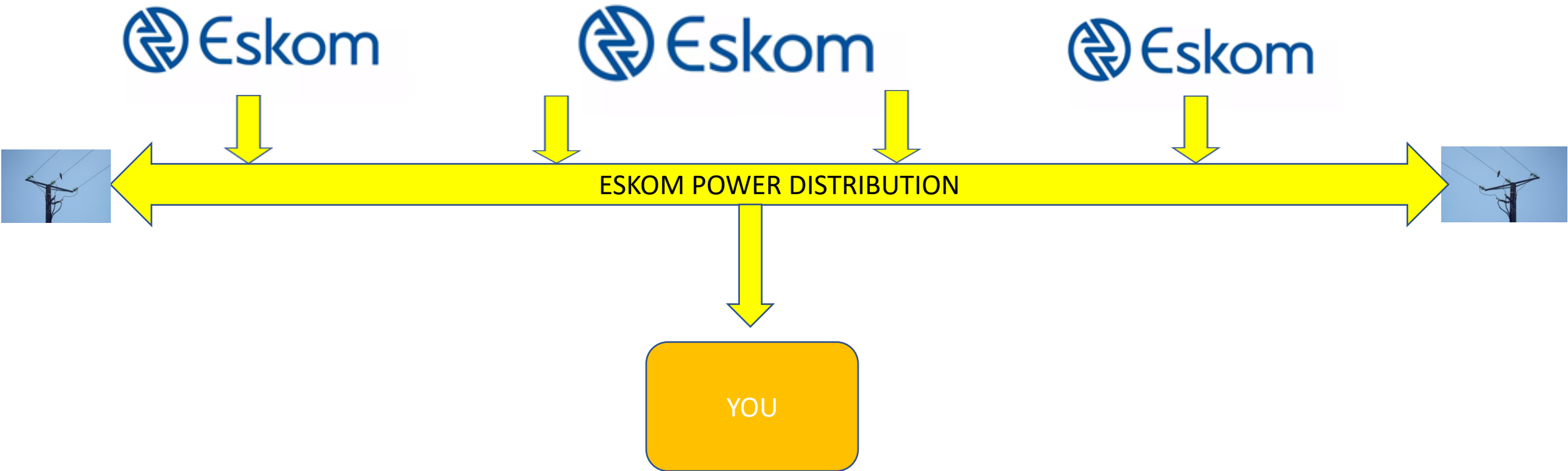


Agreed migration period



TKS Solution - Microgrid

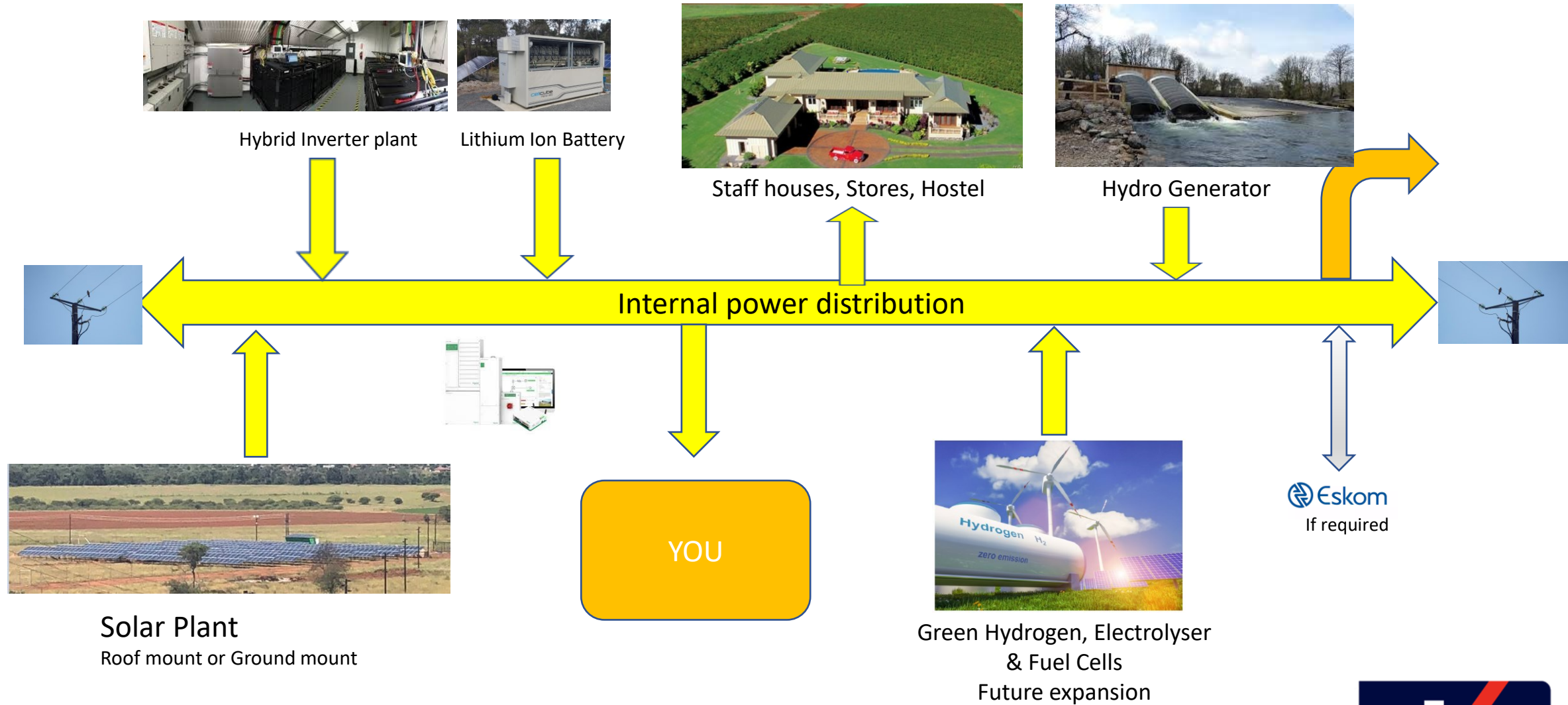
Your current grid



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Schneider
Electric

Our Solution - Microgrid



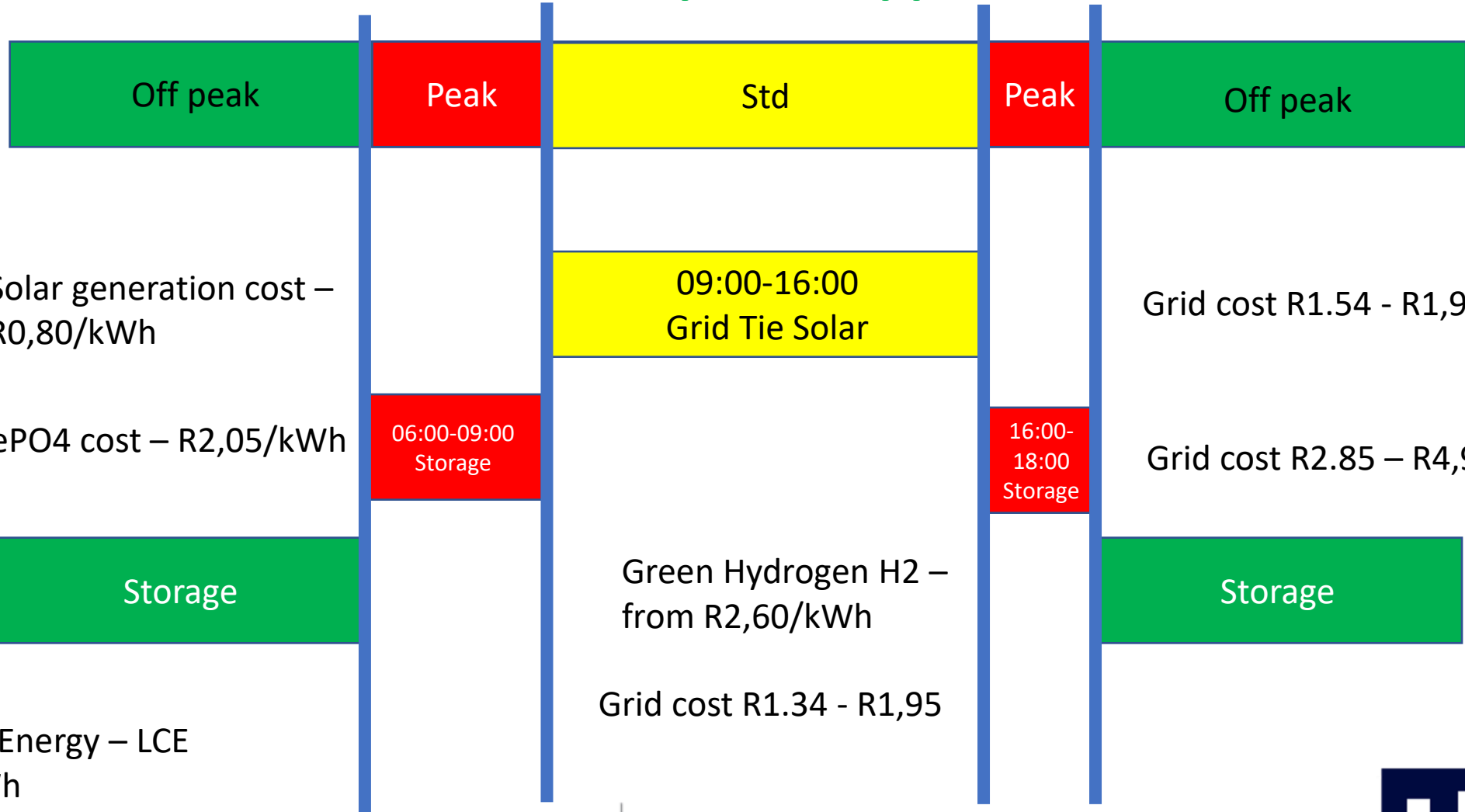
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Our Solution - Microgrid

Phase development approach

Eskom LCE – 1,95 – R2,45



Levelized cost of Energy – LCE

2022 – R1,96/kWh

2023 – R2,51/kWh

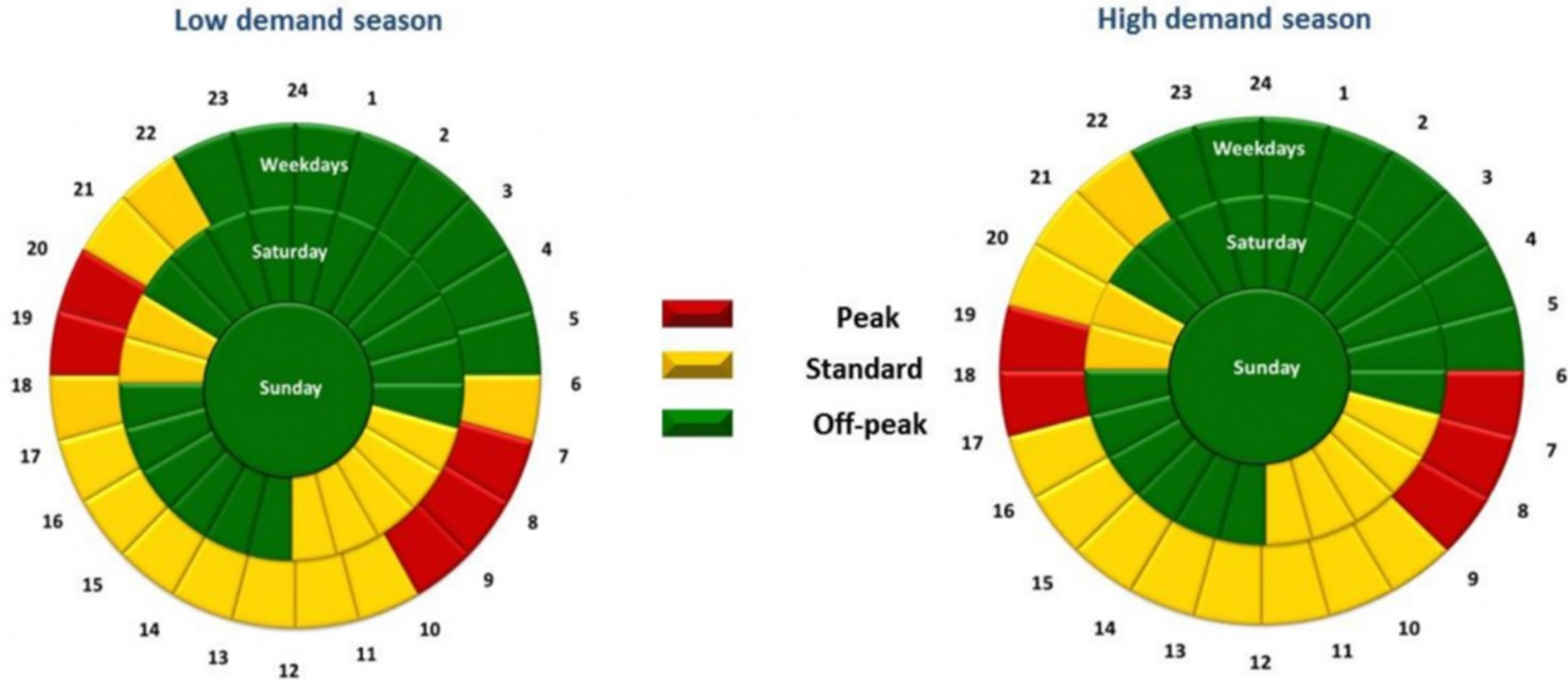
2023 – R2,96/kWh

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Our Solution - Microgrid



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SOLAR ENGINEERING

ENERGY MASTER PLAN

PHASE 1 APPROACH

- Amalgamation Eskom Points
- Construction of internal power line
- Installation of Transformer points
- Install Solar plant
- Protection and control
- Network Dynamic Stability Control
- Monitoring and control – Profile Management
- Eskom intervention

We are a One-stop Renewable EPCM³™ Solutions Provider



ENERGY MASTER PLAN

PHASE 2 APPROACH

- Solar plant extension
- Generator (TOU)

PHASE 3 APPROACH

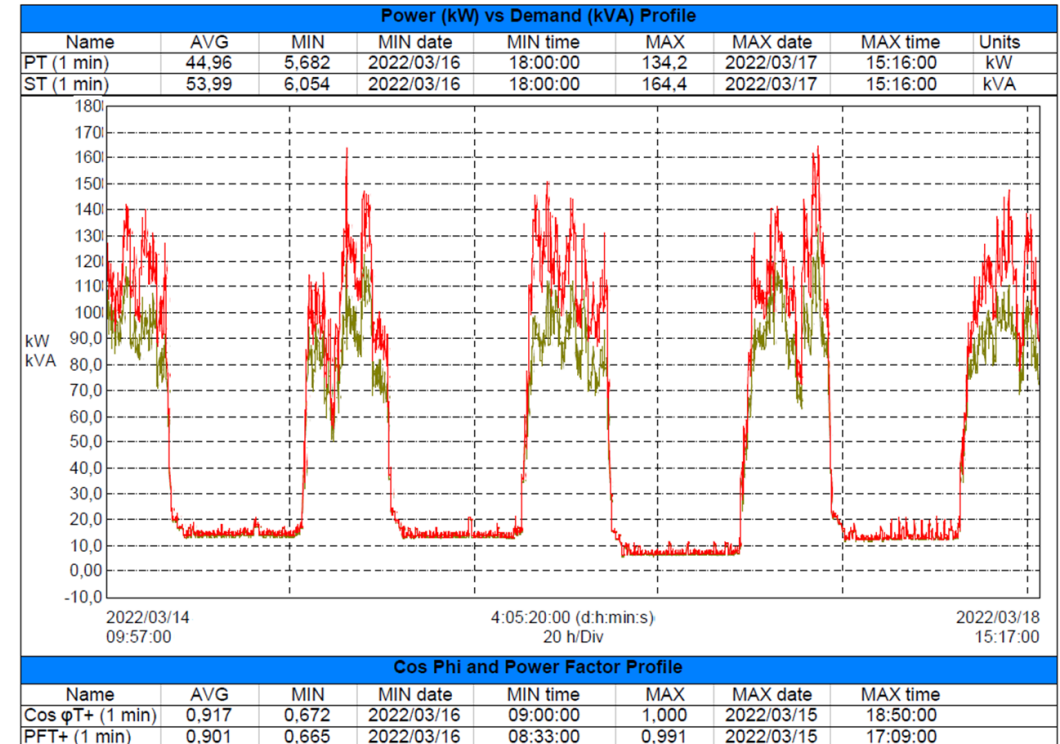
- Hydrogen Plant / Hydro Plant / Wind
- Flow battery storage
- Kinetic Storage Grid Forming Device

We are a One-stop Renewable EPCM³™ Solutions Provider



Financial Case study – current microgrid project

01/04/22		Smart Prepaid			
		Demand charge 11KV Time of Use	45 016.16	6 752.42	51 768.58
		Off-Peak Energy Charge - 11KV Time of Use	3 010.15	451.52	3 461.67
		Peak Energy Charge - 11KV Time of Use	11 128.65	1 669.30	12 797.95
		Standard Energy Charge 11KV Time of Use	17 223.36	2 583.50	19 806.86
		Fixed Charge	2 830.65	424.60	3 255.25
		Reading dates: Curr 31/03/22 Prev 01/03/22 (31 days)			
		Meter: 3507535029368(Actual) Curr 191 Cons 382 KVA (E11DEM_PK)			
		Meter: 3507535029368(Actual) Curr 150113 Cons 6183 KWH (E_PK_PP)			
		Meter: 3507535029368(Actual) Curr 114254 Cons 3826 KWH (E_OP_PP)			
		Meter: 3507535029368(Actual) Curr 405253 Cons 15494 KWH (E_STD_PP)			
		Reading dates: Curr 31/03/22 Prev 31/03/22 (1 days)			
		Meter: 3507535029368(Actual) Curr 0 Prev 0 Cons 191 KVA			
01/04/22		VAT			
		VAT 14% on services of R0		0.00	
		VAT 15% on services of R79208.97		11 881.35	
		Total Current Levy (B)	79 208.97	11 881.35	91 090.32



Financial Case study – current microgrid project

						Std kWh	Peak kWh	Off Peak kWh	kVA	Yearly
		Std	Peak	O/Peak	kVA	15500	3800	6200	250	
2022	Summer	R1,31	R2,08	R0,93	R253	R20 305,00	R7 904,00	R5 766,00	R63 250	R1 233 129,00
	Winter	R1,94	R5,06	R1,10		R30 070,00	R19 228,00	R6 820,00		
2023	Summer	R1,51	R2,31	R1,07	R291	R23 405,00	R8 778,00	R6 634,00	R72 750	R1 416 090,00
	Winter	R2,23	R5,81	R1,28		R34 565,00	R22 078,00	R7 936,00		
2024	Summer	R1,74	R2,66	R1,23	R335	R26 970,00	R10 108,00	R7 626,00	R83 750	R1 630 335,00
	Winter	R2,57	R6,68	R1,47		R39 835,00	R25 384,00	R9 114,00		
2025	Summer	R2,00	R3,06	R1,41	R385	R31 015,50	R11 624,20	R8 769,90	R96 313	R1 874 459,63
	Winter	R2,96	R7,75	R1,63		R45 810,25	R29 445,44	R10 085,39		
2026	Summer	R2,30	R3,52	R1,63	R443	R35 667,83	R13 367,83	R10 085,39	R110 759	R2 155 628,57
	Winter	R3,40	R8,91	R1,87		R52 681,79	R33 862,26	R11 598,19		
2027	Summer	R2,53	R3,87	R1,79	R487	R39 234,61	R14 704,61	R11 093,92	R121 835	R2 371 191,43
	Winter	R3,74	R9,80	R2,06		R57 949,97	R37 248,48	R12 758,01		
2028	Summer	R2,78	R4,26	R1,97	R536	R43 158,07	R16 175,07	R12 203,32	R134 019	R2 608 310,57
	Winter	R4,11	R10,78	R2,26		R63 744,96	R40 973,33	R14 033,81		
TOTAL energy cost over 7 years										R13 289 144,19

Self-funding
with-in
4-5 years

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Financial Case study – current microgrid project

No	Description	Qty	Unit	Standard Solution - TKS	Premium Solution - Schneider
1	Schneider Electric CL50 inverter	4	R 76 250,00	-	R 305 000,00
2	Alternative Inverter - TKS PCS50	4	R 68 445,00	R 273 780,00	-
3	450W Solar Panel	504	R 3 685,00	R 1 857 240,00	R 1 857 240,00
4	Mounting Structure Standard	1		R 501 480,00	-
5	Mounting Structure Aluminium	1		-	R 612 360,00
6	Static Protection Basic	1		R 32 450,00	-
7	Static Protection Integrated	1		-	R 54 660,00
8	Comms on Board	1		R 42 125,00	-
9	Monitoring and Control	1		-	R 58 325,00
10	Cabling Basic	1		R 68 305,00	-
11	Cabling Integrated	1		-	R 94 780,00
12	200kVA hybrid inverter	1	R 1 176 200,00	R 1 176 200,00	R 1 176 200,00
13	500kVA BESS battery pack	1	R 3 650 200,00	R 3 650 200,00	R 3 650 200,00
14	DB board upgrade	0			
15	Transport and Delivery	1		R 92 600,00	R 122 200,00
16	Labour	1		R 86 890,00	R 129 560,00
	Sub Total			R 7 781 270,00	R 8 060 525,00
	15% VAT			R 1 167 190,50	R 1 209 078,75
	TOTAL PRICE			R 8 948 460,50	R 9 269 603,75

Payment Summary		
100% Bond		
1	Cost of System	R 8 060 525,00
2	Yearly Energy Savings	R 1 380 240,00
3	Monthly Savings	R 115 020,00
4	100% Bonded Repayment per year	R 1 373 798,41
5	100% Bonded monthly repayment	R 114 483,20
6	Difference	R 536,80
7	Payment / Savings equalization	1st month positive

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Electric



Financial Case study – current microgrid project

Solar PV system - IRR Calculation - PREMIUM SOLUTION									
Year	Capital	KWh/Year/ kWp	R/kWh	R(kVA)/y	Energy Saving per year	Replacement Cost	Maintanace	Total	IRR
2023	-R 8 060 525,00	324000	R 4,26	R 0,00	R 1 380 240,00		-R 161 210,50	-R 6 841 495,50	28,5%
2024		321121	R 5,07	R 0,00	R 1 627 890,43		-R 172 495,24	R 1 455 395,20	
2025		318267	R 5,73	R 0,00	R 1 823 170,20		-R 184 569,90	R 1 638 600,30	
2026		315439	R 6,19	R 0,00	R 1 951 527,02		-R 197 489,79	R 1 754 037,22	
2027		312636	R 6,68	R 0,00	R 2 088 920,55		-R 211 314,08	R 1 877 606,47	
2028		309858	R 7,22	R 0,00	R 2 235 987,02		-R 226 106,07	R 2 009 880,95	
2029		307105	R 7,79	R 0,00	R 2 393 407,42		-R 241 933,49	R 2 151 473,93	
2030		304376	R 8,42	R 0,00	R 2 561 910,70		-R 258 868,83	R 2 303 041,87	
2031		301671	R 9,09	R 0,00	R 2 742 277,14		-R 276 989,65	R 2 465 287,48	
2032		298991	R 9,82	R 0,00	R 2 935 341,93		-R 296 378,93	R 2 638 963,00	
2033		296334	R 10,60	R 0,00	R 3 141 999,08		-R 317 125,45	R 2 824 873,62	
2034		293700	R 11,45	R 0,00	R 3 363 205,53	-R 169 662,12	-R 339 324,24	R 2 854 219,17	
2035		291091	R 12,37	R 0,00	R 3 599 985,59	-R 181 538,47	-R 363 076,93	R 3 055 370,20	
2036		288504	R 13,36	R 0,00	R 3 853 435,71	-R 194 246,16	-R 388 492,32	R 3 270 697,23	
2037		285940	R 14,43	R 0,00	R 4 124 729,50	-R 207 843,39	-R 415 686,78	R 3 501 199,33	
2038		283399	R 15,58	R 0,00	R 4 415 123,21	-R 222 392,43	-R 444 784,85	R 3 747 945,93	
2039		280881	R 16,83	R 0,00	R 4 725 961,54	-R 237 959,90	-R 475 919,79	R 4 012 081,85	
2040		278385	R 18,17	R 0,00	R 5 058 683,84	-R 254 617,09	-R 509 234,18	R 4 294 832,57	
2041		275911	R 19,63	R 0,00	R 5 414 830,83	-R 272 440,29	-R 544 880,57	R 4 597 509,97	
2042		273460	R 21,20	R 0,00	R 5 796 051,66	-R 291 511,11	-R 583 022,21	R 4 921 518,34	
2043		271030	R 22,89	R 0,00	R 6 204 111,62	-R 311 916,88	-R 623 833,77	R 5 268 360,97	

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Our Solution - Microgrid

1. Solar PV system
2. LiFePO₄ Battery storage
3. Generator integration
4. Integrated power lines
5. Control philosophy
6. Maintenance / Service level agreement
7. Insurance



H₂



Energy  truxure

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Battery Cell and Module

Battery Cell



12000 cells/container
6m 38 ton

Battery Module @1C



Battery Module @0.5C



750 units/container
6m 38ton



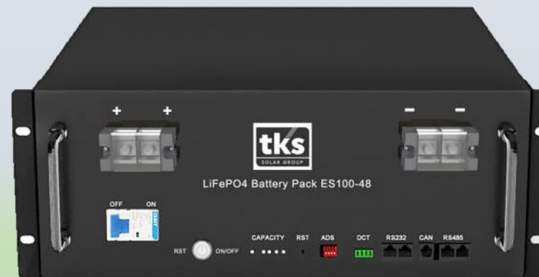


Sinexcel

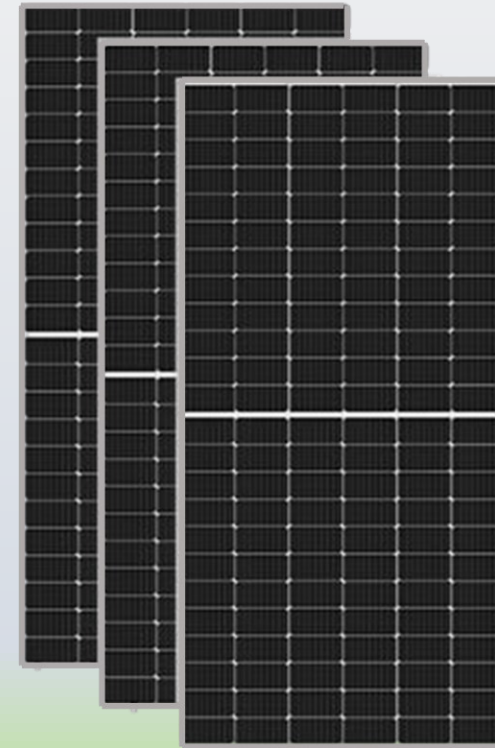


THE NEW ERA OF ENERGY STORAGE SYSTEMS

PCS Inverter: 30kW – 2MW
Battery: 60kWh – 5MWh
PV modules: 30kW – 5MW



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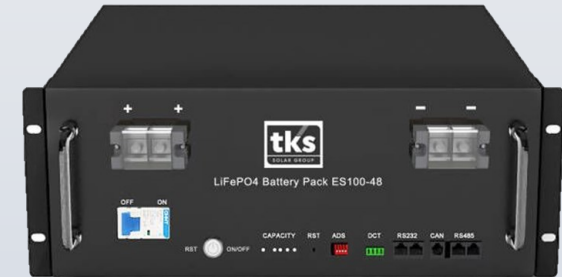
THE POWER OF MODULAR DESIGN



TKS-30P modular PCS



TKS-8k modular HV storage

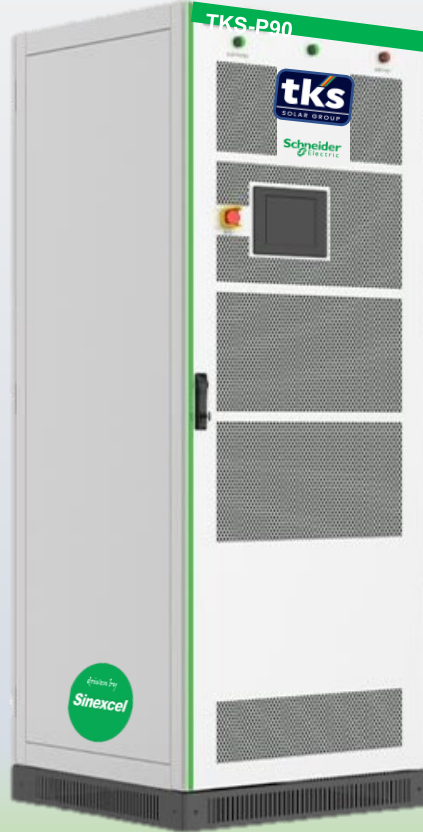


TKS-5148 modular LV storage

Sinexcel

www.tks.co.za





Sinexcel

TKS-90P

Specifications

Power Converter System			
Model	TKS-30PCS	TKS-60PCS	TKS-90PCS
Max PCS units	1	2	3
AC power range - 3 phase	30kW	60kW	90kW
Battery compatibility			
Battery string voltage range	150-750Vdc		
Battery capacity range	60-150kWh	120-250kWh	200kWh-500kWh
Battery charge/discharge rate	0,5C	0,5C	0,5C
Auto-switching Compatibility			
Switching module	TKS-PWD-100K		
Switching time	30ms		
Physical			
Size	W1100 x D1100 x H2450		
Weight (without battery)	685kg	750kg	815kg
Humidity	0-95%		
Noise	<75dB		
Protection	IP54		
Operating ambient temperatures	-30 to 55deg (derating over 45deg)		
Optional Components			
Fire Supression System	Sensor tube with FM200		
Transformer	50kVA	100kVA	100kVA
Gateway and communication	Schneider Electric		
Aux power	220V with 3kW UPS		
Compliance			



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Power Converter System							
Model	TKS-120PCS	TKS-150PCS	TKS-180PCS	TKS-210PCS	TKS-240PCS	TKS-270PCS	TKS-300PCS
Max PCS units	4	5	6	7	8	9	10
AC power range - 3 phase	120	150	180	210	240	270	300
Battery compatibility							
Battery string voltage range	150-750Vdc						
Battery capacity range minimum	250kWh	300kWh	400kWh	450kWh	500kWh	550kWh	600kWh
Battery charge/discharge rate	0,5C	0,5C	0,5C	0,5C	0,5C	0,5C	0,5C
Auto-switching Compatibility							
Switching module	TKS-PWD-300K						
Switching time	30ms						
Physical							
Size	W2100 x D1100 x H2450						
Weight (without battery) kg	895	980	1070	1170	1280	1395	1515
Humidity	0-95%						
Noise	<75dB						
Protection	IP54						
Operating ambient temperature	-30 to 55deg (derating over 45deg)						
Optional Components							
Fire Supression System	Sensor tube with FM200						
Transformer	150	150	200	250	315	315	315
Gateway and communication	Schneider Electric						
Aux power	220V with 5kW UPS						
Compliance							

TKS-k range

Battery Specifications



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ITEM	UNIT	SPECIFICATION	RENDERING
Make	-	SYL	A 3D perspective rendering of a white, rectangular battery unit. The front panel features a central cooling fan, an orange terminal block on the left, and a black terminal block on the right. Various ports and labels are visible on the front face.
Configuration	-	1P 10S	
Key Component	-	10 cells, module BMU	
Dimension(W×H×D)	mm	220×230×990	
Weight	kg	70	
Nominal Capacity	Ah	280	
Nominal Energy	kWh	8.96	
Nominal Voltage	Vdc	32.0	
Operating Voltage	Vdc	28.0~36.0	
Maximum Power	kW	4.48 (0.5C)	
Storage Temperature	°C	-30~60	A 3D perspective rendering of a white, rectangular battery unit. The front panel features a central cooling fan, an orange terminal block on the left, and a black terminal block on the right. Various ports and labels are visible on the front face.
Storage Humidity	%	≤85	





TKS-k range

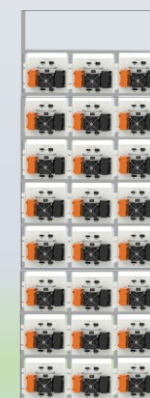
Battery Specifications

TKS Energy - HV battery range

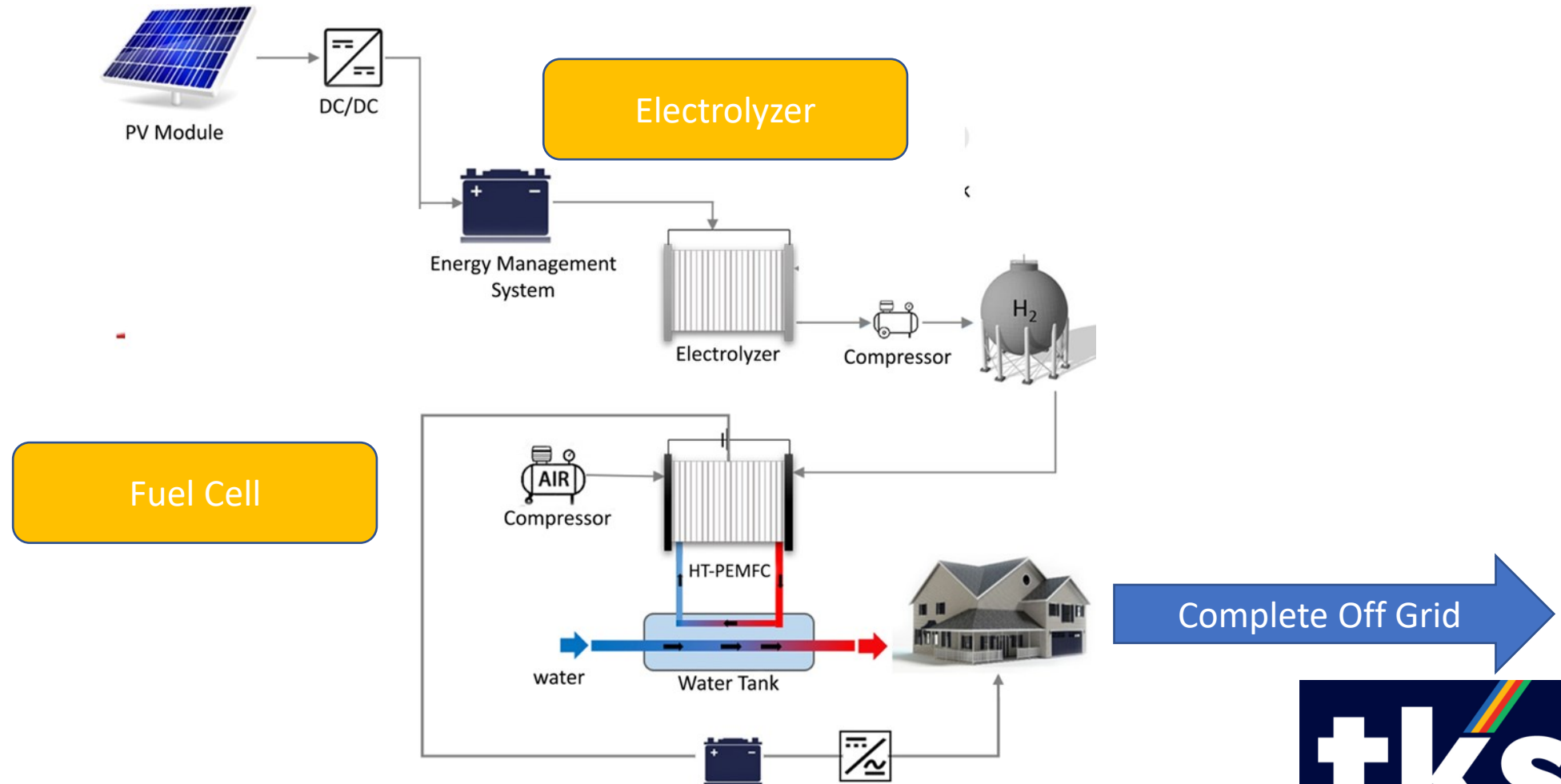
TKS-8k module s	Rows	Racks	Dimentio ns (w x d x h) m	Sub BMS	Master BMS	DC Disconne ct	Voltage	kWh	kWh rated
12	6 x 3	1	1 x 1 x 2.4	1	1	1	360	107,52	100
15	7 x 3	1	1 x 1 x 2.4	1	1	1	450	134,40	125
18	8 x 3	1	1 x 1 x 2.4	1	1	1	540	161,28	150
21	9 x 3	1	1 x 1 x 2.4	1	1	1	630	188,16	175
24	10 x 3	1	1 x 1 x 2.4	1	1	1	720	215,04	200
30	5 x 3 5 x 3	2	2 x 1 x 2.4	2	1	2	450	268,8	250
36	2 rack x 19	2	2 x 1 x 2.4	2	1	2	540	322,56	300
40		2	2 x 1 x 2.4	2	1	2	600	358,4	350
48		2	2 x 1 x 2.4	2	1	2	720	430,08	400
54		3	3 x 1 x 2.4	3	1	3	540	483,84	450
60		3	3 x 1 x 2.4	3	1	3	600	537,6	500
72		3	3 x 1 x 2.4	3	1	3	720	645,12	600
88		4	4 x 1 x 2.4	4	1	4	660	788,48	750
96		4	4 x 1 x 2.4	4	1	4	720	860,16	850
120		5	5 x 1 x 2.4	5	1	5	720	1075,2	1000
176		8	8 x 2 x 2.4	8	2	8	660	1576,96	1500
242		11	11 x 2 x 2.4	11	2	11	660	2168,32	2000



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Hydrogen



We are a One-stop Renewable EPCM³™ Solutions Provider



“Green Hydrogen Systems
electrolysers and on-site
production approach have
**enabled us to start
meeting our customers’
demand** for solar-produced
hydrogen.”

— Hans-Olof Nilsson, Nilsson Energy, Sweden





CASE STUDY –

Infrastructure

- | | | |
|-------------------------------|---|-------------------------------------|
| 1. Solar plant | - | 400kVA/450kWp |
| 2. Internal power line | - | 5km with 5 tfr's |
| 3. LiFePO4 Hybrid integration | - | 350kVA Inverter with 500kWh battery |
| 4. Hydrogen Electrolyser | - | 200kVA – 50kg – 100kg H2 per day |
| 5. Hydrogen gas storage | - | 1000kg |
| 6. Hydrogen Fuel Cell | - | 100kVA |
| 7. Hydrogen generator turbine | - | 120kVA |

Units are modular and could be expanded to increase capacity





Trackos Solar Engineering



World's #1 Solar Solutions



CASE STUDY



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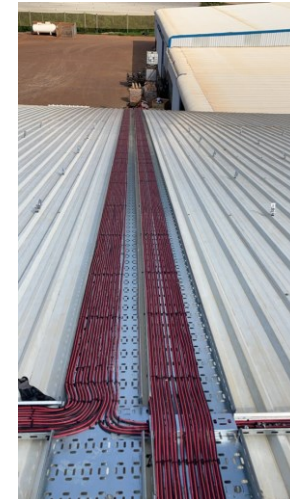
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Electric

Solar installation - 200kVA

Total solar PV - 400kVA



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Hybrid Inverter with battery pack



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EcoStruxure
Microgrid Operation

Battery Energy Storage System - BESS

Powered with EcoStruxure Microgrid Advisor and Operation

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Schneider
Electric

BESS offer overview

- **Hybrid PCS 50kW – 100KW**

- ✓ A Double Inverter Capacity PV Input for Off-grid
- ✓ Transformer Integrated

- **AC Coupling from 62,5KW up to 500kW**

- ✓ 250kW Transformer Integrated
- ✓ 500kW Transformerless
- ✓ Separate STS/ATS cabinet required

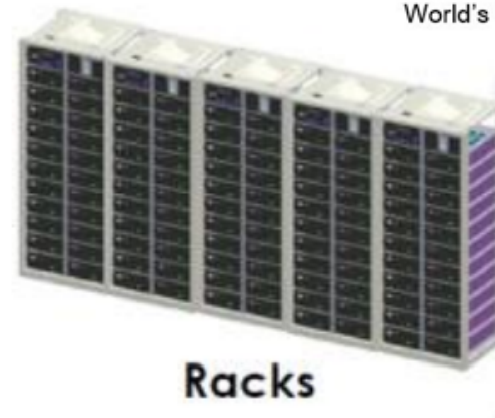


- **Batteries racks**

- LFP batteries, up to 1C-rate
- Standard rack of 108kWh ,19 mo



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Racks

Possible Plug & Play Solution
in a container

Life Is On



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Storage modules



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Battery Modules* 14 OR 19



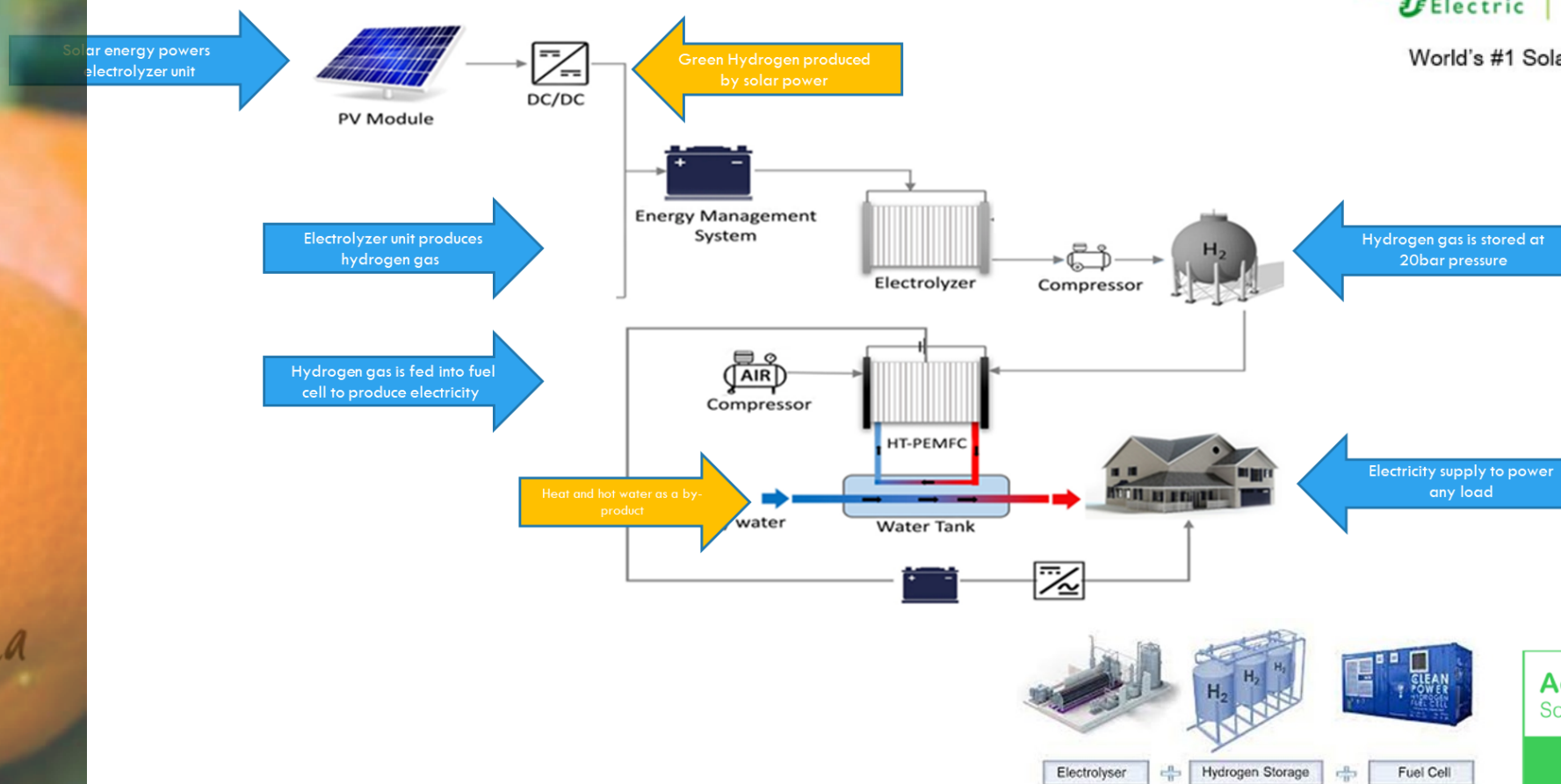
1 Control Box



The Basics of Hydrogen Energy H_2

Schneider Electric | Solar

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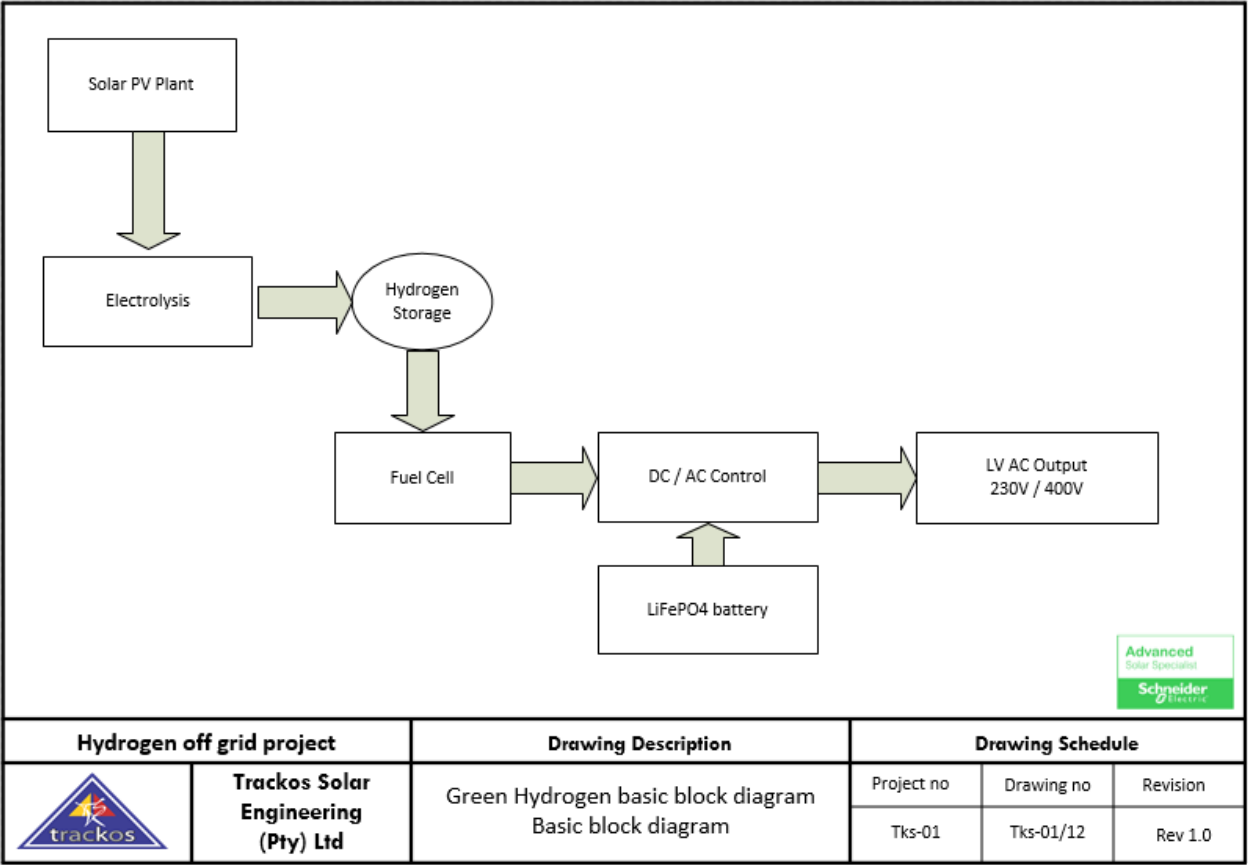
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Hydrogen block diagram

The implementation of Hydrogen Gas and Fuel Cell storage to allow complete off grid stationary application

Basic Diagram of system construction



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Electrolyser units



20kW racks



Hydrogen storage units



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100kg H₂ storage



50kg H₂ storage



Tenaris

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Schneider
Electric

Fuel Cell units



HyCube S25

- 3 pcs. of PM Module S8 integrated
- Installed Fuel Cell Power*: 25,2 kW
- Output Voltage: 230/400 VAC / 50Hz
- Indoor Use
- Emergency power supply



PM Frame

- Max. installed Fuel Cell Power**:
21,3 kW / 28,4 kW / 35,5 kW / 42,6 kW
- Size allows integration into standard cabinets



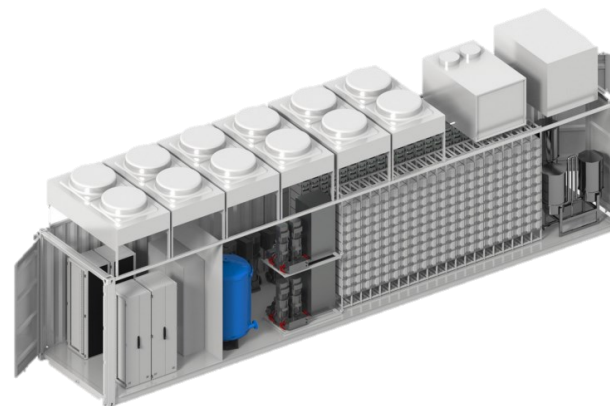
Hydrogen power plant components



Electrolyser



Stack units to container



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Fuel Cell



Stack units to container



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Hydrogen Vehicles



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Hydrogen Tractors



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New Holland Unveils NH2 Hydrogen Fuel Cell Tractor for Greening Farm Work



JCB Fuel Cell Vehicle

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Hydrogen – the new future of energy!



Wageningen University & Research platform
Hydrogen: sustainable energy storage and clean fuel for farmers





HYDROGEN is here!



Questions



Andre Anderson

Solar Engineering Specialist

M: +27 (82) 474 9087

E: andre@tko.co.za

We are a One-stop Renewable EPCM³™ Solutions Provider



Thank You



Andre Anderson

Solar Engineering Specialist

M: +27 (82) 474 9087

E: andre@tko.co.za



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