
# Economical & Environmentally friendly

## Hybrid
## Power Systems

HYBRID GENSET SOLUTIONS
TEKSAN

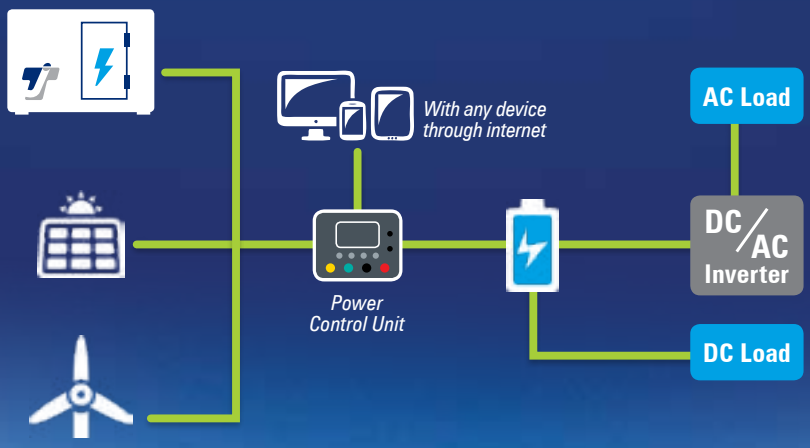
TEKSAN

25.yıl

# Hybrid
## Power Systems

**Teksan Hybrid System** is a complete electrical power supply system that can be easily configured to meet a broad range of power needs.


## How does the system operate?



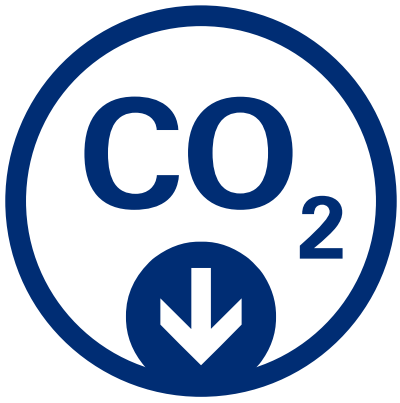
# Significant Advantage in OPEX

- Lower generator operating time up to 80%,
- Longer service intervals and fewer technical personnel allocation,
- Lower fuel consumption up to 65%,
- Reduces pay back period of the investment down to 1,5 years,
- Increases utilization period of the sytem.


# Green Energy

- Lower fuel consumption by 65%,
- Reduces $CO_2$ emission,
- Reduces noise,
- Lower heat emissions.

65%




# 1 SEMI STABLE GRID


## WHERE IT IS USED

- Semi-Stable Grid Sites
- Locations with daily scheduled rolling blackouts up to continous 4 hours or,
- Frequent short-term power outages total up to 8 hours in a day

## TARGET OF THE SOLUTION

- Providing optimum solution for lower OPEX and CAPEX
- Ensuring 100% site availability at lower cost
- Avoiding diesel engine running and fuel consumption
- 1 week emergency power supply in case of no Grid and without Re-Fuelling

## HOW IT WORKS

- Main power source is commercial grid
- In case of grid outage the batteries provides power up to 4 hours
- If grid outage lasts more than 4 hours, the diesel generator will run
- Generator will stop and transfer automatically to grid when it is available
- Batteries are to be fully charged by Grid
- The power source switching is seamless, no flickering during switch

## ADVANTAGES & DISADVANTAGES

- Compared to conventional only battery back-up solution

+ 100% site availability
+ Longer battery life
+ Higher Autonomy

- Higher footprint
- Genset Maintenance

| | | | | | |
|---|---|---|---|---|---|
| Average Load | kW | 2 | 4 | 6 | 8 |
| Max. Continuous Load | kW | 3 | 5 | 8 | 10 |
| Battery Capacity | Ah | 300 | 500 | 800 | 1000 |
| Generator Power | kVA | 6 | 10 | 22 | 22 |
| Rectifier Power | kW | 6 | 12 | 18 | 24 |
| Fuel Tank | lt | 250 | | 500 | |
| Alternative Generator Configuration - for "fast" battery charging | | | | | |
| Generator Power | kVA | 10 | 17 | 22 | 33 |
| Rectifier Power | kW | 9 | 18 | 24 | 36 |
| Optional Solar System Configuration | | | | | |
| Total Solar Power | kWp | 2 | 4 | 6 | 8 |

# 2 UNSTABLE GRID


## WHERE IT IS USED

- Semi-Stable Grid Sites
- Locations with daily scheduled rolling blackouts up to continous 8 hours or,
- Frequent short-term power outages total up to 16 hours in a day

## HOW IT WORKS

- Main power source is commercial grid
- In case of grid outage the batteries provides power up to 8 hours
- If grid outage lasts more than 8 hours, the diesel generator will run
- Generator will stop and transfer automatically to grid when it is available
- Batteries are to be fully charged by Grid
- The power source switching is seamless, no flickering during switch

## TARGET OF THE SOLUTION

- Providing optimum solution for lower OPEX and CAPEX
- Ensuring 100% site availability at lower cost
- Avoiding diesel engine running and fuel consumption
- 1 week emergency power supply in case of no Grid and without Re-Fuelling

## ADVANTAGES & DISADVANTAGES

- Compared to conventional only battery back-up solution

+ 100% site availability
+ Longer battery life
+ Higher Autonomy

- Higher footprint
- Genset Maintenance

| Average Load | kW | 3 | 5 | 8 | 10 |
|---|---|---|---|---|---|
| Max. Continuous Load | kW | 2 | 4 | 6 | 8 |
| Battery Capacity | Ah | 500 | 1000 | 1500 | 2000 |
| Generator Power | kVA | 10 | 17 | 22 | 33 |
| Rectifier Power | kW | 9 | 18 | 24 | 30 |
| Fuel Tank | lt | 250 | | 500 | |
| Alternative Generator Configuration - for "fast" battery charging | | | | | |
| Generator Power | kVA | 15 | 22 | 33 | 51 |
| Rectifier Power | kW | 12 | 24 | 36 | 45 |
| Optional Solar System Configuration | | | | | |
| Total Solar Power | kWp | 4 | 6 | 10 | 16 |

# 3 OFF GRID


## WHERE IT IS USED

- Off Grid Sites
- where emission and fuel consumption is required to be minimized
- Optimized solution for Off-grid sites based on both CAPEX and OPEX

## TARGET OF THE SOLUTION

- Providing optimum solution for Off-Grid Sites
- Reducing Engine run hour and Maintenance Cost
- Reduced Fossil Fuel Consumption
- Reduced Site Visits due to decreased run hour and fuel consumption

## HOW IT WORKS

- Main power source is solar (if equipped)
- Batteries will compansate the outage if solar source is insufficient
- If the batteries gets empty, then generator will start and feed the load
- Generator will stop after charging batteries

## ADVANTAGES & DISADVANTAGES

- Compared to conventional only diesel generator solution

\+ Lower Fuel Consumption
\+ Lower Maintenance Cost
\+ Less Site Visits

\- Higher CAPEX

| | | | |
|---|---|---|---|
| Max. Continuous Load | kW | 3 | 6 |
| Average Load | kW | 2 | 4 |
| Battery Capacity | Ah | 500 | 1000 |
| DC Generator Power | kW | 9 | 18 |
| Rectifier Power | kW | 12 | 24 |
| Fuel Tank | lt | 1.500 | 1.100 |
| Optional Solar System Configuration | | | |
| Total Solar Power | kWp | 6 | 12 |

# 4 OFF GRID PURE SOLAR


## WHERE IT IS USED

- Off-grid sites with very limited access
- Ideal for sites with low power consumption

## TARGET OF THE SOLUTION

- Providing best solution for Off-Grid Sites to reduce OPEX
- No Engine Maintenance or Fuel Consumption
- Minimized site visit frequency

## HOW IT WORKS

- Main power source is solar
- The batteries are charged during day time
- Power is supplied by batteries during night time and cloudy days

## ADVANTAGES & DISADVANTAGES

- Compared to hybrid generator solution

| | |
|---|---|
| + Very Low OPEX | - Higher CAPEX |
| + %100 Green Energy | - Higher Footprint |
| + No Site Visits | - 99,8% site availability |

| Average Load | kW | 1,0 kW | 1,5 kW | 2,0kW | 2,5 kW |
|---|---|---|---|---|---|
| Number of Panels | pcs | 24 | 42 | 48 | 54 |
| Total Solar Power | kWp | 7,8 | 13,7 | 15,7 | 17,7 |
| Footprint | m² | 40 | 70 | 80 | 90 |
| Battery Capacity | Ah | 1.500 | 2.000 | 3.000 | 4.000 |

# 5 TECHNICIAL SPECIFICATIONS

## ON-SITE UPGRADE

- Extensible Rectifier Power output by adding extra modules
- External fuel tank can be directly connected without modifications
- Availability of connecting extra battery group easily
- Connecting another hybrid generator in parallel to multiply the power output
- Extendable Solar Panel Capacity for sites with low solar irradiation

| | TJ 3000 HD | | TJ 6000 HD | |
|---|---|---|---|---|
| **SYSTEM OUTPUT** | | | | |
| Average DC Load | 3.000 W | | 6.000 W | |
| Optimized DC Load Range | 1.000 - 2.000 W | | 2.000 - 4000 W | |
| Nominal Output Voltage | 48 VDC | | 48 VDC | |
| AC Output Power (option) | 350 - 1250 VA | | 800 - 3000 VA | |
| **ENGINE** | | | | |
| Brand | Perkins | Deutz | Perkins | Deutz |
| Model | 403D-11 | F2M-2011 | 404D-22 | F3M-2011 |
| Output Power at 1800 rpm | 10,3 kW | 15,0 kW | 21,6 kW | 23,3 kW |
| Cooling Type | Water | Oil | Water | Oil |
| Operating Speed | 1200-2200 rpm | | 1200-2200 rpm | |
| Fuel | Diesel | | Diesel | |
| Standard Maintennce Interval | 500 hours | | 500 hours | |
| Extended Maintenance Interval (option) | 1.000 hours | | 1.000 hours | |
| **ALTERNATOR** | | | | |
| Type | Permanent Magnet Generator | | Permanent Magnet Generator | |
| Model | PMG140K/18-90 | | PMG140K/18-180 | |
| Output Power at 1800 rpm | 9 kW | | 18 kW | |
| **DEEP CYCLE BATTERY** | | | | |
| Technology | Lead Acid | Li-ion | Lead Acid | Li-ion |
| Type | AGM Nano Carbon | LiFePO4 | AGM Carbon | LiFePO4 |
| Nominal Capacity | 500 Ah | 400 Ah | 1000 Ah | 800 Ah |
| Nominal Voltage | 48 V | | 48 V | |
| DoD (Depth of Discharge) | 60% | 80% | 60% | 80% |
| Cycle life at 25 °C and indicated DoD% | 5.500 | 3.500 | 5.500 | 3.500 |
| Maintenance Free | Yes | | Yes | |
| Operating Temperature (°C) | -15 °C to 45 °C | 0 °C to 45 °C | -15 °C to 45 °C | 0 °C to 45 °C |
| **SIZE** | | | | |
| Weight (incl. Batteries) | 2313 | 1775 | 3.267 | 2.191 |
| Weight (excl. Batteries) | 1531 | | 1703 | |
| Dimensions (WxLxH) | 2270 x 1250 x 2202 (mm) | | 2270 x 1250 x 2202 (mm) | |

| **STANDARD FEATURES** | | | | | |
|---|---|---|---|---|---|
| Sound & Weather Proof Canopy | • | Automatic Oil Filling | • | Fuel Theft Alarm | • |
| Power Section & Protection Devices | • | Battery Low Voltage Protection | • | Integrated Fuel Tank | 1.000 liters |
| Deep Cycle Batteries in Vented Compartment | • | Short Circuit Protection | • | Communication Interface | RS232/ RS485 |
| Double Wall Fuel Tank | • | Secured Canopy with double locks | • | System Operating Temperature | - 0 °C / + 45 °C |

** The data indicated belong to the system designed with VRLA gel battery*
*** Performance simulation conducted for lattitude: 36 40 23:40 and altitude: 27 24 48:54*

*- Technical information and values are according to ISO8528, ISO3046,NEMA MG-1.22, IEC600341, BS4999-5000, VDE0530 standards.*
*- Producing with ISO9001, ISO14001, OHSAS18001, TSE, CE standards.*
*- Due to a policy of continuous improvement Teksan reserves the right to amend details and specifications without notice and all information given is subject to the Teksan's current condition of sales.*

# 6 TECHNICIAL SPECIFICATIONS

## OPTIONS

- Dual Genset Operation
- Synchronization
- Extended maintenance Interval
- Dust filters for complete system
- Super Silent Solution
- Remote Monitoring
- Anti-theft protection
- AC power output upto 10kVA
- Tailor made designs for different needs
- A/C for batteries ( zones > +45°C )
- Multi-tenant support
- Alarm Contacts for customer
- DC Distribituon board
- BLVD and LLVD
- Extra Battery Capacity
- Extra Fuel Capacity
- Higher Rectifier Power Output

| | TJ 3000 HD | | | | | | TJ 6000 HD | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OPTIONAL FEATURES | | | | | | | | | | | | |
| 230V AC Output Power | 350VA - 3000VA | | Ext. Maintenance Int. | | 1.000 hours | | IP Protection Class | | based on project requirements | | | |
| Earth Leakage Protection | for 230V AC circuit | | Add. Fuel Tank | | 1.000 - 2.000 liters | | Super Silent Canopy | | based on project requirements | | | |
| Automatic Transfer Switch | Automatic DC Transfer Panel | | Additional Battery Capacity | | 500 Ah - 1.000 Ah | | Dust Filters | | based on project location | | | |
| DC Power Distribution | 1x64A, 3x32A, 8x16A mccb | | Solar Power Kit - 1 (panels, charge reg., j.box) | | 1 x 1960 W | | Improved Security | | based on project location | | | |
| Free Contacts for external signals | 8 Input / Outputs | | Solar Power Kit - 2 (panels, charge reg., j.box) | | 1 x 3270 W | | Remote Monitoring / Control | | 2G/3G/4G/Ethernet | | | |
| Extended Operating Temperature Range | - 20 °C / + 55 °C | | Solar Support Structures | | for 1,96kWp and 3,27kWp kits | | Location Tracking | | GPS | | | |
| Load Priority | Normal / Critical Load | | Multiple Tenant Support | | Power meas. per Tenant | | | | | | | |
| | with 500Ah Lead Carbon Battery | | | | | | with 1.000Ah Lead Carbon Battery | | | | | |
| EXPECTED PERFORMANCE VALUES | at 0,5kW load | at 1,0 kW load | at 1,5 kW load | at 2,0 kW load | at 2,5 kW load | at 3,0 kW load | at 1,0 kW load | at 2,0 kW load | at 3,0 kW load | at 4,0 kW load | at 5,0 kW load | at 6,0 kW load |
| Battery Discharge duration (hours) | 28,8 | 14,4 | 9,6 | 7,2 | 5,8 | 4,8 | 28,8 | 14,4 | 9,6 | 7,2 | 5,8 | 4,8 |
| Battery Charge Duration (hours) | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 |
| Daily Cycle Amount | 0,74 | 1,34 | 1,83 | 2,24 | 2,59 | 2,89 | 0,74 | 1,34 | 1,83 | 2,24 | 2,59 | 2,89 |
| Engine Daily Running Hour (hours) | 2,6 | 4,7 | 6,4 | 7,9 | 9,1 | 10,1 | 2,6 | 4,7 | 6,4 | 7,9 | 9,1 | 10,1 |
| Engine Maintenance Frequency (days) | 192 | 107 | 78 | 64 | 55 | 49 | 192 | 107 | 78 | 64 | 55 | 49 |
| Daily Fuel Consumption (liters) | 5,1 | 10 | 14,9 | 19,6 | 24,2 | 28,8 | 9,0 | 17,7 | 26,2 | 34,5 | 42,7 | 50,8 |
| Hourly Fuel Consumption (liters) | 0,21 | 0,42 | 0,62 | 0,82 | 1,01 | 1,2 | 0,37 | 0,74 | 1,09 | 1,44 | 1,78 | 2,12 |
| Fuel Consumption per kWh [liters/kWh] | 0,43 | 0,42 | 0,41 | 0,41 | 0,40 | 0,40 | 0,37 | 0,37 | 0,36 | 0,36 | 0,36 | 0,35 |
| Number of Battery Cycles per Year | 271 | 489 | 669 | 819 | 946 | 1055 | 271 | 489 | 669 | 819 | 946 | 1055 |
| Battery Service Life (years) | 16,6 | 9 | 6,7 | 5,5 | 4,8 | 4,3 | 16,6 | 9 | 6,7 | 5,5 | 4,8 | 4,3 |
| Battery Autonomy duration (hours) | 48 | 24 | 16 | 12 | 9,6 | 8 | 48 | 24 | 16 | 12 | 9,6 | 8 |
| Fuel Transfer Frequency (days) | 196 | 100 | 67 | 51 | 41 | 35 | 111 | 57 | 38 | 29 | 23 | 20 |
| HYBRID + PHOTOVOLTAIC SYSTEM | | | | | | | | | | | | |
| Total Solar Power (kWp) | 1,96 | 1,96 | 3,27 | 6,54 | 6,54 | 6,54 | 1,96 | 3,27 | 6,54 | 9,81 | 13,08 | 13,08 |
| Number of Solar Panels (pieces) | 6 | 6 | 10 | 20 | 20 | 20 | 6 | 10 | 20 | 30 | 40 | 40 |
| Footprint of Panels with 15° incl. (m²) | 9,4 | 9,4 | 15,7 | 31,5 | 31,5 | 31,5 | 9,4 | 15,7 | 31,5 | 47,2 | 62,9 | 62,9 |
| Solar Charger Total Power (kWp) | 2,0 | 2,0 | 3,4 | 6,9 | 6,9 | 6,9 | 2,0 | 3,4 | 6,9 | 10,3 | 13,8 | 13,8 |
| Engine Daily Running Hour (hours) | 0,8 | 3,0 | 3,9 | 3,3 | 4,8 | 6,1 | 1,7 | 3,3 | 3,9 | 4,4 | 4,8 | 6,1 |
| Engine Maintenance Frequency (days) | 180 | 164 | 129 | 154 | 104 | 81 | 297 | 151 | 129 | 113 | 104 | 81 |
| Daily Fuel Consumption (liters) | 1,5 | 6,5 | 9,1 | 8,1 | 12,8 | 17,5 | 5,8 | 12,5 | 15,9 | 19,3 | 22,6 | 30,9 |
| Fuel Transfer Frequency (days) | 666 | 155 | 110 | 124 | 78 | 57 | 172 | 80 | 63 | 52 | 44 | 32 |
| Ratio of Solar Power (%) | 71% | 35% | 39% | 59% | 47% | 39% | 35% | 29% | 39% | 44% | 47% | 39% |

# 7 TURKCELL / TURKEY


*Battery Bank*


## PROJECT REQUIREMENTS

A cost effective generator set as the main off-grid power source for a telecom tower on a remote area was required by Turkcell, the biggest GSM operator of Turkey. With the project, Turkcell intended to decrease fuel and maintenance costs where to minimize the risk of monetary losses based on possible interruptions that may occur due the failure in operation of the telecom tower.

## SOLUTION WE DELIVERED

A hybrid generator set that has lower $CO_2$ emissions and fuel consumption rates, using an engine with extended periodic maintenance interval along with remote monitoring feature and high capacity fuel tank specially designed for the project. Thus, not only fuel costs but also operational expenses decreased and consequently less technical personnel and longer intervals are needed for the maintenance.

## SOME OF THE SPECIAL OPTIONS THAT PRODUCTS HAVE;

- Full Anti-theft feature,
- Special insulated canopies to avoid exterior climate effects,
- Tailor-made product and trailer designs,
- Remote monitoring (GSM Based),
- High quality battery group delivering power for longer time,
- High capacity fuel tank.

# 8 TURK TELEKOM / TURKEY



*Solar Panels & Wind Turbines*

## PROJECT REQUIREMENTS

Turk Telekom, the leading telecom operator and internet service provider in Turkey, requested a generator set as the main power source for energizing its telecom tower on a remote area. Main objectives of the project were decreasing the operational expenses while reducing the risks of financial losses due to power outages.

## SOLUTION WE DELIVERED

Teksan designed a tailor-made hybrid generator set that can operate integratedly with solar panels to deliver 65% saving on fuel consumption and 80% decrease in engine operation time. Thanks to its engine with extended periodic maintenance interval, remote monitoring and high capacity fuel tank, System needs lesser technical personnel and longer intervals for the maintenance during its operations which to reduce operational expenses significantly.

## SOME OF THE SPECIAL OPTIONS THAT PRODUCTS HAVE;

- Solar panel integration,
- Full Anti-theft feature,
- Special insulated canopies to avoid exterior climate effects,
- Tailor-made product design,
- Remote monitoring (GSM and Internet Based),
- High quality battery group delivering power for longer time.


## Some of our References in Telco Industry

| | | | |
|---|---|---|---|
| Airtel | CONGO | Ooredoo Telecom | ALGERIA |
| Allai Newroz Telecom | IRAQ | Saudi Telecom | SAUDİ ARABIA |
| Alkan Telecom | EGYPT | Turkcell | TURKEY |
| Alsys Telecommunication | ROMANIA | Turk Telekom | TURKEY |
| Brt Media | CYPRUS | Tigo | CONGO |
| Camusat | TANZANIA | Ucell | UZBEKISTAN |
| Helios Tower | CONGO | Uganda Telecom | UGANDA |
| Iceland Telecom Ltd. | ICELAND | Ums | UZBEKISTAN |
| JV Coscom | UZBEKISTAN | Vodacom | CONGO, TANZANIA |
| Kazakh Telecom | KAZAKHSTAN | Vodafone | NETHERLANDS |
| Magticom Ltd. | GEORGIA | Xpress Telecom | JORDAN |
| Mts | BELARUS, UZBEKISTAN | Yemen Telecom | YEMEN |

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