

# PVsyst - Simulation report

## Grid-Connected System

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Project: WORLD BANK

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 27.68 kWp

World Bank - Nigeria

**PVsyst V7.4.7**

VC0, Simulation date:  
13/08/25 17:34  
with V7.4.7

**Project summary****Geographical Site****World Bank**

Nigeria

**Situation**

Latitude 9.04 °N

Longitude 7.52 °E

Altitude 0 m

Time zone UTC

**Project settings**

Albedo 0.20

**Weather data**

World Bank

Meteonorm 8.1 (2010-2021), Sat=100% - Synthetic

**System summary****Grid-Connected System**

Simulation for year no 10

**No 3D scene defined, no shadings****PV Field Orientation**

Fixed plane

Tilt/Azimuth 10 / 180 °

**Near Shadings**

No Shadings

**User's needs**

Daily household consumers

Seasonal modulation

Average 11.0 kWh/Day

**System information****PV Array**

Nb. of modules 45 units

Pnom total 27.68 kWp

**Inverters**

Nb. of units 1.5 units

Pnom total 22.50 kWac

Pnom ratio 1.230

**Battery pack**

Storage strategy: Self-consumption

Nb. of units 10 units

Voltage 51 V

Capacity 3120 Ah

**Results summary**

Produced Energy 41254 kWh/year

Used Energy 4004 kWh/year

Specific production 1491 kWh/kWp/year

Perf. Ratio PR 75.03 %

Solar Fraction SF 100.00 %

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## PVsyst V7.4.7

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## General parameters

## Grid-Connected System

No 3D scene defined, no shadings

## PV Field Orientation

## Orientation

Fixed plane

Tilt/Azimuth 10 / 180 °

## Sheds configuration

No 3D scene defined

## Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

## Horizon

Free Horizon

## Near Shadings

No Shadings

## User's needs

Daily household consumers

Seasonal modulation

Average 11.0 kWh/Day

## Storage

Kind Self-consumption

## Charging strategy

When excess solar power is available

## Discharging strategy

As soon as power is needed

## PV Array Characteristics

## PV module

Manufacturer

Jinkosolar

Model

JKM-615N-66HL4M-BDV

(Original PVsyst database)

Unit Nom. Power

615 Wp

Number of PV modules

45 units

Nominal (STC)

27.68 kWp

Modules

3 string x 15 In series

## At operating cond. (50°C)

Pmpp

25.67 kWp

U mpp

568 V

I mpp

45 A

## Total PV power

Nominal (STC)

28 kWp

Total

45 modules

Module area

121 m<sup>2</sup>

## Inverter

Manufacturer

VMC

Model

Sunvec 15KTLD3

(Original PVsyst database)

Unit Nom. Power

15.0 kWac

Number of inverters

3 \* MPPT 50% 1.5 units

Total power

22.5 kWac

Operating voltage

160-950 V

Max. power (=&gt;25°C)

16.5 kWac

Pnom ratio (DC:AC)

1.23

No power sharing between MPPTs

## Total inverter power

Total power

22.5 kWac

Nb. of inverters

2 units

0.5 unused

Pnom ratio

1.23

## Battery Storage

## Battery

Manufacturer

BYD

Model

Battery Box Premium LVS 12.0

## Battery pack

Nb. of units

10 in parallel

Discharging min. SOC

40.0 %

Stored energy

95.8 kWh

## Battery input charger

Model

Generic

Max. charg. power

23.0 kWdc

Max./Euro effic.

97.0/95.0 %

## Battery to Grid inverter

Model

Generic

Max. disch. power

2.2 kWac

Max./Euro effic.

97.0/95.0 %

## Battery Pack Characteristics

Voltage

51 V

Nominal Capacity

3120 Ah (C10)

Temperature

Fixed 20 °C



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## Array losses

## Array Soiling Losses

Loss Fraction 3.0 %

## Thermal Loss factor

Module temperature according to irradiance  
Uc (const) 29.0 W/m<sup>2</sup>K  
Uv (wind) 0.0 W/m<sup>2</sup>K/m/s

## DC wiring losses

Global array res. 206 mΩ  
Loss Fraction 1.5 % at STC

## Serie Diode Loss

Voltage drop 0.7 V  
Loss Fraction 0.1 % at STC

## LID - Light Induced Degradation

Loss Fraction 2.0 %

## Module Quality Loss

Loss Fraction -0.8 %

## Module mismatch losses

Loss Fraction 2.0 % at MPP

## Module average degradation

Year no 10  
Loss factor 0.4 %/year

## Mismatch due to degradation

Imp RMS dispersion 0.4 %/year  
Vmp RMS dispersion 0.4 %/year

## IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

## Spectral correction

FirstSolar model

Precipitable water estimated from relative humidity

Coefficient Set	C0	C1	C2	C3	C4	C5
Monocrystalline Si	0.85914	-0.02088	-0.0058853	0.12029	0.026814	-0.001781

## System losses

## Unavailability of the system

Time fraction 2.0 %  
7.3 days,  
3 periods

## AC wiring losses

## Inv. output line up to injection point

Inverter voltage 380 Vac tri  
Loss Fraction 0.47 % at STC

## Inverter: Sunvec 15KTLD3

Wire section (2 Inv.) Copper 2 x 3 x 10 mm<sup>2</sup>  
Average wires length 20 m



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## Detailed User's needs

Daily household consumers, Seasonal modulation, average = 11.0 kWh/day

### Summer (Jun-Aug)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	5.0	500
TV / PC / Mobile	2	100/app	5.0	1000
Domestic appliances	1	500/app	4.0	2000
Fridge / Deep-freeze	2		24	1598
Dish- & Cloth-washers	1		2	2000
Ventilation	1	100 tot	24.0	2400
Air conditioning	1	1000 tot	3.0	3000
Stand-by consumers			24.0	144
Total daily energy				12642

### Autumn (Sep-Nov)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	5.0	500
TV / PC / Mobile	2	100/app	5.0	1000
Domestic appliances	1	500/app	5.0	2500
Fridge / Deep-freeze	2		24	1598
Dish- & Cloth-washers	1		2	2000
Ventilation	1	100 tot	24.0	2400
Stand-by consumers			24.0	144
Total daily energy				10142

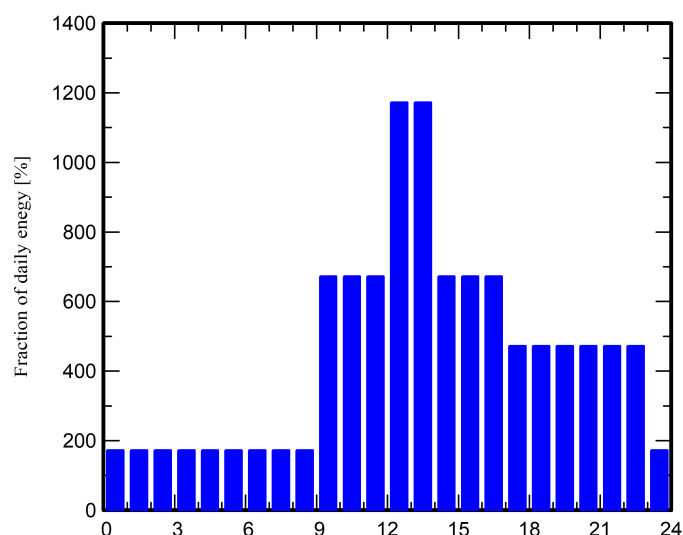
### Winter (Dec-Feb)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	6.0	600
TV / PC / Mobile	2	100/app	6.0	1200
Domestic appliances	1	500/app	6.0	3000
Fridge / Deep-freeze	2		24	1598
Dish- & Cloth-washers	1		2	2000
Ventilation	1	100 tot	24.0	2400
Stand-by consumers			24.0	144
Total daily energy				10942

### Spring (Mar-May)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	5.0	500
TV / PC / Mobile	2	100/app	5.0	1000
Domestic appliances	1	500/app	5.0	2500
Fridge / Deep-freeze	2		24	1598
Dish- & Cloth-washers	1		2	2000
Ventilation	1	100 tot	24.0	2400
Stand-by consumers			24.0	144
Total daily energy				10142

### Hourly distribution





# Project: WORLD BANK

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## Main results

### System Production

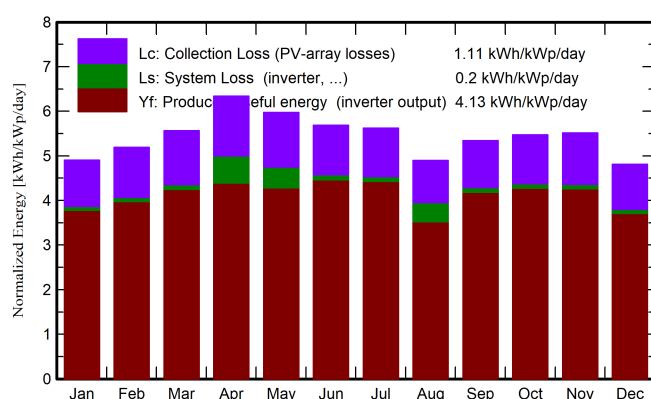
Produced Energy 41254 kWh/year  
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Specific production 1491 kWh/kWp/year  
Perf. Ratio PR 75.03 %  
Solar Fraction SF 100.00 %

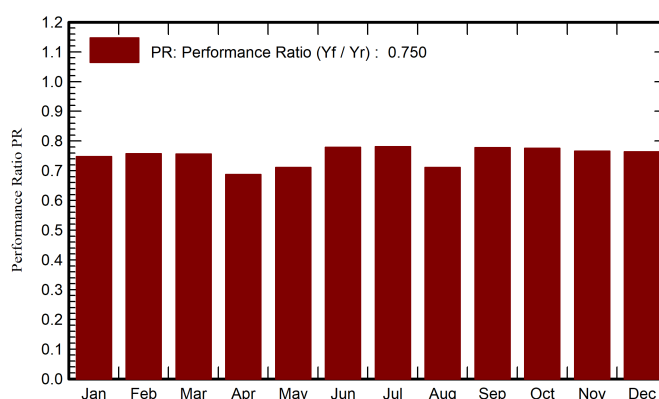
### Battery aging (State of Wear)

Cycles SOW 99.6 %  
Static SOW 90.0 %

Normalized productions (per installed kWp)



Performance Ratio PR



## Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_User	E_Solar	E_Grid	EFrGrid
	kWh/m²	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	kWh	kWh	kWh
January	168.0	78.6	27.99	152.0	142.6	3324	339.2	339.2	2805	0.000
February	154.3	95.8	30.36	145.4	137.5	3158	306.4	306.4	2738	0.000
March	177.9	104.8	32.04	172.6	164.0	3741	314.4	314.4	3300	0.000
April	190.3	97.8	31.09	190.3	181.3	4154	304.3	304.3	3315	0.000
May	180.6	94.5	29.45	185.1	176.4	4079	314.4	314.4	3330	0.000
June	164.2	83.6	26.74	170.6	162.4	3802	379.3	379.3	3299	0.000
July	168.7	86.4	26.28	174.4	165.9	3897	391.9	391.9	3380	0.000
August	150.8	91.4	25.36	151.9	144.0	3398	391.9	391.9	2595	0.000
September	163.3	81.6	25.58	160.2	151.9	3565	304.3	304.3	3143	0.000
October	179.3	83.9	26.83	169.6	160.3	3761	314.4	314.4	3325	0.000
November	183.8	57.7	27.86	165.4	155.5	3627	304.3	304.3	3205	0.000
December	167.1	72.3	27.92	149.2	139.7	3266	339.2	339.2	2815	0.000
Year	2048.4	1028.5	28.11	1986.7	1881.4	43773	4004.0	4004.0	37250	0.000

### Legends

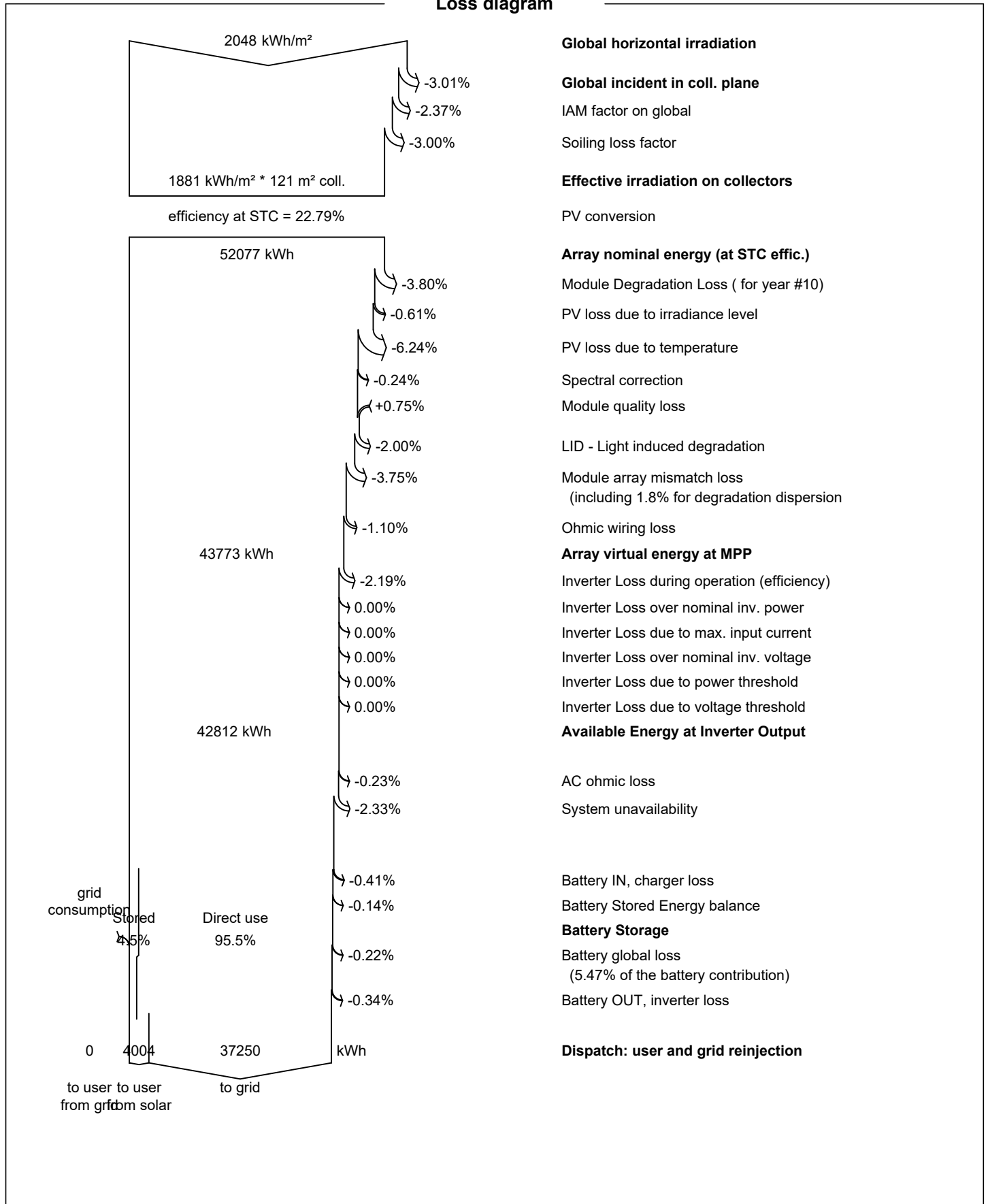
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_User	Energy supplied to the user
T_Amb	Ambient Temperature	E_Solar	Energy from the sun
GlobInc	Global incident in coll. plane	E_Grid	Energy injected into grid
GlobEff	Effective Global, corr. for IAM and shadings	EFrGrid	Energy from the grid



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**Loss diagram**



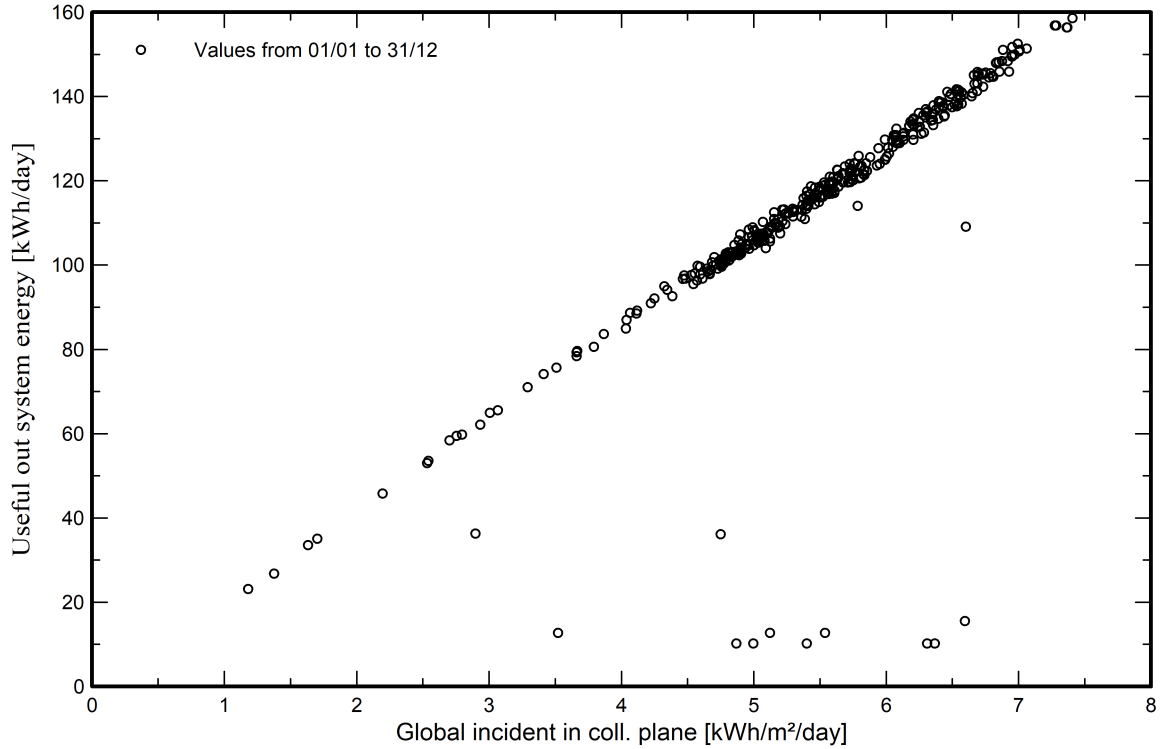


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**Predef. graphs**

**Daily Input/Output diagram**



**System Output Power Distribution**

