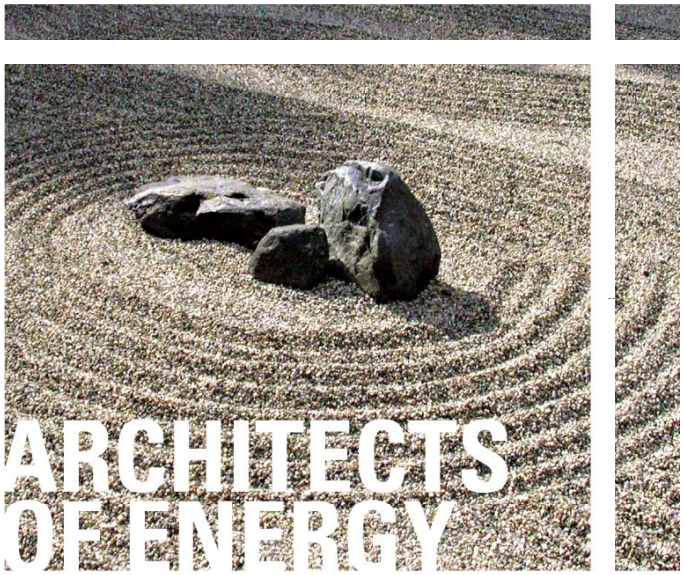
SolarEdge

Distributed Solar Power Harvesting System



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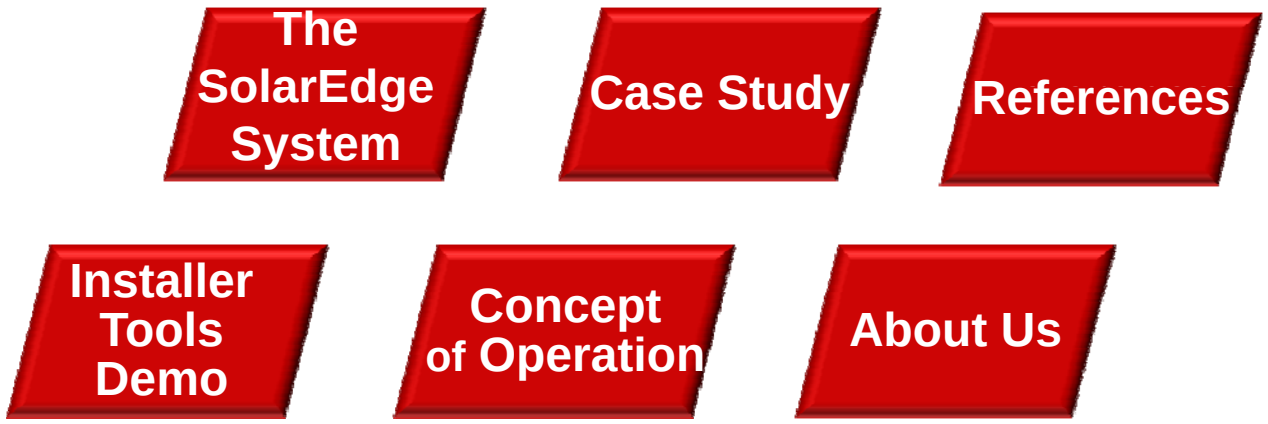
The SolarEdge System



SolarEdge Leads the Distributed Power Harvesting Market

- **Worldwide presence and distribution**
- **Global high quality mass production facilities**
- **Over 50MW of systems delivered in 2010**

The Problem

Inherent Problems in Traditional Systems

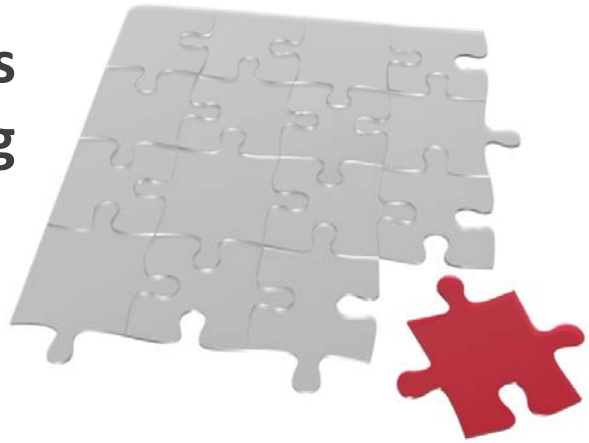
Energy Loss

- Module mismatch (3-5% loss)
- Partial Shading (2-25% loss)
- Undervoltage/Overvoltage (0-15%)
- Dynamic MPPT loss (3-10% loss)

System Drawbacks

- No module level monitoring
- Limited roof utilization
- Safety Hazards
- Theft

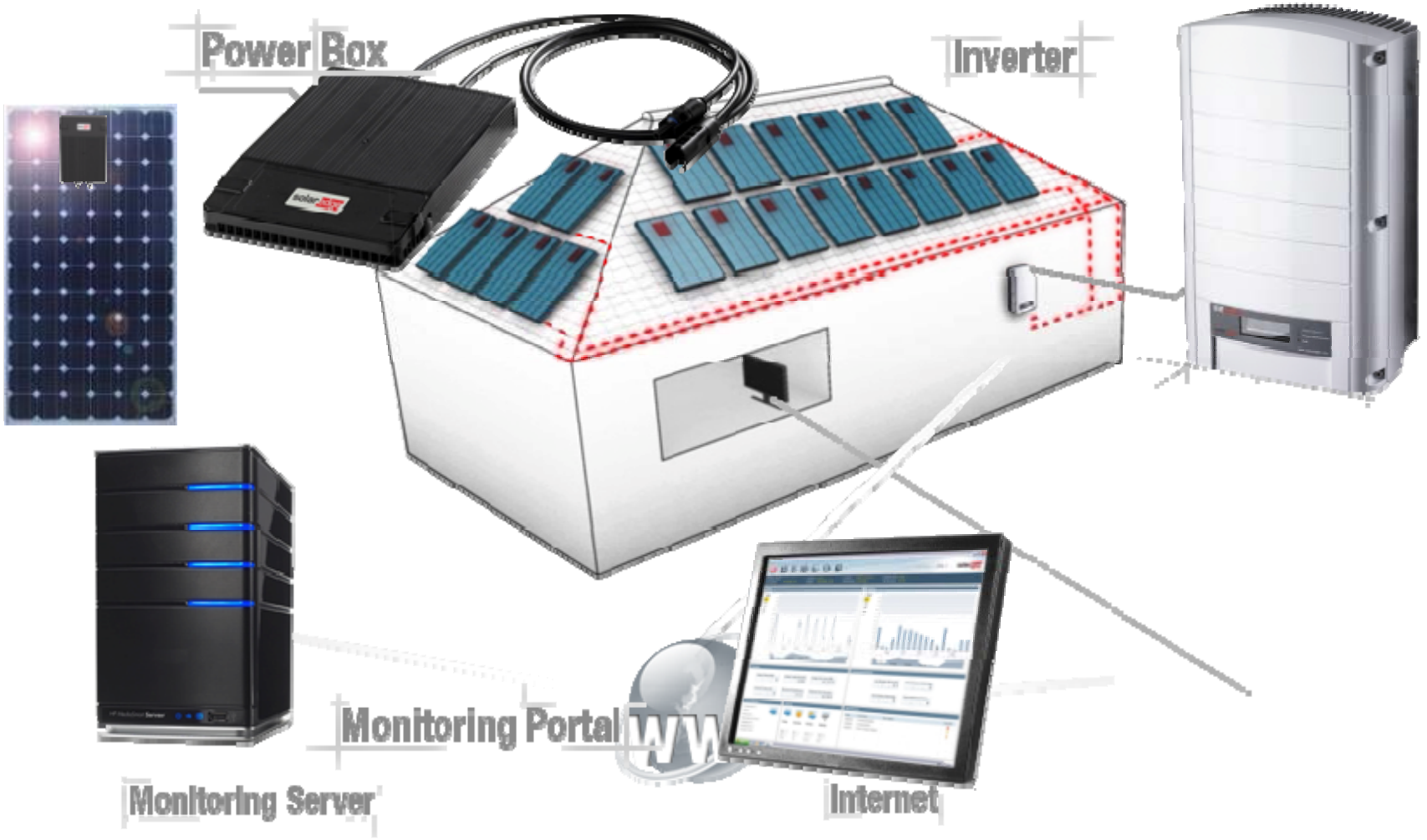
SolarEdge solution overcomes all energy losses providing up to 25% more energy while solving the other system drawbacks at a comparable price to traditional inverters



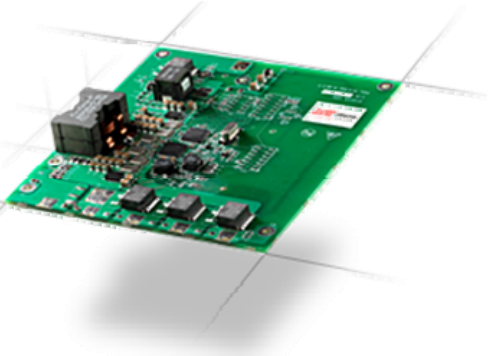
The Solution

SolarEdge System Overview

- Module level optimization
- Fixed voltage - ideal installation
- Module level monitoring
- Enhanced safety solution



SolarEdge PowerBox Product Line



- Per-module Maximum Power Point Tracking (MPPT)
- Advanced, real-time performance measurement
- Module shut-down for Installer and Firefighter safety
- Embedded by module manufacturers, or connected by installers to c-Si and thin-film modules

250w/350w
Module Add-on

250w/350w
Thin Film Module
Add-on

250w Module
Embedded

Fixed String Voltage - Enabler

String voltage is always fixed, regardless of temperature and string length

- Flexible design for maximum roof utilization:
  - Parallel strings of unequal lengths
  - Modules on multiple roof facets
  - Modules with different power ratings
  - Modules of different technologies
- Longer strings for savings on wiring and BoS components

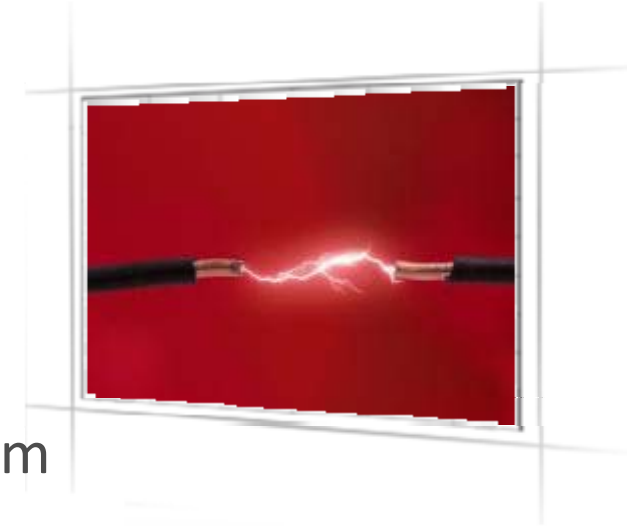
String voltage is always optimal for DC/AC conversion

- High inversion efficiency at all times
- Prevention of under/over voltage situations
- Inverter cost reduction

Unique Safety Solution

Electrocution Prevention & Fire Safety

- Automatic module DC shutdown when inverter is not operating
- Module and Inverter thermal shutdown
- **Electric arcs** are automatically detected and prevented by module shutdown



The Result:

- Higher security for Installers, maintenance teams, and firefighters
- Improved asset protection - roof, solar system
- Better suited for future insurance requirements

Unique Theft Prevention Solution

Stolen Module “Immobilization”

Stolen modules with embedded PowerBox can be digitally locked to prevent re-use

The Result:

Theft deterrence protects

your PV assets at no added cost

Module-Level Monitoring

Automatic, accurate fault detection

- Faults located on site map
- No additional wiring
- Web and iPhone application

The Result:

- Remote Diagnostics
- Operations and Maintenance cost reduction
- Increased system availability and production
- Proactive customer service

SolarEdge Inverter Product Line

- Inverters specifically designed for Power Optimizers
- >97% weighted efficiency
- Simpler design → Highest reliability at the minimal cost
- Built-in communication hardware

Single phase inverters: worldwide and US
3.3kW – 6kW

Three phase inverters: worldwide and US
8kW – 15kW

The SolarEdge Product Family

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SolarEdge PowerBoxes	250W Module Add-on 	350W Module Add-on 	350W Thin Film Add-On 	250W/350W Module Embedded 
SolarEdge Single Phase Inverters	3.3kW 	4kW 	5kW 	6kW 
SolarEdge Single Phase Inverters US	3.3kWUS 	4kWUS 	5kWUS 	6kWUS 
SolarEdge Three Phase Inverters	8kW 	10kW 	12kW 	
SolarEdge Three Phase Inverters US	8kWUS 	10kWUS 	12kWUS Coming H2/2010 	15kWUS Coming H2/2010 
SolarEdge Monitoring	Module Monitoring 	String Monitoring 	iPhone Application 	
SolarEdge Communication Accessories	Communication interface for non-SolarEdge inverters Coming H2/2010 	GSM modems 	Inverter Wireless connection (ZigBee network) 	
SolarEdge Installer Tools	Site Design Tool 	Commissioning Tool 	Configuration Tool 	Co-planar Mounting Bracket 

Benefits Summary

- **The only commercially available solution to solve all following pressing needs, while reducing the cost of energy**

UP TO 25% MORE ENERGY

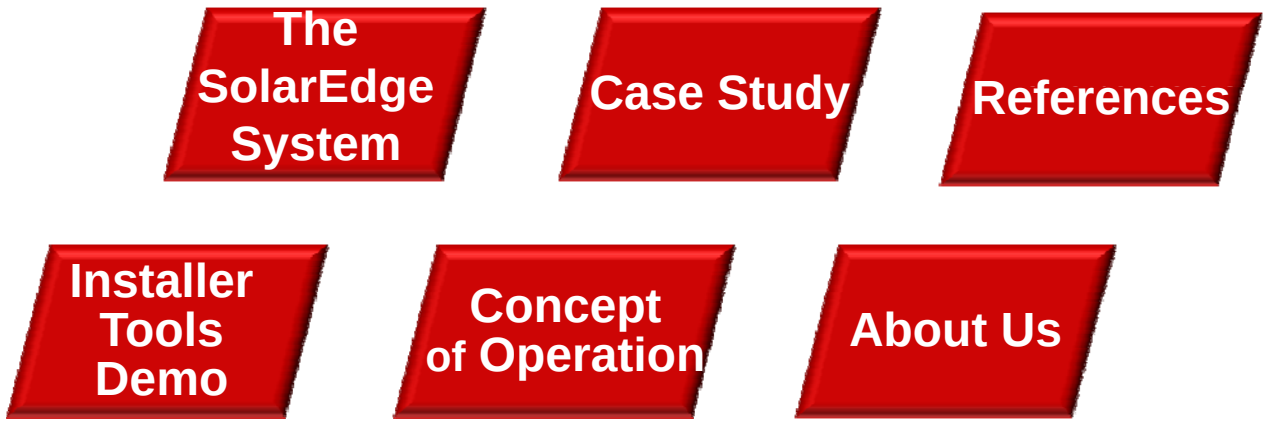
Constraint-free site design & optimal site-area utilization

Real-time module-level web monitoring:
Maintenance cost reduction and higher yields

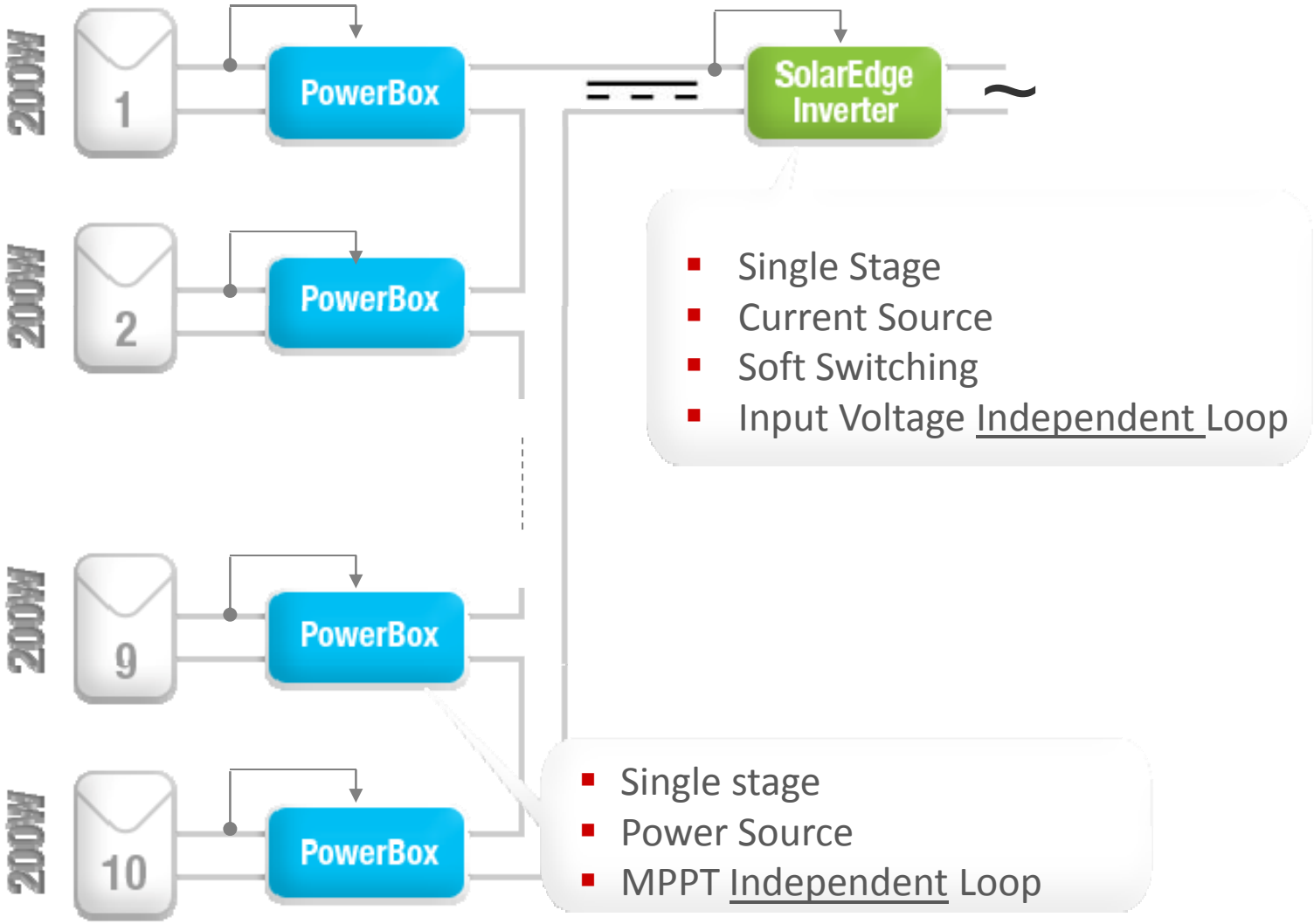
Automatic module shut-down
Unique electrocution prevention and fire safety

Module theft detection and immobilization

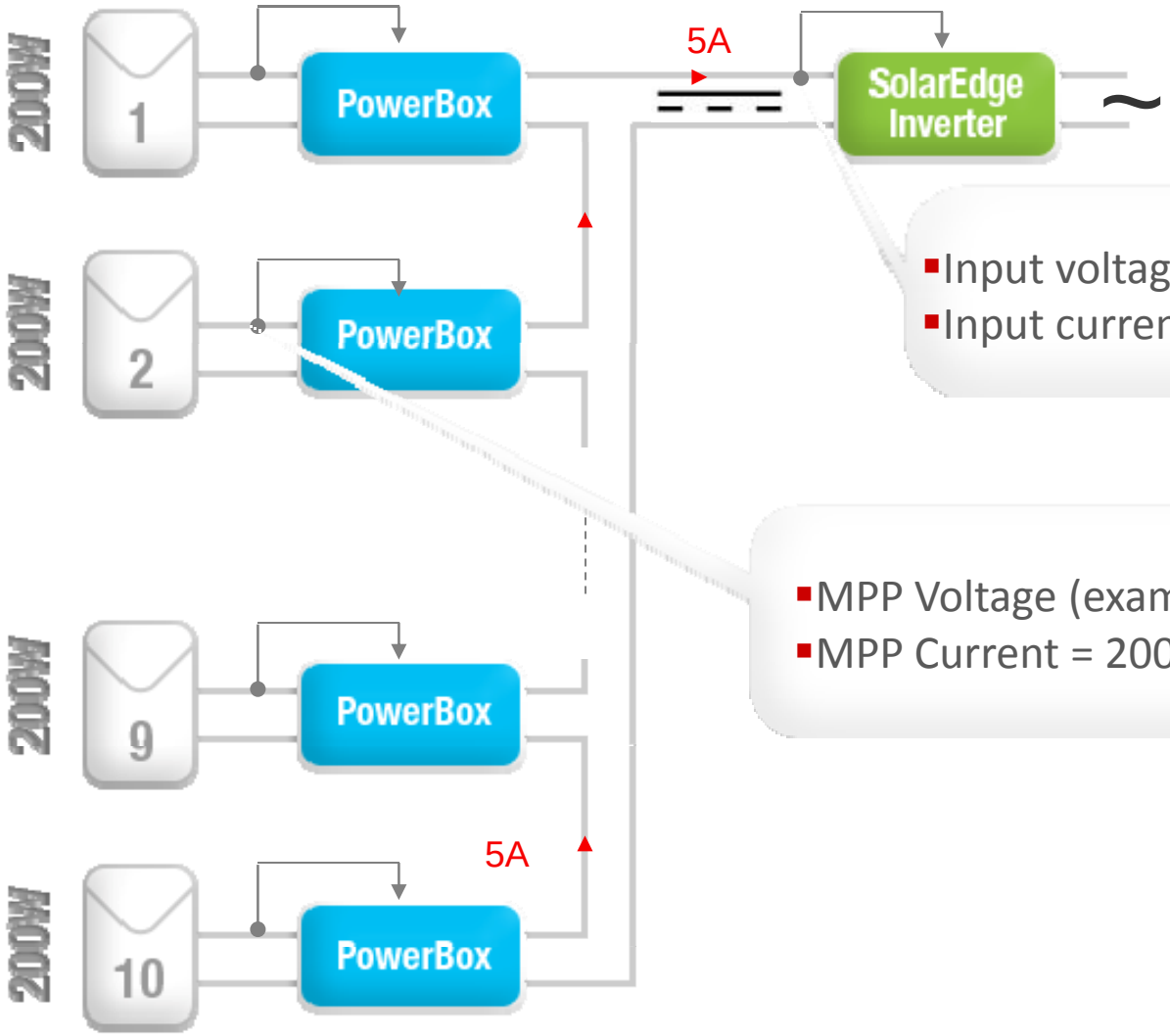
Concept of Operation



SolarEdge Solution



SolarEdge Solution - Example



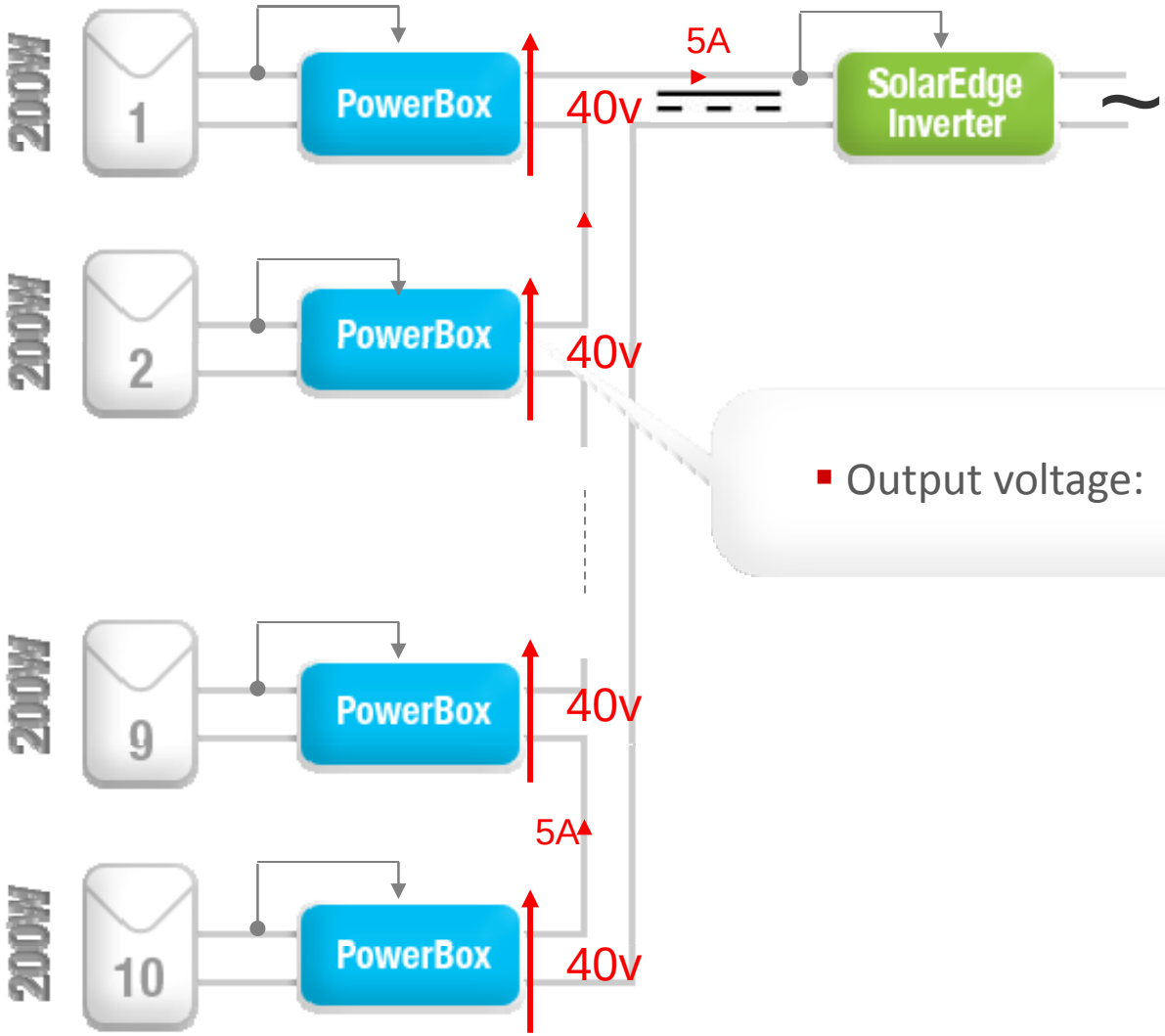
- Module Power = 200W
- Total System Power = 2000W

- Input voltage (regulated by loop): *400V
- Input current = 2000W / 400V = 5A

- MPP Voltage (example) = 32v
- MPP Current = 200W / 32v = 6.25A

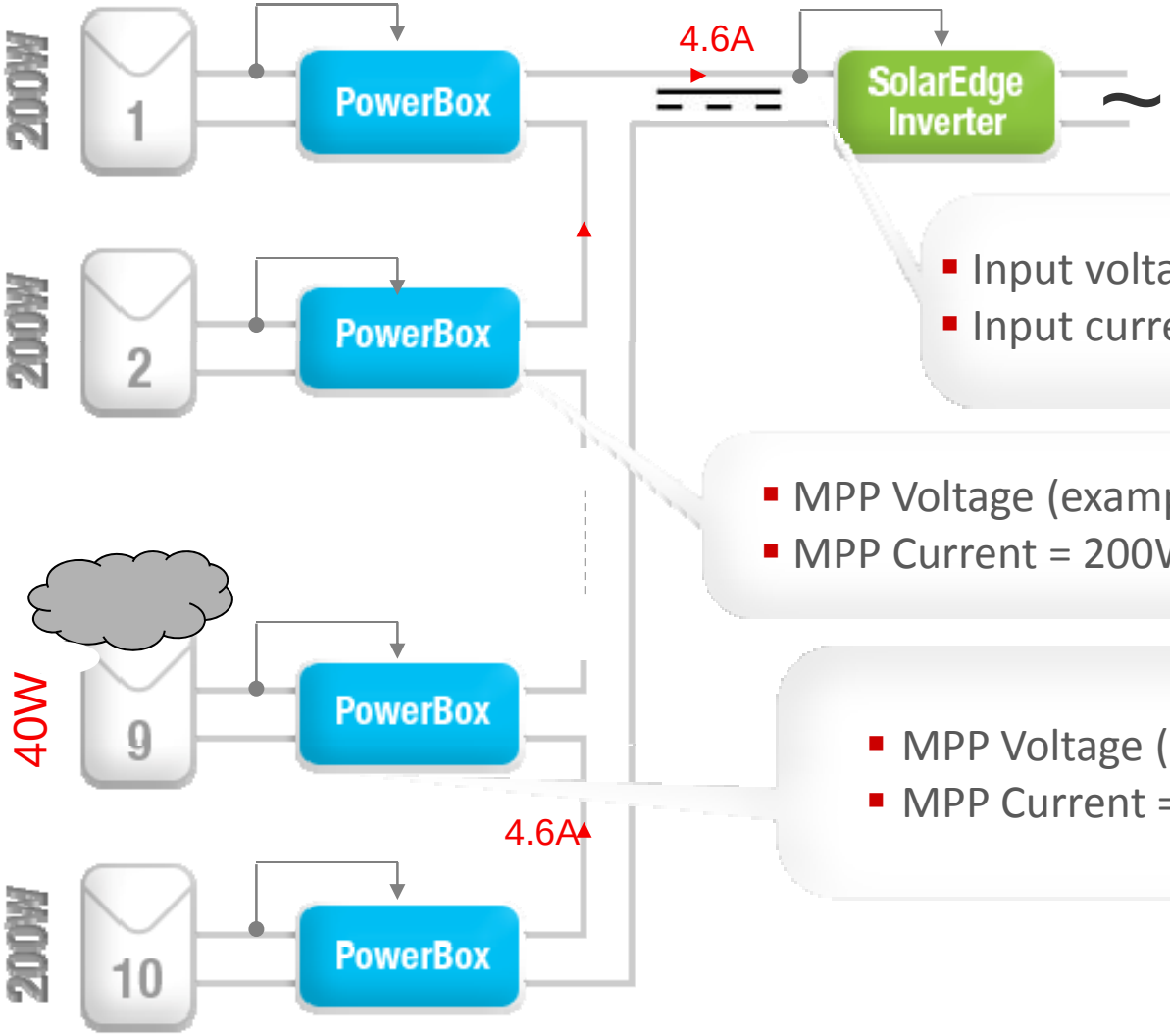
* 400V used here for simplified calculations

SolarEdge Solution - Example



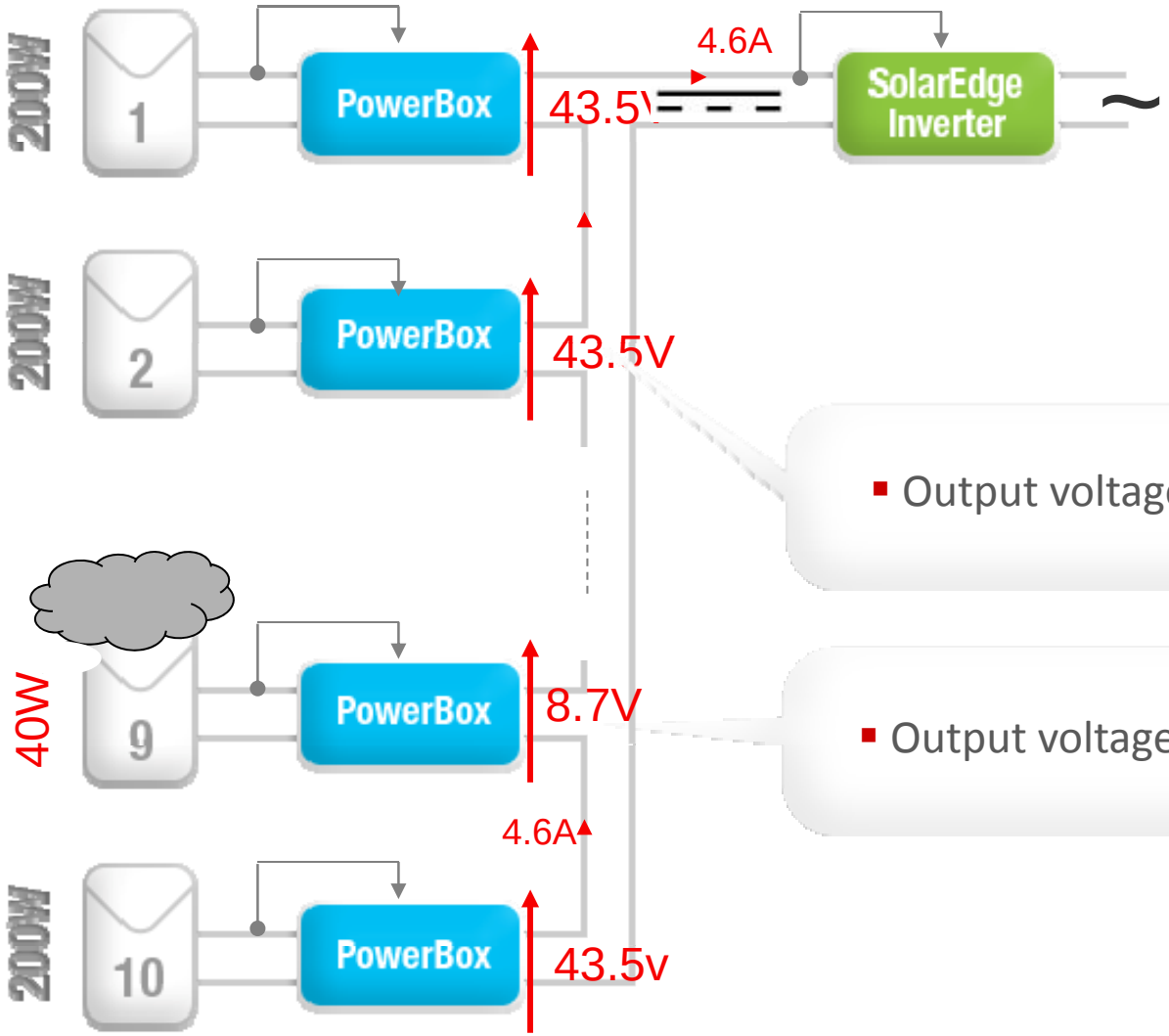
- Output voltage: 200W / 5A = 40v

SolarEdge Solution - Example



- Total System Power = 1840W
- Input voltage (regulated by loop): 400V
- Input current = 1840W / 400V = 4.6A
- MPP Voltage (example) = 32v
- MPP Current = 200W / 32v = 6.25A
- MPP Voltage (example) = 28v
- MPP Current = 40W / 28v = 1.43A

SolarEdge Solution - Example



- Output voltage: 200W / 4.6A = 43.5v
- Output voltage: 40W / 4.6A = 8.7v

Case Study:
Design and Energy Benefits

The SolarEdge System

Case Study

References

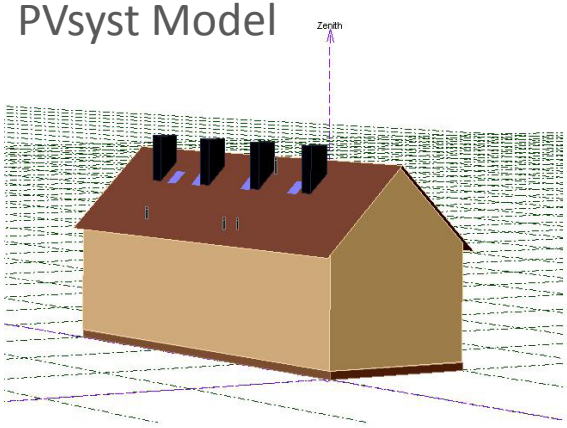
Installer Tools Demo

Concept of Operation

About Us

Comparative Analysis:
Roof System Design, Germany

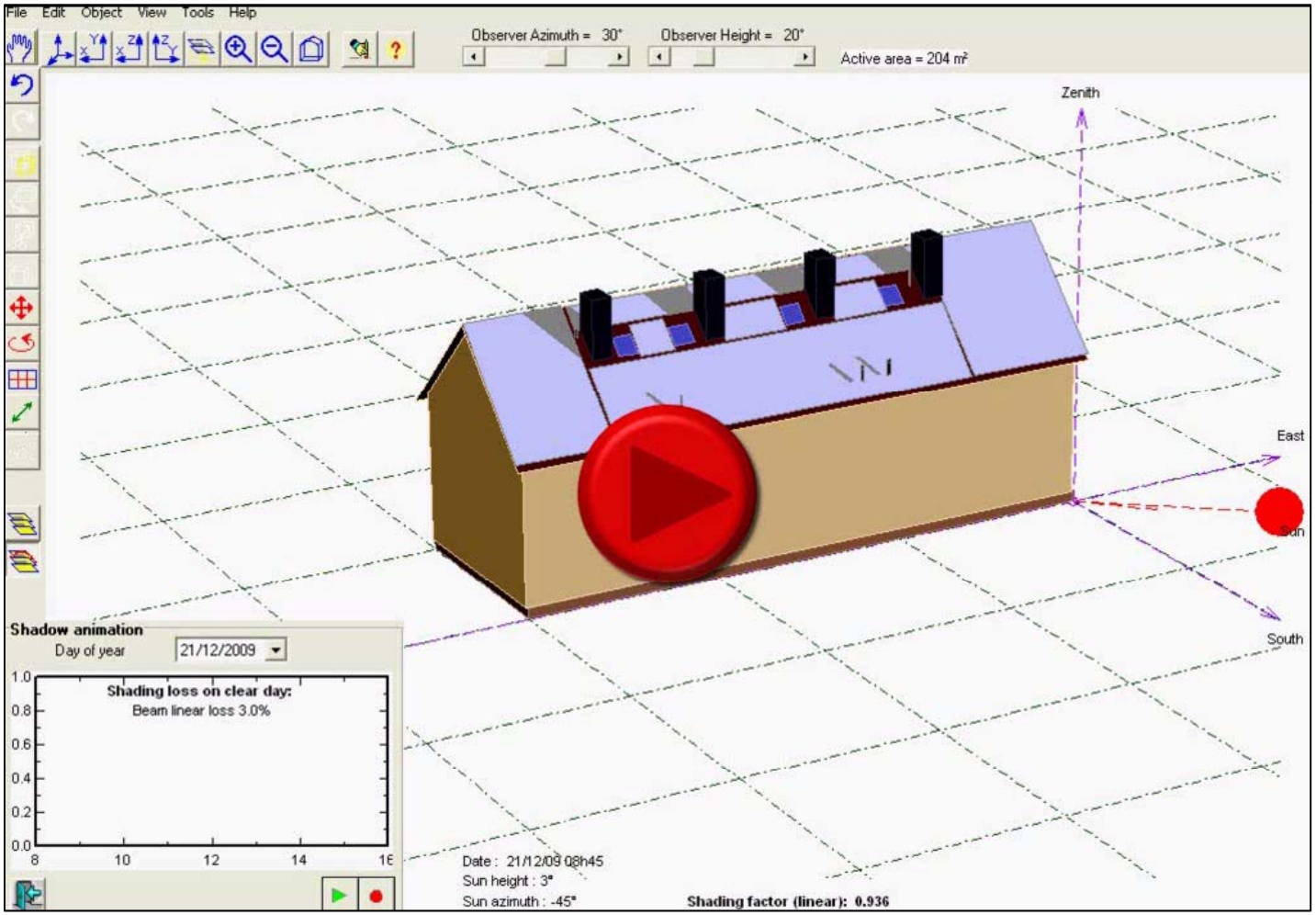
PVsyst Model



- SolarEdge System design (inverters + PowerBoxes) vs. traditional inverters of a leading brand
- PVsyst design and energy calculation for two scenarios:
  - Full roof utilization
  - Shading avoidance

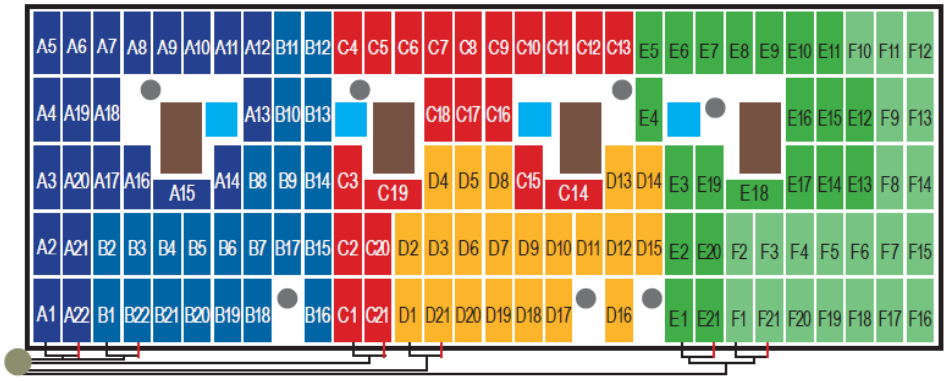
Scenario 1: Full Roof Utilization
Shading Simulation

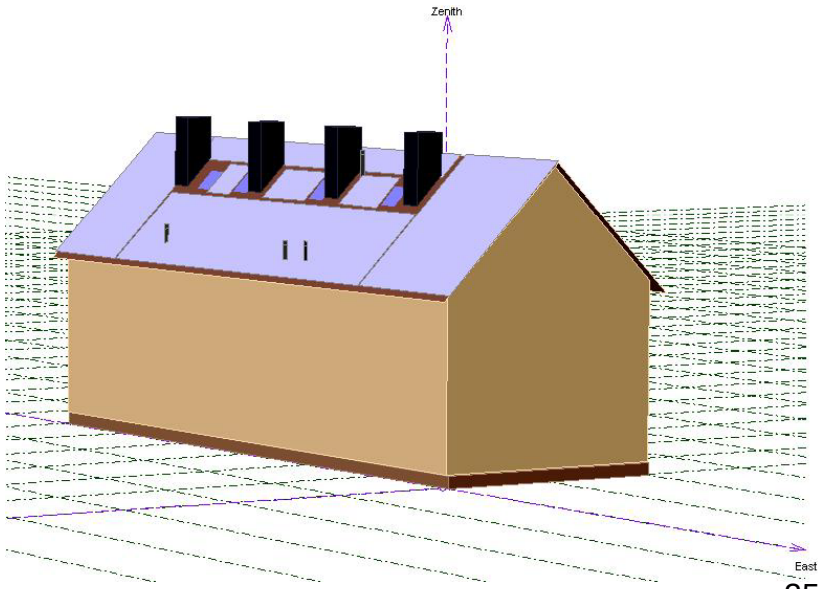
- 128 Solon modules cover all available roof space
- PVsyst shading simulation:



Scenario 1: Full Roof Utilization
Traditional Inverters Design

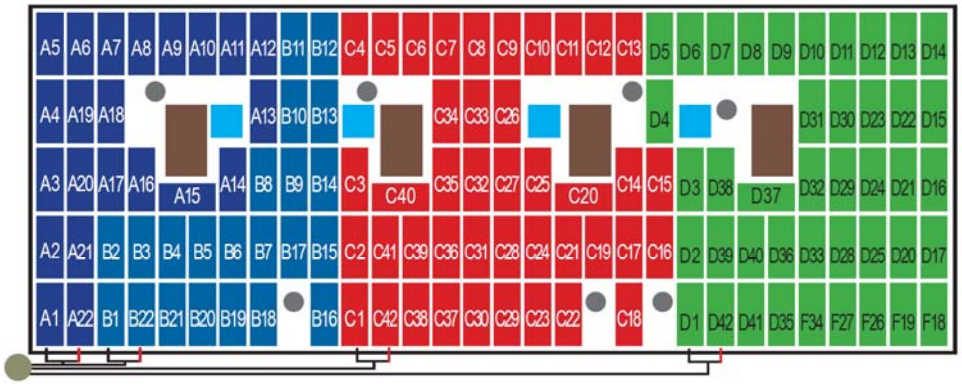
- Leading 3-phase, 97.5% weighted efficiency
- 3 x 10kW inverters: 2 strings of 21 or 22 modules each
- Wiring: 76m (rooftop: 58m + conduit: 18m)
- Peak Power: 29.44 kWp

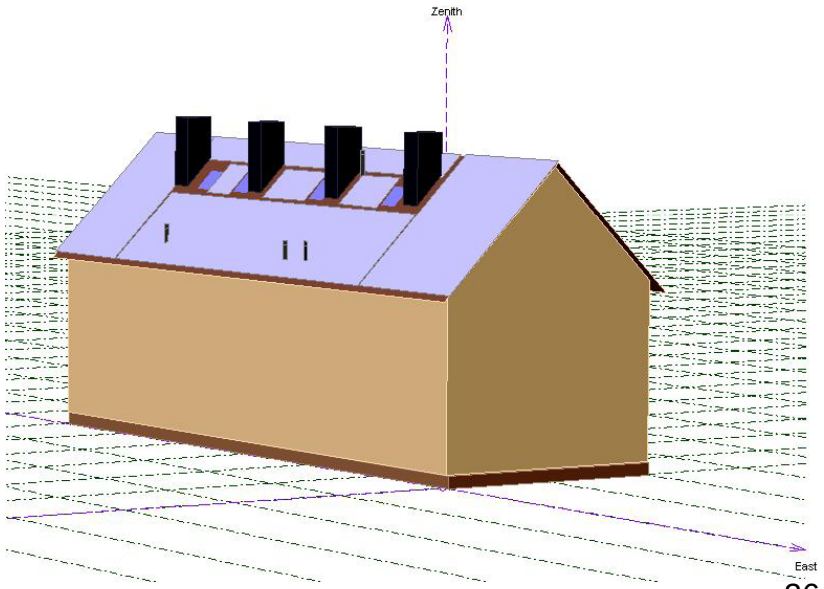




Scenario 1: Full Roof Utilization
SolarEdge System Design

- SolarEdge PowerBox per module, and 3-phase inverters
- 3 x 10kW inverters: **longer strings**, up to 42 modules each.
- **Less wiring**: 62m (rooftop: 44m + conduit: 18m)
- Peak Power: 29.44 kWp





Scenario 1: Full Roof Utilization
PVsyst Annual Energy Estimation

Traditional Inverters

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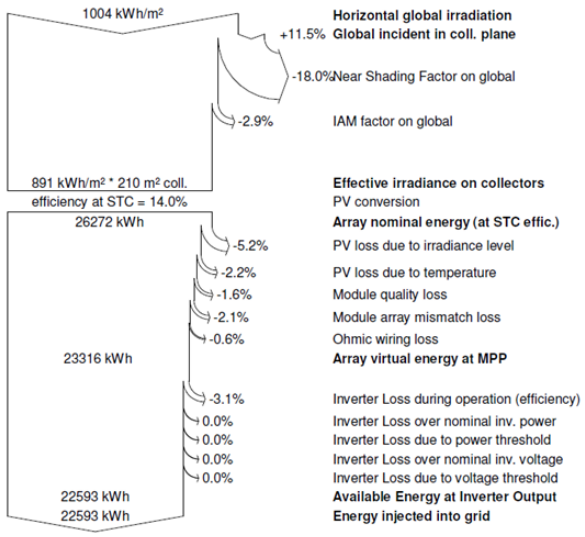
Grid-Connected System: Loss diagram

Project : German House
Simulation variant : 3x10k with shade simulated

Main system parameters	System type	**Grid-Connected**			
Near Shadings	According to strings				
PV Field Orientation	tilt	45°	azimuth	0°	
PV modules	Model	Black 230/07(230)	Pnom	230 Wp	
PV Array	Nb. of modules	128	Pnom total	**29 kWp**	
Inverter	Model		Pnom	10 kW ac	
Inverter pack	Nb. of units	3.0	Pnom total	**30 kW ac**	
User's needs	Unlimited load (grid)				

Loss diagram over the whole year



SolarEdge System

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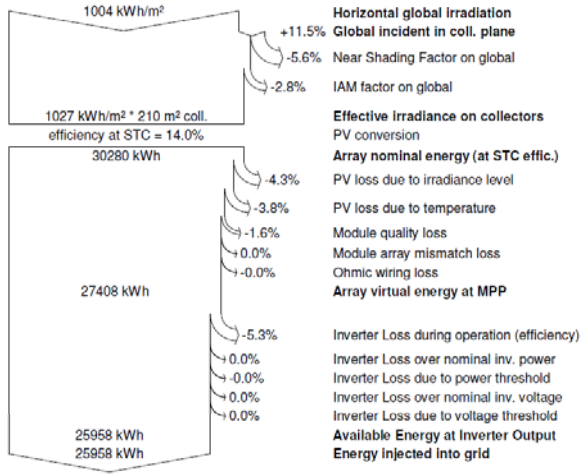
Grid-Connected System: Loss diagram

Project : German House
Simulation variant : SE 3x10k with shade simulated

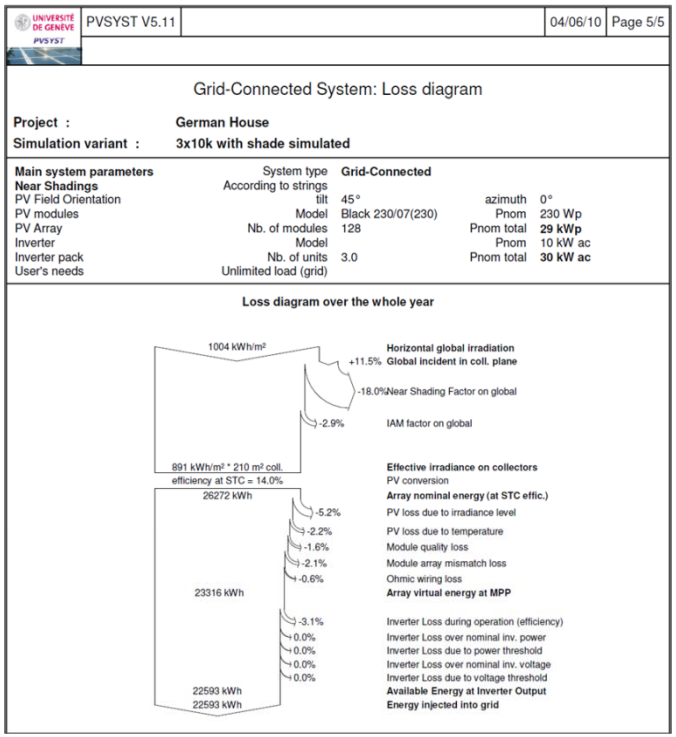
Main system parameters	System type	**Grid-Connected**			
Near Shadings	Linear shadings				
PV Field Orientation	tilt	45°	azimuth	0°	
PV modules	Model	Black 230/07(230)	Pnom	230 Wp	
PV Array	Nb. of modules	128	Pnom total	**29 kWp**	
Inverter	Model	SE10k	Pnom	10 kW ac	
Inverter pack	Nb. of units	3.0	Pnom total	**30 kW ac**	
User's needs	Unlimited load (grid)				

Loss diagram over the whole year



Scenario 1: Full Roof Utilization
SolarEdge Design and Added Energy Benefits

	Traditional Inverters	SolarEdge System
Peak Power	29,440 kWp	29,440 kWp
Wiring	76m	62m (18% saving)
Shading loss	18%	5.6%
Module Mismatch loss	2.1%	0%
Annual AC Energy	**22.59 kWh**	**25.96 kWh (+14.9% gain!)**



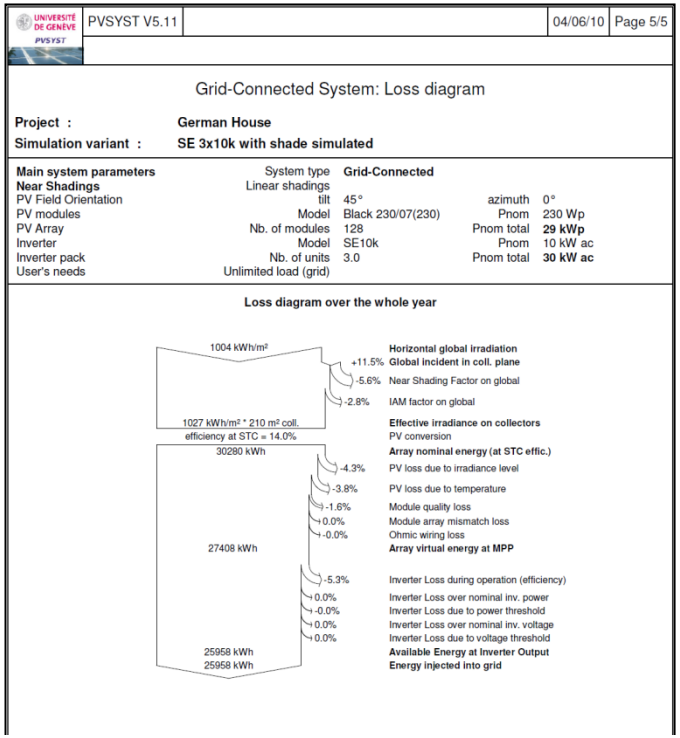
PVSYST V5.11 — 04/06/10 — Page 5/5

Grid-Connected System: Loss diagram

Project : German House
Simulation variant : 3x10k with shade simulated

Main system parameters		System type	**Grid-Connected**		
Near Shadings		According to strings			
PV Field Orientation		tilt	45°	azimuth	0°
PV modules		Model	Black 230/07(230)	Pnom	230 Wp
PV Array		Nb. of modules	128	Pnom total	**29 kWp**
Inverter		Model		Pnom	10 kW ac
Inverter pack		Nb. of units	3.0	Pnom total	**30 kW ac**
User's needs		Unlimited load (grid)			

Loss diagram over the whole year



PVSYST V5.11 — 04/06/10 — Page 5/5

Grid-Connected System: Loss diagram

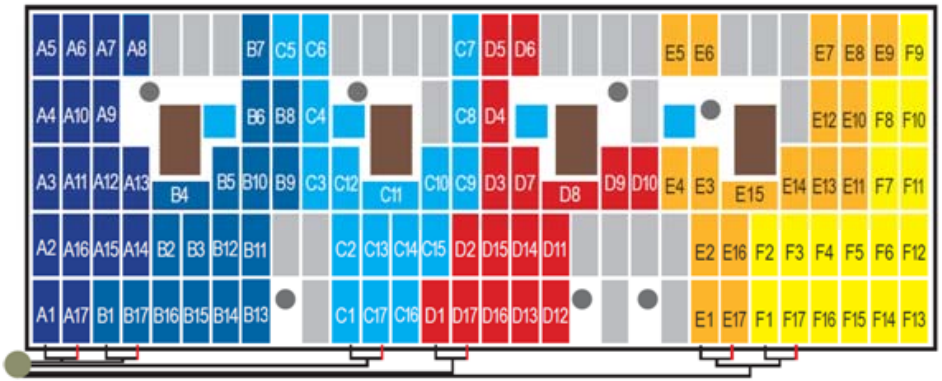
Project : German House
Simulation variant : SE 3x10k with shade simulated

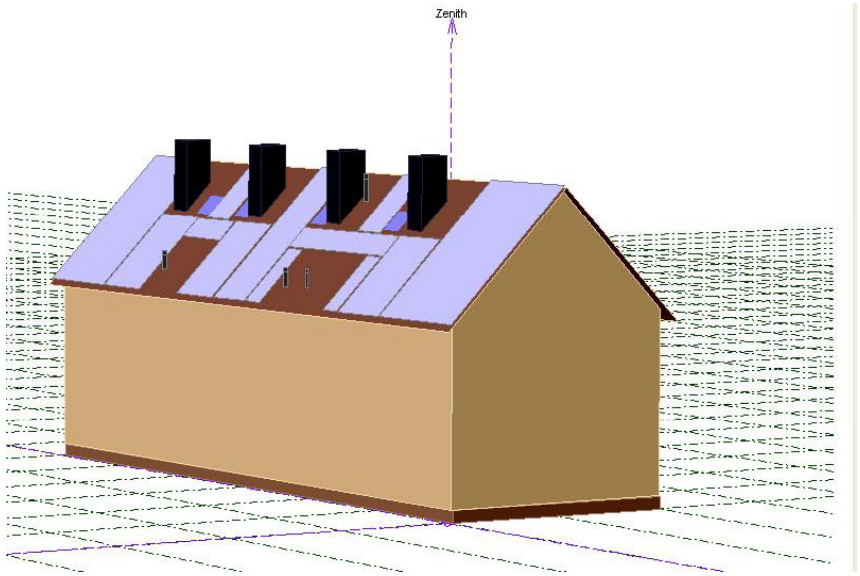
Main system parameters		System type	**Grid-Connected**		
Near Shadings		Linear shadings			
PV Field Orientation		tilt	45°	azimuth	0°
PV modules		Model	Black 230/07(230)	Pnom	230 Wp
PV Array		Nb. of modules	128	Pnom total	**29 kWp**
Inverter		Model	SE10k	Pnom	10 kW ac
Inverter pack		Nb. of units	3.0	Pnom total	**30 kW ac**
User's needs		Unlimited load (grid)			

Loss diagram over the whole year

Scenario 2: Shading Avoidance
Traditional Inverters Design

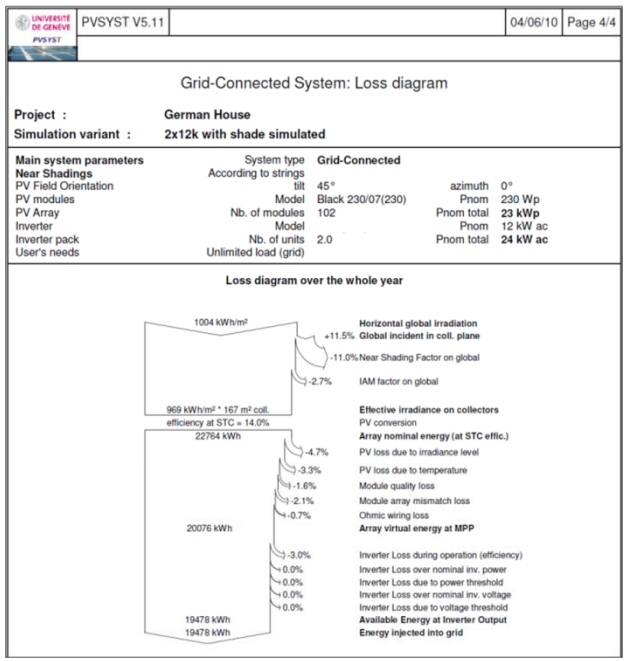
- 102 Solon modules now cover only mostly-unshaded roof space
- Leading 3-phase, 97.5% weighted efficiency
- 2 x 12kW inverters: 3 strings of 17 modules each
- Wiring: 100m (rooftop: 76m + conduit: 24m)
- Peak power: 23.46 kWp





Summary: Scenario 1+2
SolarEdge Design and Added Energy Benefits

	Traditional Inverters		SolarEdge System
	Shading avoidance	Full roof utilization	
Peak Power	23,460 kWp	29,440 kWp	29,440 kWp
Wiring	100m	76m	62m (18% saving)
Module Mismatch loss	2.1%	2.1%	0%
Annual AC Energy	**19.48 kWh**	**22.59 kWh**	**25.96 kWh (14.9% gain!)**


PVSYST V5.11 04/06/10 Page 4/4

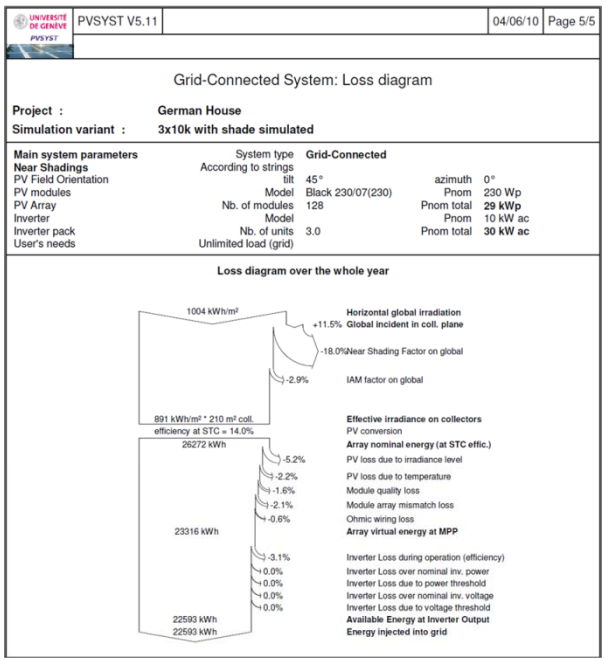
Grid-Connected System: Loss diagram

Project : German House
Simulation variant : 2x12k with shade simulated

Main system parameters: Grid-Connected
Near Shadings: According to strings
PV Field Orientation: tilt 45° azimuth 0°
PV modules: Model Black 230/07(230) Pnom 230 Wp
PV Array: Nb. of modules 102 Pnom total 23 kWp
Inverter: Model Pnom 12 kW ac
Inverter pack: Nb. of units 2.0 Pnom total 24 kW ac
User's needs: Unlimited load (grid)

Loss diagram over the whole year

1004 kWh/m² — Horizontal global irradiation
+11.5% Global incident in coll. plane
-11.0% Near Shading Factor on global
-2.7% IAM factor on global
969 kWh/m² * 167 m² coll. — Effective irradiance on collectors
efficiency at STC = 14.0% — PV conversion
22764 kWh — Array nominal energy (at STC effic.)
-4.7% PV loss due to irradiance level
-3.3% PV loss due to temperature
-1.6% Module quality loss
-2.1% Module array mismatch loss
-0.7% Ohmic wiring loss
20076 kWh — Array virtual energy at MPP
-3.0% Inverter Loss during operation (efficiency)
0.0% Inverter Loss over nominal inv. power
0.0% Inverter Loss due to power threshold
0.0% Inverter Loss over nominal inv. voltage
0.0% Inverter Loss due to voltage threshold
19478 kWh — Available Energy at Inverter Output
19478 kWh — Energy injected into grid


PVSYST V5.11 04/06/10 Page 5/5

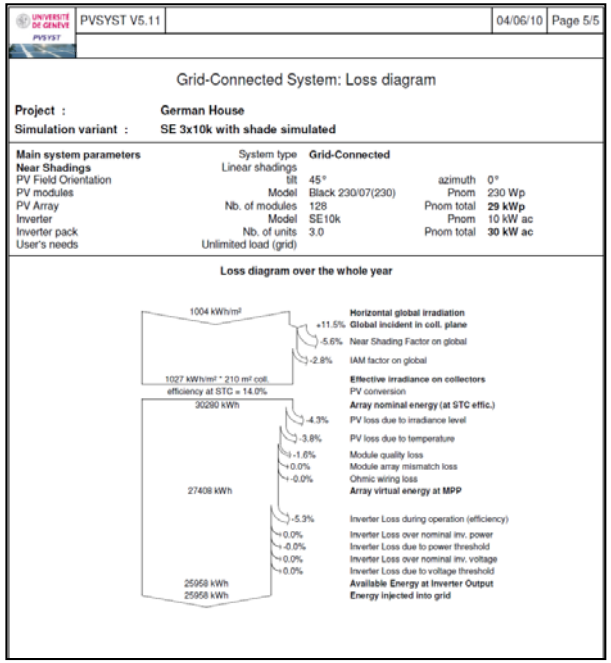
Grid-Connected System: Loss diagram

Project : German House
Simulation variant : 3x10k with shade simulated

Main system parameters: Grid-Connected
Near Shadings: According to strings
PV Field Orientation: tilt 45° azimuth 0°
PV modules: Model Black 230/07(230) Pnom 230 Wp
PV Array: Nb. of modules 128 Pnom total 29 kWp
Inverter: Model Pnom 10 kW ac
Inverter pack: Nb. of units 3.0 Pnom total 30 kW ac
User's needs: Unlimited load (grid)

Loss diagram over the whole year

1004 kWh/m² — Horizontal global irradiation
+11.5% Global incident in coll. plane
-18.0% Near Shading Factor on global
-2.9% IAM factor on global
891 kWh/m² * 210 m² coll. — Effective irradiance on collectors
efficiency at STC = 14.0% — PV conversion
26272 kWh — Array nominal energy (at STC effic.)
-5.2% PV loss due to irradiance level
-2.2% PV loss due to temperature
-1.6% Module quality loss
-2.1% Module array mismatch loss
-0.6% Ohmic wiring loss
23316 kWh — Array virtual energy at MPP
-3.1% Inverter Loss during operation (efficiency)
0.0% Inverter Loss over nominal inv. power
0.0% Inverter Loss due to power threshold
0.0% Inverter Loss over nominal inv. voltage
0.0% Inverter Loss due to voltage threshold
22593 kWh — Available Energy at Inverter Output
22593 kWh — Energy injected into grid


PVSYST V5.11 04/06/10 Page 5/5

Grid-Connected System: Loss diagram

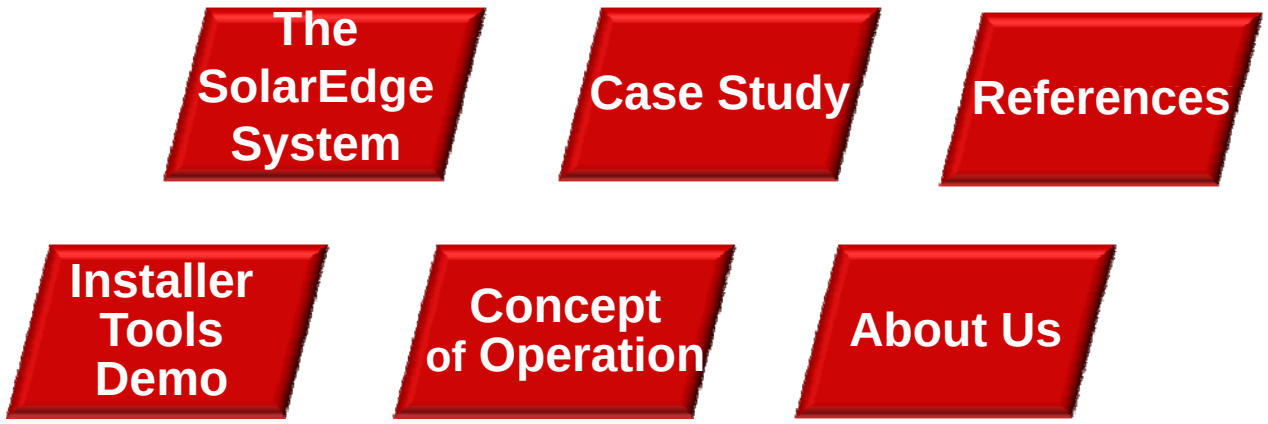
Project : German House
Simulation variant : SE 3x10k with shade simulated

Main system parameters: Grid-Connected
Near Shadings: Linear shadings
PV Field Orientation: tilt 45° azimuth 0°
PV modules: Model Black 230/07(230) Pnom 230 Wp
PV Array: Nb. of modules 128 Pnom total 29 kWp
Inverter: Model SE10k Pnom 10 kW ac
Inverter pack: Nb. of units 3.0 Pnom total 30 kW ac
User's needs: Unlimited load (grid)

Loss diagram over the whole year

1004 kWh/m² — Horizontal global irradiation
+11.5% Global incident in coll. plane
-5.6% Near Shading Factor on global
-2.8% IAM factor on global
1027 kWh/m² * 210 m² coll. — Effective irradiance on collectors
efficiency at STC = 14.0% — PV conversion
30290 kWh — Array nominal energy (at STC effic.)
-4.3% PV loss due to irradiance level
-3.8% PV loss due to temperature
-1.6% Module quality loss
0.0% Module array mismatch loss
-0.0% Ohmic wiring loss
27408 kWh — Array virtual energy at MPP
-5.3% Inverter Loss during operation (efficiency)
0.0% Inverter Loss over nominal inv. power
-0.0% Inverter Loss due to power threshold
0.0% Inverter Loss over nominal inv. voltage
0.0% Inverter Loss due to voltage threshold
25958 kWh — Available Energy at Inverter Output
25958 kWh — Energy injected into grid

References



50MW To Be Installed Worldwide in 2010

SolarEdge Energy Gain - References

SolarEdge systems were compared side by side with leading inverters

- 2 kWp, **East Asia**, afternoon partial shading
- SolarEdge produced from **4%** (no shading) to **15%** (partial shading) more energy

- 2.8 kWp, **Spain**, no shading
- SolarEdge produced **4%** more energy

SolarEdge Energy Gain - References (cont.)

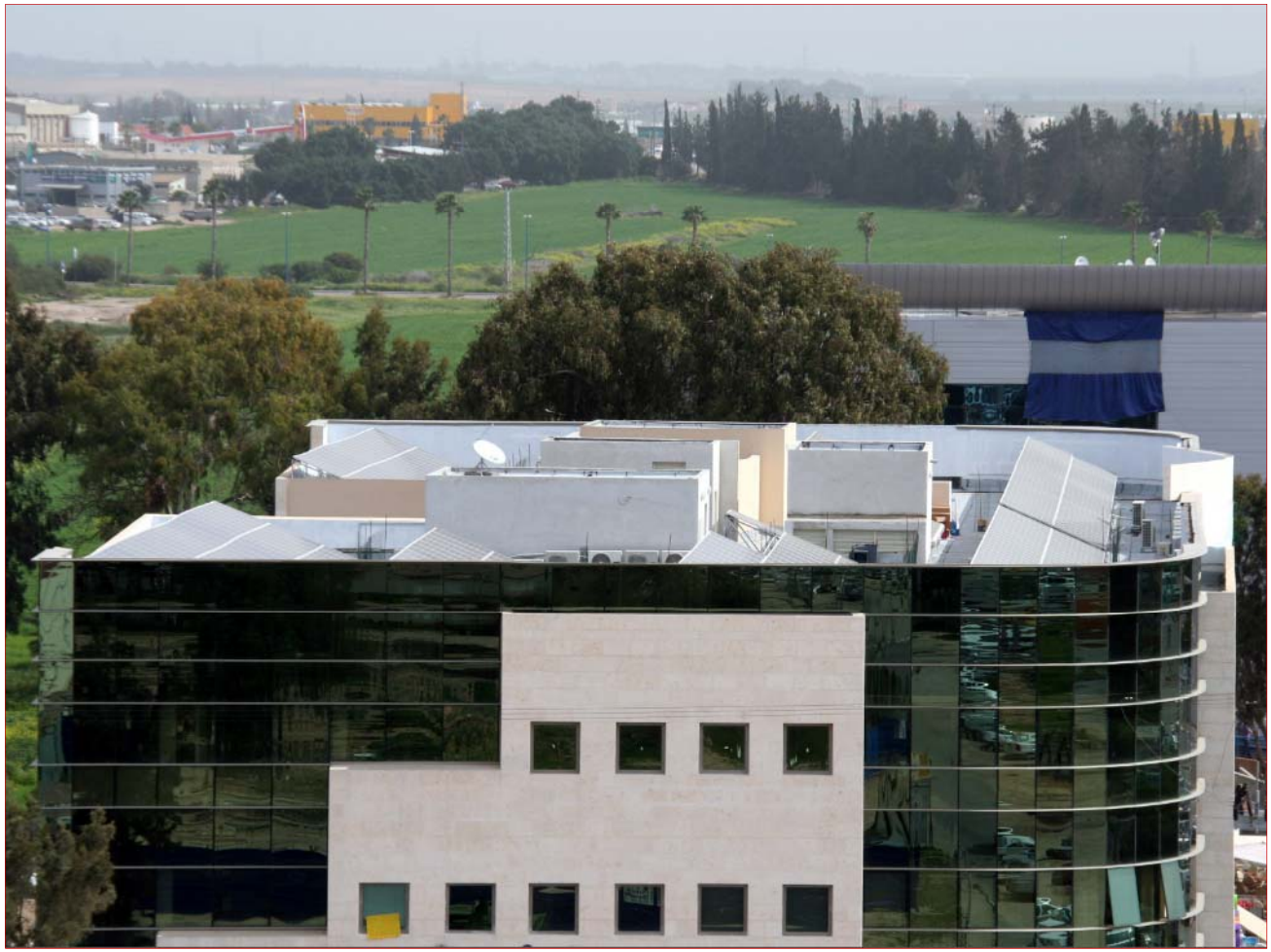
SolarEdge systems were compared side by side with leading inverters

- 3.96kWp, **Germany**
- Artificial shading on 0.5% of the array
- SolarEdge produced **4% - 8%** more energy

- 2.16kWp, un-shaded, unstable grid conditions
- SolarEdge produced **11%** more energy
- Grid instabilities hampered the performance of the standard inverter, without any impact on SolarEdge.

Enabler - 100kW Commercial Site

- Shading tolerance and design flexibility enable 100kW installation on a challenging commercial building



Testimonials – Hundreds of Sites in France

"After the installation of several hundred systems, we are confident that SolarEdge provides solutions that solve major power conversion problems, and render our installations more reliable over time."

Fabrice Pierron, Vice President

Testimonials – Increased Energy Production

"The plants we installed using SolarEdge are exceptionally energy efficient. They produce more power than other systems we have tried and are easy to install."

Eric Gatterer, General Manager

Testimonials – Strong Partnerships

"At the beginning, we were the first to work with SolarEdge because we believed in their vision. Today, years later, SolarEdge has fulfilled its word and has turned into a long term and steadfast working partner."

Klaus Gehrlicher, CEO

Installer Tools Demo

The SolarEdge System

Case Study

References

Installer Tools Demo

Concept of Operation

About Us

Installer Tools

Site Design Tool

Configuration Tool

Site Mapping Tool

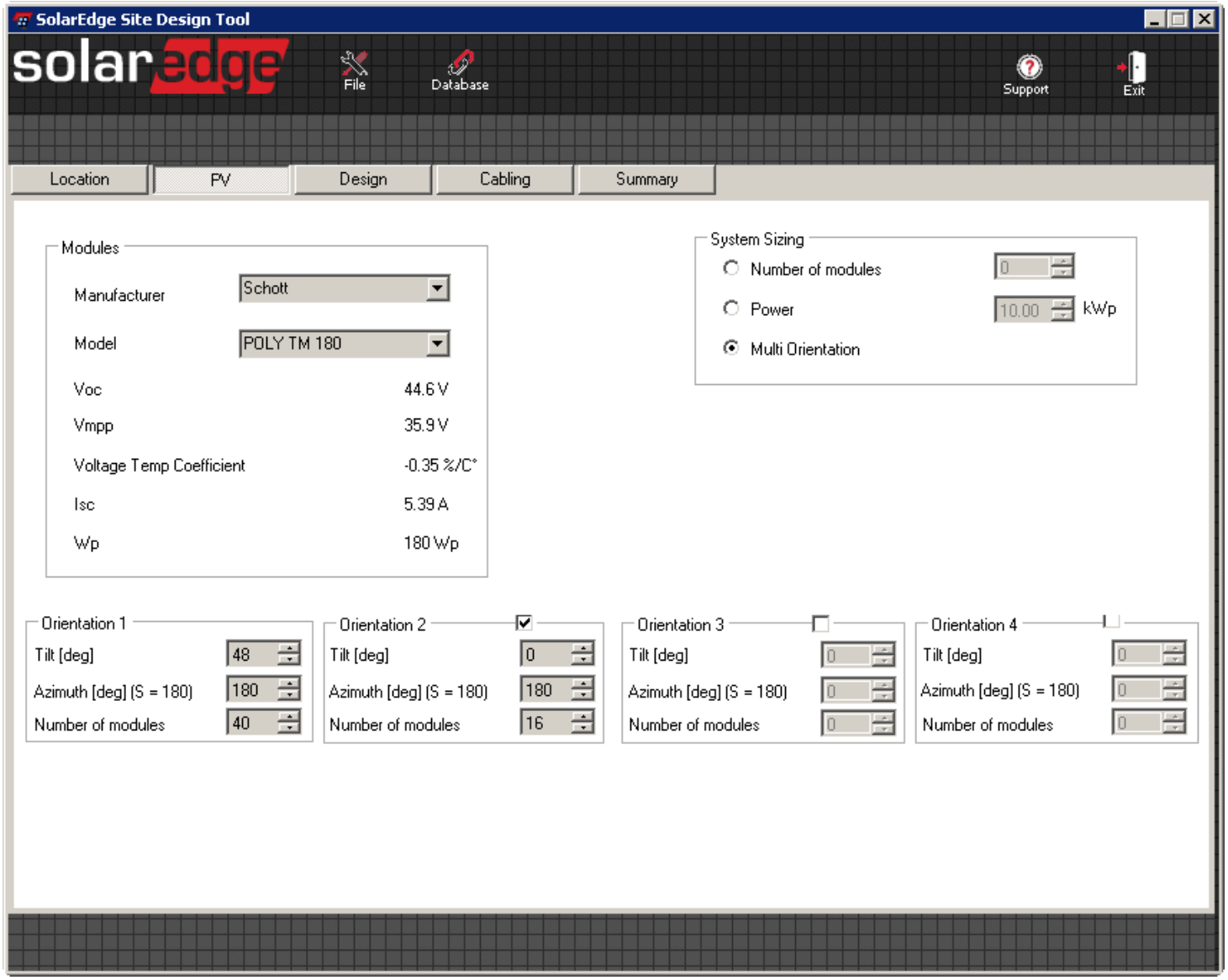
Software tools making our simple installation even easier

Site Design Tool

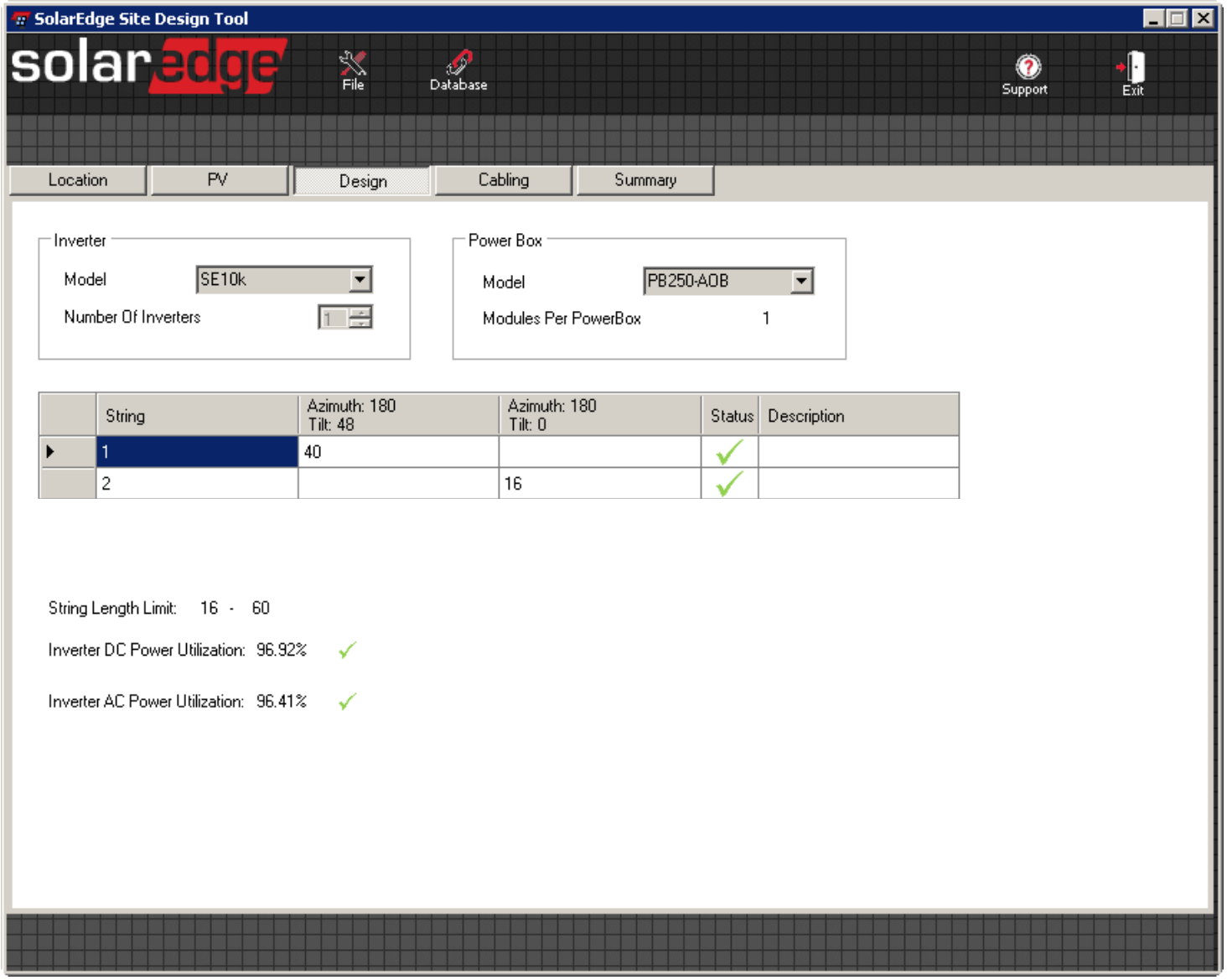
SolarEdge Site Design Tool

- Recommends string layout and inverter / PowerBox selection, per site sizing
- Easy verification of any design
- Supports multi-orientation and unequal string length layouts
- Estimates annual energy production
- Free to download

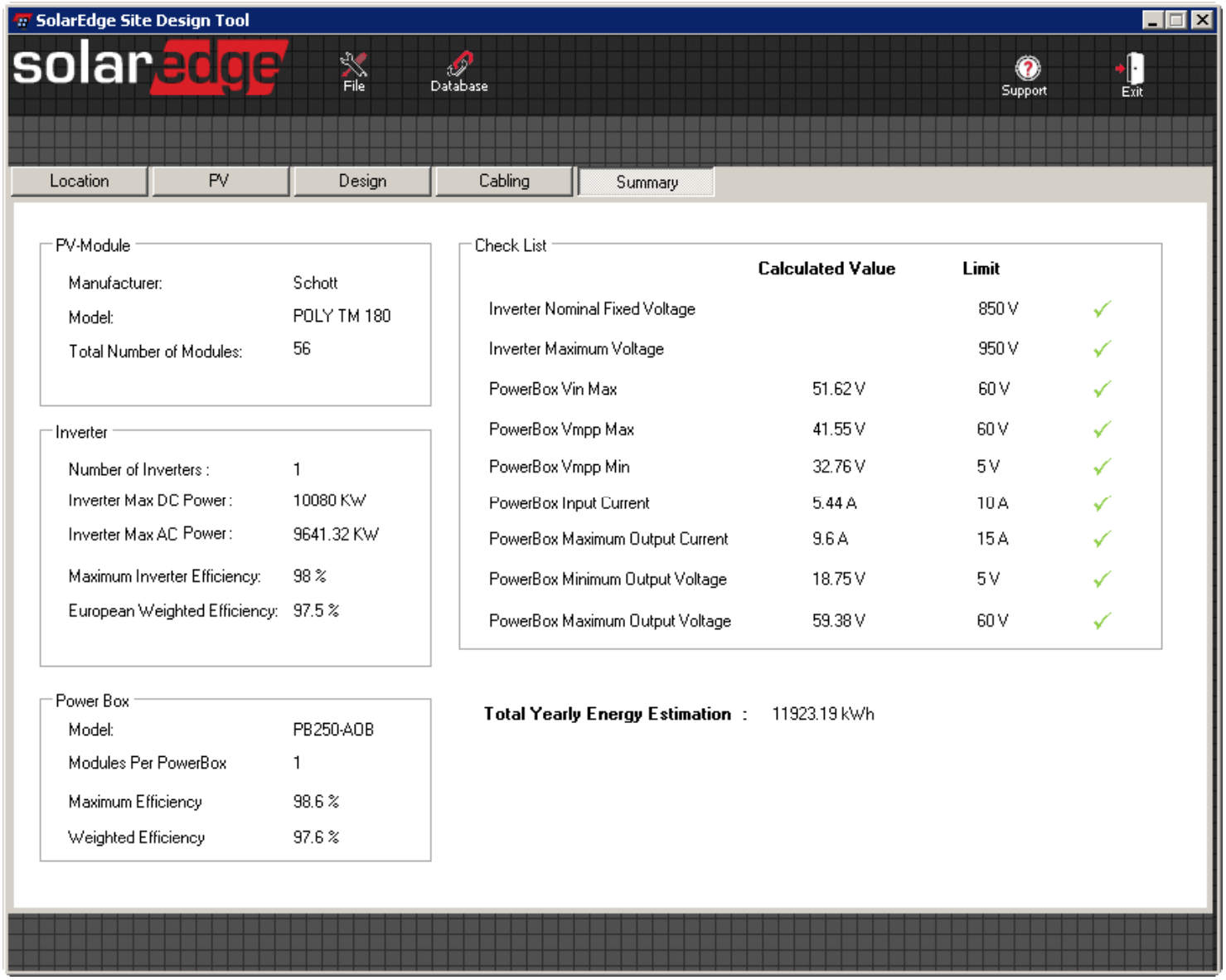
Site Design Tool –
Setting PV Sizing and Orientations



Site Design Tool – Recommended Sting Design and Product Selection



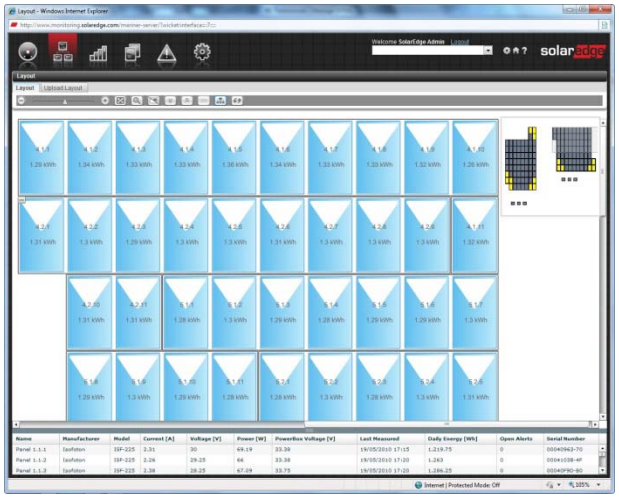
Site Design Tool – Summary, Verification, and Energy Estimation



Site Mapping Tool

SolarEdge Site Mapping Tool

- Scans PowerBox barcodes to create a map of your PV site
- Physical maps facilitate remote diagnostics through the SolarEdge Monitoring Portal
- Free to download for any Windows Mobile Phone
- Rugged industrial casing device optional

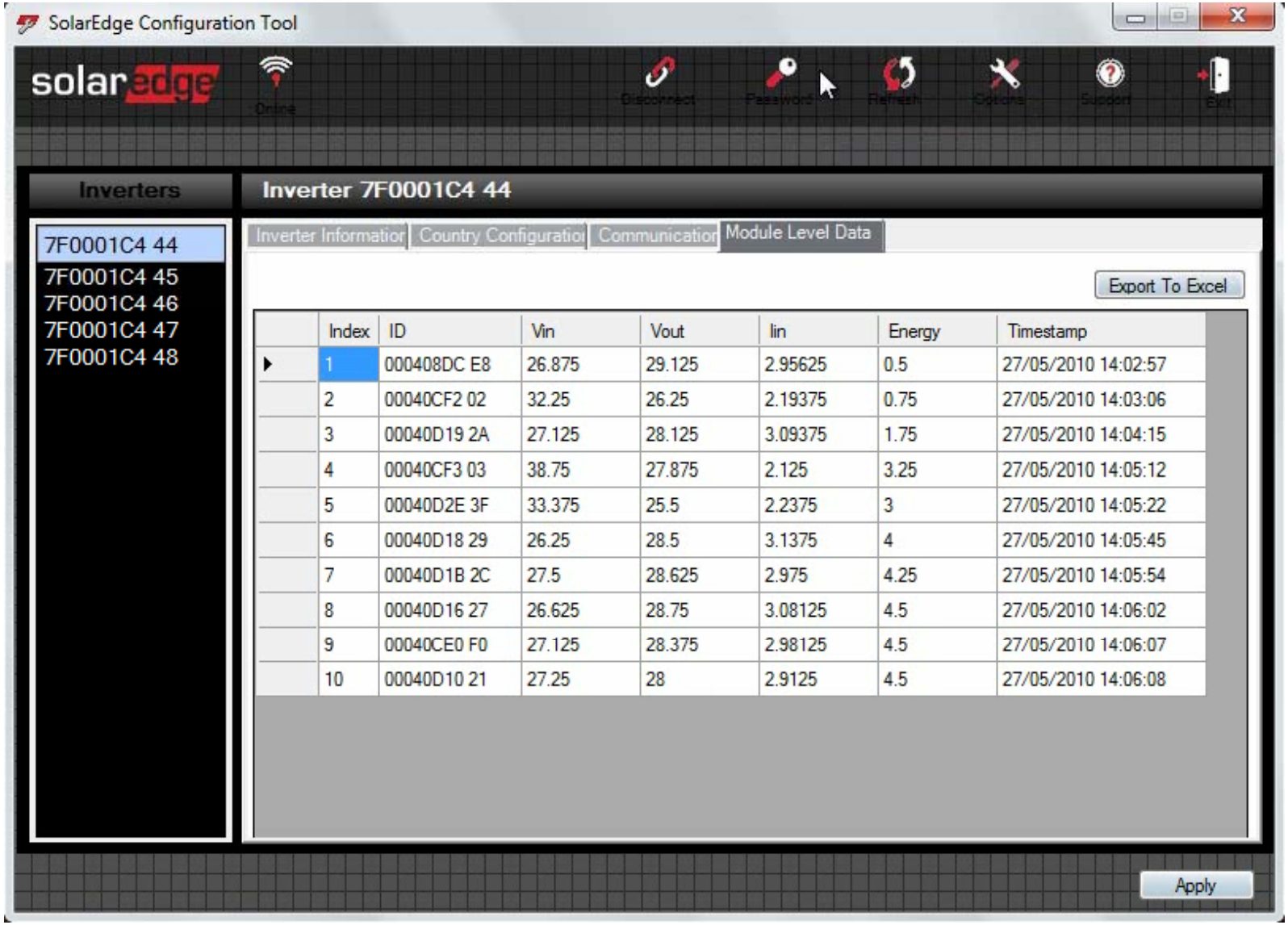


Configuration Tool

SolarEdge Configuration Tool

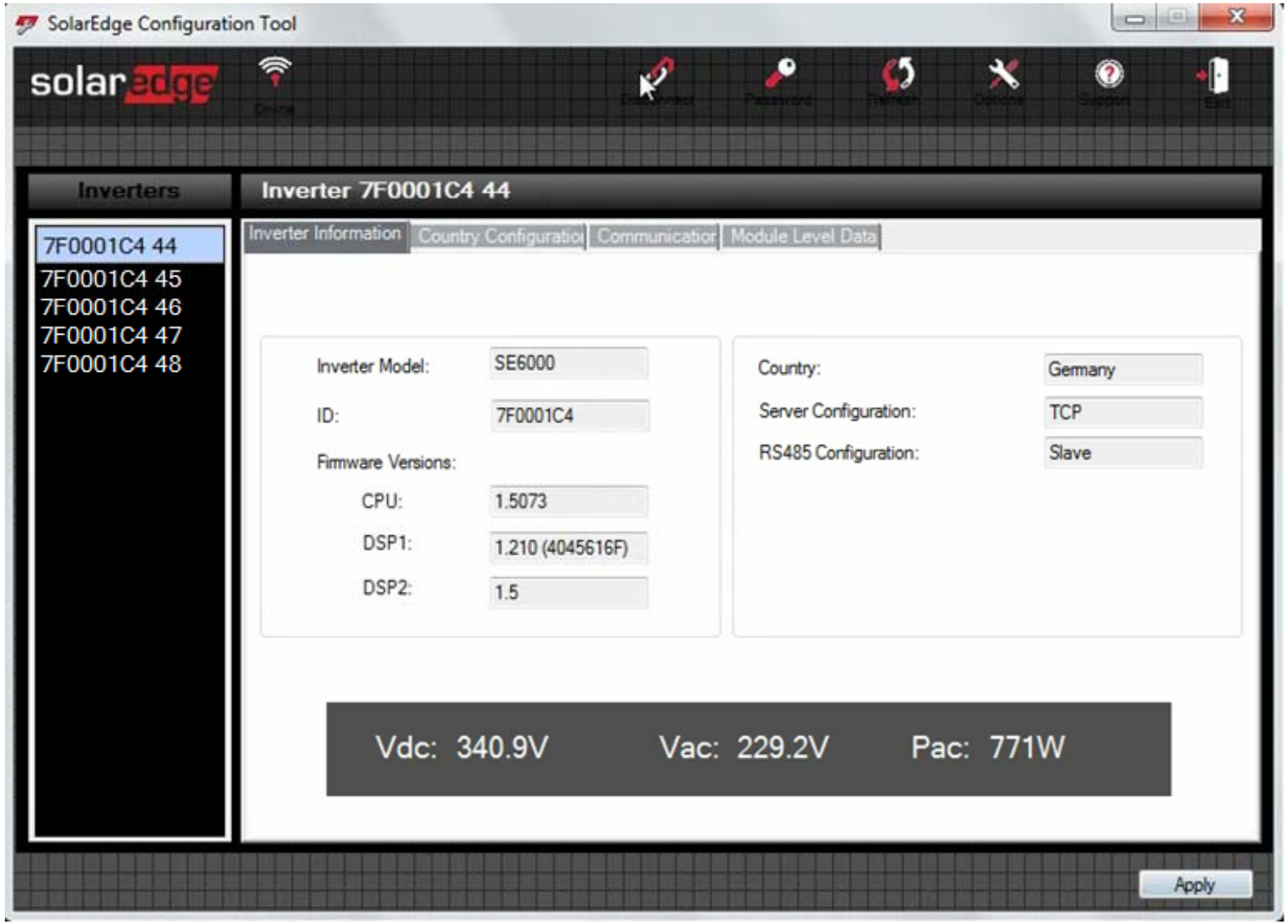
- On site module-level performance verification
- Configure the inverter without removing its cover
- Multiple inverters configured from one location via RS485
- Setup LAN, RS485 and wireless ZigBee communication
- Create detailed report for support calls
- Free to download

Configuration Tool –
On-site Module Level Performance Verification

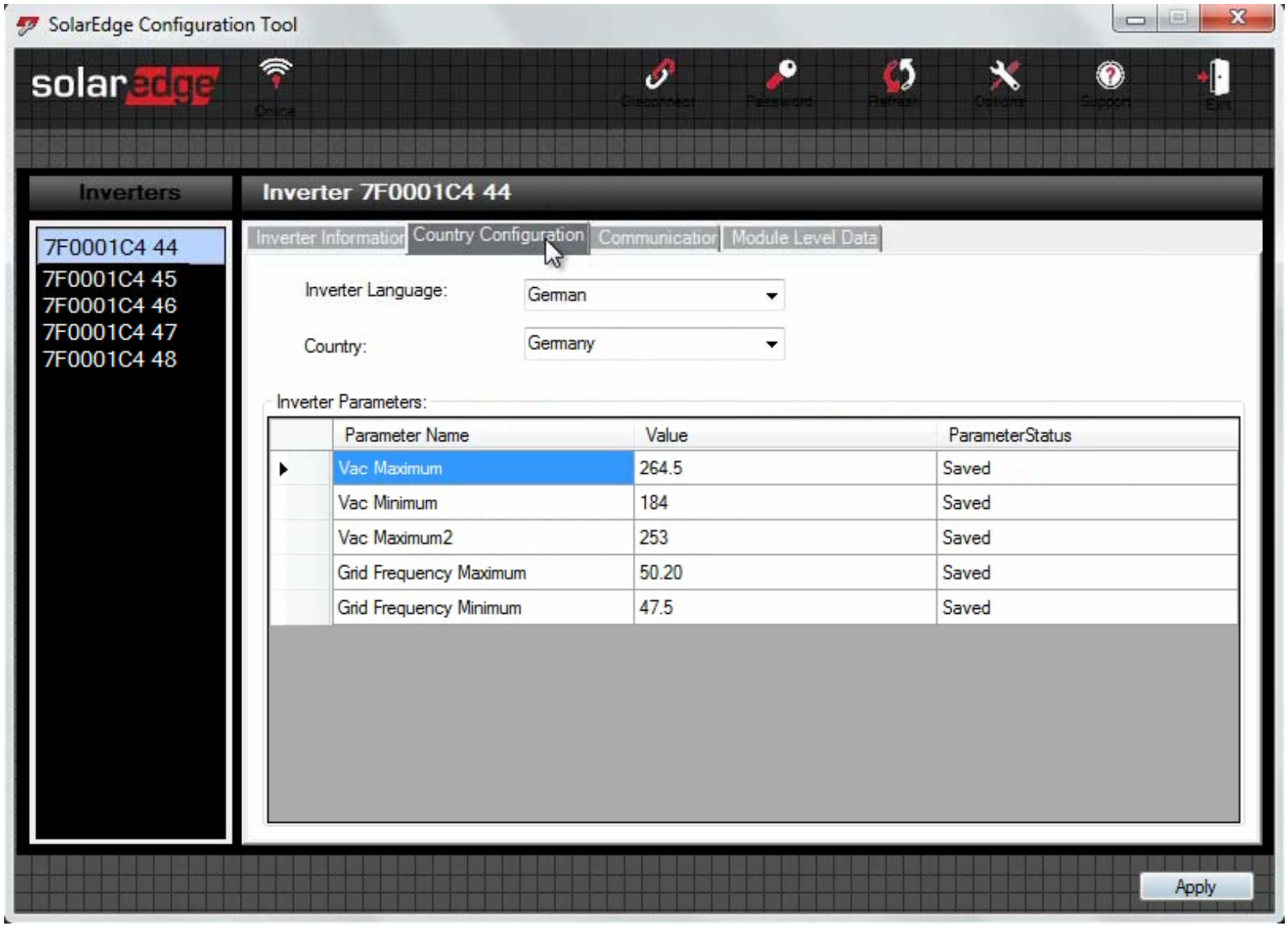


Index	ID	Vin	Vout	Iin	Energy	Timestamp
1	000408DC E8	26.875	29.125	2.95625	0.5	27/05/2010 14:02:57
2	00040CF2 02	32.25	26.25	2.19375	0.75	27/05/2010 14:03:06
3	00040D19 2A	27.125	28.125	3.09375	1.75	27/05/2010 14:04:15
4	00040CF3 03	38.75	27.875	2.125	3.25	27/05/2010 14:05:12
5	00040D2E 3F	33.375	25.5	2.2375	3	27/05/2010 14:05:22
6	00040D18 29	26.25	28.5	3.1375	4	27/05/2010 14:05:45
7	00040D1B 2C	27.5	28.625	2.975	4.25	27/05/2010 14:05:54
8	00040D16 27	26.625	28.75	3.08125	4.5	27/05/2010 14:06:02
9	00040CE0 F0	27.125	28.375	2.98125	4.5	27/05/2010 14:06:07
10	00040D10 21	27.25	28	2.9125	4.5	27/05/2010 14:06:08

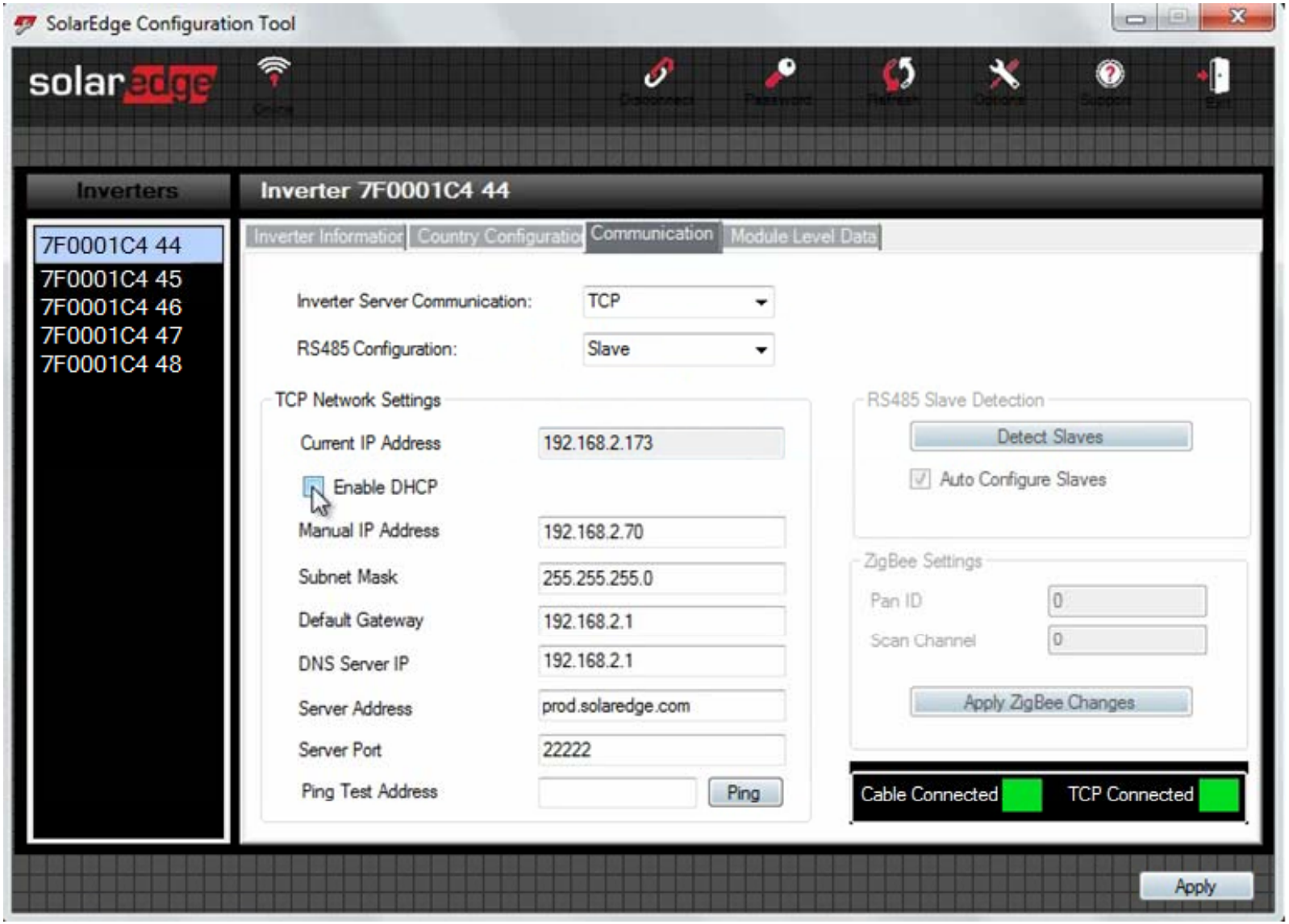
Configuration Tool – Multiple Inverter On-site Information



Configuration Tool –
Setting Country Parameters and LCD Language



Configuration Tool – Setting LAN and Wireless Parameters



About Us

The SolarEdge System

Case Study

References

Installer Tools Demo

Concept of Operation

About Us

Introduction to SolarEdge

- SolarEdge leads the solar revolution of per-module power electronics, for maximum solar energy harvesting at lower cost
- SolarEdge delivers a full solution for today's Solar PV challenges, from module to grid