Panasonic

NEW

25 years

EXTENDED PRODUCT GUARANTEE

*: from 01.2017

HIT® Photovoltaic Module

Iris Hellas
Technology Innovations
www.irishellas.com

More Power on any Roof!

Panasonic Solar:
More Energy, More Peace-of-Mind

Panasonic Corporation / Eco Solutions Company

June 2017

Panasonic: *a solid and sustainable partner*

Panasonic

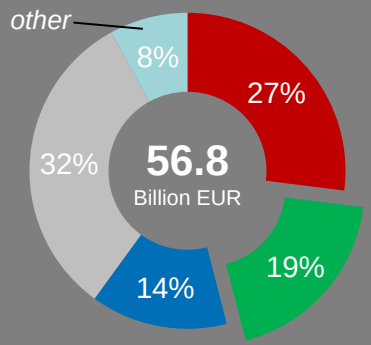
AP Appliances

ES Eco Solutions

AVC AVC Networks

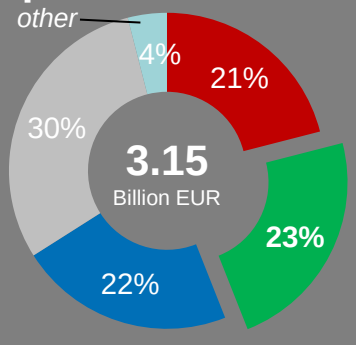
AIS Automotive & Industrial Syst.

Sales FY2016



-1.9% vs FY2015

Op. Profit FY2016



+9% vs FY2015

Brand-new, vertically-integrated 300 MW factory, Kulim (Malaysia)

100% control of Manufacturing, R&D and QA

HIT® Own cell techology

1 Billion HIT solar cells produced since 1997

Since 1975 in solar business

heterojunction technology since 1990

HIT® mass-production since 1997

25.6%

cell efficiency

(for HIT® solar cells at research level)

PECMY – Reduce Environmental Impact!

200 kWp
HIT®
PV SYSTEM

HIT DOUBLE
INTEGRATION

USE OF SOLAR MODULES

EFFLUENT
PURIFICATION
FACILITY

WASTEWATER TREATMENT AND RECYCLYING

OFFICE

SHOWROOM

USE OF NATURAL LIGHT FOR OFFICE LIGHTING

SLUDGE TANK

SLUDGE
DEHYDRATOR
AND DRYER

50% REDUCTION OF SLUDGE

COOLING
SYSTEM

INDUSTRIAL
FREEZER

RECYCLING OF INDUSTRIAL WASTE-HEAT FOR COOLING

REDUCTION FIGURES:

POWER (MWh/year)	**CO_2** (tones/year)	**Cost** (RM/year)
4,403.2	**2,346.1**	**1,276,824**

HIT®: *100% Panasonic*

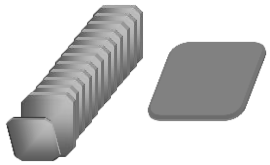
Vertical integration ► from ingots to modules. Self-engineered production machinery

Vast product line ► in-house production of PV inverters and storage solutions

R&D

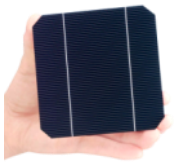
Nishikinohama Factory, Japan

Ingots/wafers



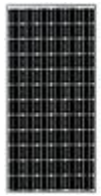
SANYO Solar of Oregon, US
Panasonic Energy Malaysia

Cells



Nishikinohama Factory, Shimane SANYO, JP
Panasonic Energy Malaysia

Modules



Nishikinohama Factory, Shiga Factory,
Panasonic Energy Malaysia

Inverters/Storage

Shimane SANYO, Technodevice, Mie, JP

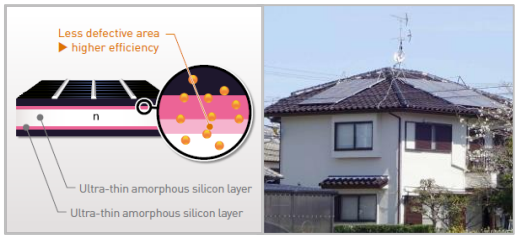
Sales Companies

Munich, Germany. PESEU

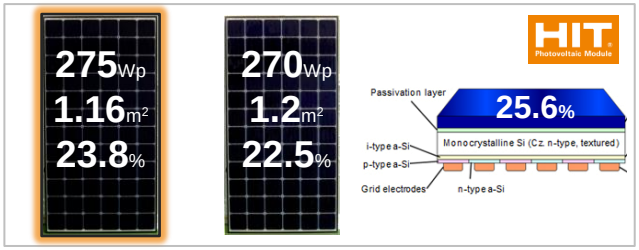
Panasonic

Experience: *40 years to look back, 25 ahead fully guaranteed!*

1975	**Started R&D for amorphous solar cells**
1980	World's first commercialization of amorphous solar cells
1990	**Started R&D for HIT®**
1992	First installation of an on-grid PV system for residential use in Japan
1997	**Started mass-production and sales of HIT®**
2011	TOKAI university solar car powered by Panasonic starts its series of solar challenge victories (2011- today)
2012	Panasonic receives prestigious IEEE award for HIT™
	Panasonic Energy Malaysia Sdn. Bhd. starts mass production
2013	New lab. record for cell efficiency: 24.7%=World No.1
2014	New lab. record for cell efficiency: 25.6%=World No.1 **Cumulative cell production reaches 1 billion.**
2015	**40th year anniversary in solar business** New record for module efficiency: 22.5%=World No.1
2016	**NEW N330/325 and 15-year product guarantee** New record for module efficiency: 23.8%=World No.1
2017	**20-year HIT® mass-production jubilee!**

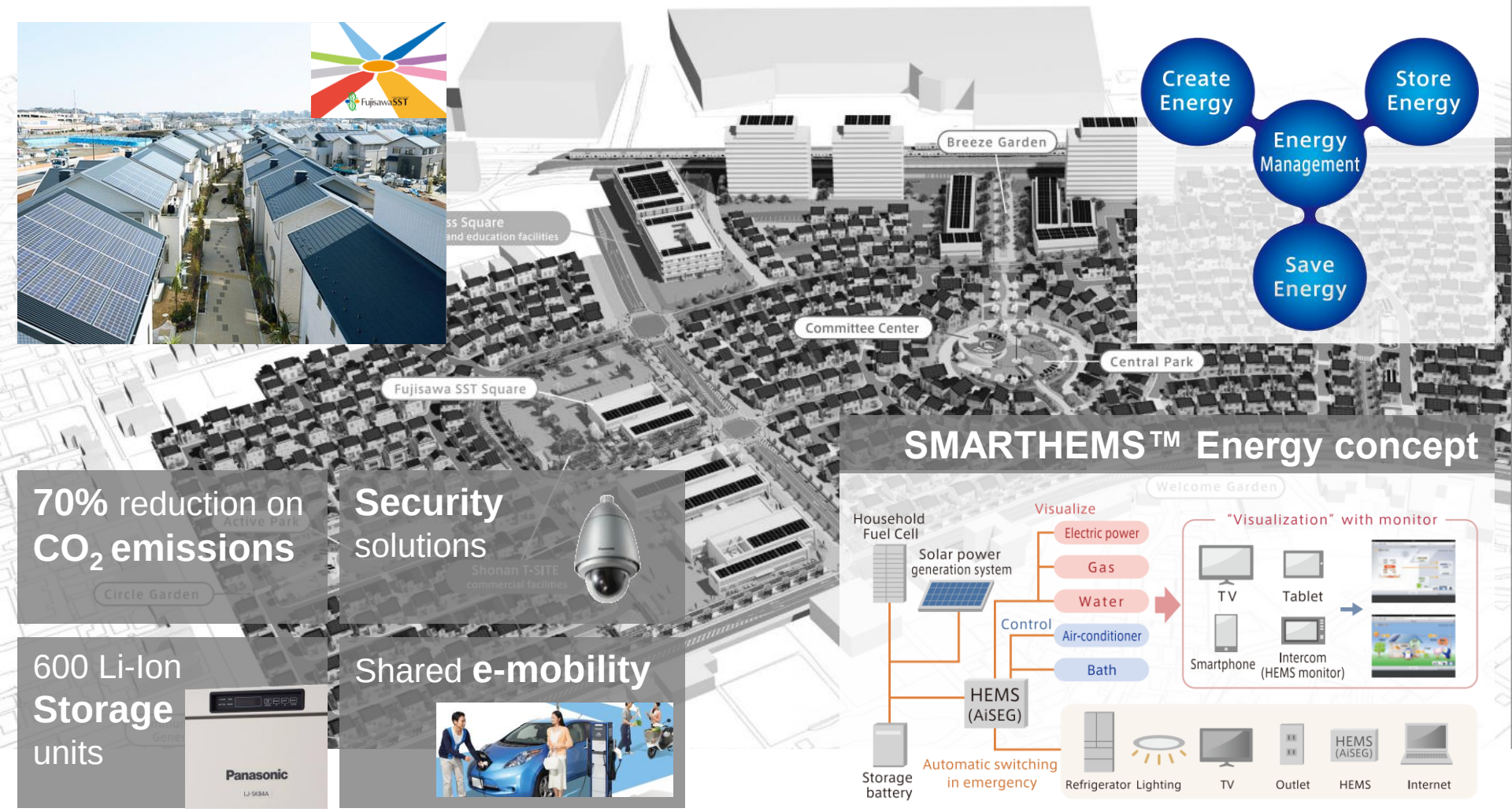


SANYO
Panasonic



Panasonic

Fujisawa Sustainable Smart Town: *a vision turned reality*



70% reduction on **CO_2 emissions**

Security solutions

600 Li-Ion **Storage** units

Shared **e-mobility**

SMARTHEMS™ Energy concept

A whollistic approach lead by Panasonic for *a BETTER WORLD, a BETTER LIFE*

Panasonic

HIT® Photovoltaic Module: *extra quality and reliabilty*

Proven high reliability

Public failure rate figures: **0.0037%***

Passed **Long Term Sequential Test by TüV Rheinland** (> 92% of P_{ini})

: as of June 2017 from over **3.97 M solar modules sold in Europe since 2003*

International Standards

\+

Panasonic **Internal Tests**

IEC 61215 Module reliability test, IEC 61730 Module safety test
Proven PID resistance, JISQ8901, Salt-mist corrosion (level 6),
fire resistance class UNO (UNI 9177, Italy)

300% IEC standard testing plus company-specific tests prior to launch

>20 internal reliability and safety tests

(including reliability check under toughest conditions as defined by JIS, Japanese Industrial Standards)

▼ Panasonic internal tests (examples)

Cold heat shock test

"Typhoon" resistance test

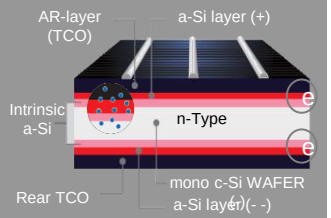
Weight resistance test

HIT® Photovoltaic Module: *better long-term performance*

Higher quality and superior technology result in **long-term output stability**

Unique cell structure

- n-type c-Si wafer
- symetrical
- bifacial

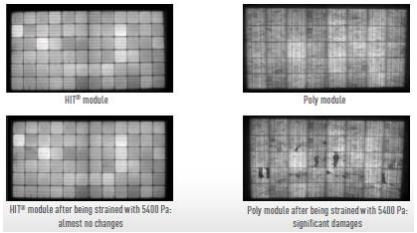


Water drainage

- better self-cleaning
- at glass-level

Less micro-cracks

- flexible, smaller cell



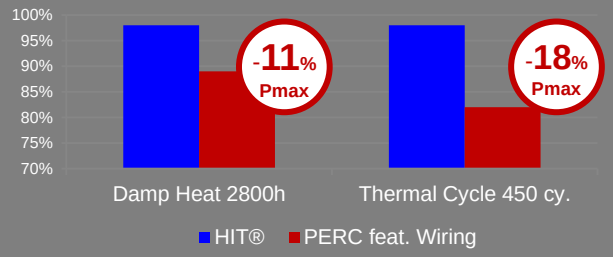
Stable "bus-bar" connections and cell structure after internal tests

vs. PERC-Mono feat. 12-wire cell connections

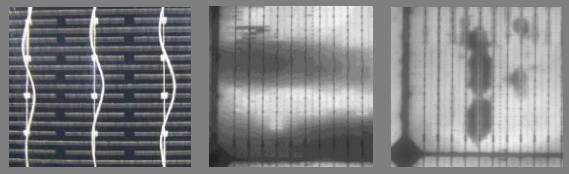
After 300% IEC resistance tests:

(Thermal cycle and damp-heat tests; 450 cylcles and 2800 hours respectively)

Pmax. after 300% IEC resistance tests:



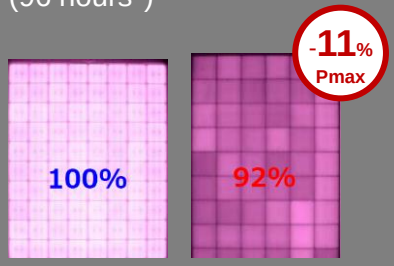
EL-test shows visible damage onPERC feat. Wiring:



Loose electrodes | Dark spot | "FLUX"-Damage

After PID test:

(96 hours*)



HIT® | PERC feat. Wiring

*: PID TEST condition: 60° C/80%, water flow on glass surface, 1000 V_{DC} @ Chemitox, JP

Panasonic

HIT® Photovoltaic Module: *more experience, better guarantee!*

From 01.2016, **product guarantee is extended from 10 to 15 years!**

Panasonic's experience and reliability indicators:

- Over 40 years in solar, over 25 years of heterojunction technolo
- Almost **20 years since begin of manufacturing of HIT® solar mod**
- 100% control of manufacturing process in Panasonic's own facilities (In
- Sales and failure rate in Europe monitored since 2003: **> 3.7 million m**

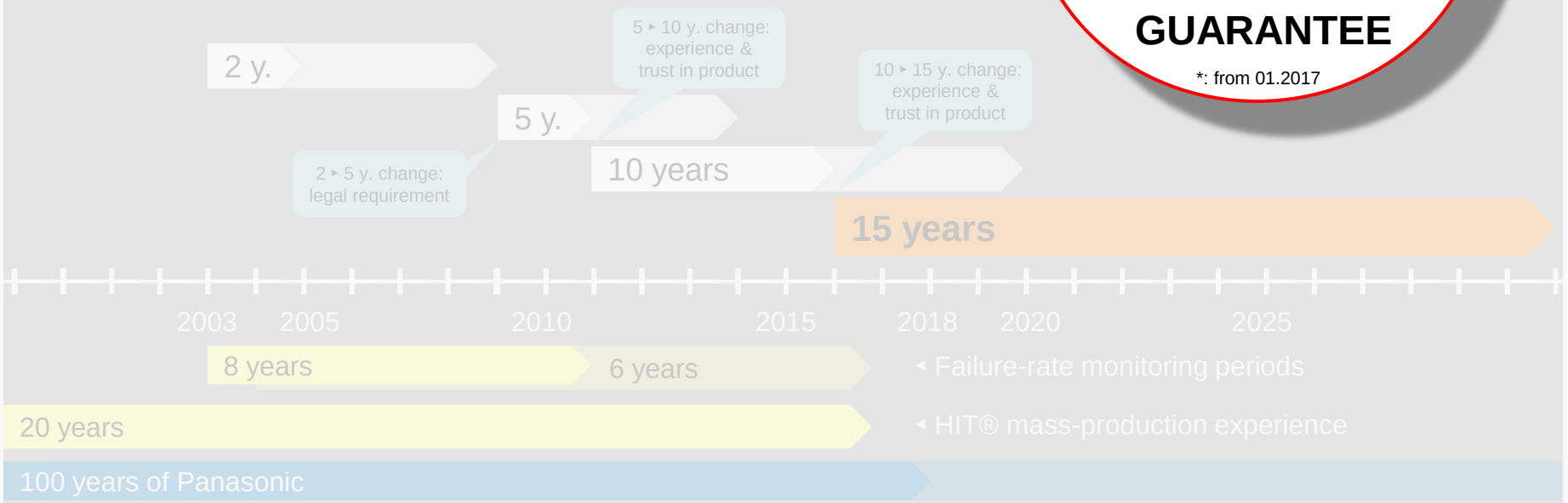
NEW

25 years

EXTENDED PRODUCT GUARANTEE

*: from 01.2017

Product guarantee evolution for SANYO/Panaso



Panasonic

HIT® Photovoltaic Module: *more power on any roof!*

3 high-efficiency HIT® module formats for more flexibility of installation and **more power on any roof!**

up to 19.4% eff.

only 15 kg

2x width = length

screwless black anodized frame

0.8 m

4 shading zones

ideal for portrait installation

More rows on flat roof

up to 19.7% eff.

more power, less modules needed

Lower BoS costs

4 shading zones

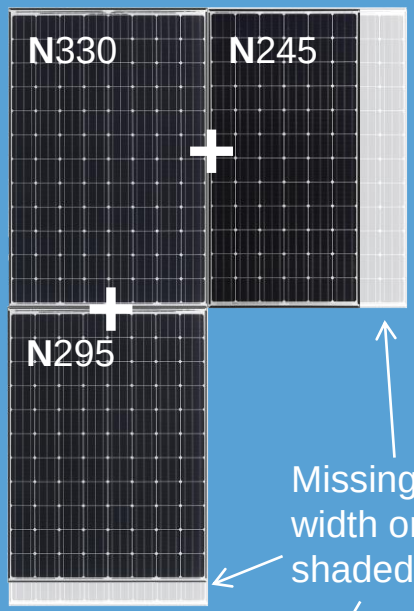
Standard 60-cell module

Higher output/roof results and a **cheaper installation** *(better BoS)*

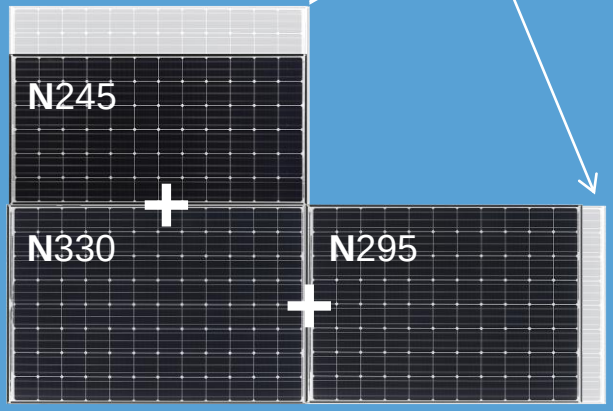
Panasonic

HIT® Photovoltaic Module: *Module combination for even more power*

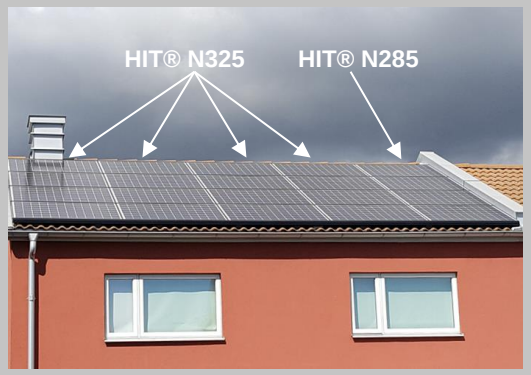
Portrait:



Landscape:



Add an extra row/column of modules with our combinable* HIT® formats



Regular roof:

Extra row of 4 x HIT® N285

Pmax increase:

vs HIT®: +22%

vs Standard: +41%

NOTE: Standard 280Wp 60-cell modules taken as reference

Difficult roof:

Extra row of 3 x HIT® N245

Pmax increase:

vs HIT®: +28%

vs Standard: +49%

NOTE: Standard 280Wp 60-cell modules taken as reference

**: for the electrical combination a solution with multiple stings, MPP-trackers or optimisers should be considered*

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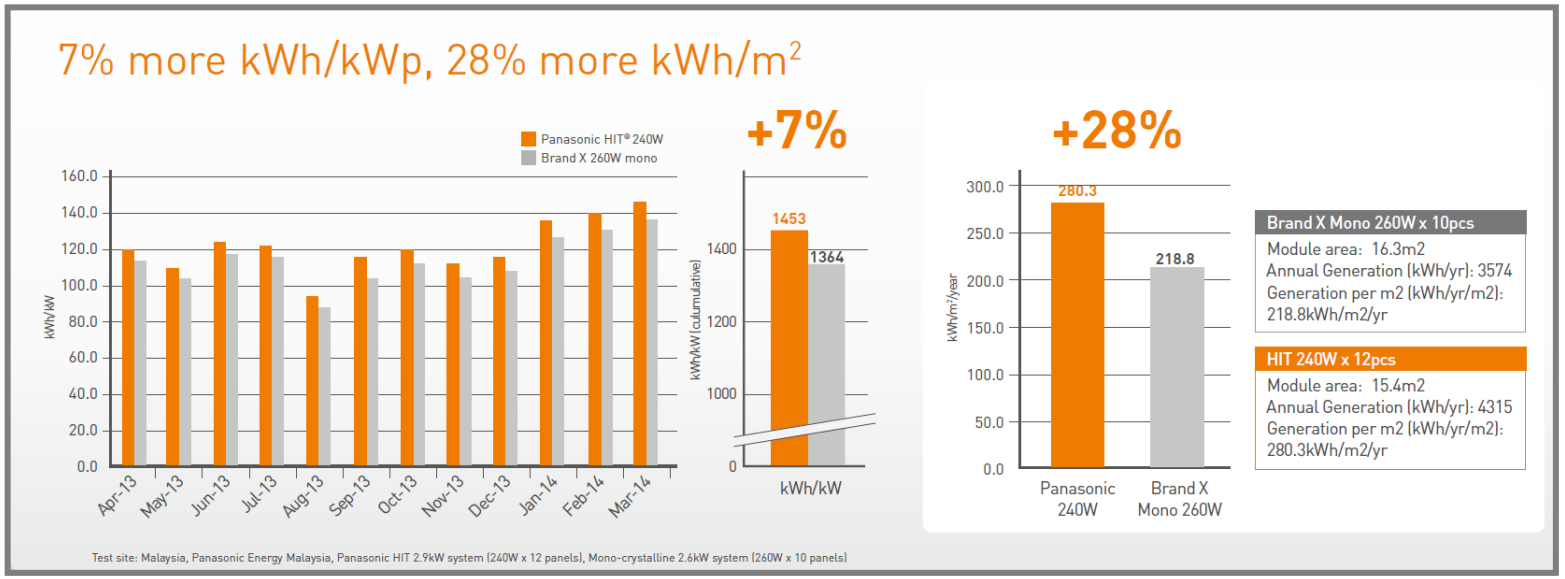
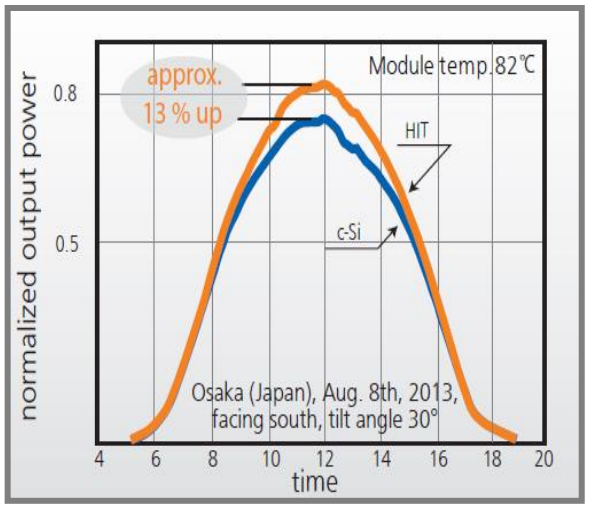
HIT® Photovoltaic Module: *better yield*



Industry-lowest temperature coefficient (-0.258%/˚C of Pmax) and better spectral sensitivity **result in MORE kWh/kWp!**



In central & northern Europe:

3-10% more yield expected*

**: than equivalent systems with conventional crystalline PV modules*

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HIT® Photovoltaic Module: *better yield (in % vs PVGIS forecast)*

North IT / 8.75 kWp

NL / 3.12 kWp

CH, Tessin / 1.4 MWp

GB, Wales / 3.84 kWp

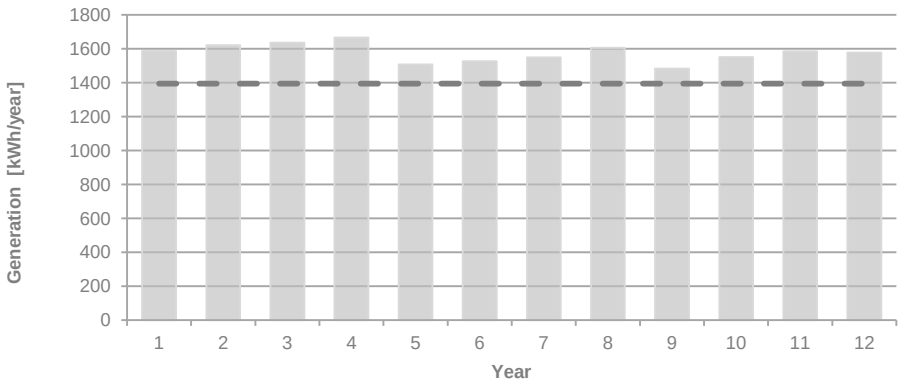
DE, Saxony / 5.16 kWp

CH, Solothurn / 224 kWp

FR, Bourgogne-F.C. / 429.9 kWp

HIT® Photovoltaic Module: *better long-term performance*

HIT®: better than the expectations and no measurable **degradation**



UK, 12 years

14% more

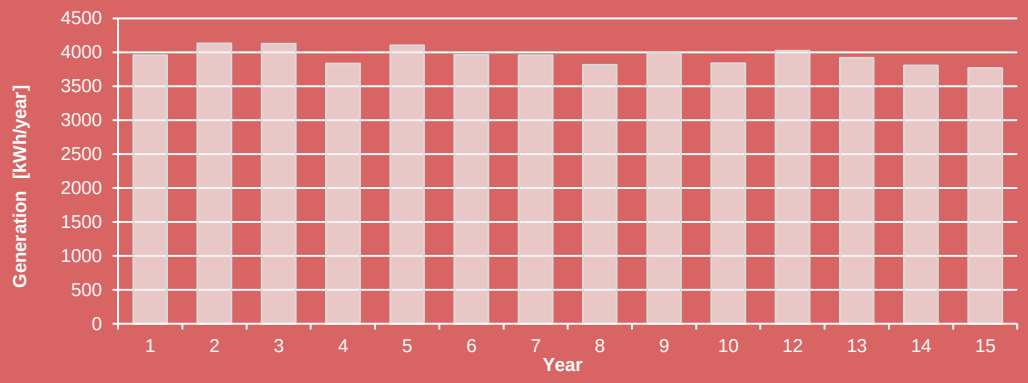
SAP: 774 kWh/kWp
Yield (12 y): 874 kWh/KWp

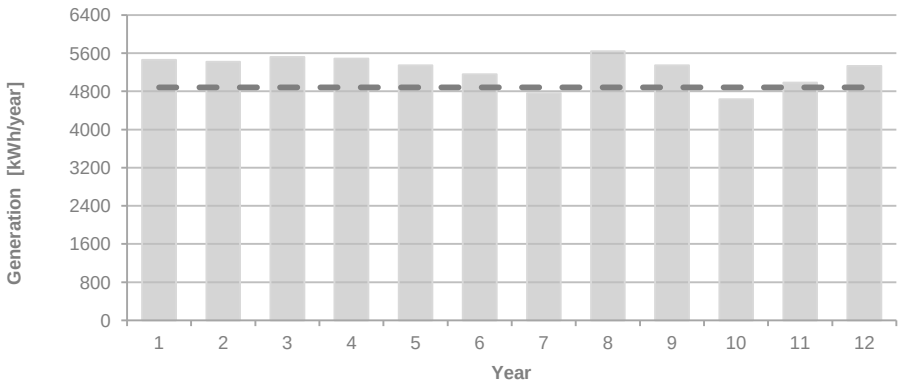
Installation: März 2004
Location: Gloucestershire
Model: HIP-180BE
Output: 1.80 kWp
Tilt: 40 degrees
Orientation: South West

Japan, 15 years

Yield (15 y): 1181 kWh/KWp

Period: 11.2002 – 10.2016
Installation: July 2002
Location: Osaka, Japan
Model: HIP-G751B1 (167 Wp)
System output: 3.34 kWp





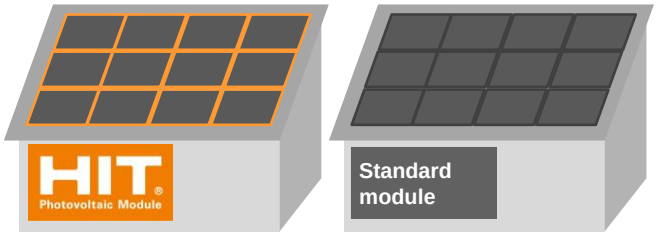
GER, 12 years

8% more

PVGIS: 969 kWh/kWp
Yield (12 y): 1043 kWh/KWp

Installation: Jan 2004
Location: Gunzenhausen, Bavaria
Model: HIP-J54BE2
System output: 5.04 kWp
Tilt: 45 degrees
Orientation: SSW

HIT® Photovoltaic Module: *higher final profit, more independence*



7x4 m (28m²) roof in Amsterdam,NL, facing south, no shading and 35° tilt; 3% better yield expectation for HIT® –kWh/kWp-

1) HIT®	**2) Standard**
12xN325	12x280 Wp
3.90 kWp (+16%)	**3.36 kWp**
6868.47 EUR	4694.35 EUR

4000 kWh/year electricity consumption

Convenient BoS

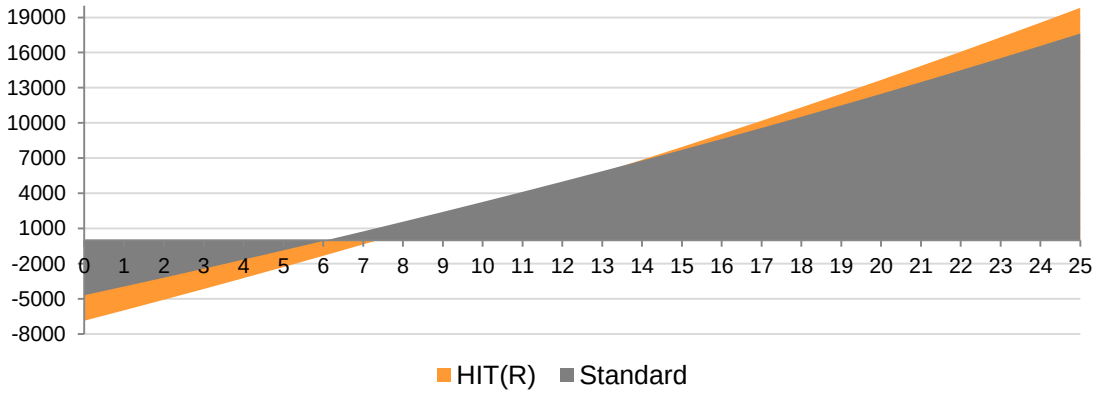
HIT® vs Standard
(Example Netherlands)

	EUR/W_p
Modules	+48%
Inverter	-14%
Mounting Syst.	-14%
Installation	-14%
(Margin installer:	**+33%)**
SYSTEM:	**+15%**

	HIT®		Stand.
kWh/year [average 25 years]	**3641**	+20%	**3046**
Energy independence [in % average 25 years]	**91%**	+15%	**76%**
Yearly savings (average 25 J.) [EUR]	**1067**	+20%	**893**
IRR [%]	**14%**		**17%**
Final profit (after 25 y.) [EUR]	**19818**	+12%	**17627**

More power on the roof + better BoS = **higher final profit for the customer**
higher margin for the installer

12% more profit!



-91% electricity bill!

MORE:

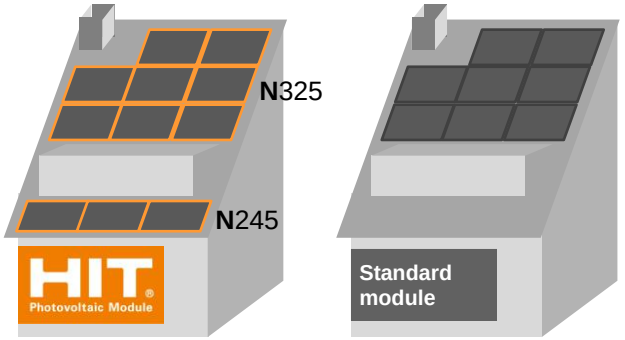
+12% PROFIT (Customer)
+33% MARGIN (Installer)

MORE:

PEACE-OF-MIND
with Panasonic HIT®

Panasonic

HIT® Photovoltaic Module: *EVEN HIGHER final profit!*



8xN325 + 3xN245
3.335 kWp (+49%)
6247.56 EUR

8x280 Wp
2.240 kWp
3106.72 EUR

3500 kWh/year electricity consumption

Roof in Amsterdam (NL). Facing south,no shading, 35deg. Tilt , 3% better yield for HIT®

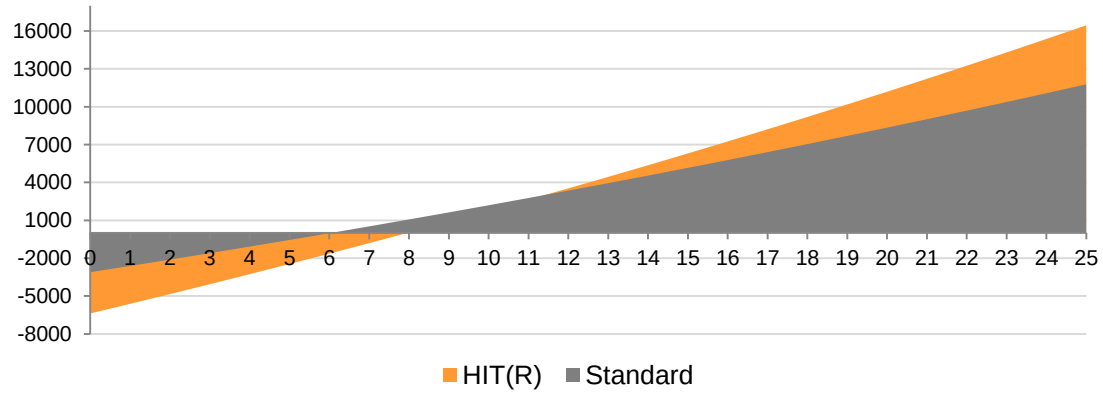
Convenient BoS

HIT® vs Standard
(Example Netherlands)

	EUR/W_p
Modules	+48%
Inverter	-40%
Mounting syst.	-7%
Installation	-25%
(Margin installer:	**+62%)**
SYSTEM:	**+8,5%**

	HIT®		Stand.
kWh/year [average 25 years]	**3114**	+53%	**2030**
Energy independence [in % average 25 years]	**88%**	+31%	**58%**
Yearly savings (average 25 J.) [EUR]	**913**	+53%	**595**
IRR [%]	**13%**		**17%**
Final profit (after 25 y.) [EUR]	**16573**	+41%	**11774**

More power on the roof + better BoS = **higher final profit for the customer**
higher margin for the installer



-88% electricity bill!

MORE:

+41% PROFIT (Customer)
+62% MARGIN (Installer)

MORE:

PEACE-OF-MIND
with Panasonic HIT®

Panasonic

HIT® Photovoltaic Module: *green and aesthetic*






No toxic materials *(RoHS-compliant)*

Cell : Pb, Cd-free TCO and soldering (FLUX)
Module: Pb-free connectors and junction box

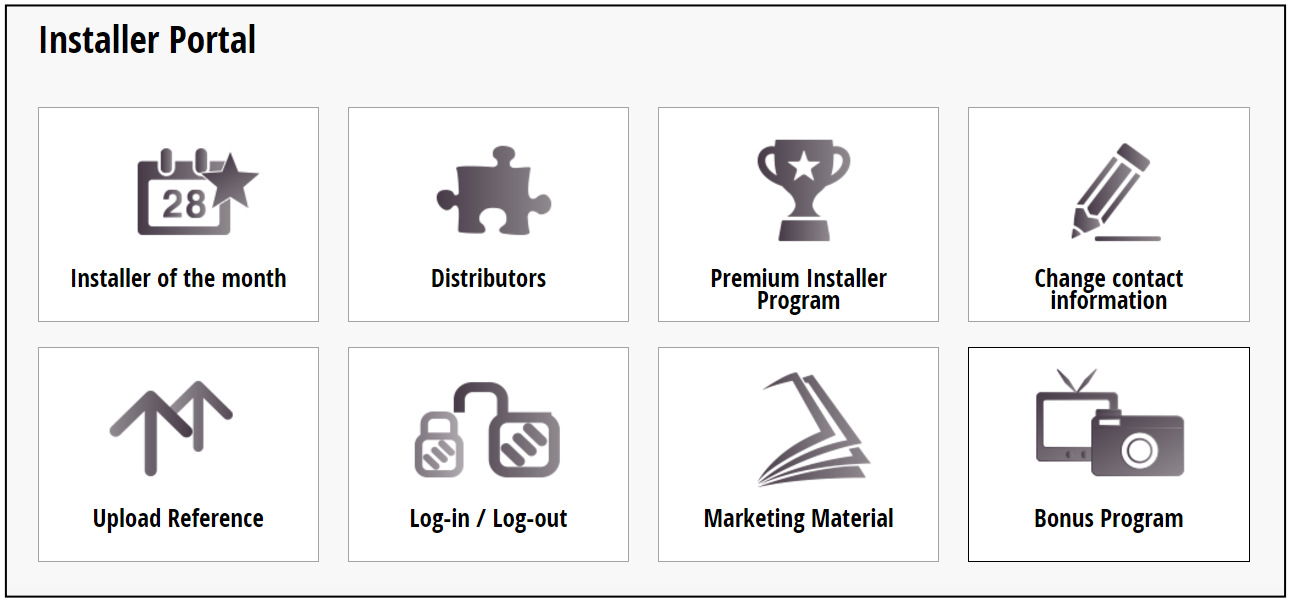
Recycling

WEEE-Directive-conform
Founding member of PVCycle

Dedicated Installer Portal:

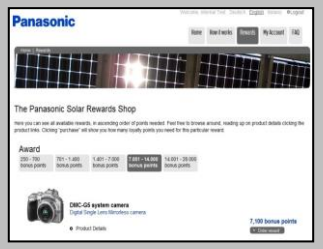
- Contact details
- Reference upload
- Marketing webshop
- Bonus programme

Register **here**



Leads & Visibility

Bonus rewards



Marketing support

Case studies

Trainings & Events

… and interaction on social media

(secure extra bonus points with your reference posts)

Panasonic

THANK YOU FOR YOUR ATTENTION!