

# Back-contact modules with conductive backsheet. Turning cost into value, for all



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# Endurans™ Solar in a nutshell

Innovative solutions for solar panel manufacturers

**Experts**  
in polymer  
science, co-  
extrusion, solar  
technology

**Production**  
facilities across  
Asia, Europe &  
America

Market leader  
in co-extruded  
backsheets.  
**Endurans™ HP**  
*All-purpose  
Sustainable*

Market leader  
in conductive  
backsheets (CBS).  
**Endurans™ CB**  
*High-end aesthetics  
& output*

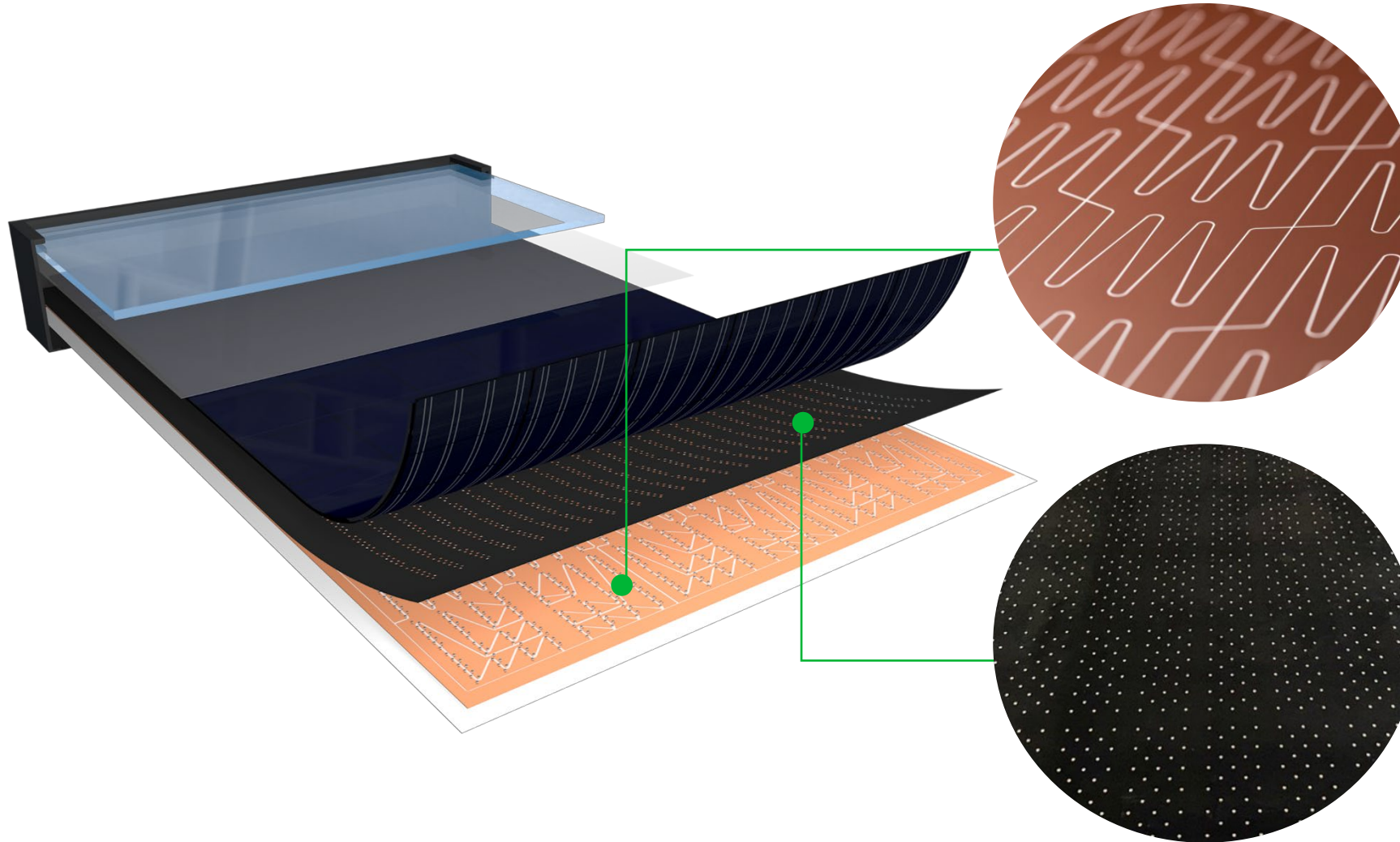
**New products:**  
Insulator sheets  
Specialty encapsulants  
Transparent Backsheet  
EPE patches





# Back contact modules with CBS interconnection

Endurans products are fully compatible with MWT cells and IBC cells



## Conductive backsheet

- Rear side insulation
- Cell interconnection
- Commercial >5yrs

## Rear perforated Insulator

- Internal insulation contacts (+/-)
- Holes for contact points
- Black only (no white)

# Solar creates Value (revenue > cost)



Cost is important



Value is more important



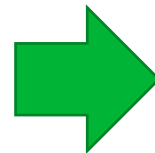
# Value creation model – CBS back-contact modules

## Improving margins throughout the value chain

- Cost-of-ownership and Value Creation model
  - Developed by Endurans Solar
  - Input / support from value chain partners including Apricum, ISC Konstanz and Eurotron
- Flexible model to compare cell and interconnection types

### Input: Characteristics of

- Production line
- Cell and module
- Cost of BOM, labor, overhead
- Cost of BOS, O&M
- PV System / geography
  
- More than 80 parameters in total



### Output: Values/differences for

- Module performance
- Module cost
- Revenues from module sales
- Revenues from energy yield
- Value creation at end customer level
  
- Objective comparison of module concepts

# Value creation model BC+CBS vs other technologies

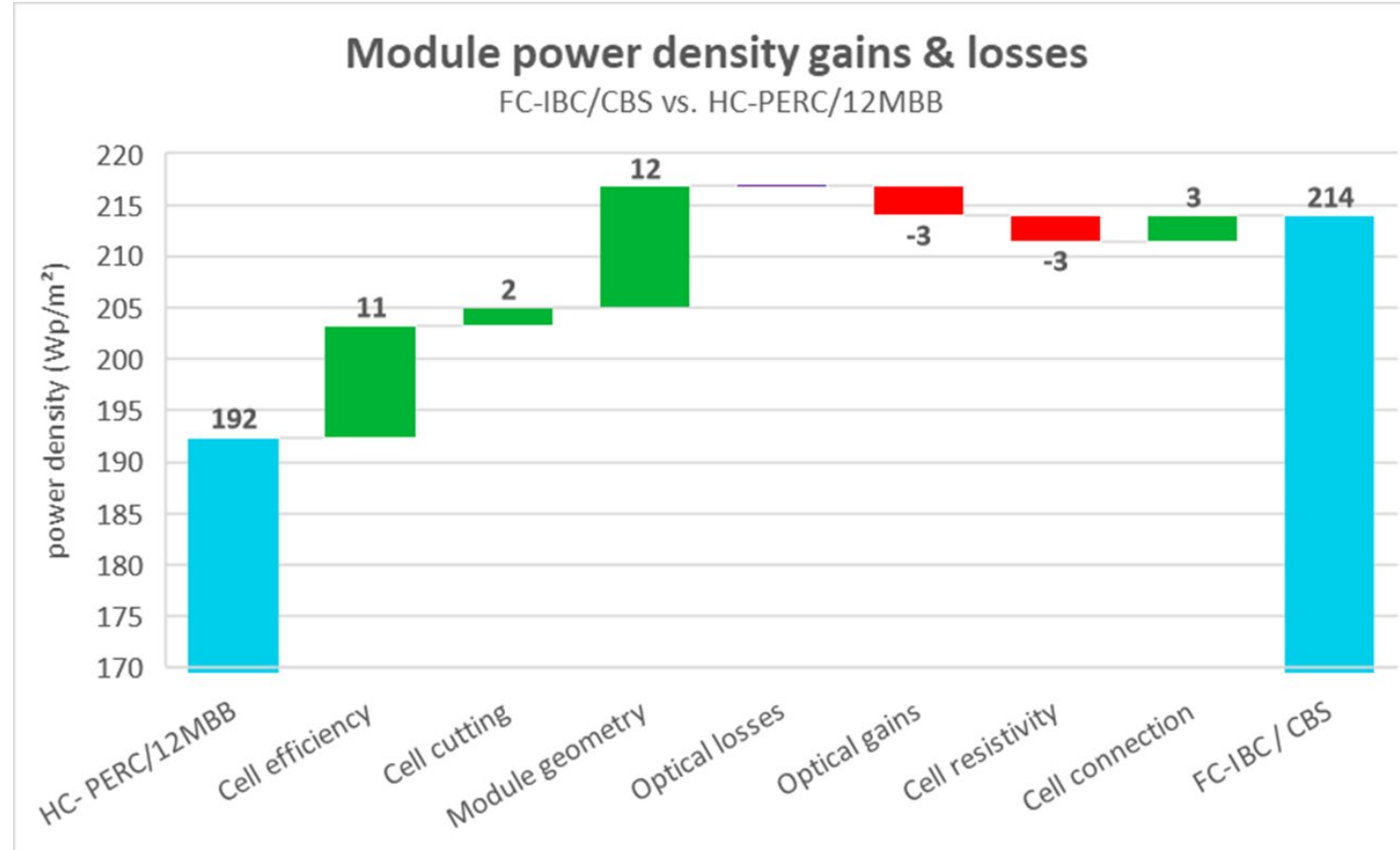
## Module designs - key performance parameters

	pPERC Half cell / 12 BB	MWT Full cell / CBS	IBC Half cell / ribbons	IBC Half cell / CBS	IBC Full cell / CBS
# Cells	6x20 HC M6	6x10 FC M6	6x20 HC M6	6x20 HC M6	6x10 FC M6
Module area (m <sup>2</sup> )	1.86	1.76	1.80	1.77	1.76
Module power (Wp)	358	368	374	378	378
Module power density (Wp/m <sup>2</sup> )	192	209	207	213	214
Specific yield (kWh/kWp)	1100	1138	1122	1138	1160



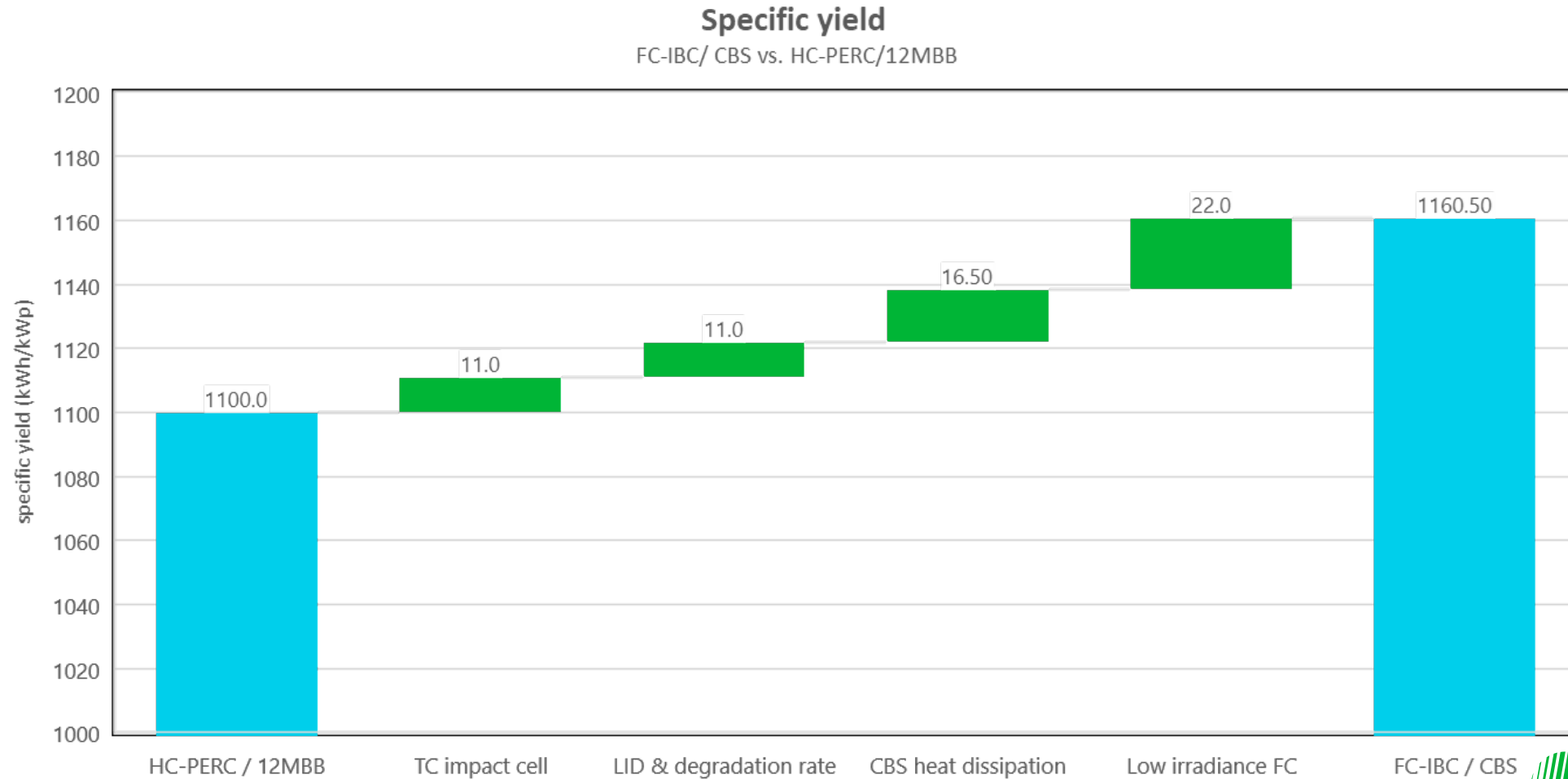
# Higher power density - FC IBC/CBS vs HC PERC/MBB

Gain of 22 Wp/m<sup>2</sup> (11%) from higher cell efficiency, smaller module and lower resistive losses



# Specific yield gain for FC IBC/CBS vs HC PERC/MBB

Modules with CBS operate at lower temperature; full cells provide better low irradiance performance

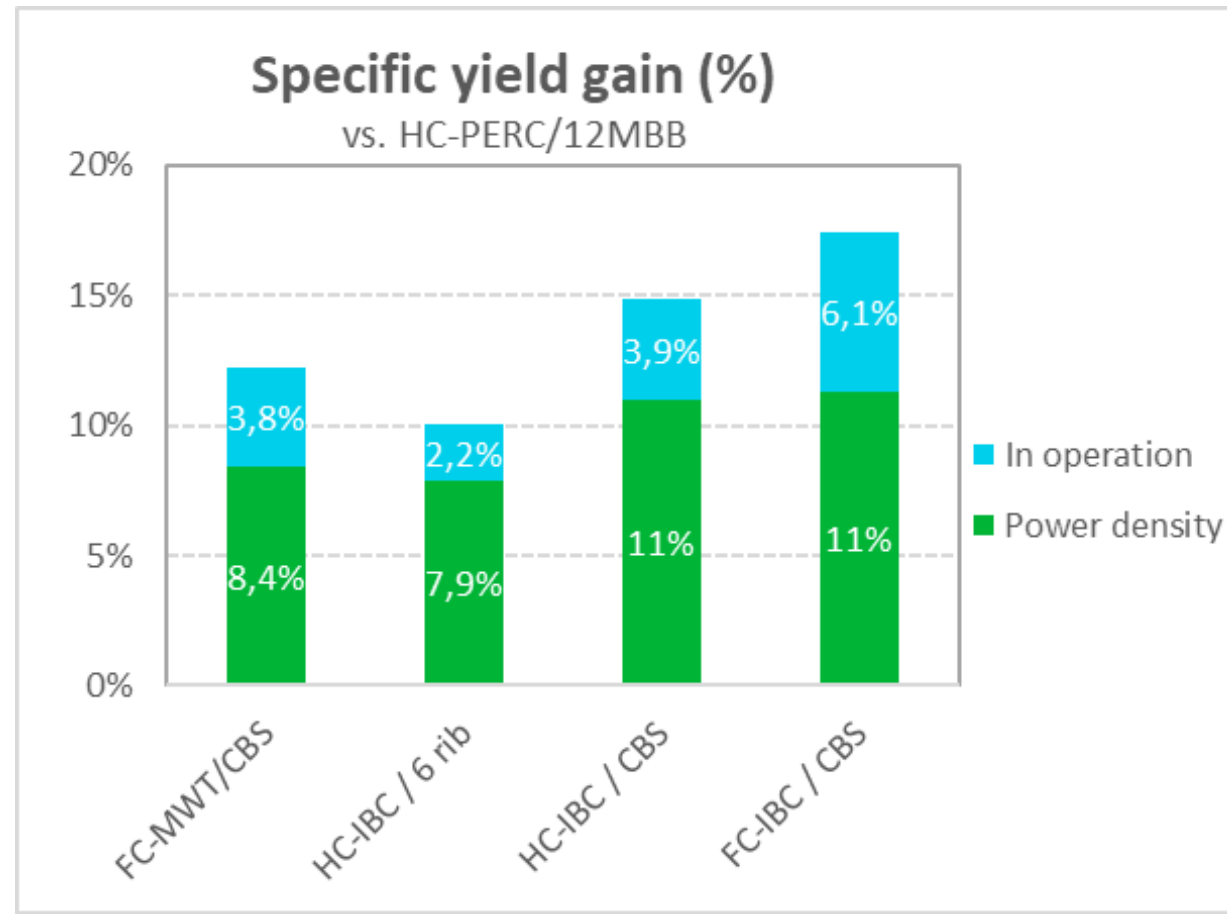


8 Specific yield of reference is 1100 kWh/kWp (~Munich)  
Gain will be even higher for locations with higher irradiation and operating temperature



# Turning higher performance into higher value

Higher power and specific yield : 17% additional output for FC IBC/CBS vs pPERC



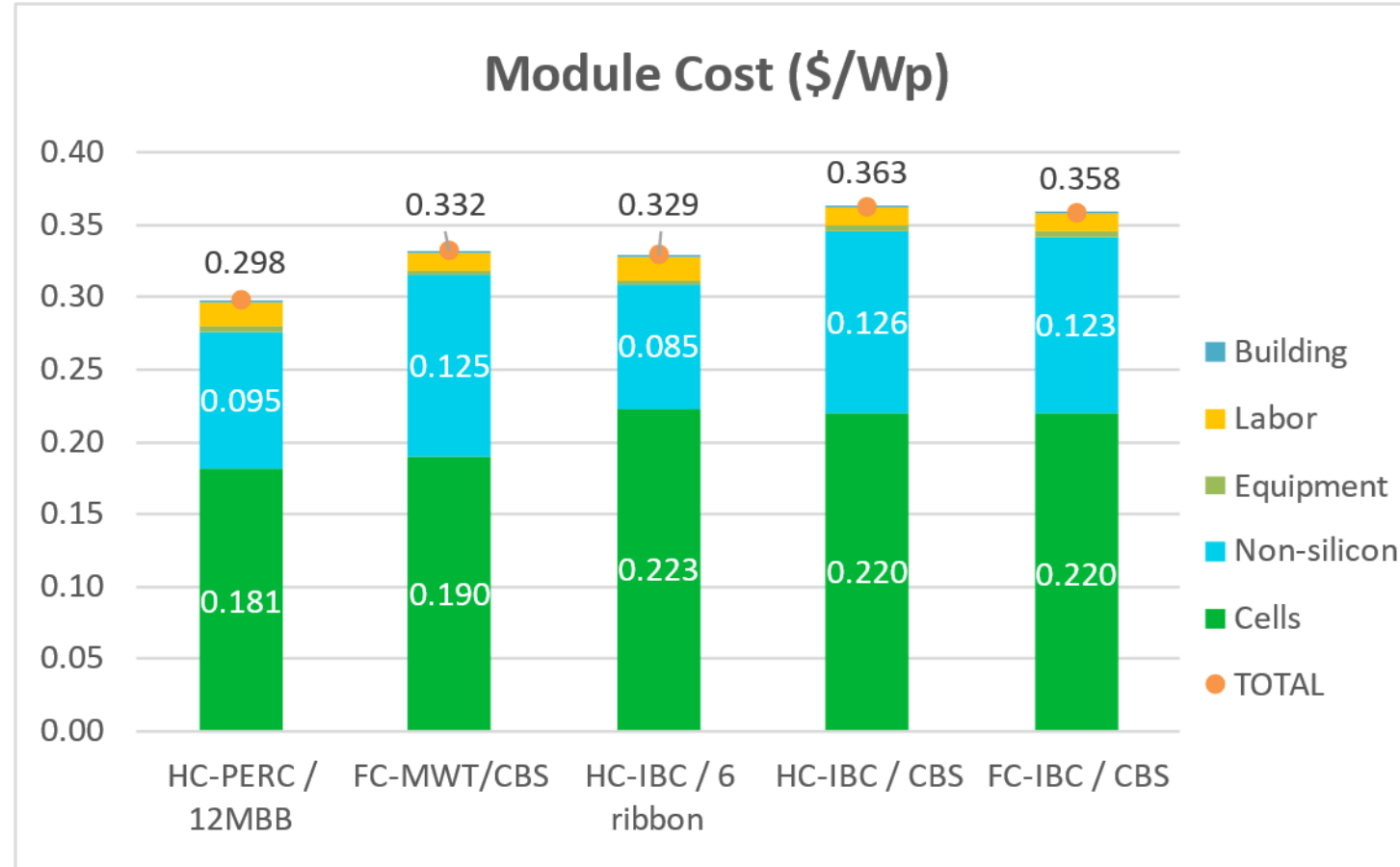
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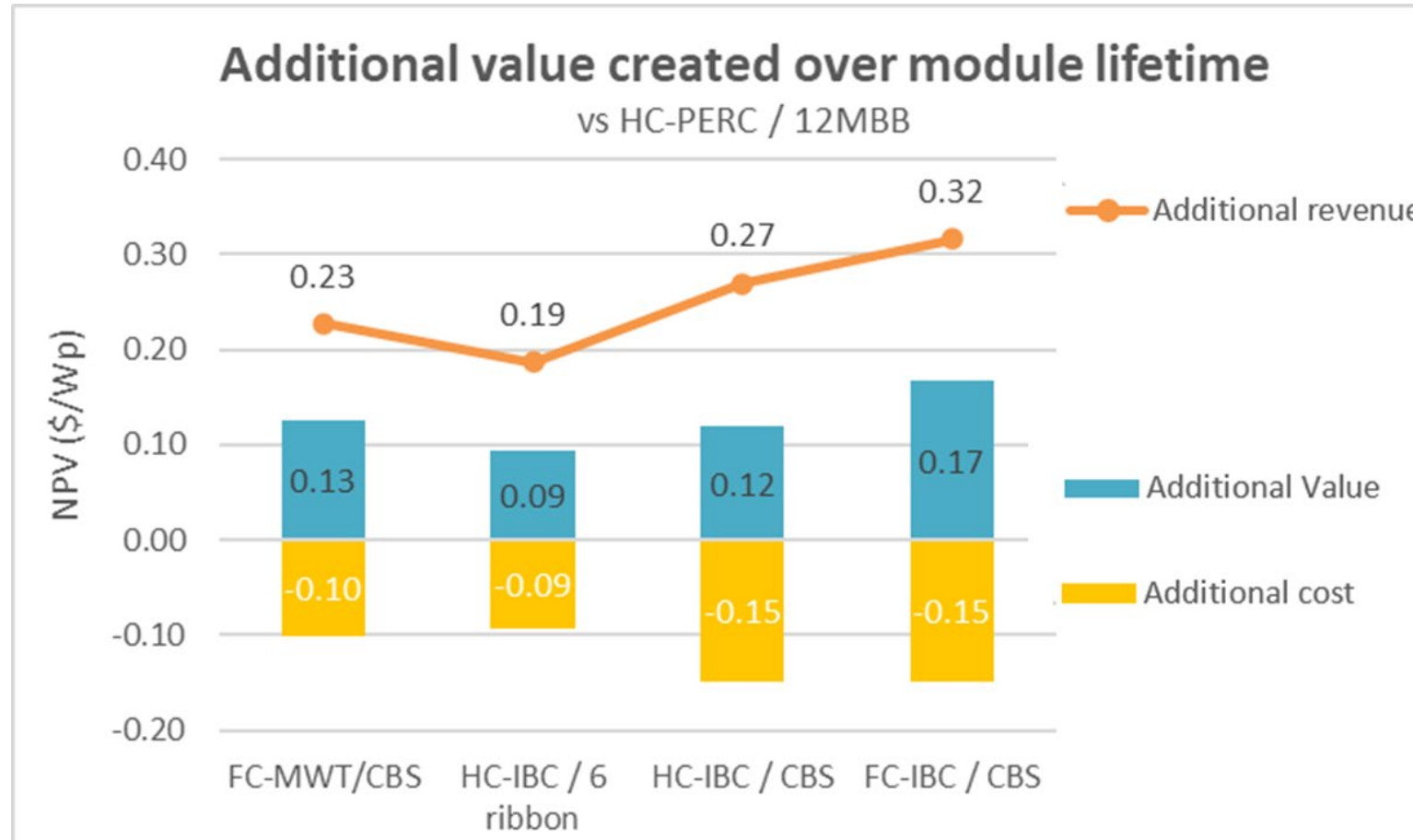
# Total cost of ownership for the module maker

Total cost of ownership is ~0.06 \$/Wp higher for IBC/CBS than for pPERC but...



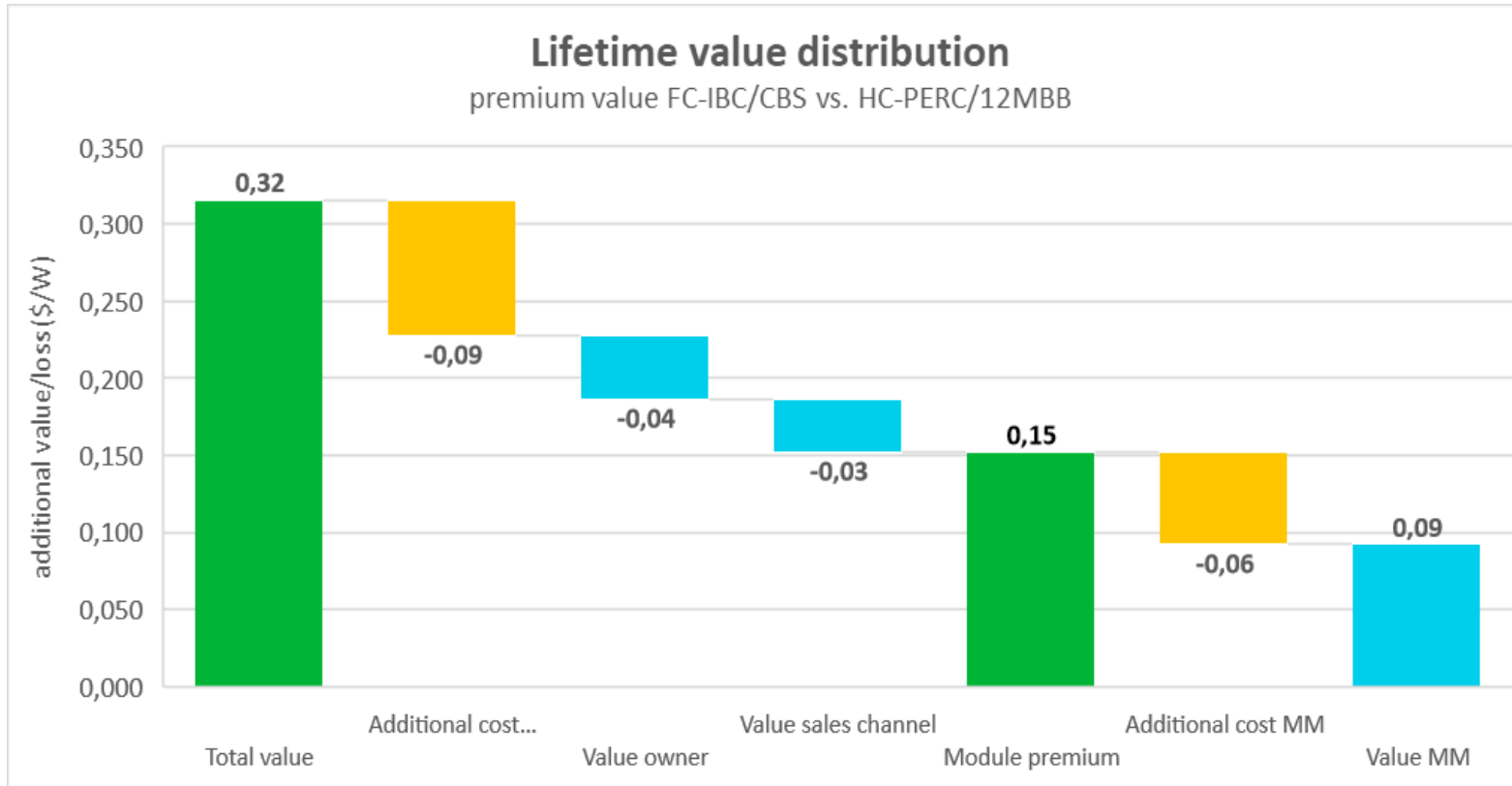
# Value Creation, Revenue > Cost

BC technology creates significant additional value; upto 0.17\$/Wp for FC-IBC/CBS



# Value creation and distribution in the chain

FC IBC/CBS vs HC pPERC/12 MBB



**Total value creation, \$/Wp 0.32**

Value distribution (example)

Add BoS cost -0.09

Value share - Owner -0.04

Value share - Channel -0.03

Module premium 0.15

Add module cost -0.06

**Module manufacturer**

**Add. profit, \$/Wp 0.09**

**Add. Profit, \$/yr >20M**

Assumptions:

Electricity price 0.13\$/kWh

25yr system lifetime, WACC 5%

End-customer captures 25% of value added

Sales channel captures 20% of value added





# Same sun. More power.<sup>TM</sup>

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