

# 1,500V PV PROJECTS WITH SMA



**INCREASED  
PROFITABILITY,  
RELIABLE  
ENERGY SUPPLY**

# 35 YEARS EXPERIENCE IN PV SYSTEM TECHNOLOGY



**Rely on system solutions from the market leader**



**Count on a track record of 55GW installed base**



**Profit from reliable performance and maximum yields**



**Count on German Engineering & rigorous testing**



**Benefit from the world's most comprehensive Service portfolio**



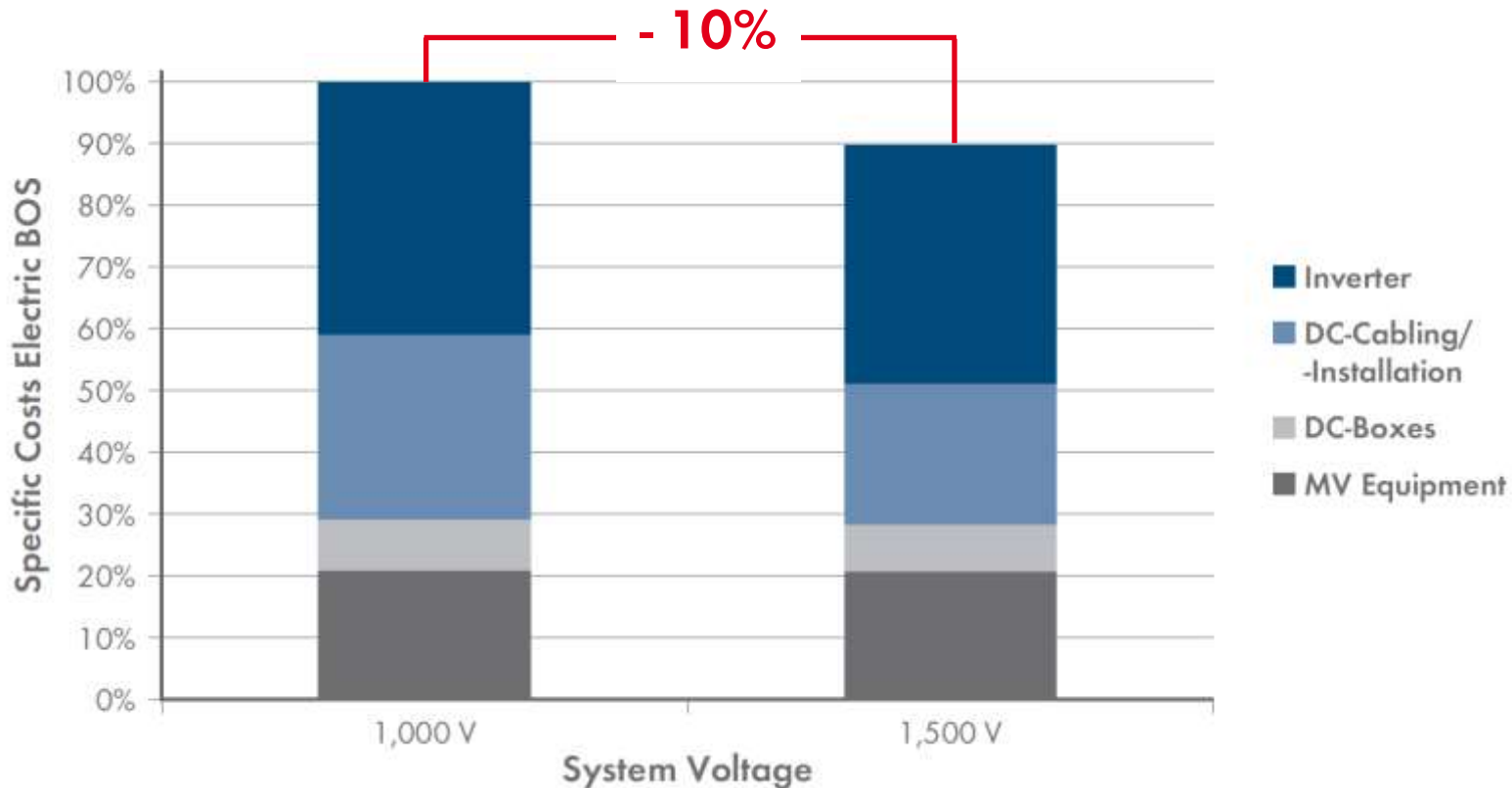
**Calculate with renowned bankability**

**> SMA is the world's most experienced inverter provider and system solution expert**

# 1,500V DC SYSTEMS **REDUCE COSTS** OF UTILITY SCALE PV



Electrical balance of system costs are up to **10%** lower when implementing 1,500 V technology.\*



> The 1500 V technology provides cost savings up to 10 %

\* Evaluation based on analysis of 4 major electrical BOS cost components. Excluding panels, mounting structure, tracker etc. Calculation should be used as an example, cost savings highly depend on project conditions.

# SMA SYSTEM SOLUTIONS FOR 1,500V PV PROJECTS



## Kit and Turnkey solutions

up to 5,500kW

UPSys



MVPS



> Tailored power conversion systems as **true turnkey container solution** (MVPS) or as **kit** for on-site assembly (UPSys). For **IEC** and **ANSI** markets.

## Inverters

up to 2,750 kW



> The Sunny Central 2750-EV inverter for power plants in IEC and ANSI markets.

## Medium Voltage Blocks

up to 5.500kW



> Specially engineered MV blocks fit perfectly to 1,500V SMA inverters.

## System components



> String-Monitors & Combiner (only IEC)



> Power Plant Controller

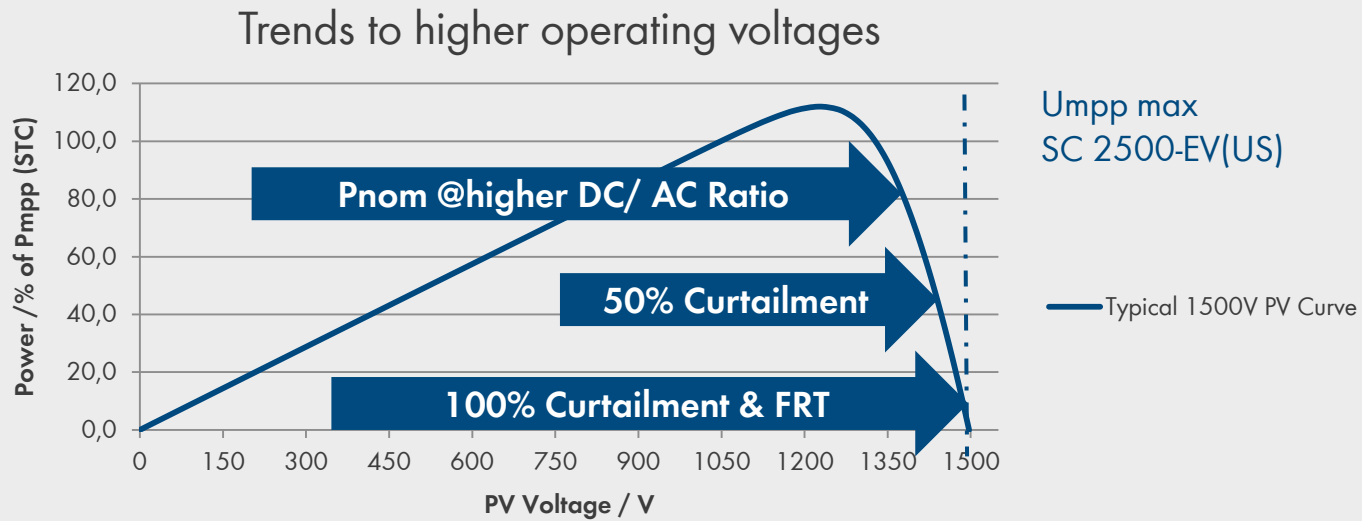
## Service



> Operation & Maintenance

> **SMA offers solutions for the entire value chain from DC to the MV grid**

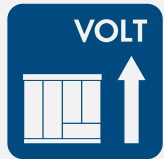
# HIGHER AVAILABILITY WITH SUPERIOR STACK DESIGN



- > PV Sites are operating more frequently at higher DC Voltages closer to Open Circuit Voltage (1500 Vdc)
- > Reasons: Higher DC/AC Ratio (Supersizing), Curtailment Commands, higher Module Fill Factors and Fault Ride Through Events (FRT)
- > Operating at higher DC Voltages impacts the stack lifetime

> In current and future plant designs sufficient Design Reserve becomes crucial

# HIGHER AVAILABILITY THROUGH SUPERIOR STACK DESIGN @1500 VDC



## 38%

SMA Design Reserve\*

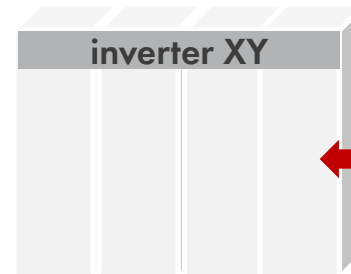
VS

## 12%

"standard" Design Reserve



← 2x 1,200 V IGBT's



← 1x 1,700 V IGBT's



- > 100% Curtailment capability
- > Continuous operation at 1500 V possible
- > Optimized for a 25 year lifetime and lowest failure rates

- > Insufficient curtailment capability
- > Insufficient Design Reserve
- > higher failure rate

> The Sunny Central 2500/2750-EV (US) guarantees lowest failure rates with it's high Design Reserve

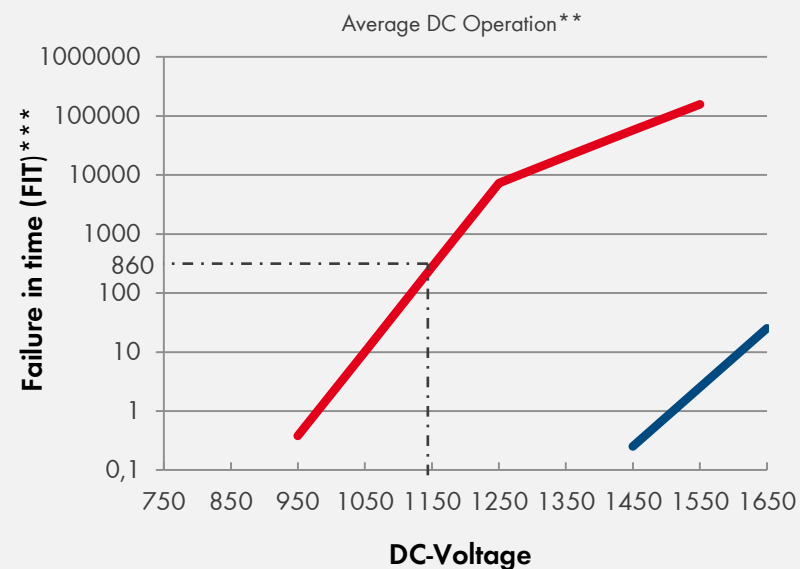
# SMA STACK DESIGN LEADS TO BETTER PERFORMANCE



**Sufficient Design Reserve @ Open Circuit Voltage (1500 V) is the key to reliable operation**

- > Example: Assuming average operation voltage from 1150Vdc (at sea level)
  - > 1x 1700 V IGBT's = 1 Inverter **will fail 3 times** in 20 years\*
  - > 2x 1200 V IGBT's = **0** failures 20 years\*
- > At 2000m (a.s.l.) Cosmic Radiation increases at least by factor **5**
  - > 1x 1700 V IGBT's = 1 Inverter **will fail 15 times** in 20 years\*
  - > 2x 1200 V IGBT's = **0** failures 20 years\*

## IGBT failures due to Cosmic Radiation



— Inferior stack design (1x 1,700 V IGBT)      — SMA's superior stack design (2x 1,200 V IGBT)

> True 1500V Systems cannot be realized with 1700V IGBT's

\* Only related to Cosmic Radiation, Cosmic Radiation is the effect of irradiance on elements

\*\* Considering 150% PV field supersizing and curtailment commands

\*\*\* 1 FIT = One failure in 1 billion operating hours

# CONCLUSION



- > 1500V PV plant design provides BOS cost savings up to 10 %
- > SMA has a full 1500V portfolio.
- > SMA Turnkey solution up to 5.5 MWac available.
- > Inverter technology needs engineered key components (e.g. IGBTs) to exploit the full advantages of PV plant at 1500V.



ENERGY  
THAT  
CHANGES



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