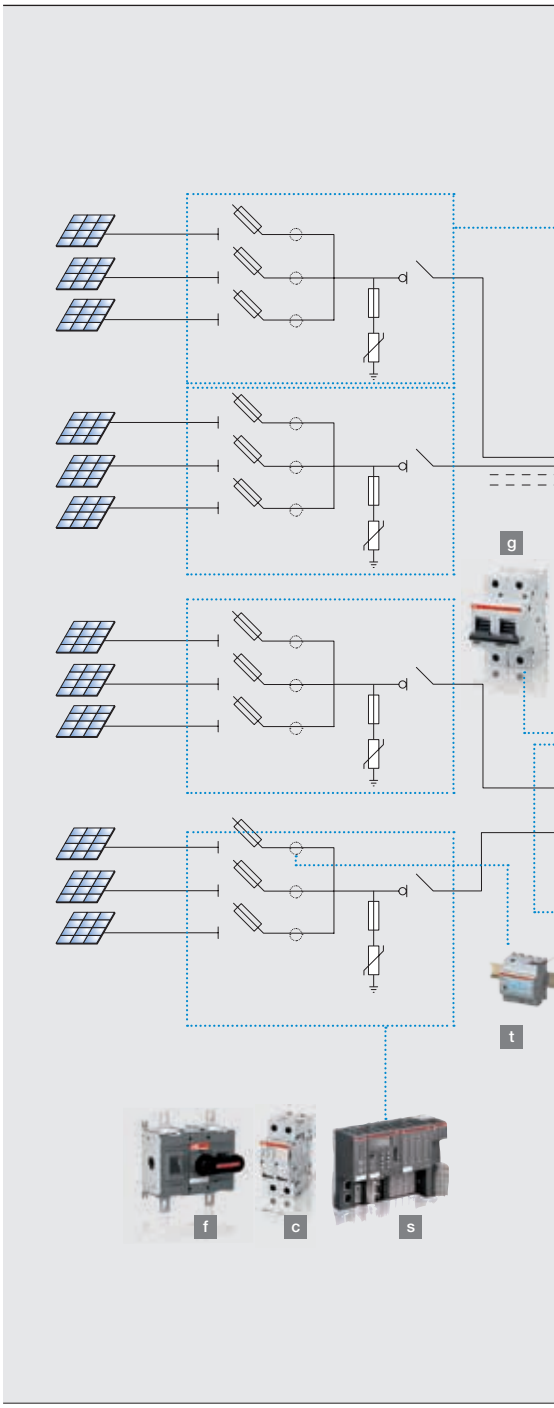
Next-generation components

Advanced low-voltage components for next-generation 1,500 V DC utility-scale PV solar applications

ALLEN AUSTIN, FEDERICO MAI – Solar photovoltaics is the fastest growing renewable energy source in the world and ABB, a leading industry supplier, is committed to meeting the needs of this rapidly developing industry by providing a complete portfolio of products, systems and solutions for photovoltaics applications. To date it has met the challenge of the next-generation advanced component design by introducing a new line of 1,500 V DC low-voltage components that ensures safe processing of 1,500 V DC power, including reduced power losses, reduced number of poles, visible blade technology, integrated heat dissipating and advanced arc extinguishing technologies.

1 Example of photovoltaic applications: commercial 20



As the solar photovoltaic (PV) industry continues to become an increasingly important share of the energy mix, the balance of system component technology is continually evolving to help lower the cost of energy production. In the past few years, the industry has seen a tremendous jump from 600 V DC inputs to 1,000 V DC inputs, which represent the majority of utility-scale solar PV installations. The next step in this trend is systems with 1,500 V DC inputs, which, by increasing the voltage level, enable higher power output capability by up to 50 percent – thus decreasing system losses and balance-of-plant costs.

ABB has developed 1,500 V DC low-voltage components in order to process this new power. These components include switches, molded-case circuit breakers, contactors, surge protection devices and voltage/current sensors. Some components are rated up to 3,000 A / 1,500 V DC and carry various certifications, UL and IEC included.

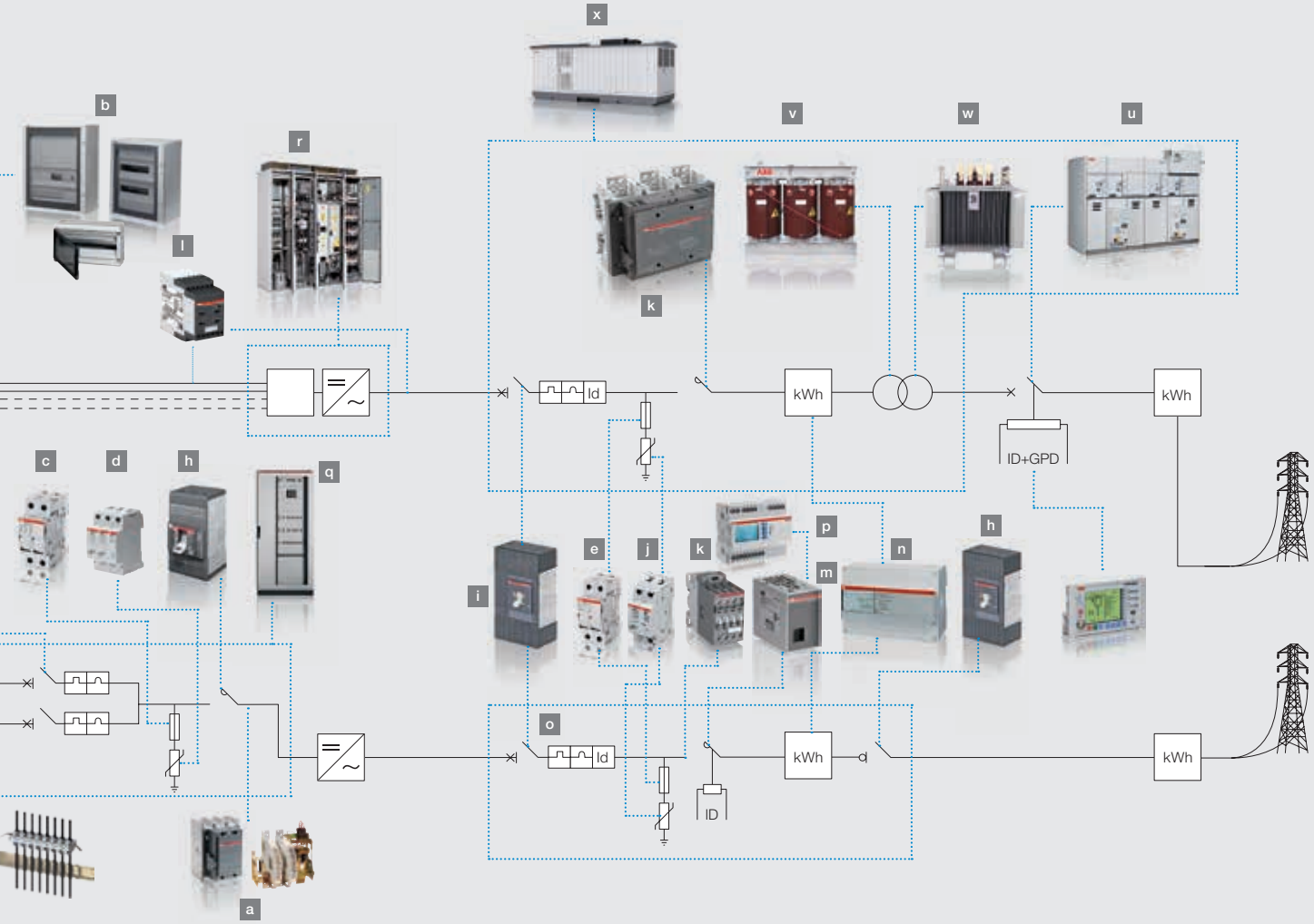
Adapting to the solar market

Clearly 1,500 V DC is not new – for instance it is used in rail applications – but adapting it to the solar market has brought certain challenges.

A major challenge has been the issue of higher voltage requirements affecting the design of the system and insulation requirements. Temperature is an additional aspect that has to be addressed with components in the PV plant having to operate at higher temperatures, often reaching 70° C. Additionally, components for the 1,500 V DC PV utility-scale installations may have to be designed for bidirectional current flow.

The new products also ensure safe processing of 1,500 V DC power, as well as reduced power losses, reduced number of poles, visible blade technology, integrated heat dissipating and advanced arc extinguishing technologies.

In addition to the increased voltage, the new products can also handle more current – up to 6,000 A depending on the device. This allows for utility-scale PV combiner boxes and inverters to handle more power. Some of the new products can handle two 1,500 V DC inputs simultaneously.



Low-voltage products
a – Contactors: GAF series, IOR bar contactors
b – DC string boxes:
Switchboards: Gemini series,
Consumer units: Europa series
c – Fuse disconnectors: E 90 PV; Fuses: E 9F PV
d – Surge protective devices: OVR PV
e – Fuse disconnectors: E 90
f – Switches: OTDC series,
Miniature circuit-breaker disconnectors: S800 PV-M
g – Miniature circuit breakers: S800 PV-S
Miniature circuit breakers: S200 M UC Z
h – Switch disconnectors: Tmax PV
i – Molded-case circuit breakers: Tmax
j – Surge protective devices: OVR T1 / T2
k – Contactors: A and AF series
l – Insulation monitoring devices: CM-IWN
m – Power supplies
n – Energy meters: EQ meters
o – Residual current device blocks: DDA 200 B
Residual current devices: F202 PV B and F204 B
Miniature circuit breakers: S 200
p – CM-UFD.M22
q – ArTu switchboards

Solar inverters
r – Central inverters: PVS 800
Remote monitoring portal

String monitoring
s – PLC AC500
t – Current Measurement System (CMS)

Medium-voltage products
u – Secondary switchgear
v – Dry-type transformers
w – Liquid-type (oil-filled) transformers
x – Compact secondary substations

Already a leading supplier for all photovoltaic applications, ABB can now also provide advanced solar components to its customers that will allow them to begin their own next-generation 1,500 V DC PV utility-scale designs, thus enabling them to benefit from higher efficiency and reduced costs for their systems → 1.

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