# DAANAA

### **Power Transaction Technology**

# Solar Benefits

## 

higher performance substring diagnostics

>>>



simplified & flexible system



## OVERCOMING HURDLES IN SOLAR ENERGY SYSTEMS

#### ENERGY LOSSES & FAILURES

#### **CURRENT SOLAR SYSTEMS HAVE CHALLENGES WITH:**

#### SERIES CONNECTIONS: IMPACT ON OUTPUT

Cell-to-cell series connections inside a solar module cause the lowest-performing cell to affect string output. Minor variations in irradiance (shade, snow, soiling, bird droppings, leaves), cell mismatch, and interconnections are non-uniformities that reduce performance. Bypass diodes usually isolate the affected portion of the panel, yet still result in losses of available energy from unobstructed cells.



#### VOLTAGE VARIATION: IMPACT ON INVERTER EFFICIENCY AND PANEL RELIABILITY

Cell-to-cell performance differences activate bypass diodes, causing voltage variations that stress panel electronics and impact output. In the panel, this results in hotspots and bypass diode degradation. Off-panel, the result is reduced inverter efficiency. Addressing this problem with module-level power electronics introduces complexities without eliminating cell-level losses and clipping.

#### **INADEQUATE** DIAGNOSTICS



#### 3 LIMITED, COMPLEX SYSTEMS



#### SUPERFICIAL DIAGNOSTICS: DEPENDENCE ON THE INVERTER

Determining root causes for failures usually requires a site visit, which is costly and time consuming. All could take hours of operational time before replacement and unfavorable experiences lead to reputation challenges. Installers are constrained by their maintenance obligations when they would rather install for new clients.

#### MULTIPLE COMPONENTS: BURDEN TO INSTALL, MAINTAIN AND EDUCATE

Multiple-component systems increase the likelihood of installation errors, complicate the sales process with perplexing customer education, and create challenges in upholding brand reliability when equipment comes from separate manufacturers. Multiple components introduce design constraints and incompatible matching, which is at the mercy of distributor inventory and installer preferences.

#### EQUIPMENT MISMATCH: DEALING WITH DESIGN CONSTRAINTS

PV system design is at the mercy of distributor inventory and installer preferences, and once installed, requires a lot to be readapted to changing needs. Installers often improvise away from errors in designed layouts, and depend on the equipment they have access to, causing equipment mismatch inefficiencies and reduced system reliability.

# UNLOCKING THE POWER OF SOLAR INNOVATION WITH DAANAA

#### DAANAA TECHNOLOGY INTEGRATED INTO PV MODULES OFFERS THE FOLLOWING BENEFITS:

#### **INCREASED OUTPUT: HIGH TOLERANCE TO SHADE AND NON-UNIFORMITIES**

Generate >40%<sup>\*</sup> more energy per year by eliminating energy losses caused by irradiance variability, cell mismatch, wiring, and other non-uniform conditions. Daanaa technology optimizes power from shorter, isolated substrings.

# \*

PERFORMANCE

WITH REDUCED

**FAILURE RISK** 

HIGHER

#### SYSTEM RELIABILITY: VOLTAGE STABILITY & BUILT-IN INVERSION

Maintain the most optimal system efficiency and eliminate clipping with Daanaa's substring-level MPPT and DC optimization, and built-in AC inversion. Our technology allows for AC/DC output selection for systems with storage. Designed to withstand high lamination temperatures, Daanaa maintains consistent temperature levels and ensures long-term PV system efficiency. Additionally, it supports quality assurance through self-testing and diagnostics of embedded electronics in post-panel production.

\*Annual energy harvest increase is dependent on panel architecture and environmental conditions.

#### SUBSTRING MONITORING & DIAGNOSTICS







#### DEEPER DIAGNOSTICS: SUBSTRING-LEVEL INSIGHTS

Offer granular substring diagnostics for easy monitoring and faster maintenance resolution. Maintenance providers and property owners will know what they need to do if a panel encounters a reduction in performance. Diagnostic features are made available by Daanaa's built-in substring data transfer capability.

#### PLUG & PLAY PV MODULES: EASY OPERATIONS AND CUSTOMER EDUCATION

Facilitate installation, operations, and maintenance, and streamline customer education by optimizing the balance of systems. All that installers want is a plug & play solution that is easy to install and that property owners can quickly understand. Daanaa technology eliminates DC optimizers and inverters, microinverters, monitoring, and rapid shutdown devices external to the module. This allows for a single point of warranty and higher quality control, from the fabric to the roof.

#### DESIGN FLEXIBILITY: NO DEPENDENCIES, SIMPLE TO ADAPT OR UPGRADE

Freedom from external components eliminates challenges with equipment matching restrictions. It allows for an easy resizing, inclusion of energy storage, among other adaptations to meet the increasing energy demand.

#### **DAANAA SOLUTION:** POWER TRANSACTION UNIT (PTU)

Daanaa's proprietary PTU is integrated into the PV module during the manufactuting process.



\*\*For illustration, values depend on solution specification.



#### DAANAA TECHNOLOGY ENABLES THE FOLLOWING:



- 6-9 half cut cells per substring for high resolution energy generation
- Diode free operation
- Built-in DC optimizer, AC inverter and rapid shutdown functionalities
- Precise control with selectable output modes, supporting low/high voltage DC or grid-tie AC output
- Substring level monitoring and remote diagnosis
- Galvanic isolation
- Lossless aggregation of power
- Industry leading safety, designed for >25y
- Integration with any solar cell type, size and chemistry
- Use of existing production methods

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#### **TEST RESULTS AND VALIDATION**

Daanaa-integrated panels were tested by a world-renowned third-party testing facility. Our Power Transaction Unit (PTU) outperformed its competing microinverter models under various shading scenarios. The result was a significant increase in energy production across all scenarios.

#### **BENEFITS TO MARKET PLAYERS**



**TO PV MANUFACTURERS** 

Greater control over the supply chain warranties and quality of service, potential for greater margins, panel design flexibility, ease of high-power panel adoption into the market, and better performing panels.



#### **TO INSTALLERS**

Simplified installation and facilitated customer education during sales, system design flexibility, fewer warranty claims, and access to new markets.



**TO PROPERTY OWNERS** 

Hassle-free, higher energy production, faster ROI, and greater offset on property energy bills.

#### **EXPANDING DAANAA'S TECHNOLOGY:** BEYOND SOLAR, INTO BATTERIES, VEHICLES & MORE.

The current Battery Management Unit (BMU) presents challenges related to safety and reliability, design and integration, and serviceability.

- Safety and reliability: Battery cells interconnected in series present thermal challenges, leading to string failures. Voltage dependence on state of charge (SoC) impacts reliability of the full system.
- Design and integration: Integrating BMUs into a greater system demands a complex arrangement of components and software, causing full-system manufacturing bottlenecks.
- Serviceability: Interconnected cells cannot easily be serviced. When one cell underperforms, it is the entire string that requires replacement, causing waste of perfectly working cells.

Daanaa offers a solution that addresses these issues by integrating a BMU within each battery cell or sub-module. Equipped with embedded power electronics and control systems, this solution ensures safety isolation and balancing, over 150x voltage conversion (up to 920V from a single cell), bidirectional power flow with high discharging and charging rates, and continuous monitoring of SoC. Its application flexibility allows for granular control and adaptability to individual cells. This approach not only addresses existing BMU challenges, but enhances the efficiency, weight reduction, reliability, and second life of battery cells/packs across various applications.

#### EXPLORE DAANAA'S POWER TRANSACTION TECHNOLOGY







Connect with Daanaa to explore the multiple ways our technology can support your energy needs.

#### **ABOUT US**

Daanaa is a fabless semiconductor company with a power transaction technology that allows energy to be transferred freely, safely, and efficiently in AC and DC without requiring additional power conversion equipment. The versatile core technology is applicable to multiple verticals and industries including solar photovoltaics, battery management systems, electric vehicles and beyond.

#### CONTACT US TO LEARN MORE

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# EXPLORE THE NNOVATION

⊃\\ Energy Untethered<sup>™</sup>

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