



CHANGING HOW SOLAR CELLS ARE MADE

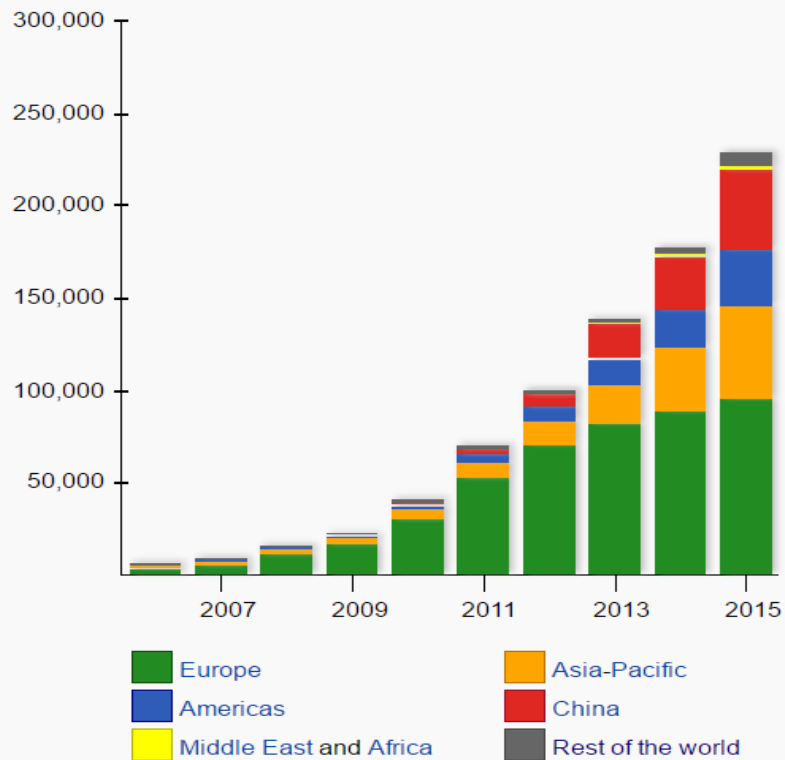
November, 2016

The Solar Energy Industry is Growing



Worldwide growth of photovoltaics

Cumulative capacity in megawatts [MW_p] grouped by region^{[1][2][3][4]:15:17}



Recent and projected capacity (MW_p)

Year-end	2010	2011	2012	2013	2014 _e	2015 _p
Cumulative	40,336	70,469	100,504	138,856	178,391	233,000
Annual new	17,151	30,133	30,011	38,352	40,134	55,000
Growth new p.a.	134%	76%	0%	28%	5%	37%

Natcore's Technologies

Foil Cell™

(All Back Contact Solar Cell)

Natcore's Foil Cell uses high-speed, low temperature laser process

INCREASE
efficiency



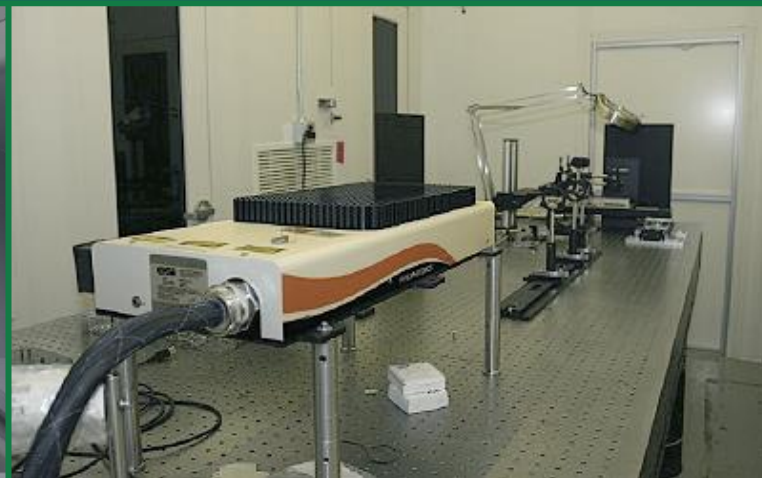
Black Silicon

Natcore's black silicon technology streamlines the path to low solar cell reflectance

REDUCE
costs



Natcore Laboratory – Rochester, N.Y.



19,000
sq ft facility

8,000
sq ft of
'class 10,000'
clean room

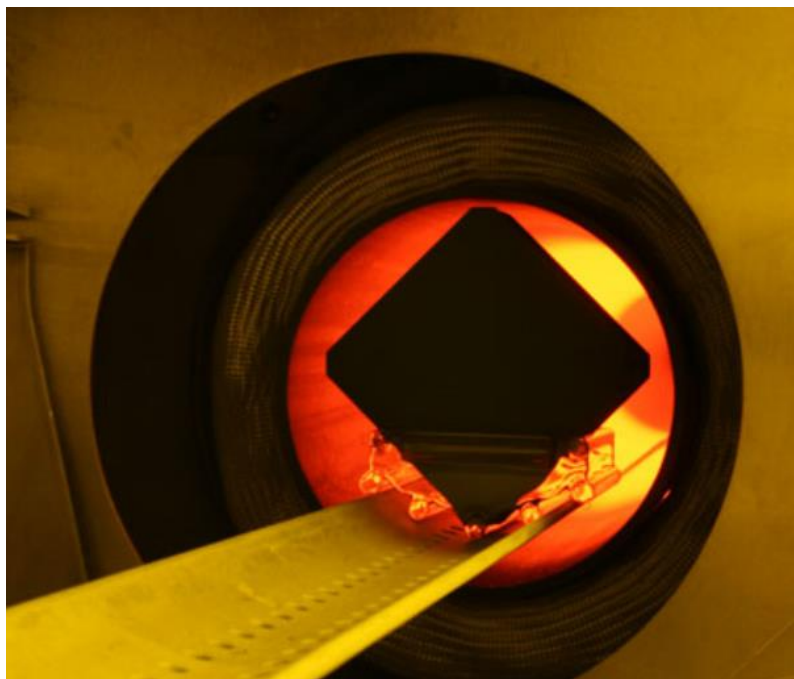
Full solar cell process from bare silicon wafer to working cells

Natcore R&D Center – Rochester, N.Y.



Technician working at one of several clean room wet benches.

Natcore R&D Center – Rochester, N.Y.



(Left) Solar wafers entering the diffusion furnace. *(Right)* Work performed using customized R&D equipment.

A Versatile, Customizable System

Traditional silicon hetero-junction cells hold the record for efficiency, **but high costs make them impractical**

25.6%

Output

The current world leader in efficiency



FOIL CELL™ TECHNOLOGY



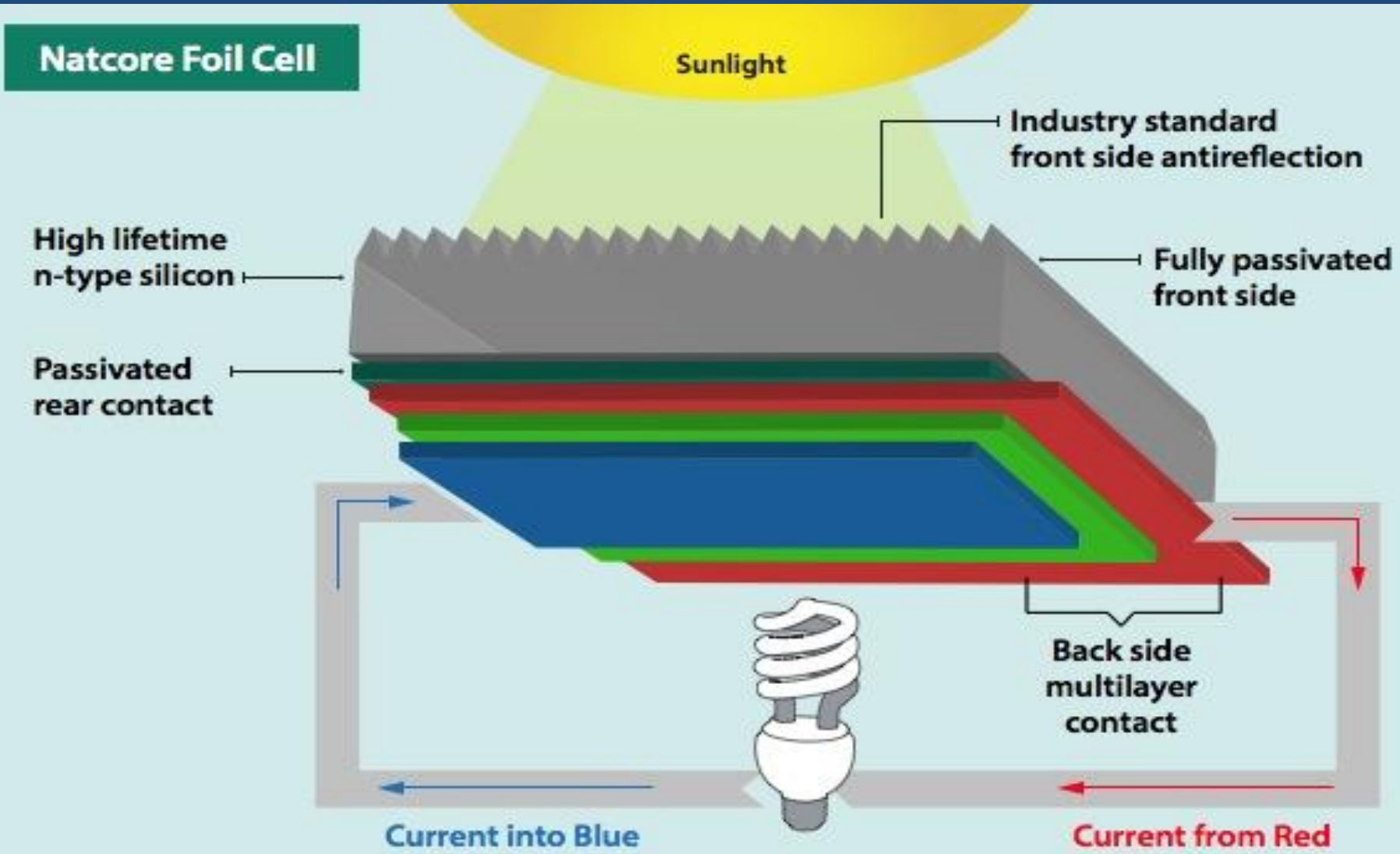
Natcore Foil Cell™

- Natcore Foil Cell™ combines a revolutionary laser process with a novel metallization strategy, enabling high efficiency cell architectures at low cost.
- The key feature: metallization of the cell by direct attachment of a bilayer aluminum foil laminate.
- The concept simplifies the fabrication of several silicon based, all-back contact cell architectures.
- A cell of this type holds the world record for silicon cell efficiency at 25.6%.

Natcore Foil Cell™ key advantages that overcome complicated & expensive production requirement limitations:

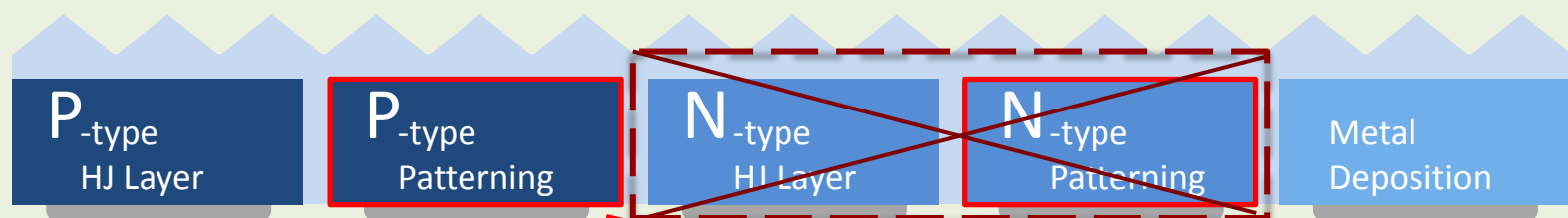
- The laminate processing and cell attachment merges multiple steps into one.
- Performed in ambient fab conditions, occupies a small fab footprint and is low in capital cost.
- All contact metal is aluminum foil. A significant cost savings is derived by eliminating copper or silver metallization materials.
- Further cost and simplicity come from leveraging the high volume processes that already exist worldwide for forming and processing aluminum foils and laminates.
- All-back-contact cells tend to have very low cell-to-module (CTM) losses, due in large part to the ability to couple them with very conductive module backplanes and minimize front encapsulant thickness.

Natcore Foil Cell™

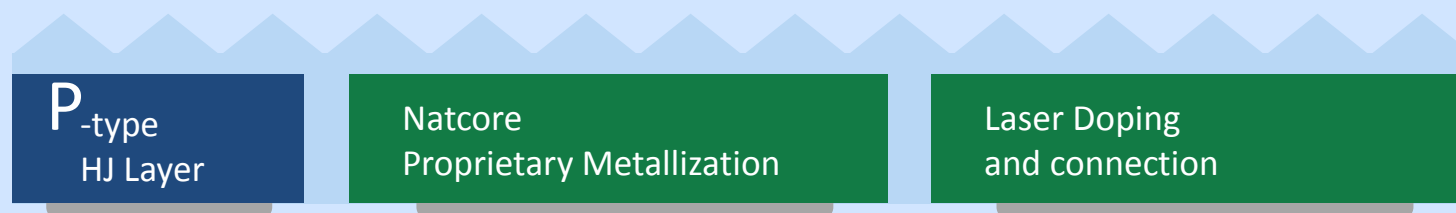


Simple Process – Reduces Cost

BACK CONTACT HETEROJUNCTION CELLS COMPLEX PROCESS



BACK CONTACT HETEROJUNCTION CELLS NATCORE PROCESS



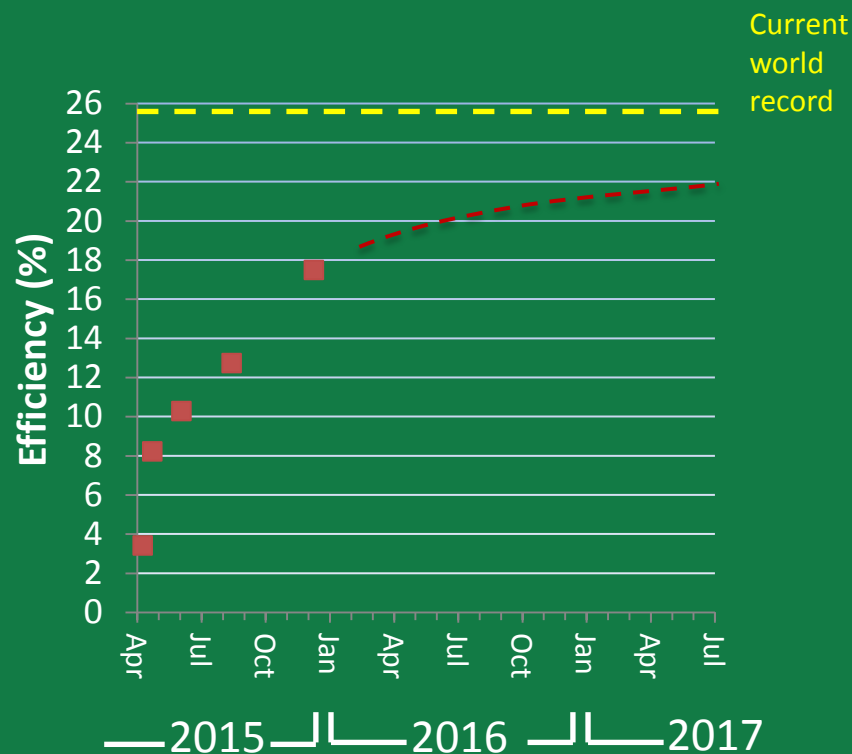
Significantly expensive steps removed from manufacturing process

Commercial manufacturing could reach as high as **26%** efficiency

Prototype Development

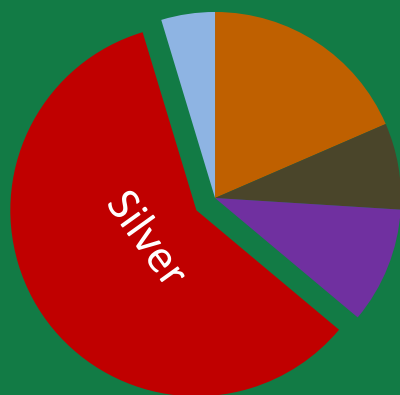
A Story of Rapid Progress

- Laser processed / back contact cells: Work started Q3/2014
- Multilayer structure: First versions achieved April 2015



Very Low Cost

Standard Cell Costs



Standard
Cell Fabrication

Cost Advantages

- Elimination of silver in cell fabrication
- Atmospheric / dry / low footprint metallization process
- Simplified module integration

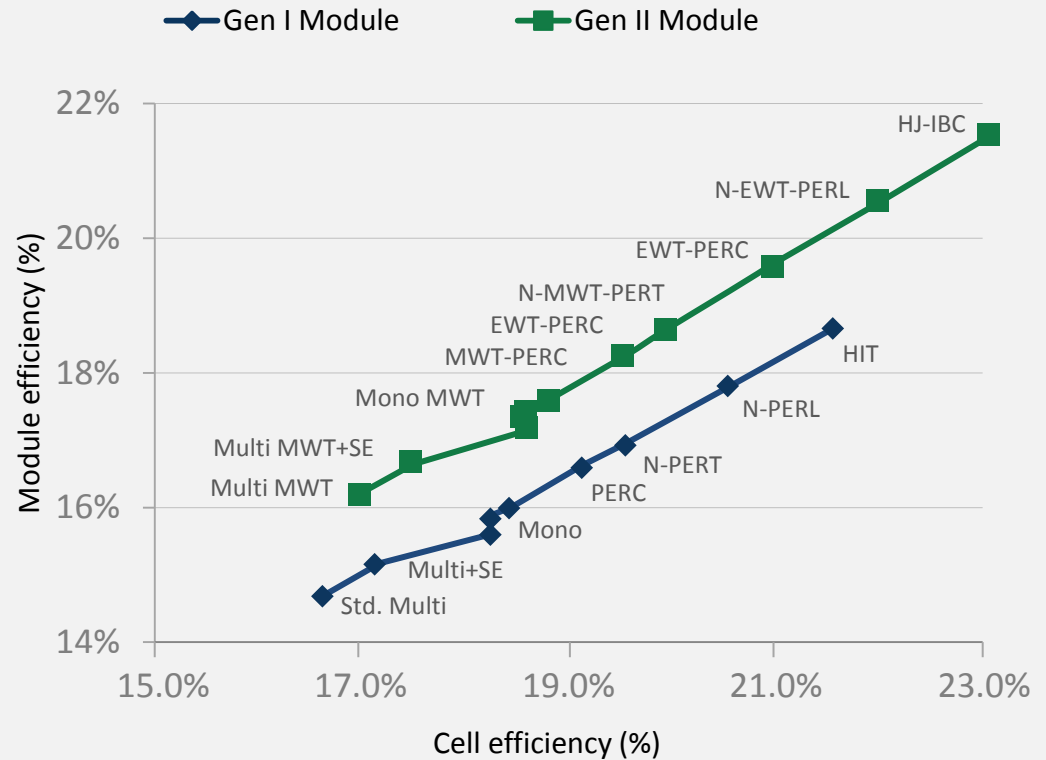
Cell-To-Module (CTM) Energy Loss

Less electrical resistance

Less wasted space

The best structure for eliminating CTM loss

Sometimes a CTM *gain* if surface area isn't wasted



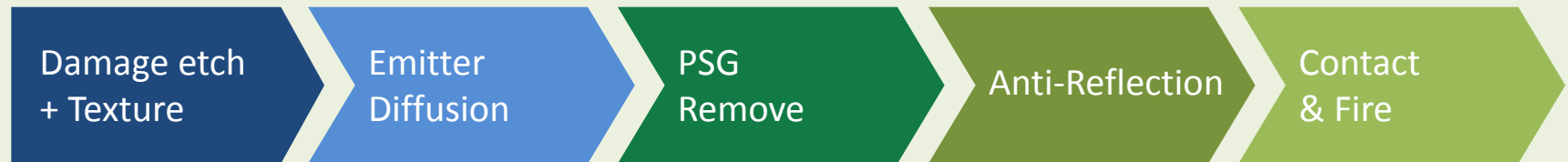
Natcore Back Contact: Better efficiency and Better CTM

BLACK SILICON TECHNOLOGY



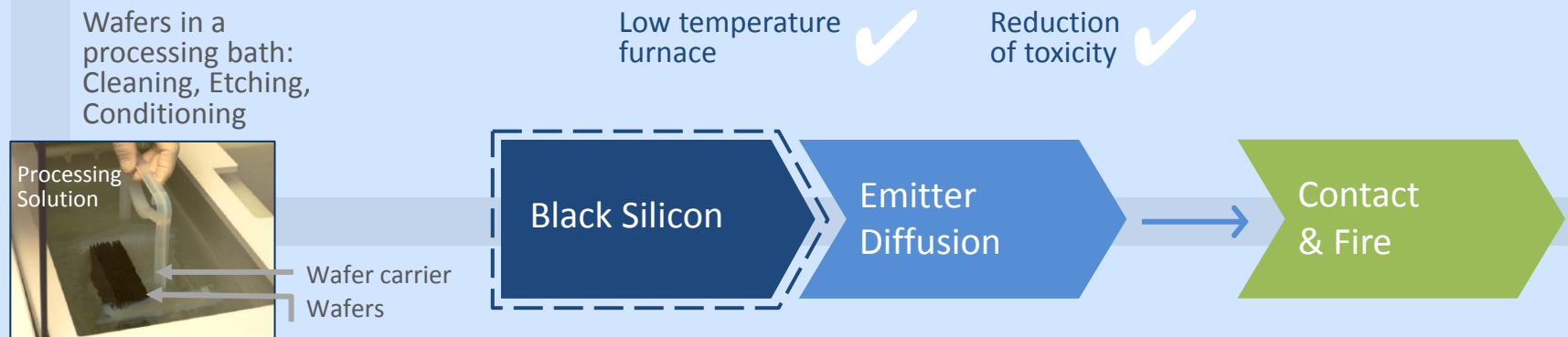
Solar Cell Manufacturing Process

STANDARD PROCESS



Our Process

BLACK SILICON PROCESS



Low temperature reduces toxicity and produces the best condition for uniform, single-sided black silicon application

BUSINESS MODEL & COMMERCIALIZATION



Business Path

- Natcore has demonstrated proof of concept of a revolutionary new solar cell structure and process.
- Now focused on improving the performance of prototype devices
- Seeking a partner that can assist in the commercialization process

3 Revenue Streams

Licensing

- Laser Processing
- Black Silicon
- Equipment manufacturing

Royalties

- Laser Processing
- Black Silicon
- Equipment

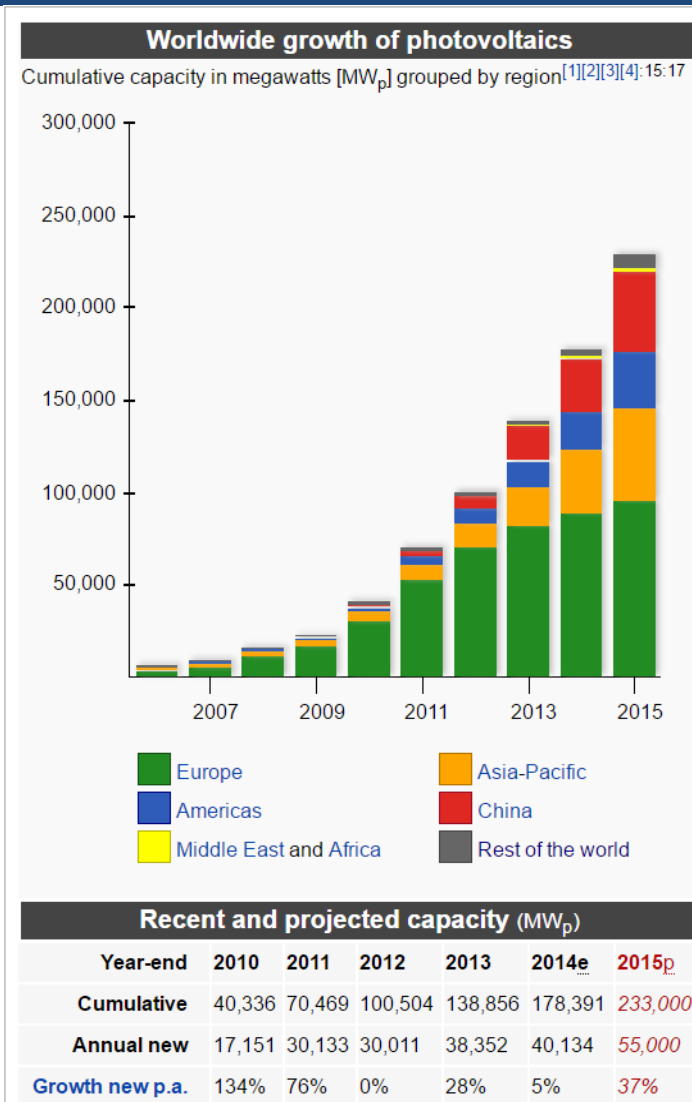
Material sales

- Built/shipped by others, but unit sales to Natcore
- Chemicals, foils, etc.

IP Position and Strategy

- Natcore has strong patent expertise
- US and International filings in various areas
 - 31 granted patents
 - 34 pending patents
- Laser / Foil Cell & module IP:
Comprehensive filings
- Coverage areas:
 - Novel cell structure
 - Module integration
 - Processing methods

PV Growth Worldwide



Best-of-Breed

*Choosing
the Best*

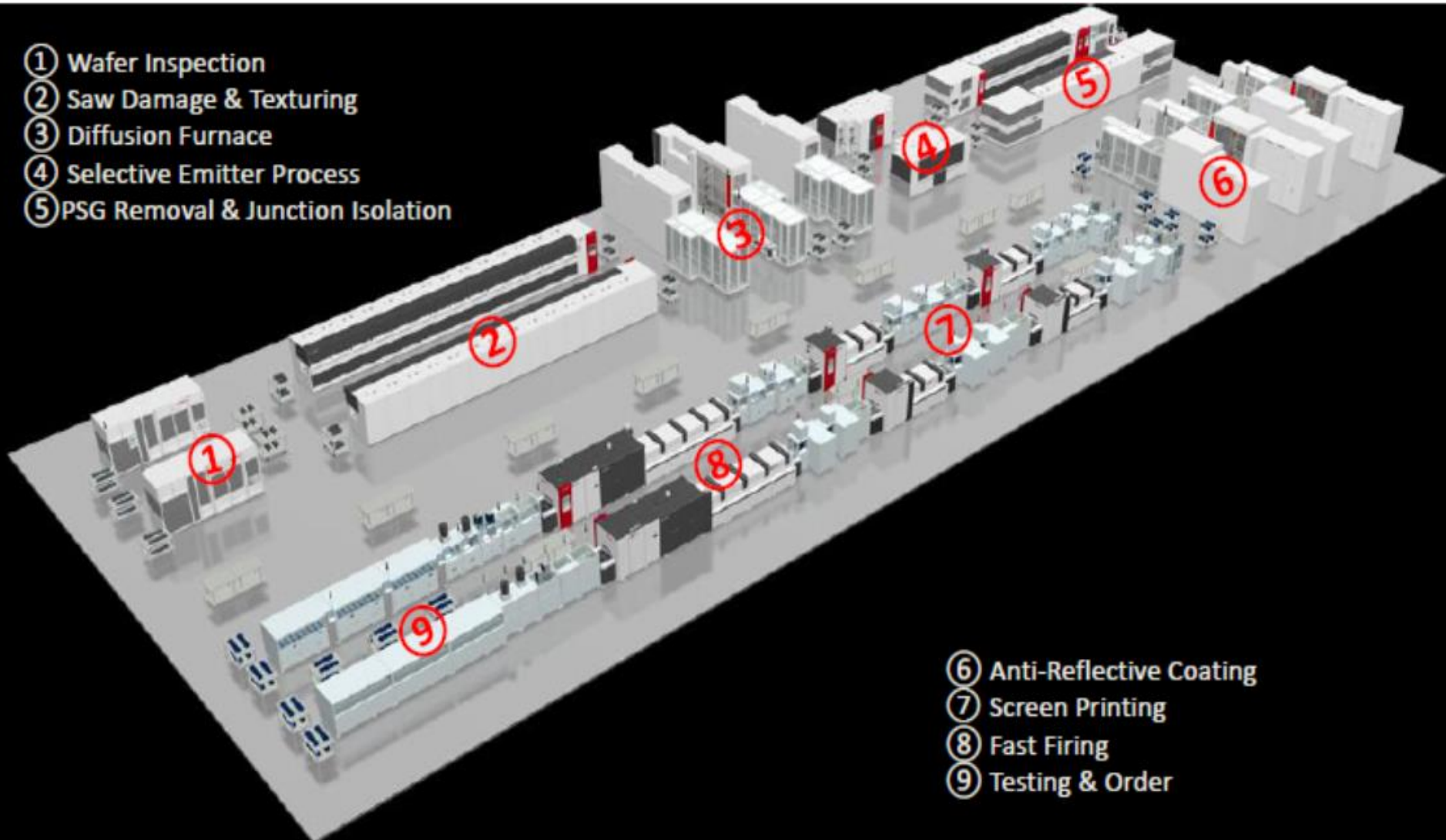
Best-of-Breed



ALFA TAU ENGINEERING S. r. l.

Best-of-Breed Proposed Solar Facility Layout

- ① Wafer Inspection
- ② Saw Damage & Texturing
- ③ Diffusion Furnace
- ④ Selective Emitter Process
- ⑤ PSG Removal & Junction Isolation



- ⑥ Anti-Reflective Coating
- ⑦ Screen Printing
- ⑧ Fast Firing
- ⑨ Testing & Order

Natcore & Synergistic Partners



Consulting

We have been retained by United Energy Ltd. to develop a 56.18 MW facility in Vietnam. This [video](#) shows some of the details (power station, point of delivery, anti-intrusion system).

- Provide project financing and technology;
- Design, develop, implement and bring solar plants to the turnkey phase;
- Serve as supplier and promoter of the project;
- Select suppliers, PV plant locations and EPC company.



Best-of-Breed Turnkey Projects

- We serve on these projects as a Consultant or General Contractor.
- Hire subcontractors and vet every component of the project.
- Currently working on these Best of Breed projects:

Belize: 10 MW



Australia: 30 MW

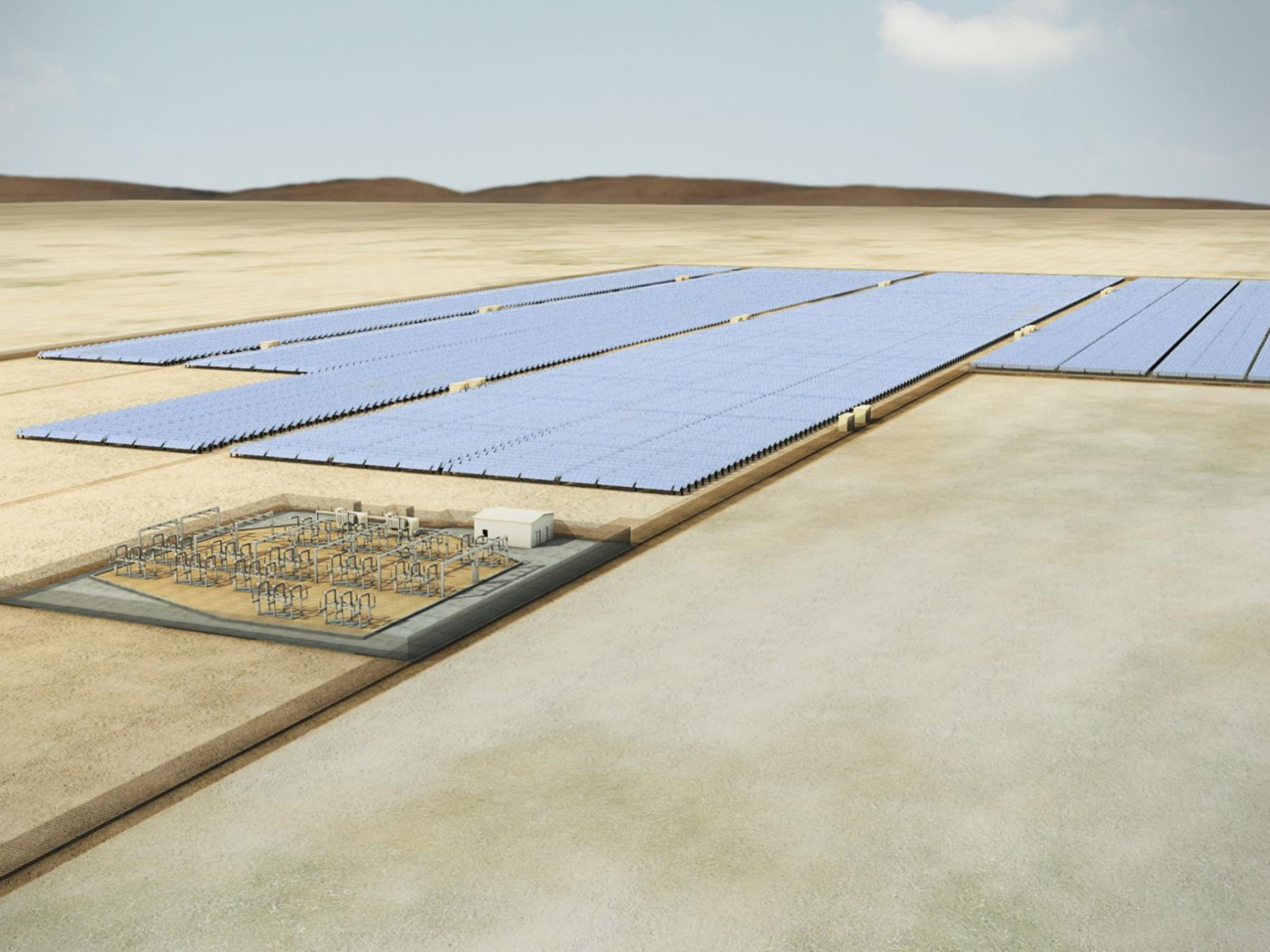


Vietnam: 200 MW



Middle East: 1,000 MW





Best of Breed Project

PROCESS

- Identify In-Country Partner
- Find and Control Suitable Land
- Obtain Government Permits for Project
- Confirm Engineering Feasibility Study
- Negotiate Power Purchase Agreement
- Source and Bid Equipment (Modules, Frames, Inverters, etc.)
- Engage Engineering Procurement Company

Best-of-Breed - Vietnam

Vietnam Project - 200 MW
Drone aerial image of land.



Pipeline Projects

Vietnam

Australia

Belize

Middle East

South Africa

Ukraine/Moldova

Philippines

Vietnamese Project

- **Vietnamese Project** - 56.18 MW PV Plant

- Total Investment \$65.5 M
- PPA:
 - Average Yearly Revenue - \$9.3 M (20 years)
 - Monthly Revenue - \$774,000

Vietnamese Project – 56.18 MW

Revenue

- Engagement fee - \$1.5 M
- Cost Plus (\$65 M x 5) - \$3.25 M
- Annual Partnership Participation (10%) - \$930,000
- 20 Year Term - \$18.6 M

Vietnamese Project – 200 MW

Revenue

- Engagement fee - \$6 M
- Cost Plus - \$13 M
- Annual Partnership Participation (10%) - \$3.72 M
- 20 Year term \$74.4 M

