LET´S BRING GW PV PRODUCTION BACK TO EU AGAIN

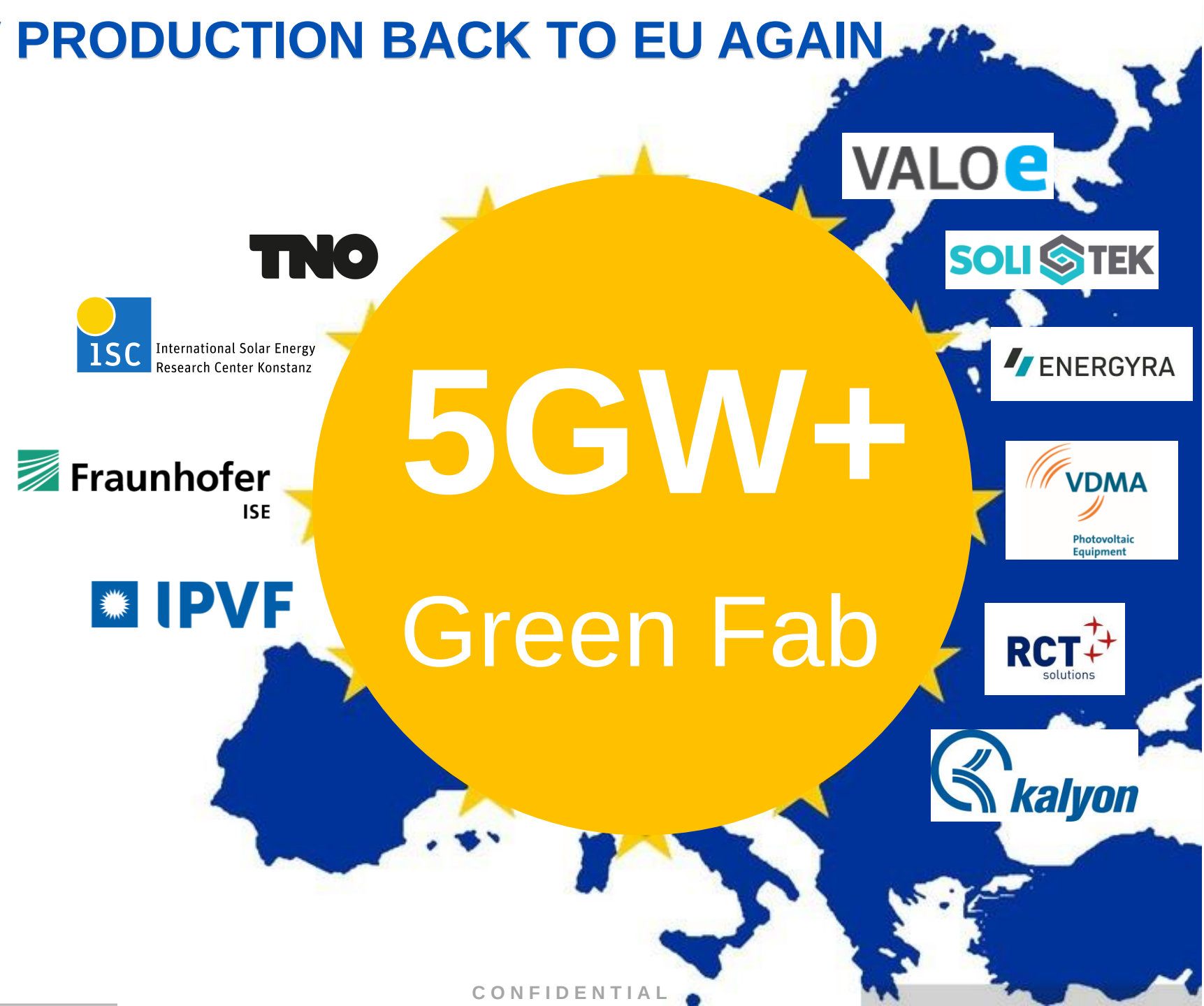
LET´S BRING GW PV PRODUCTION BACK TO EU AGAIN

Industry:

Energyra Netherlands
Kalyon Turkey
RCT Germany
Solitek Lithuania
Valoe Finland
VDMA Germany

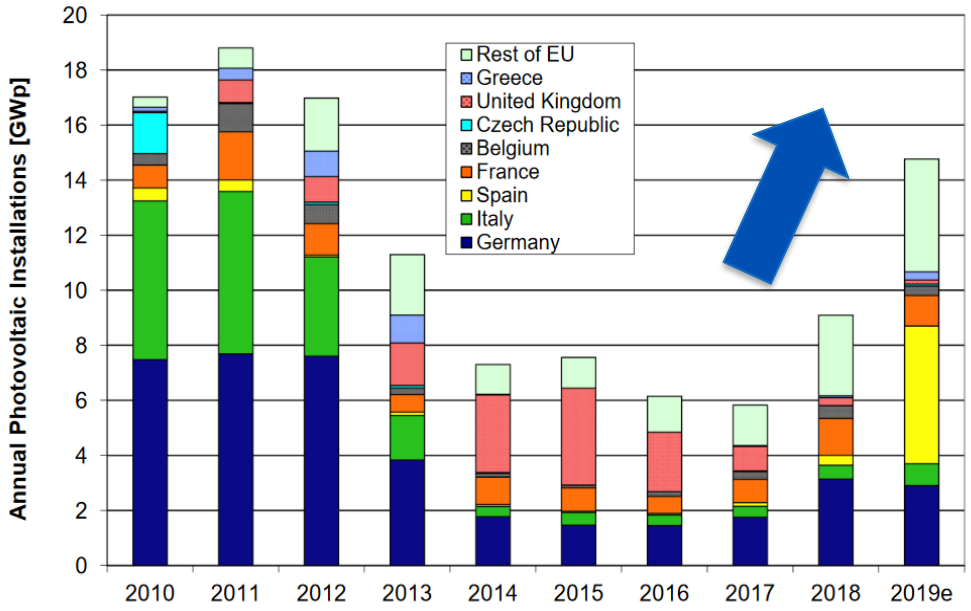
Institutes:

Fraunhofer ISE Germany
IPVF France
ISC Konstanz Germany
TNO Netherlands



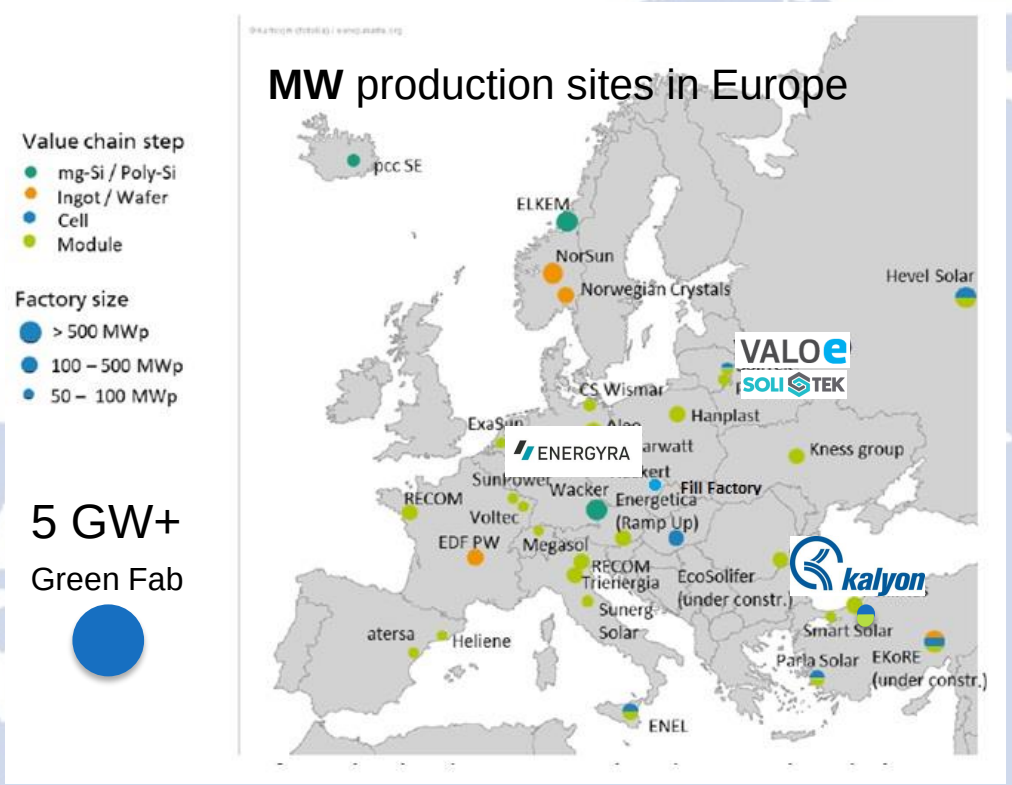
Challenge

GW annual PV installations in EU



Source: [Sol 2019, Sys 2019] and own analysis

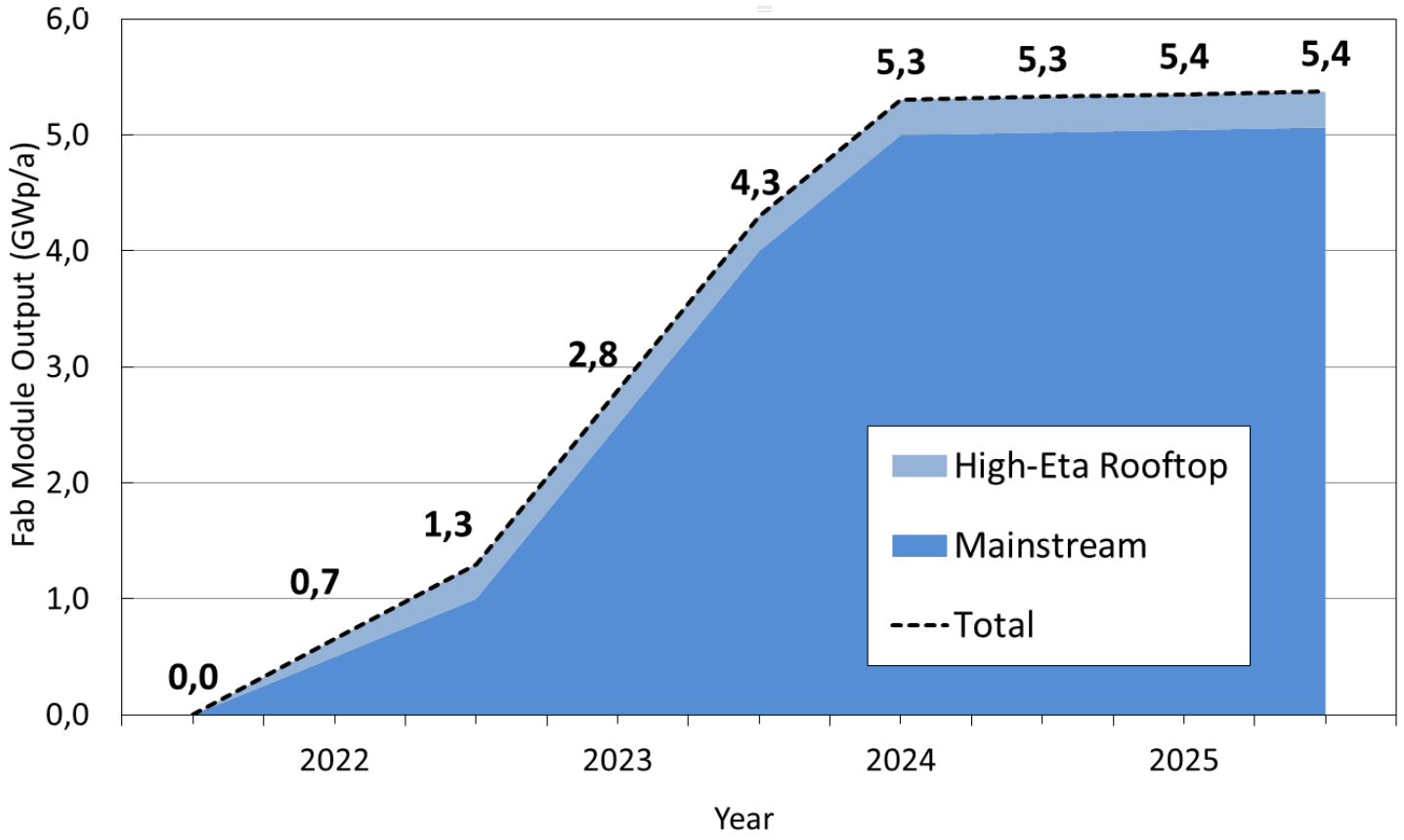
MW production sites in Europe



- PV developments come from EU, but **small fraction of PV production in EU left**
- Future global and EU electricity will come from PV but **critical dependency on Chinese industry**
- Currently **no supply chain for PV in Europe** left

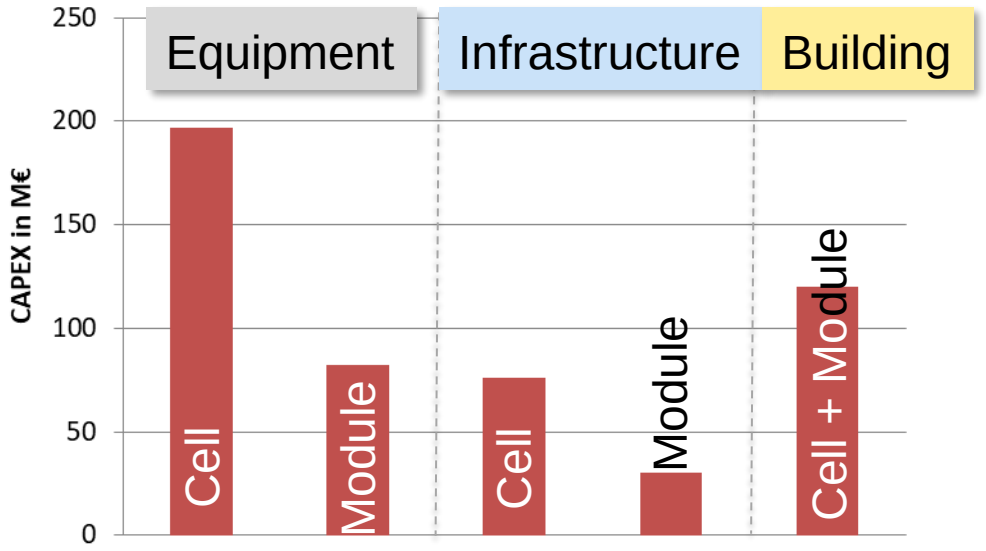
Solution

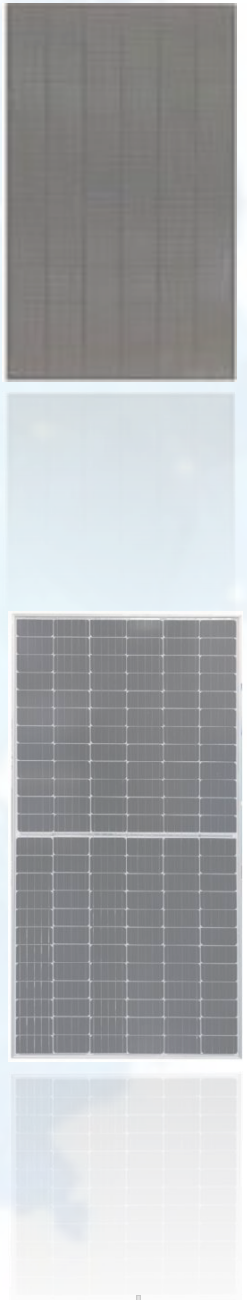
- Start production of advanced **state of the art technology** in EU
- Big enough to **regain supply chain**
- Globally competitive by using **most modern automated production technologies** and Know How from EU institutes
- Use **high efficiency technology from EU development** on top of mainstream technology
- **Partnership** with EU companies



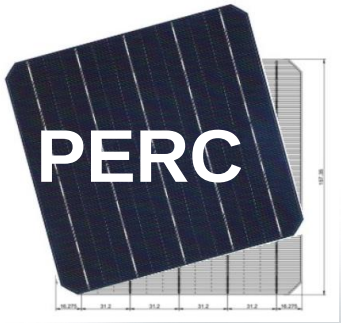
Project summary: 5GW Green Fab

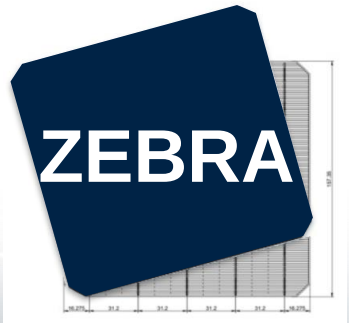
- Production start 15 months after finance closure
- Investment volume ca. 500 M€
- 2.500 staff
- 24/7 Production in 5 Shifts



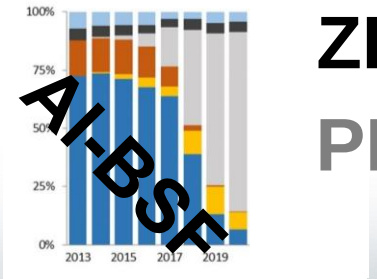


Technology: Solar cell



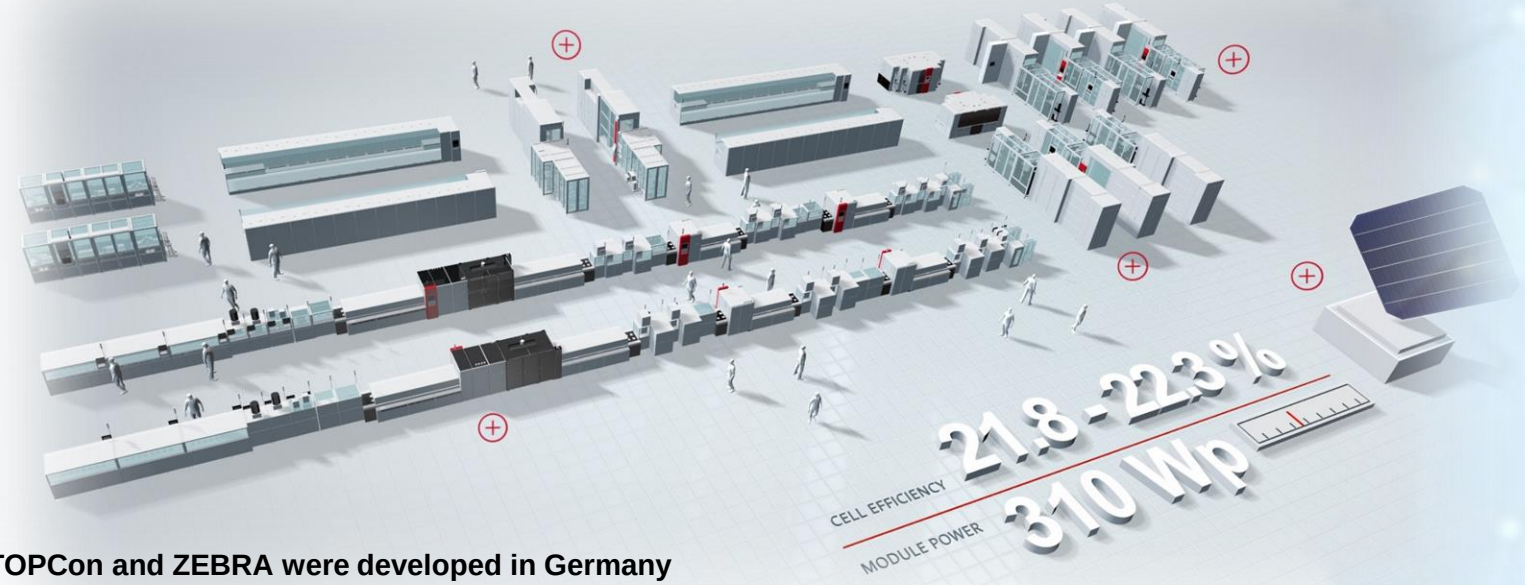


PV Technologies



ZEBRA: 24-25%

PERC: 23-24%



PERC, TOPCon and ZEBRA were developed in Germany

PERC Solar cell technology No.1 Technology to produce cost effective High Efficiency Solar Cells and will stay as mainstream for the next 5 years.

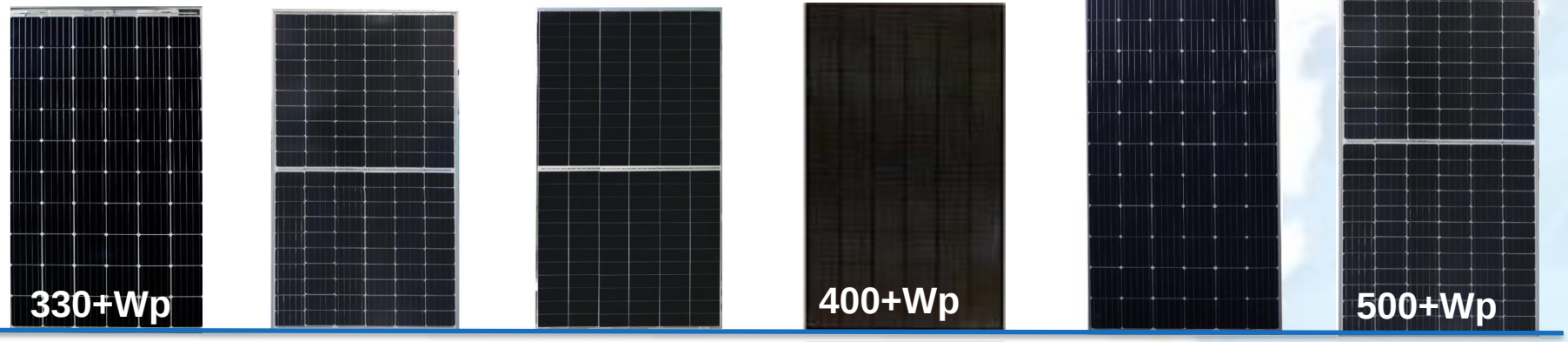
PERC Production lines can be transferred easily to TOPCon or IBC technology with few adjustments. Even tandem technology possible.

Factory starts with 5GW PERC and 0.3GW ZEBRA.

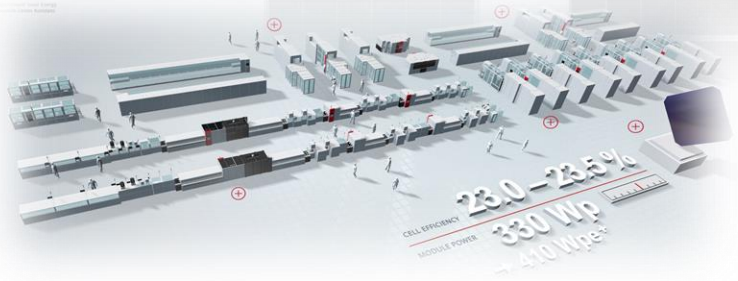
Depending on future market requirements exsisting production lines can be upgraded to ZEBRA or TOPCon.

Technology: Module and PV Systems

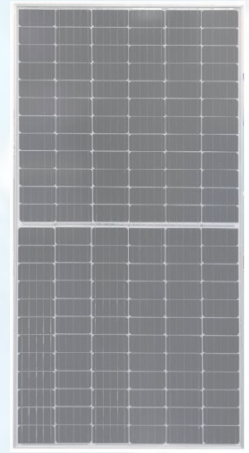
All type of modules will be produced in same factory



Modern bifaciale Solar Cells (PERC, TOPCon, ZEBRA) incorporated in highly efficient modules.



Black IBC (ZEBRA) Modules for Roof Top.
Bifacial Modules for BIPV
Light weight bifacial Modules for commercial roofs
Transparent bifacial Modules for Carports
Large area bifacial Modules for Green field Power plant



Technology: PV Systems in Germany

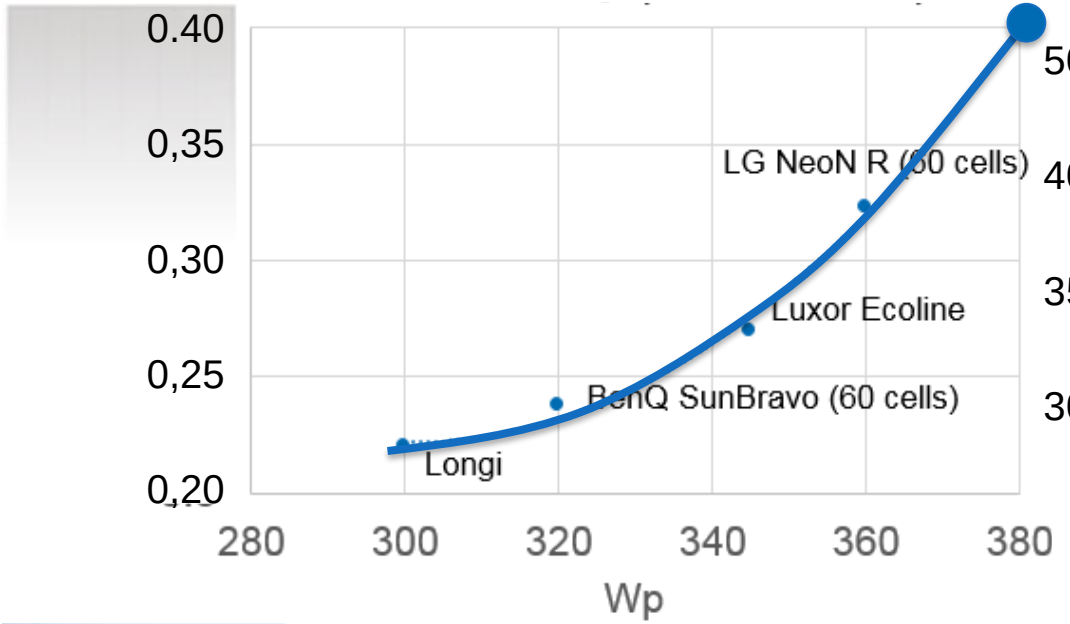
HIGH EFFICIENCY

Black ZEBRA 60 Cell Modules

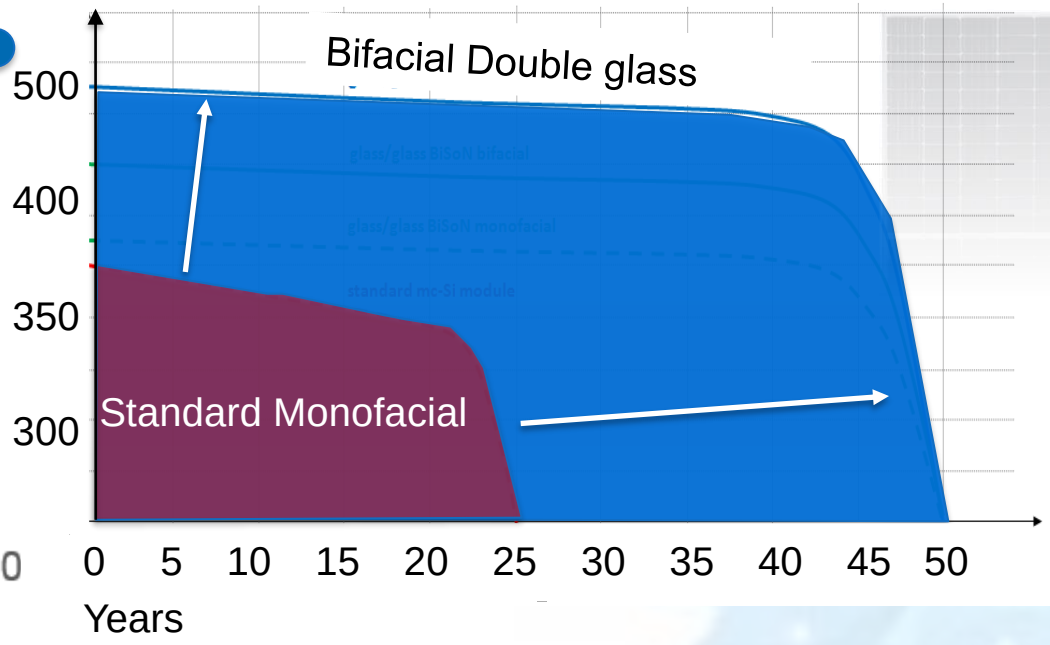
STANDARD MODULE

Bifacial PERC Glass/Glass 72 Cell Modules

Price for high efficiency module [€/Wp]



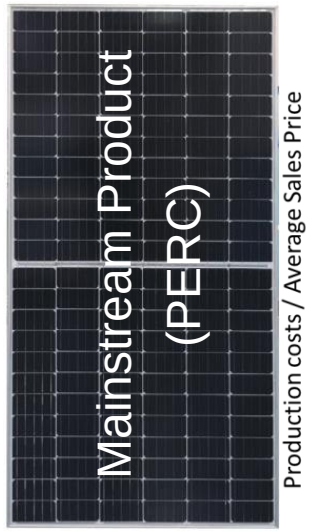
Module power [Wp]

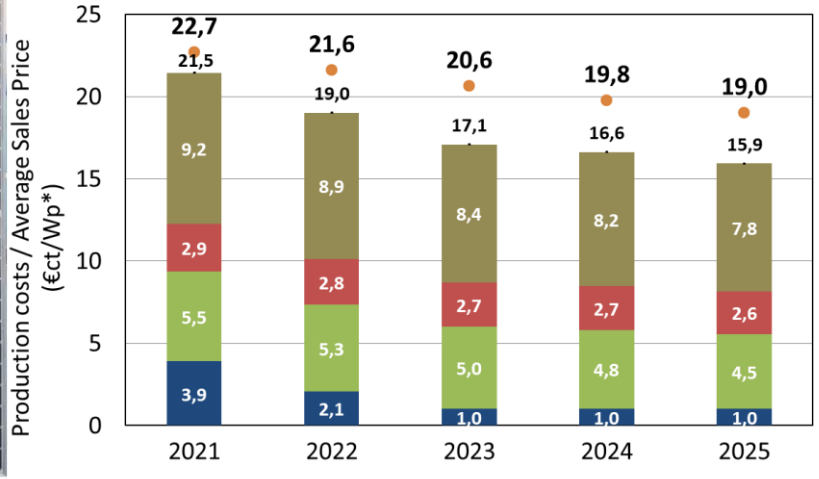


> 40ct/Wp

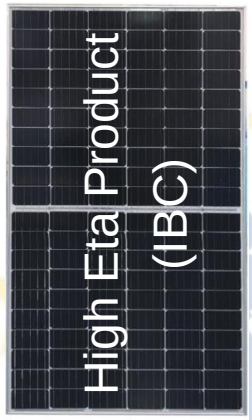
< 3ct/kWh

Status

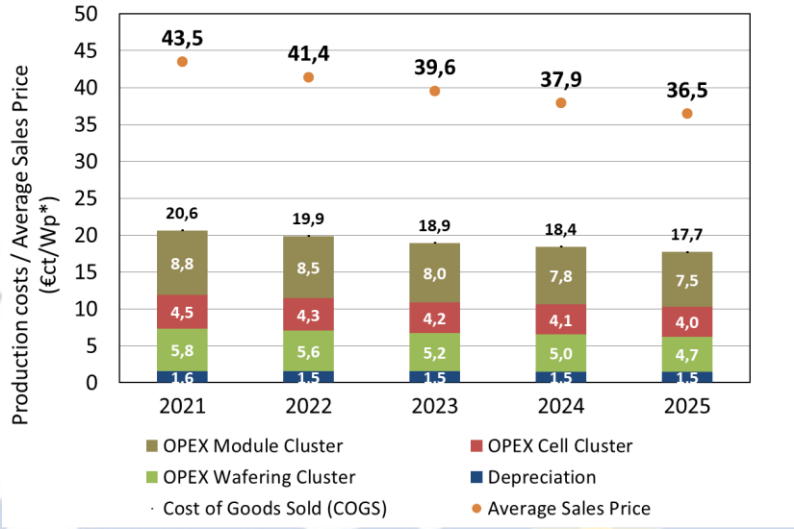




500Wp



400Wp



- **Technological and financial concept developed** by partners Fraunhofer ISE, RCT Solutions, ISC Konstanz and vdma

- Creation of more than **2.500 direct jobs** in production and **total 15.000 jobs** including supply chain and O&M

- **Investor talks** initiated

Factory Description: example Kalyon PV Turkey

Integrated Factory with an annual capacity of 500 + 500 MW

- Ingot (CZ pulling, RCZ)
- Wafer (DWS)
- Solar cell (PERC, bifacial, selective emitter)
- Module (mono- and bifacial, half cell,

Current Status in the Factory

- Ingot line (picture)
- First Ingot Out ➔ 30/06/2020

- Cell line – Diffusion (picture)
- First Cell Out ➔ 16/08/2020

- Wafer line – Wire saw (picture)
- First Wafer Out ➔ 07/08/2020

- Module line – Laminator (picture)
- First Module Out accomplished

Possible political support

Production in Europe is economically viable but supply chain first has to rebuild itself

- Support in the first years is advantageous e.g. by
  - collateral for loans
  - support of local content
  - equip public buildings mainly with EU modules

- Support for EU PV production as IPCEI

- Funding for technology development and EU open lab

LET´S BRING GW PV PRODUCTION BACK TO EU AGAIN

Thank you for supporting our initiative

5GW+ Green Fab; PV production in Germany / Europe from 2021