

Company Profile

H2GEMINI - The PV Process & Manufacturing Experts

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Dr. Dirk Habermann, CEO/CTO
former
CTO, SCHMID Group
CTO, Meyer Burger



Uwe Habermann, CEO/CFO
former
VP Integrated Factory Solutions, SCHMID Group
Head of Project Engineering, Meyer Burger

Dr. Dirk Habermann is CEO/CTO and Founder of H2GEMINI. He has 25 years experience in material science, semiconductor, and photovoltaic technology. Previously, he held the positions of Chief Innovation Officer of Meyer Burger Technology AG and CTO of the Schmid-Group where he was responsible for the installation and ramping of >1.5GW of turnkey solar cell production lines.

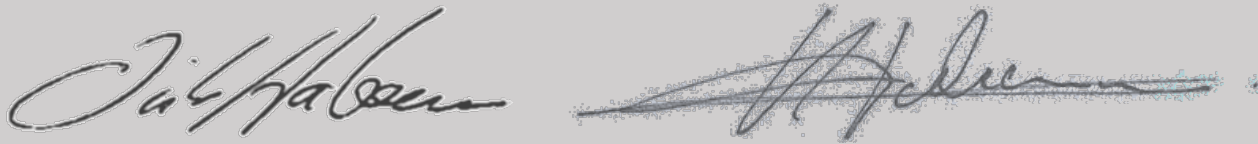
In the last 15 years, he also has served director and vice president levels in the field of PV technology and automation technology. Dirk holds numerous patents in PV technology, is co-author of books for mineralogy and material science and published about 100 papers in the field of solid-state physics, material science/mineralogy, and photovoltaics. He is member of the Industry Board of the Intersolar North America and the EU PVSEC International Scientific Advisory Committee.

Founder and CEO/CFO of H2GEMINI, **Uwe Habermann** studied Biology at University of Bochum, studied Business Management & Economics in Cologne and holds a Master's Degree in Marketing & Communication.

After his career as a Production Director for international OEM manufacturing in the textile industry and Managing Director of an international trading company, he moved to PV Industry in 2008. He served as Director for Integrated Fab Solutions in the SCHMID-Group and most recently as Head of Project Engineering at Meyer Burger AG. Since 2008, Uwe has successfully led global business development of PV manufacturing worldwide including the establishment of the largest cell production facility in India and the first fully integrated PV production facility in Latin America.

Mission Statement

H2GEMINI is standing for dedication to the design of solar energy product manufacturing, utilizing best in class capital equipment and providing a technology roadmap to ensure the long term success of our customers.



Dr. Dirk and Uwe Habermann

Shape the future



Photovoltaic

The **H2GEMINI** owner team has been dedicated to the photovoltaic industry for more than 20 years and is therefore one of the leading minds in the industry. The developed forward-looking technologies and production concepts at a very early stage and played a decisive role in shaping the global solar industry. Thanks to innovative production and process solutions, solar energy has already become the cheapest form of energy in many countries.



Wind Energy

Wind energy is an indispensable component of the renewable energy mix. Wind Energy helps to stabilize the grids and is therefore a guarantee for falling energy prices worldwide. New environmentally compatible concepts have led to a broad acceptance of this renewable energy.



Energy Storage Systems

In cooperation with leading institutes and manufacturing companies. With an holistic view on the energy generation, **H2GEMINI** is developing integrated energy solutions combining Solar, Wind Energy and Storage Systems.

Our Work Experience (extract)



Featured Projects:

MOSER BAER Photo Voltaic Ltd., India, first full automated cell turnkey line (~120 MWp)

MILLINET SOLAR, Korea, Cell Turnkey line (~ 60 MWp)

INDOSOLAR, Indian Tier one cell manufacturing (~600 MWp)

Blue Chip, Austria, Worldwide first Cell line with PERC Technology (~100 MWp)

REC Norway, 2 Turnkey lines (~200 MWp)

REC Singapore, 8 Cell lines with PERC Technology (~900 MWp)

EPSE, Argentina, the first full integrated ingot — module manufacturing project in South America (under construction) (~ 70 MWp)

SIEMENS, feasibility study incl. Basic Design „1.2 GW Polysilicon to Module“

IP: Access to several international patents and several patents pending

Global Footprint





H2GEMINI

Competence Density Concept

H2GEMINI has put together a pool of experts from years of successful cooperation.

H2GEMINI temporarily generates a maximum expert density in the customer project in order to develop highly specialized solutions in the shortest possible time.

Through the CDC concept, we create more solution efficiency, increased production capacity and flexibility, product quality improvements and superior capabilities to meet the customer's needs.

Process and Engineering excellence, commitment and reliable service are the means by which H2GEMINI accomplishes our mission of complete client satisfaction.



H2GEMINI

Competence Density Concept

CUSTOMER
Special
Requirements

H2GEMINI
PROCESS-
KNOW HOW
ENGINEERING

SeREN
Financing
Project
Management

WERK 5
ENGINEERING

PACE TEC
ENGINEERING

CSEM
FRAUNHOFER
CEA INES

e&c
Facility
Planning

BERGEN
INDA

>200 experts
Engineers
Scientists
Operator
Maintenance
Support



R&D Network & Cooperation



Fraunhofer-Institut für Solare Energiesysteme ISE



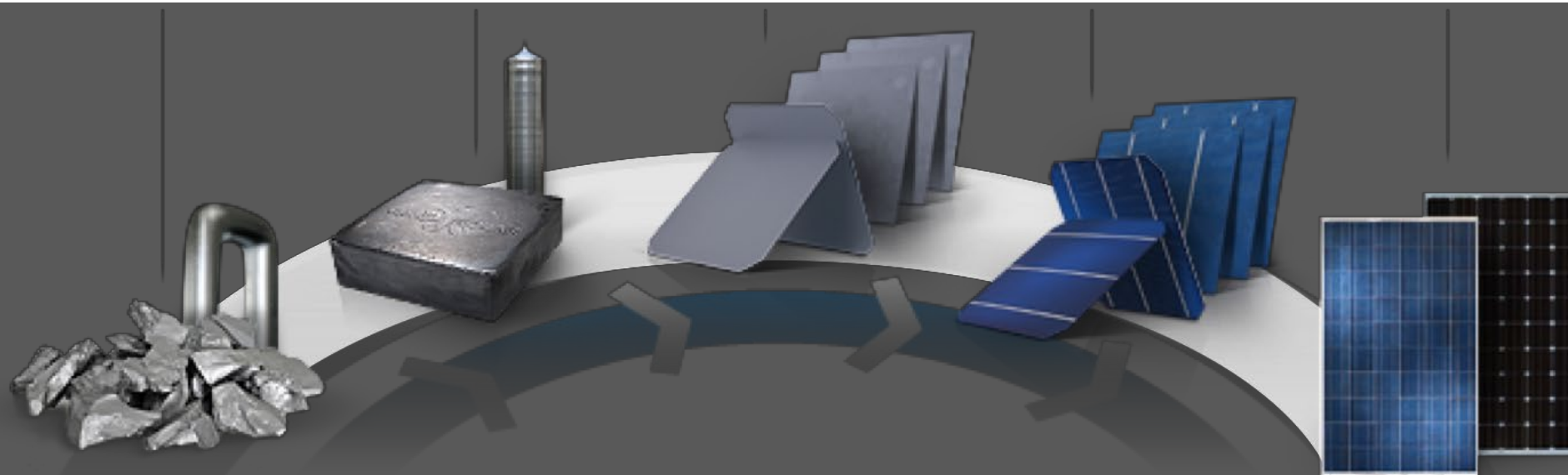
Polysilicon

Ingot

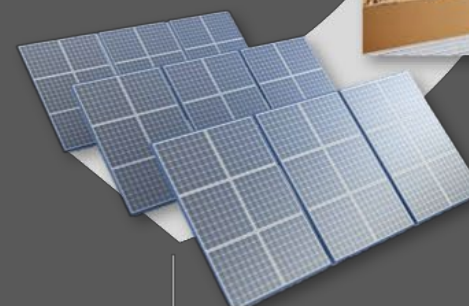
Wafer

Solar Cells

Modules



H2GEMINI
Process Competence
along the PV Value Chain



PV Power Plant

EPC

H2GEMINI Project Support

Consulting

- Market Research
- Production Analysis
- Cost optimization
- Vendor evaluation
- Feasibility & Case Studies
- Permitting Support
- Patent Research
- Technology selection
- ROI Analysis

Design & Engineering

- Manufacturing Engineering
- Project Engineering
- Facility + Capacity planning
- Automation + Line engineering

Project Management

- Project Execution
- Project Structuring
- Time scheduling
- Tendering & Procurement support
- Vendor Management

Manufacturing & Process Support

- Process Ramp Up
- Production Support
- Continuous cost reduction
- Benchmarking
- Process development
- Process optimization
- Training

Specialized Automation



H2GEMINI develops specialized automation solutions for industries that need to handle surface-sensitive and thin substrates safely and at high speeds. These include, for example, solar wafers with a thickness of 60-180 μm .

In our partner network, we combine process, design know-how and highly qualified specialists for detailed solutions to produce customer-specific solutions where a ready-made solution does not deliver the desired results. Our focus is on functionality, process reliability, efficiency and cost optimization.

In addition to individual solutions for specific process steps, H2GEMINI also provides complete system integrations and factory automation.



Machine development

Process development

IP Consulting and Licensing

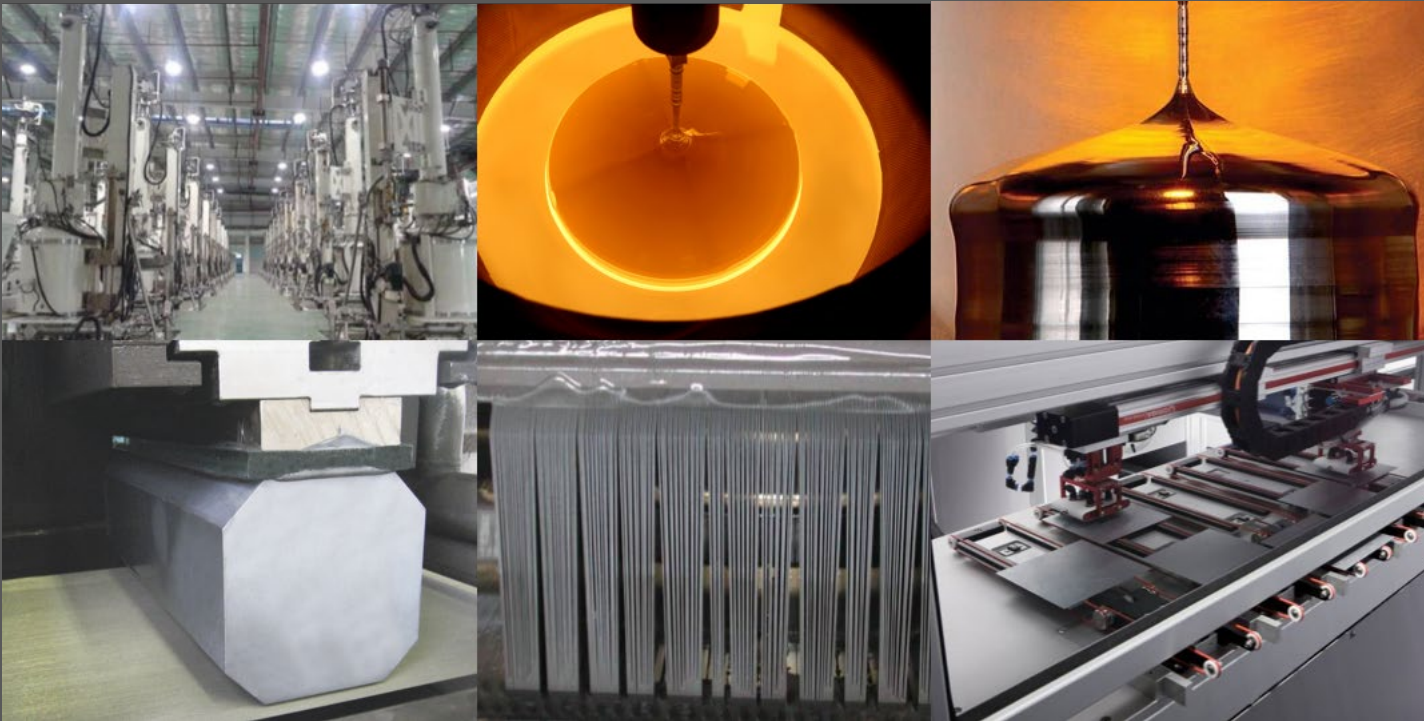
44 int. patents focused on photovoltaic

New alkaline inline-texturing for Mono

Wet chemical wafer edge treatment

Silicon Crystal Structure defect healing process

Ingot-Wafer Technology



H2GEMINI cooperates with the leading suppliers of diamond sawing technology. The aim is continuous cost and process development for integrated photovoltaics.

A decisive success factor for **H2GEMINI** is the integrated view from polysilicon to module. The aim is to optimize conversion processes, material qualities and properties, material thicknesses along the entire value chain to achieve high efficiency and low costs.

Polysilicon purification

Mono crystalline n-type and p-type material

Multi crystalline material

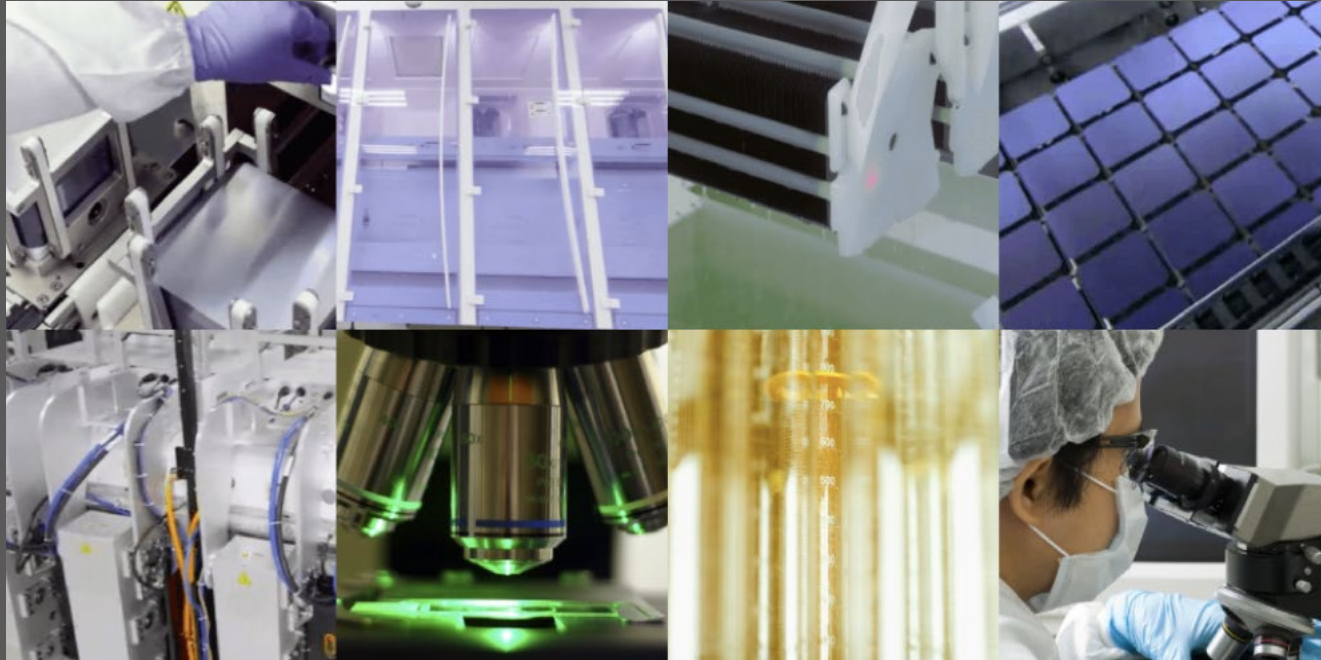
Mono and Multi ingot growing

Diamond sawing technology

Surface cleaning

Wafer handling and process automation

Cell Technology



H2GEMINI HJT Line

Throughput: 3300 w/h

Capacity: >140 MWp

Footprint : <450 m²/100 MWp

H2GEMINI's fully automated solar cell production lines combines highest production efficiency and reliability with the most advanced solar cell technology.

H2GEMINI own a-Si passivation receipt with VOC: > 735mV (confirmed by independent PV institute)

The special **H2GEMINI** platform technology for fully automated production lines enables maximum productivity at low investment costs and is already designed for wafer thicknesses of <120 micron.

H2GEMINI solar cell production lines are designed for PERC, PERT and Heterojunction (HJT) bi-facial and mono-facial technologies and enable flexible and easy upgrades to new technologies.

Module Technology



H2GEMINI HYBRID Module Line

(glass-glass + glass/back sheet)

Throughput: 5000 w/h

Capacity: >200 MWp

Footprint : <870 m²/100 MWp

H2GEMINI HYBRID module manufacturing lines are designed to produce both types of modules (glass-glass and glass-back sheet) to saturate all market requirements for utility scale power plants, BIPV and roof top applications. The pre-designed interfaces allows an easy and fast upgrade by minimizing the investments.

To meet the individual customer requirement, the line automation will be customized from semi- up to full automation.

The hybrid laminator for glass-glass and glass-back sheet modules provides a high stable quality due to a double side heating process. With more than 10 years field experience in mass production, the hybrid laminator is the work horse in module manufacturing

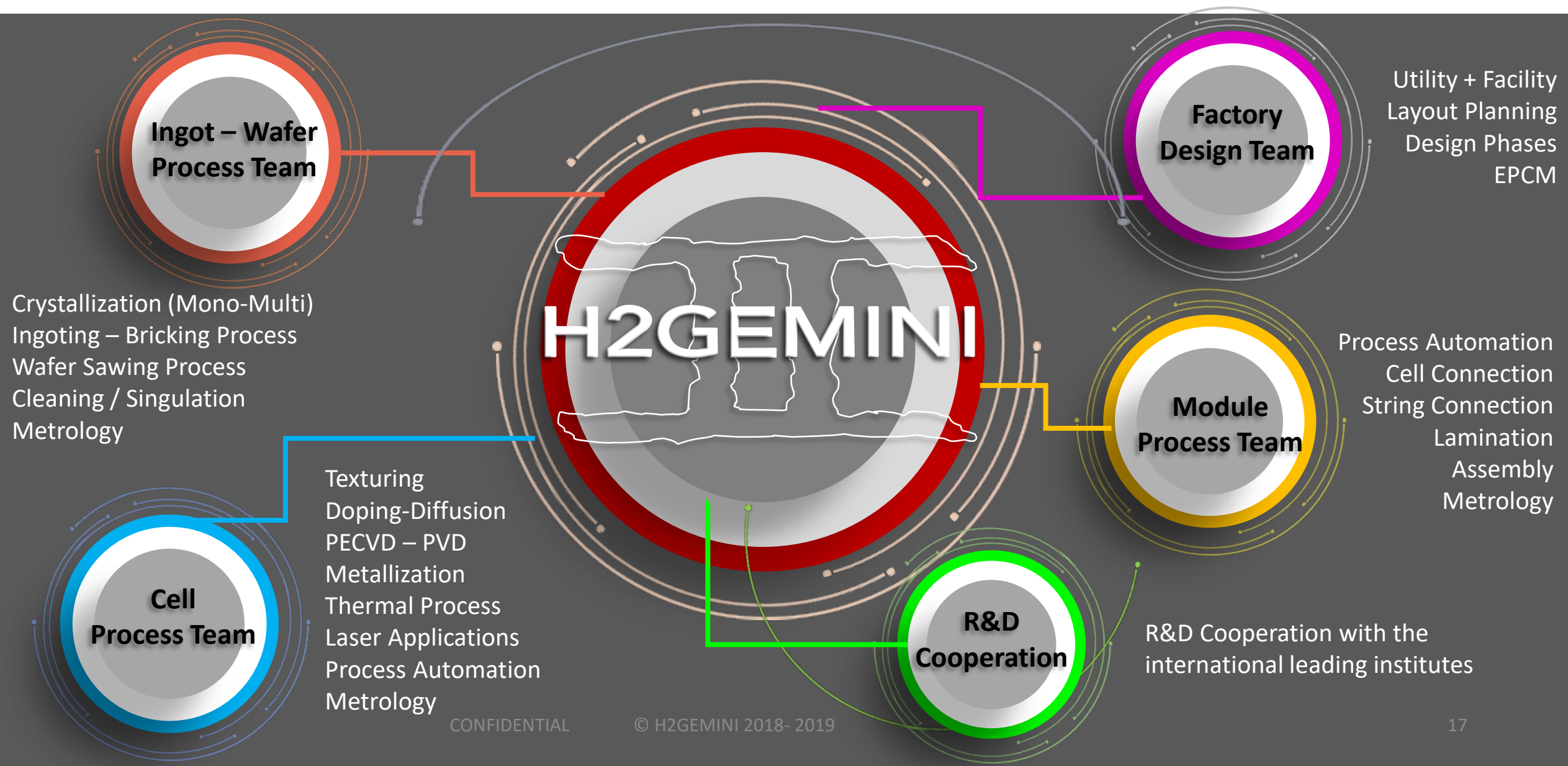
Process Ramp Up-Production Support



H2GEMINI Process Team members are all senior process engineers and scientists with minimum 15 years experience in process, manufacturing and development.

Direct access to up to 100 experienced mechanical and electrical engineers to support equipment installation and manufacturing.

Process Ramp Up-Production Support



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The Company believes any such statements are based on reasonable assumptions and reflect the judgement of H2GEMINI Technology Consulting management based on factors currently known by it. No assurance can be given that these forward-looking statements will prove accurate and correct, or that anticipated, projected future results will be achieved.