MEYER BURGER

SOLAR PRODUCTION IN GERMANY

Strategic Innovation Leadership As A Cornerstone For European Energy Sovereignty

BIG PICTURE

We are at the beginning of a solar energy age. In many parts of the world, and after only two decades of development, photovoltaics (PV) is already by far the most cost-effective, environmentally and climate-friendly technology for generating electricity.

Globale Global ambitions for more climate protection, a continuing cost degression and solar radiation available practically everywhere make solar power generation the most important energy source worldwide in the long term. This development meets an electricity demand that will increase by more than a quarter in Germany alone by 2030[1] – driven by decarbonization based on the electrification of more and more areas of life and sectors such as electromobility as well as by the planned large-scale use of green hydrogen. Global demand for PV systems is even growing exponentially.[2] Currently, this strategically important key industry is **dominated by China** due to a consistent and determined industrial policy over the past decade – in the **area of solar cells and modules at more than 90%** and in the **field of PV inverter technology at more than 60%**.

At the same time, the solar industry is facing a turning point **in the wake of a new innovation cycle**, comparable to the transition from 4G to 5G in mobile communications. Unlike the high profile digital sector, the most modern PV technology, including intellectual property, is **„Made in Europe"** – for now. In the context of this development, Germany and Europe have possibly the **last chance for a renaissance of PV production** – including the role as a pacemaker for the central key technology of renewable energies in the coming decades.

The 5G standard of photovoltaics is called **Heterojunction/SmartWire**. This combines the latest generation of solar cells with a worldwide unique connection technology. This significantly **increases the output** of the modules used, while **at the same time reducing the electricity production costs (€/kWh)**. Heterojunction/SmartWire modules are **market-ready** and ready for **large-scale production**. Both the accompanying business model and the manufacturing technology know-how are available. This is the basis for a **globally competitive production** that can hold its own in the long term – **also in relation to the Asian competition**.

In the field of **Inverter[3]/System Technology, the German PV industry has been a key innovation driver of the energy transition** from the very beginning. It has contributed significantly to the mass suitability and **enormous cost reductions of photovoltaics**.

With its high level of innovation, it continues to enable grid integration and efficient use of ever larger quantities of renewable energy.

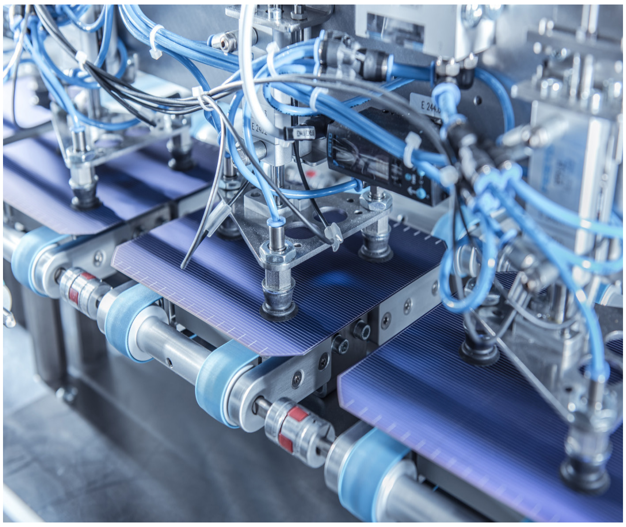
> This development is taking place in the slipstream of the political goals of the German energy transition and the European Green Deal: a European PV production supports and operationalizes the plans for these monumental and cross-generational projects and transforms them into domestic value creation.

At the same time, European cell, module and inverter production underpins the **desired sovereignty** in key technology areas – especially in the highly relevant energy sector – and promotes **greater supply chain resilience** for the post-Corona period through a strength-oriented European focus.

Exploiting this momentum **requires a holistic industrial strategy and new cross-sector and cross-association alliances**. Unlike in the past, this approach jointly covers **the generation of electricity and production of the necessary technology** and precisely addresses relevant tasks of the future (keyword sector coupling, electromobility and green hydrogen as well as the rapidly increasing demand for cost-effective, renewable electricity). Without an approach to European solar production based on strategic industrial policy, there is a short-term threat of complete technological dependence on Asian suppliers, a considerable reduction in the European depth of value added and the loss of a rich European research and development landscape along with current employment in the photovoltaic sector.

In addition, **concrete support measures** for the solar sector are necessary in the short term – above all in the form of fair **framework conditions** and the provision of **sufficient project and grant funding**. The operationalization of the Green Deal as well as the recovery measures currently being implemented to overcome the economic consequences of COVID-19 can define valuable standards here. Furthermore, a **program for German 10 million or a European 100 million roofs** could set standards for the way into the solar future.

The **German and European PV industry** has the necessary system understanding and the development and production capacities to take advantage of this historic opportunity to market the systems worldwide and maintain **a leading position in international competition**.



PICTURE: Meyer Burger

01

EXHIBITION AND VISION

Where do we stand?

In most regions of the world, photovoltaics already achieves the lowest costs for energy generation compared to the individual technologies. As a key technology of the future, it is indispensable for the implementation of climate targets and European energy sovereignty. The know-how for the new innovation cycle of the solar industry lies in Europe.

A SOLAR RENAISSANCE IS WITHIN REACH

Solar energy is experiencing a worldwide boom and is on the way to becoming by far the cheapest of all forms of energy generation. According to the International Renewable Energy Agency (IRENA), the electricity production costs of PV have fallen by 82% since 2010.[4]

Electricity from German ground-mounted systems now only costs around 5 cents per kWh[5] – the technology beats all fossil power plants.[6] Particularly advantageously located plants, such as in the Gulf region, now produce electricity for less than 1.5 cents per kWh.[7] In Europe, PV power plants are increasingly being installed without any subsidies or government tenders.

This trend of increasing performance and simultaneously reducing costs continues: The solar industry is currently on the threshold of a new innovation cycle. A new generation based on state-of-the-art heterojunction cells combined with efficiency-enhancing SmartWire connection technology is ready to take efficiency and international competitiveness to a new level. Its suitability for mass production has already been successfully proven.

While almost 95% of the value added in solar cells and modules today takes place in Asia, most of it in China, the intellectual property for next generation solar technology lies in Europe. With the Heterojunction/SmartWire technology, a permanently competitive production can be established in Germany and compete in the long term. Due to the expected high demand for solar modules in the EU member states, it makes sense to establish production facilities in other European markets.

The Fraunhofer ISE Institute and a study by the VDMA confirm that solar cells and modules can be produced competitively in Europe, partly because, among other factors, transport costs from Asia are eliminated. These contribute to about 10% of the total costs and will increase even further. The reconstruction of the European value chain should therefore be positioned at the heart of EU **energy policy**.[8]

Innovations by European manufacturers enable continuous efficiency increases and cost reductions in the field of PV system technology, too. New generations of large solar inverters deliver up to 50% more power than their predecessors at approximately the same volume and weight, while at the same time expanding functions such as system integration of battery storage.

With the increasing networking and digitalization of energy supply, additional requirements are being added, especially with regard to system integration and security of supply through PV as well as IT security. In this area, the European PV industry has an advantage over its Chinese competitors based on its free market organization and independence, and can guarantee higher standards of data security.

A favorable market environment confirms such statements and the growing demand for state-of-the-art modules for new and existing PV power plants:

- **Huge market potential.** The global and European market potential (new and existing systems) is immense. At the end of 2019, more than 580 gigawatts (GW)[9] of solar capacity was installed worldwide, thereof 132 GW in Europe[10] and almost 50 GW in Germany[11]. The use of solar power is steadily increasing. In Germany alone, experts expect a doubling of the electrical energy consumption from renewable sources by 2030 compared to today's electricity generation. In 2050, solar energy can meet about 25% of the growing global demand for electricity and thus become the second largest source of electrical energy.[13]
- **Record high in financed solar capacities.** The renewable energy **capacities financed** within one year reached a record high of 184 GW (excluding large hydropower plants) in 2019. Solar energy accounts for 118 GW of this – the **highest annual increase within a year** to date.[14]
- **PV growth rates fueled by European CO_2 reduction targets.** The EU Commission plans to raise the European **CO_2 reduction targets from 40% to 55% by 2030** (the European Parliament even requires 60%). To accomplish this giant leap, the installed PV capacity in the EU and the UK must be increased to 455-605 GW, according to a study by the Photovoltaic Research Institute IPVF. This means an **annual growth rate between 12% and 15%** to expand the European PV market from about 16.5 GW in 2019 to 50-80 GW by 2030.[15]
- **Germany ranks fourth worldwide in terms of investments in renewable energies in the last decade.** Between 2010 and 2019, Germany was behind only China, the USA and Japan with total investments of 156 billion euros. In 2019, 2.9 billion euros were invested in Germany in the installation of photovoltaic systems (an increase of 430 million euros compared to 2018) and 850 million euros in wind power.[16]
- **Sector coupling as a further driver for the expansion of solar capacities.** For implementation of the PV goals in the German climate protection program 2030, which provides for a doubling of the total installed capacity to about 100 GW by the end of this decade, an **annual increase of at least 5 GW of capacity is necessary** in Germany alone. As part of the intended **sector coupling**, it is not only energy production but also **transport (especially e-mobility),**

(industrial) heat and building/living that are becoming the application focus for solar energy. It can therefore be assumed that gross electricity consumption in 2030 will be far above today's requirements. The mechanism for adjusting the expansion corridors provided for in EEG 2021 will probably need to be adjusted to 10GW/a in order to achieve the set targets in 2030.

Additional economic and political objectives and social developments are in favor of PV production in Germany and Europe:

JOB ENGINE

The revitalization of a European PV industry would create about 14,000 direct permanent jobs at an annual production of 20 GW (from wafer to module). In addition, jobs will be created through the installation, operation and maintenance of commercial and industrial solar systems. Overall, a revival of the European solar industry promises to **create more than 100,000 sustainable jobs along the value chain.**[17] This can partially compensate for a reduction in employment as part of the coal phase-out and in other carbon-intensive processes.

GERMAN ENERGY TRANSITION AND EUROPEAN GREEN DEAL

Germany is currently planning a CO_2 reduction of 80 to 95% by 2050 compared to 1990 and a 65% share of renewable energies in gross electricity generation by 2030. The Green Deal as a central project of the EU Commission under Ursula von der Leyen even provides for climate neutrality by 2050 and a Europe-wide decarbonization of the energy sector with a renewable share of 38-40% by 2030. Both **goals can only be achieved by significantly accelerating the expansion of regenerative capacities, including solar**.

CONTINENTAL RECYCLING ECONOMY

The EU project aligns the entire value chain of a product and its life cycle – from development to production and recycling – with environmental sustainability. In this context, **European PV production** is plausible and **would significantly improve the CO_2 footprint compared to solar technology, which has so far mainly been produced in Asia, through location policy measures alone**. In addition, the European solar industry is working urgently to develop its own standards for the recyclability of its products.

EUROPEAN INDUSTRIAL STRATEGY AND TECHNOLOGICAL SOVEREIGNTY

Greentech is the key technology of the 21st century alongside digitization. In contrast to AI or autonomous driving, the **patents and technological leadership in the field of photovoltaics are still in Europe**. The planned European production of solar cells and modules as well as the strengthening of European production in the field of PV system technology will **enable the safeguarding of long-term national and European industry and infrastructure interests in the context of global challenges** such as the climate and COVID 19 crisis. **In terms of energy security**, the use of renewable energies not only enables a cost-effective and climate-friendly supply, it also puts Europe in a position to confidently **handle imports of raw materials** from politically unstable regions. In addition, having our own production facilities allows us to adapt our relationship with China and avoid new dependencies in the energy sector with certainty. The People's Republic has been particularly aggressive in its pursuit of strategic interests in the field of renewable energies and in the past has actively promoted the acquisition and migration of European cutting-edge technology in the context of the strategic development of a monopolistic solar industry. Domestic solar value creation allows Europe to benefit from the fruits of its intellectual work, which has expanded for years thanks to excellent research funding in Europe and Germany. It makes this **indispensable sector resilient to future crises in the sense of the EU's desired "technological autonomy" and "reshoring"**.

PICTURE: Meyer Burger (Photovoltaic Production in Germany)

ACCEPTANCE AND AREA

Solar energy is the energy source that currently enjoys the **highest consumer acceptance**. This enables it to close the gaps, especially in the area of roof systems, that opened up with acceptance difficulties for onshore wind turbines. At the same time, solar energy is flexible and scalable, which means that areas already occupied can be used several times, for example in rooftop installations, alongside transport infrastructures such as freeways and railroad lines, in "agricultural photovoltaics" or by means of floating PV. Nevertheless, the availability of land in densely populated Europe will also be a critical factor for photovoltaics in the medium to long term. It is therefore important to push for the most **efficient use of land** right away. The more efficient the PV modules and inverters used, the more energy can be obtained from the limited space – the new **highly efficient Heterojunction/ SmartWire technology** "Made in Europe" can set the standard for this.

PICTURE: Next2Sun (Agricultural Photovoltaics)

ALTOGETHER, PV PRODUCTION IN GERMANY AND EUROPE IS ECONOMICALLY AND POLITICALLY BENEFICIAL ALONG THE ENTIRE VALUE CHAIN.

PV PRODUCTION "MADE IN EUROPE" CAN BE THE BREAKTHROUGH FOR THE IMPLEMENTATION OF POLITICAL GOALS IN THE ENERGY TURNAROUND AND FOR A MORE INTENTIONAL INDUSTRIAL STRATEGY.

EXCURSION TECHNOLOGY

HETEROJUNCTION/SMARTWIRE CONNECTION (SWCT™) PHOTOVOLTAICS TECHNOLOGY

The **Heterojunction/SmartWire (HJT/SWCT™)** cell/module technology combines two high-performance technologies. The modules that combine HJT cell technology and SmartWire Connection Technology achieve a particularly high efficiency and are superior to most other available technologies in terms of performance. Energy yields on the same area are up to 20% higher than with conventional PV technologies.

The advanced **Heterojunction cell technology (HJT)** combines the higher module efficiency of monocrystalline solar cells with advantages of thin-film technologies. For the production of the electrical structures, thin layers of amorphous silicon as well as transparent, conductive oxide layers (TCO) are deposited on both sides of a silicon wafer. The double-sided coating gives an HJT cell performance optimization features and can, for example, absorb light on both sides (bifaciality). The silicon wafer inside the cell produces electricity, the coating reduces transmission losses of electrical energy. The efficiency of the cell is therefore particularly high, at over 24%. Heterojunction cells have a significantly lower temperature coefficient than conventional silicon solar cells, resulting in significantly improved energy yields at higher operating temperatures. The HJT technology is able to work with significantly thinner silicon wafers, which reduces costs and above all the CO_2 footprint of photovoltaics.

The **SmartWire Connection Technology** connects solar cells with a foil-wire electrode. The cell connection on both sides of the cell is made by means of many very thin, round copper wires, which create up to 2,000 contact points per cell and replace the previously used conductors (busbars) as the central distributor of electrical energy. The round copper wires also ensure that the amount of sunlight reflected on the cell increases, power generation starts earlier in the day and therefore electricity is generated for longer and without interruption. Thus the energy yield (kWh/kWp) is higher than that of modules with busbar connections. SWCT technology conserves materials such as silver, which reduces manufacturing costs. Furthermore, the SWCT technology is completely lead-free, which is essential for Europe with regard to the Electronic Scrap Directive (RoHS) and cannot be achieved to the same extent by alternative technologies.

02

CALL TO ACTION

Recommendations for political action: Identifying opportunities, improving framework conditions and setting a strategic course

Despite groundbreaking research and development and a considerable production history in Germany and Europe, we depend on imports from the Far East and especially from China for about 95% of our PV cells and modules and over 60% of our PV inverters.

> Although the demand for solar systems is growing rapidly throughout Europe, there is a threat of a further, final sell-out of cutting-edge technology developed here. But political foresight can help change that outcome.

The foundations for a successful future of solar value creation in Germany and Europe have been laid and join with an advantageous market environment. In order to derive real success from this backdrop of opportunities, a number of supporting measures are required:

I. ECOSYSTEM OF RENEWABLE ENERGIES HOLISTIC THINKING: ALLIANCES, FINANCING AND PROMOTION FOR PV GENERATION AND PRODUCTION

The focus of national and European solar initiatives and programs is always on the production of photovoltaic energy. This approach ignores the actual basis, the production of solar technology as the beginning and origin of the solar value chain – including the associated economic and strategic opportunities, but also threatening dependencies. This is where a **holistic perspective and planning** will be required in the future.

The European production capacities for wafers and modules currently still in operation are less than 2 GW. Solar cells, the actual "engine" of a solar module, are no longer produced in Europe. In order to **expand production on a large scale, sufficient financial resources** in the form of specially created credit lines are needed as the first step. The **funding objectives of national and European project and funding banks should be adapted and explicitly include the production of solar technology**. Until now, PV has generally only been eligible for support in the area of electricity generation, whereas the production of PV technology is not planned or is classified as a risk area. This leaves key areas of future industrial value creation to China in particular and creates dependencies.

It would also be beneficial to have an alliance of leading companies and associations from all value-added sectors involved, which would jointly draw up a "Solar Energy Master Plan" and leave behind the previous division into production and generation.

II. GREEN RECOVERY TO OVERCOME THE ECONOMIC CORONA COSEQUENCES

National and European economic stimulus programs are the central lever for coping with the immense economic consequences of the COVID 19 pandemic. The European recovery instrument "Next Generation EU", with its impressive volume of 750 billion euros, plans to increase existing funding and create additional funding (including the Just Transition Fund to help member states accelerate the transition to climate neutrality).

The Green Deal is intended to act as a strategy for the recovery program. Investments in e.g. renewable energy projects, clean technologies and value chains as well as a massive renovation wave of buildings and infrastructure will be the main focus. In order to strengthen the resilience of the economy, Europe should also build its **strategic autonomy** in a number of specific areas, including strategic value chains. Here, solar production should be explicitly included and promoted.

In view of both the security of supply and the forecast massive increase in PV expansion, and in the interest of more resilient production chains, **production should take place regionally in the EU and be accompanied by resources from the recovery funds.**

III. USE EEG-REFORM NUTZEN UND PV-AUSBAU VERVIELFACHEN

If the climate policy goals of the Paris Climate Agreement are to be achieved, the annual expansion target corridor of the EEG amendment of effectively just under 5 GW is clearly too low. What is needed is an annual increase of well over 10 GW. This is also supported by the expected increase in electricity demand due to the growing field of electromobility, digitization and hydrogen applications in the coming decades.[18]

Due to the massive drop in the cost of PV power generation, the economic costs of a significantly higher expansion can not only be absorbed, they will even pay off in the end. So-called grid parity, which refers to the equal electricity production costs of renewable and fossil energies, has already been achieved today. In this context, solar energy not only pays off in applications for own consumption, it also increasingly gets by without any public subsidies for large solar power plants.

IV. STRENGTHEN OWN CONSUMPTION AND PROSUMERS

The own consumption of PV electricity is an **essential component of a decentralized energy transition**. For both private consumers and for trade and industry, electricity costs have become a sensitive cost item that can be significantly reduced by using PV systems (with or without storage). At the same time, decentralized power generation relieves the transmission grids where expansion is faltering. Own consumption should therefore be **encouraged and not hindered**.

A first step on the way to an advantageous prosumer society is a generous increase of the minor limits for exemption from the EEG reallocation charge[19] along with simplification for the commercial and industrial sector. In particular, **PV own consumption** can **become a competitive factor for**

medium-sized companies that do not benefit from exemptions for large industrial consumers. In order to effectively reduce electricity costs and improve the climate balance here, it is necessary to **reduce rather than increase regulatory and bureaucratic hurdles**.

In this context, the requirement for plants of 500 kW and more to participate in tenders should be revised, as it particularly affects medium-sized companies and their roof areas, which will become increasingly important in the future.[20] The middle class must be free to decide how and where it gets its energy. On the contrary, particularly in view of the potential and the increased use of the roof segment that has so far been under-utilized, there should be an additional bonus for optimal utilization in terms of highest energy yields on existing roof areas. There is a huge potential for PV systems of over 160GW.[21]

In order to avoid burdening consumers without the possibility of generating their own electricity, we support **grid-compatible control of PV systems** and a fundamental reform of taxes, charges and levies on electricity in the near future.

V. MAINTAINING SOCIAL ACCEPTANCE BY PROMOTING THE EXPANSION OF PV SYSTEMS THAT PROTECT THE LAND

The space required for PV expansion will be increasingly contested. So far, only a few people have given much thought to the **land consumption of photovoltaics**, as there are few conflicts and land is available either free of charge (roof) or relatively cheap (open space). This will change with the increasing penetration of areas with PV and competition from other land uses. In order not to run into similar conflicts as with onshore wind energy, **politics should already intervene today to control land use**. After all, social acceptance of the energy transition is essential for its success, in the future as well. The **use of the most efficient technology is therefore essential** in order to gain as much energy as possible from a minimum area, both for roof systems and open space systems. The market is currently steering in the wrong direction here, because the price alone speaks for the cheapest product.

A **top-runner approach** is a suitable instrument for steering this development in a profit-maximizing, sustainable direction. It is based on a **predefined yield standard** and minimum requirements for quality, life cycle and sustainability (ecolabel), which are to be achieved **in tender segments or specific contract categories** (a level playing field for environmental standards). Public sector facilities or municipal real estate will particularly benefit from faster amortization and higher degree of innovation.

The product group specific standard is defined and continuously refined in the light of expected technical progress. A distinction should be made between the roof and open space segments. **High-efficiency modules** could be given preference here within the framework of **minimum**

criteria for participation in tenders, corresponding innovation tenders or promotion bonuses for **higher-yielding plants**.

In the open space segment, the use of bifacial modules, in addition to high module efficiency, is essential for optimal yield per unit area. These modules can use both direct irradiation on the front side as well as the indirect light on the back side to generate electricity. Meyer Burger proposes a minimum **bifacial module efficiency of 25%** for this approach. Alternatively, a "land conservation bonus" on the granted feed-in tariff would be conceivable, provided that PV modules with these minimum parameters are used.

VI. ESTABLISHING NEW SOLAR CONCEPTS

With the necessary massive expansion of solar energy, **long-term land use concepts** must be considered. Space in Europe is scarce and the expansion of photovoltaics must not be at the expense of excessive land consumption. This is why new concepts such as agricultural photovoltaics, in which agricultural land is also used as site for photovoltaics, or floating PV on lakes are gaining in importance. This requires, **in particular, incentives for farmers** in order to sensitize them to the associated opportunities for greater sustainability and a further financial pillar.

In general, wherever possible, a solar extension to (state-owned) infrastructures such as freeways and railroad lines, quarry ponds or alpine infrastructures such as dams should be considered. In order to promote this development, separate tender segments or an award bonus should be introduced in the existing innovation tenders for agricultural and floating photovoltaics.

VII. INITIATE NATIONAL 10 MILLION / EUROPEAN 100 MILLION ROOFS PROGRAM

In order to additionally boost **PV demand for the development of a secure, cost-effective and climate-friendly energy supply and in the interest of the economy and technology leadership, and to position Germany as a leading solar market**, the German government should set up a national 10 million roofs program. The project would have a European and international signal effect and could be taken up and expanded by the European Union.

Building blocks for a corresponding initiative would include a mandatory installation of solar systems for new buildings (initially in the public sector, later also in the private sector), fundamental combination with intelligent home storage systems and the area of e-mobility (would have additional positive effects for relieving the burden on the electricity grids and expanding e-mobility), further development and simplification of the tenant electricity models

(additional potential: 3.8 million tenant households[22]) and special tenders for large-scale PV systems in urban areas as a separate segment within the PV auctions above 750 kW (leads to an improved position compared to the other, larger module classes). On a European level, a similar 100 million roofs program could be established with a correspondingly higher target level.

VIII. LEVERAGING SYNERGIES WITH THE ELECTROMOBILITY SECTOR

The decarbonization of the mobility sector can be achieved primarily through a rapid market ramp-up of electromobility. In view of the German and European CO_2 reduction targets, **only electricity from locally generated renewable energy sources will be considered for the electric charging of e-vehicles in the medium term**. For this reason, there should be a similar legal regulation within the next five years to establish requirements for public-sector vehicle fleets. Later, this should be expanded step by step for both commercial and private electric cars – analogous to the expansion of renewable energies and power grids.

PICTURE: Markus Distelrath on Pixabay

03

LIGHTHOUSE PROJECTS

What the solar energy of the future could look like.

I. GIVING EXISTING INFRASTRUCTURE A GREEN FUTURE: FLOATING PV IN THE HAMBACH OPENCAST MINE

Solar parks offer an innovative possibility for the use of opencast mines in Germany after the coal phase-out and broaden the overall scarce space available.

Against this background, Gunter Erfurt, CEO of Meyer Burger, presented his idea of a floating solar park on the site of the Hambach opencast mine.[23] After the already planned flooding, up to 50 million solar modules with an output of 10 GW could be installed on the area of 50 square kilometers. This is roughly equivalent to the electricity generated by the Weisweiler, Neurath, Niederaussem and Frimmersdorf coal-fired power plants in the Rhenish mining district, which the opencast mine has supplied to date. Another advantage of using the Hambach opencast mine for sustainable electricity production would be that **the existing power transmission lines for the power plants could continue to be used**.[24] In addition, the regional production of solar cells would create **about 8,000 new jobs** in a region dependent on coal mining. Similar concepts can be transferred to other lignite mining areas in Germany and Europe.

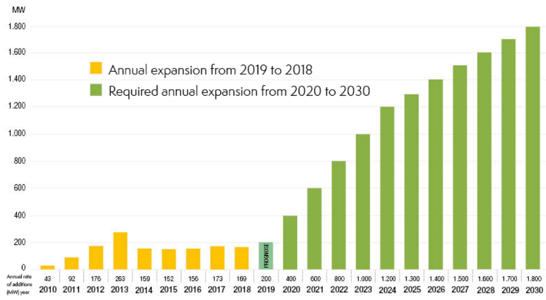
PICTURE: AFP

II. TAKE PEOPLE ON THE JOURNEY: THE 1 MILLION PHOTOVOLTAIC ROOFS PROGRAM IN AUSTRIA

The Austrian coalition government of the Austrian People's Party (ÖVP) and the Greens presented a 1 million photovoltaic roofs program as part of their 2020-2024 government program. This is intended to help achieve the government's ambitious goals. Thus Austria is to obtain 100% of its electricity from renewable energies from 2030. This will require an additional 27 terawatt hours (TWh) of renewable energies, of which 11 TWh are planned for photovoltaics.

The 1 Million PV Roofs Program is an addition to the existing 100,000 Roofs Photovoltaic Program, which will be accompanied by the **easing of administrative hurdles**. Among other things, it will **simplify the legal framework for PV systems**, enable the expansion of existing systems without losing the feed-in tariff, extend the performance-related subsidy limits and promote the installation of PV systems outside buildings on sealed areas or the dual use of areas.

Added PV power in Austria 2010 - 2018 and required expansion



SOURCE: PV AUSTRIA

Many of these **positive approaches can also be transferred to other European countries**.

III. STRIVING FOR ENERGY SOVEREIGNTY ROLE MODEL: POLITICAL SUPPORT FOR THE PRODUCTION OF BATTERY CELLS

The **establishment of a – politically supported – European battery cell production** is a good example for similar necessities in the PV sector. Since the market here has also been left entirely to Asian suppliers, the EU Commission has now **classified European manufacturing expertise as an important project of European interest (IPCEI)**. The goal is to build the most innovative and sustainable batteries in time for the expected ramp-up of electromobility. This is intended to secure value creation and jobs in Europe and strengthen technological sovereignty.

The first major project for industrial battery cell production in Europe is a factory in Kaiserslautern, Germany, which is being built together with Opel and PSA and is to produce batteries for electric cars from 2025 - creating 2,000 new jobs. The project **benefits from relaxed state aid rules** and is subsidized by France, Germany and the EU with a total of 1.3 billion euros.

SOURCES

1. See: https://www.ewi.uni-koeln.de/de/news/ee-ziel-2030/.

2. Note: According to current estimates, the global PV market will triple to 300 GW by 2030; cf: https://www.sma.de/filead-min/content/global/Investor_Relations/Documents/Praesentationen/2020/20200813_Analyst_Investor_Presentation_Half_Yearly_Statement_H1-2020.pdf

3. Explanation: An inverter is a device for converting DC voltage into AC voltage (with the least possible loss of efficiency).

4. See: https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019.

5. See: https://www.pv-magazine.de/2020/10/26/durchschnittlicher-zuschlagswert-fuer-photovoltaik-steigt-minimal-auf-523-cent-pro-kilowattstunde/.

6. See: https://www.ise.fraunhofer.de/content/dam/ise/de/documents/publications/studies/DE2018_ISE_Studie_Stromge-stehungskosten_Erneuerbare_Energien.pdf (Note: Due to the sharp rise in CO_2 certificate prices in the meantime, it can be assumed that the production costs of electricity from lignite are also higher than the costs of PV.).

7. See: https://www.pv-magazine.com/2019/11/22/dubai-confirms-saudis-acwa-won-900-mw-solar-project-tender-with-0-016953-kwh-bid/ (Note: Price converted from USD to EUR; IRENA - Renewable Power Generation Costs 2019).

8. See: https://www.pv-magazine.de/2018/09/11/photovoltaik-produktion-in-europa-wettbewerbsfaehig-moeglich/.

9. See: https://www.pv-magazine.com/2020/04/06/world-now-has-583-5-gw-of-operational-pv/#:~:text=Global%20grid%2Dconnected%20solar%20capacity,the%20International%20Renewable%20Energy%20Agency.

10. See: EU Market Outlook for Solar Power: 2019-2023 – SolarPower Europe.

11. See: https://www.pv-magazine.com/2020/01/31/germany-added-almost-4-gw-of-pv-in-2019/#:~:text=Overall%2C%20Germany's%20cumulative%20solar%20capacity,for%20solar%20subsidies%20is%20reached.

12. See: Das BEE-Szenario 2030 – Bundesverband Erneuerbare Energien.

13. See: https://www.irena.org/publications/2019/Nov/Future-of-Solar-PhotovoltaicSiehe: Global Trends in Renewable Ener-gy Investment 2020 – Frankfurt School – UNEP Collaborating Centre.

14. See: Global Trends in Renewable Energy Investment 2020 – Frankfurt School – UNEP Collaborating Centre.

15. See: Solar Europe Now – Call to Action for a solar-inclusive Green Deal – IPVF, May 2020.

16. See: Global Trends in Renewable Energy Investment 2020 – Frankfurt School – UNEP Collaborating Centre.

17. See: Solar Europe Now – Call to Action for a solar-inclusive Green Deal – IPVF, May 2020.

18. Note: Due to sector coupling and the electrification of industrial manufacturing processes, gross electricity consump- tion could rise to as much as 750 terawatt hours in 2030 (see leading Dena study, EMI study of 2020).

19. Note: The Renewable Energy Directive of the EU RED II stipulates in Art. 27 that all apportionments up to 30kWp are to be removed by mid 2021.

20. See: https://www.pv-magazine.de/2020/11/03/eupd-research-eeg-entwurf-verhindert-bis-2030-drei-milliarden-euro-investitionen-in-gewerbliche-photovoltaik-anlagen/.

21. Lödl, Martin among others: Assessment of the photovoltaic potential on roof surfaces in Germany; 11th Symposium on Energy Innovation, 10-12 February 2010, Graz/Austria, working paper, p. 12.

22. See: https://www.bmwi.de/Redaktion/DE/Pressemitteilungen/2017/20170124-studie-mieterstrom.html.

23. See: https://www.radiorur.de/artikel/mega-solarpark-im-tagebauloch-581120.html.

24. See: https://www.radioerft.de/artikel/solarpark-auf-dem-hambacher-see-als-vorbild-fuer-europa-594407.html.

CONTACT

MEYER BURGER (GERMANY) GMBH

AN DER BAUMSCHULE 6-8
D-09337 HOHENSTEIN-ERNSTTHAL

+49 3723 671 101
info-hohenstein@meyerburger.com

MEYER BURGER