



Federal Ministry
for Economic Affairs
and Energy



MITTELSTAND
GLOBAL
EXPORTINITIATIVE ENERGIE

energy solutions – made in Germany

Solar power for a sustainable industry sector – Implications for Germany and the Philippines

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7th of May
Manila



Facilitator



Agenda

- **Introduction - Reiner Lemoine Institut**
- **Overview – PV in Germany**
- **Motivation – PV for a sustainable industry sector**
- **Closer look – PV self-consumption**
- **At a glance – fields of application in Germany**
- **Excursus – potential applications in the Philippines**

Reiner Lemoine Institut

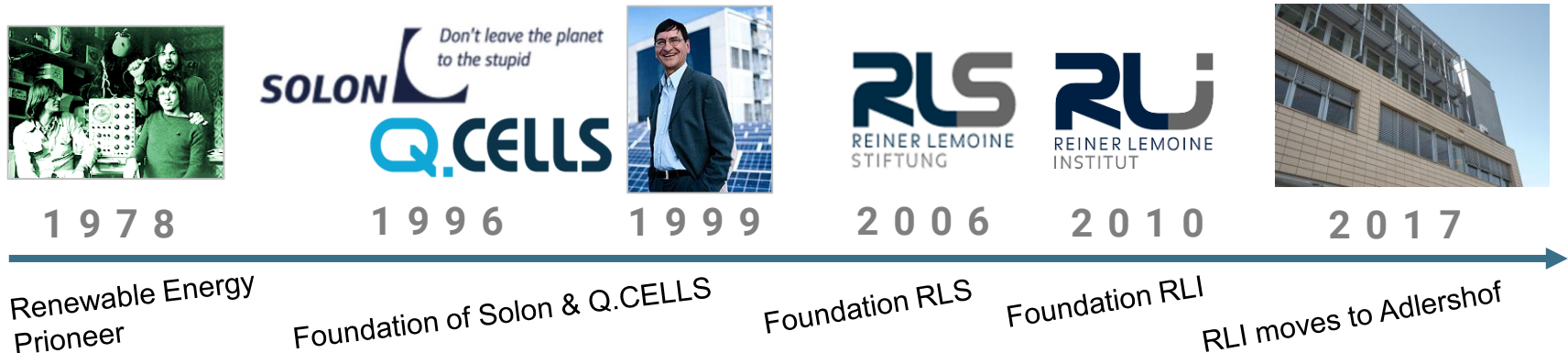
- Non-profit research institute
- 100 % subsidiary of Reiner Lemoine-Foundation (RLS)
- Founded 2010 in Berlin
- Managing Director: Dr. Kathrin Goldammer
- ≈ 70 researchers and students
- Member of e.g.: ARE, Eurosolar, SDSN, dena



Reiner Lemoine
Founder of Reiner Lemoine-Foundation



Reiner Lemoine Institut



- **General Goals of RLI**

We conduct applied research to scientifically support the long-term transition of the energy supply system towards renewable energy.

- **Staff**

Today about 70 researchers, organized in 3 Teams

Reiner Lemoine Institut

Transformation of Energy Systems

We analyze and optimize future scenarios with an energy supply largely based on renewable energy sources.

- Scientific monitoring of the energy transition– on national, regional and EU-Scale
- Simulation and optimization of cross-sectoral energy systems
- Analysis of single technology performances in integrated energy systems (energy storage, PtG, PtH, cogeneration)
- Research on transitional energy processes

Mobility with Renewable Energies

We analyze sustainable mobility concepts through sophisticated implementation and optimization of renewable energy systems.

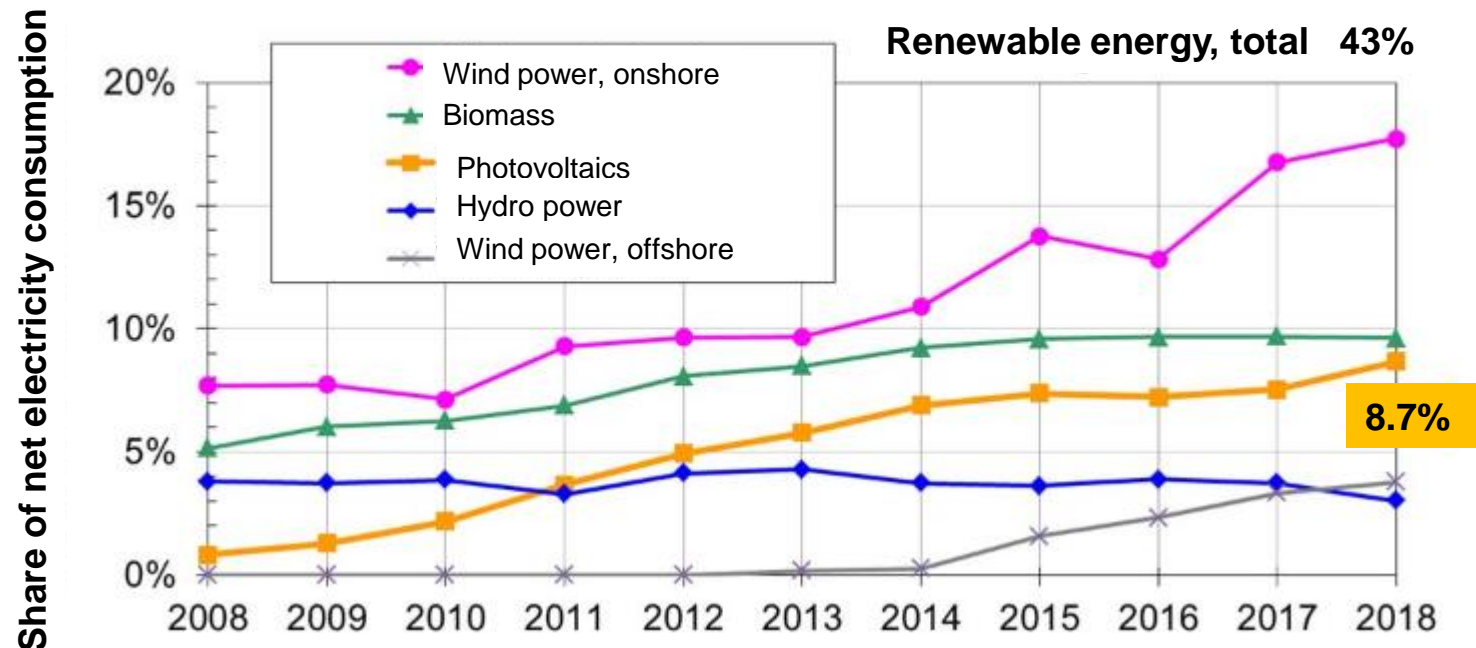
- Battery electric mobility: propulsion of vehicles using electric energy from Renewable Energies
- Hydrogen-electric mobility: production of hydrogen via electrolysis and Renewable Energies
- Synthetic-methane-gas-based mobility: production of methane gas via electrolysis, Renewable Energies and methanation

Off-Grid Systems

We support the development of sustainable energy supply for remote regions.

- Strategies for rural electrification
- Simulation and optimization of hybrid mini-grids
- Combining GIS-analyses and energy system simulations
- Market potential analyses and business implementation strategies

PV in Germany – recent developments



Source: Fraunhofer ISE. Aktuelle Fakten zur Photovoltaik in Deutschland (2019)

PV in Germany – Facts for 2019

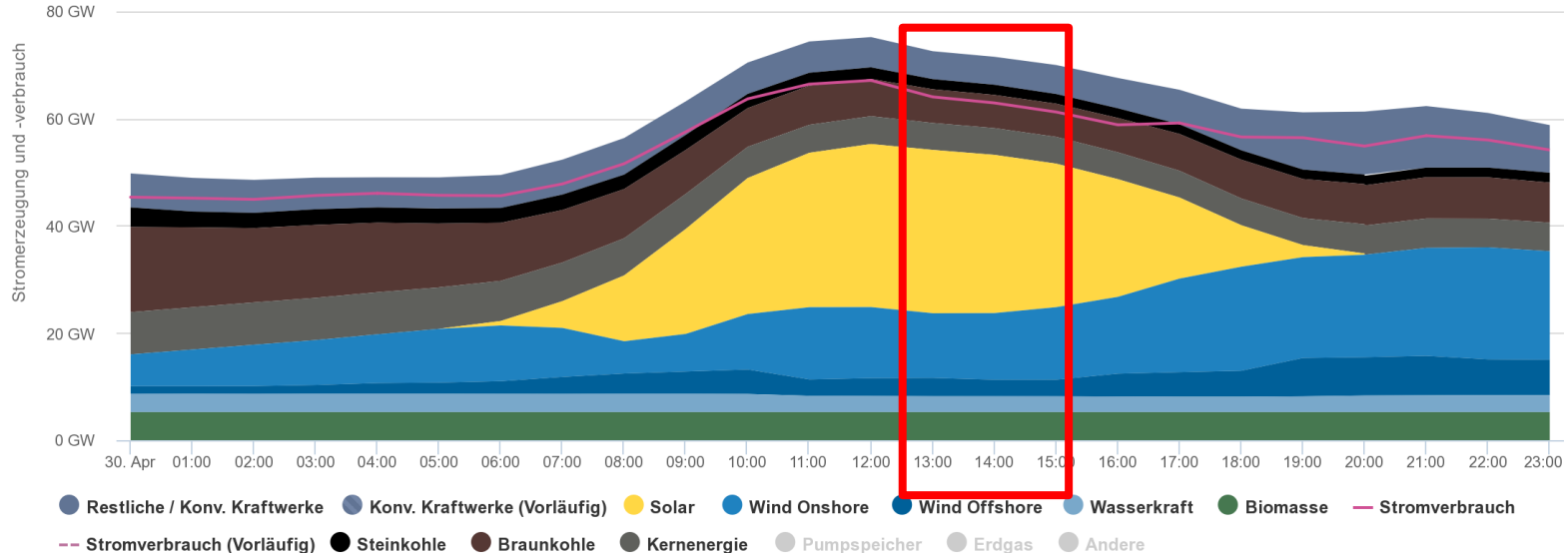
- **45.9** GW of PV installed
- PV power generation of **46** TWh
- **1.6 million** PV facilities
- PV power covers up to **45%** of demand on workdays and up to **60%** of demand on weekends
- PV power remains one of the main technologies for achieving Germanys RE targets and the “Energiewende”
(**35%** by **2020** and **80%** by **2050**)



Figure: PV plant and roof-top PV in Bavaria.
Source: Matthias Resch

Source: Fraunhofer ISE. Aktuelle Fakten zur Photovoltaik in Deutschland (2019)

Record for renewable energy share: April 2017



- 85% renewable energy share between 13h – 15h
- Average RE share for entire day was 64%

- Very high generation from solar and wind power plants at the same time
- Lower demand on Sunday

Source: Agora Energiewende Agorameter

PV in Germany – Energiewende next steps

Till 2020 (Focus: Flexibilisation)

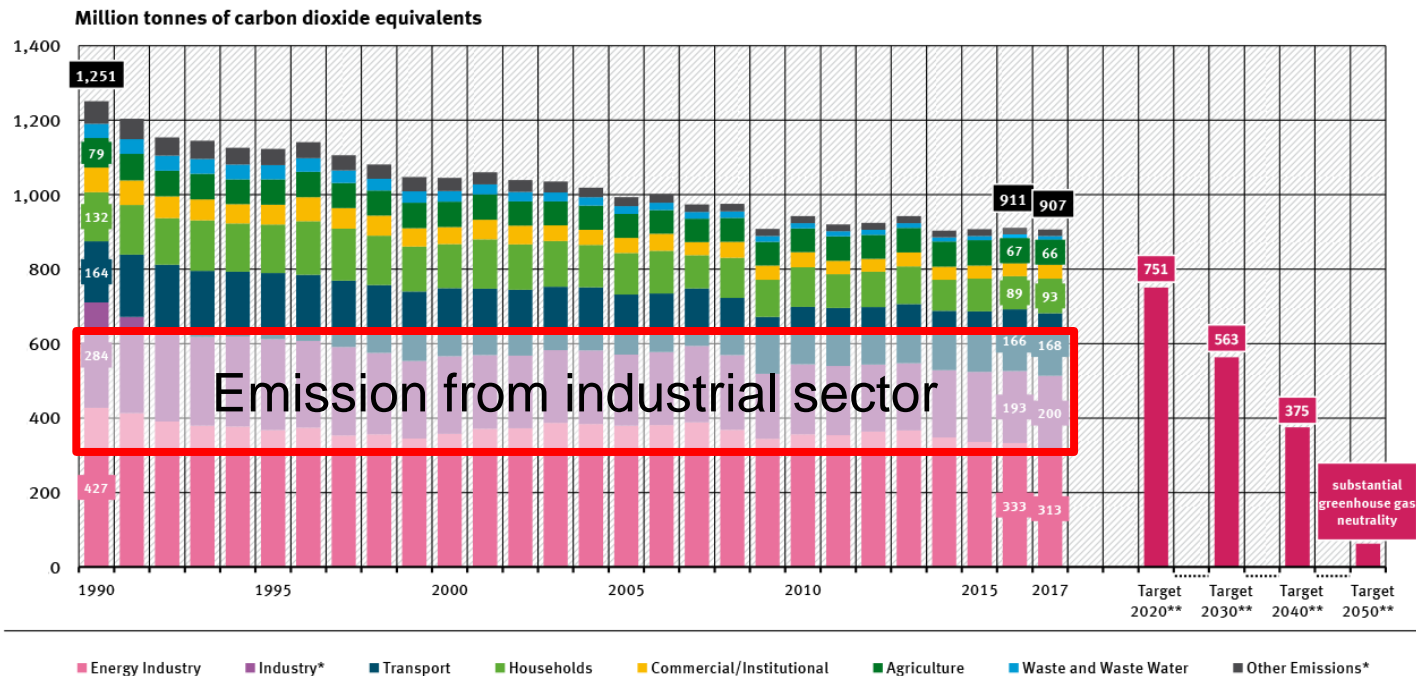
- 52 GW PV power capacity
- Increased energy efficiency focusing on night time consumption
- Smart demand management
- Integration of battery storage solutions
- Reinforcement of grid connection to neighbouring countries

Beyond 2050 (Focus: Storage)

- 200 GW PV power capacity
- Integrated renewable energy storage system, power-to-gas
- Increased energy efficiency focusing on buildings
- Heat supply 100% covered by RE
- Transport sector mainly relies on electro mobility or RE gas driven vehicles

Motivation – Why do we need PV in the industry?

Emission of greenhouse gases covered by the UN Framework Convention on Climate



Emissions by UN reporting category, without land use, land use change and forestry

* Industry: Energy and process-related emissions from industry (1.A.2 & 2);

Other Emissions: Other combustion (rest of CRF 1.A.4, 1.A.5 military) & fugitive emissions from fuels (1.B)

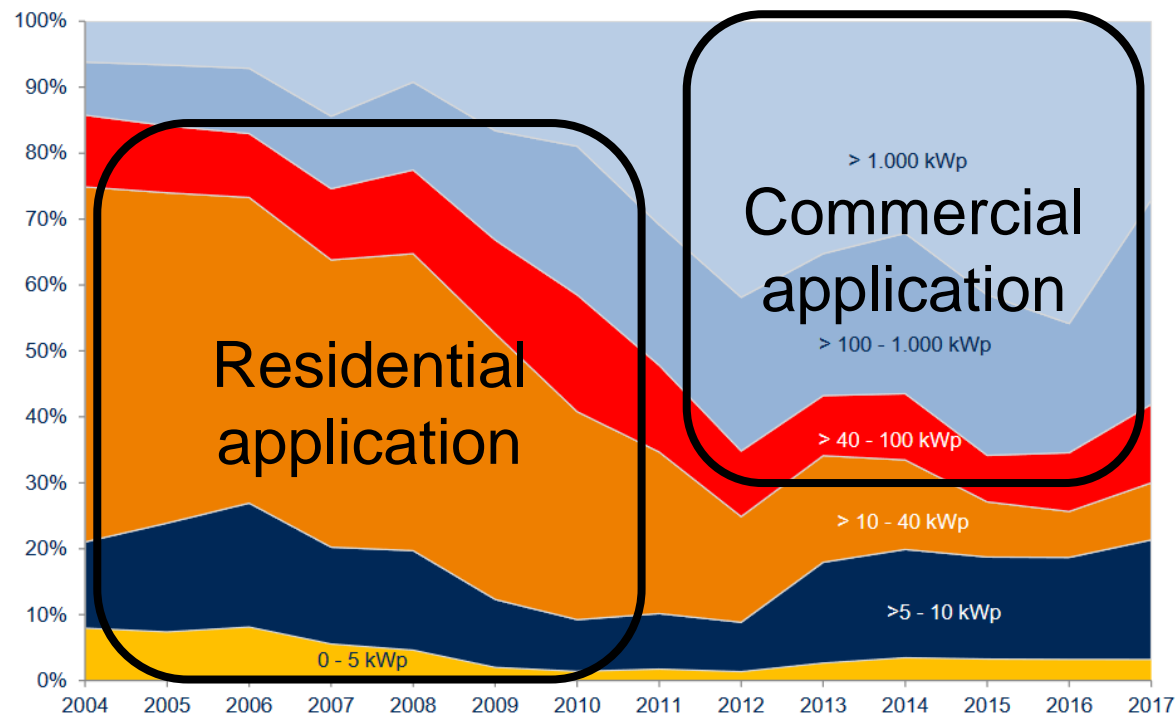
** Targets 2020 to 2050: Climate Protection Plan 2050 of the Federal Government

Source: German Environment Agency, National Inventory Reports for the German Greenhouse Gas Inventory 1990 to 2017 (as of 01/2019)

Source: Umweltbundesamt 2019

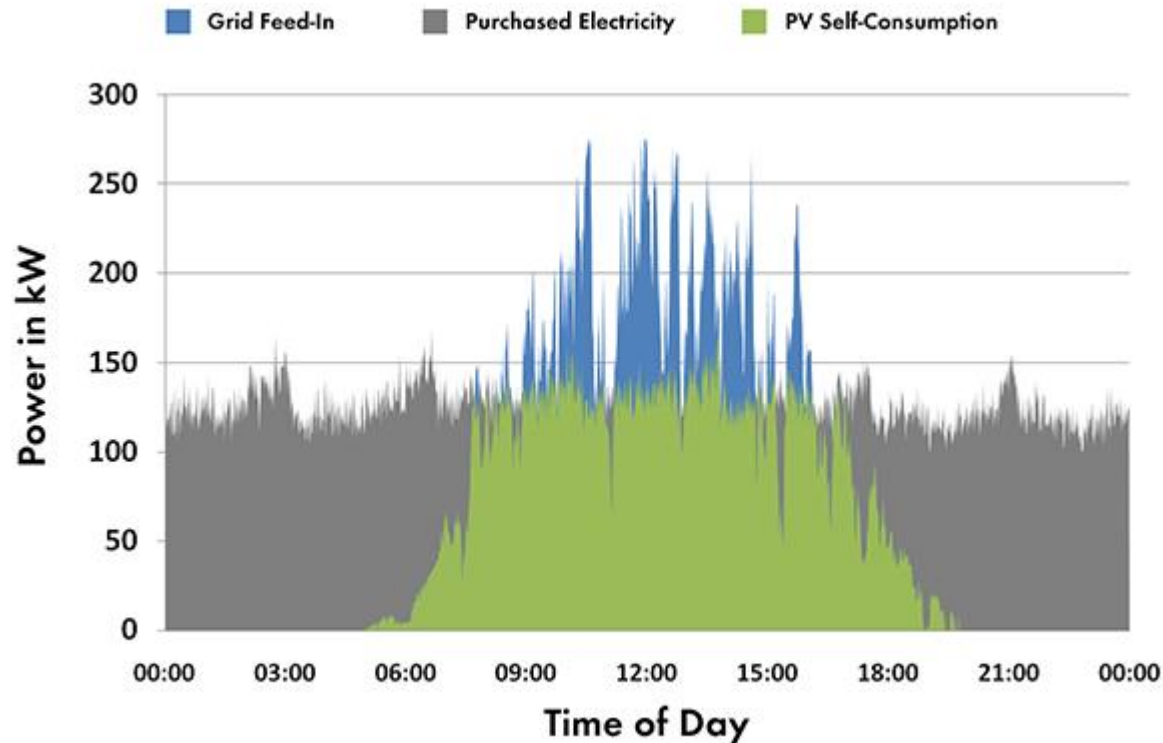
Motivation – Why do we need PV in the industry?

Size classes of PV installations from 2004 - 2017



Source: BSW-Solar 2018

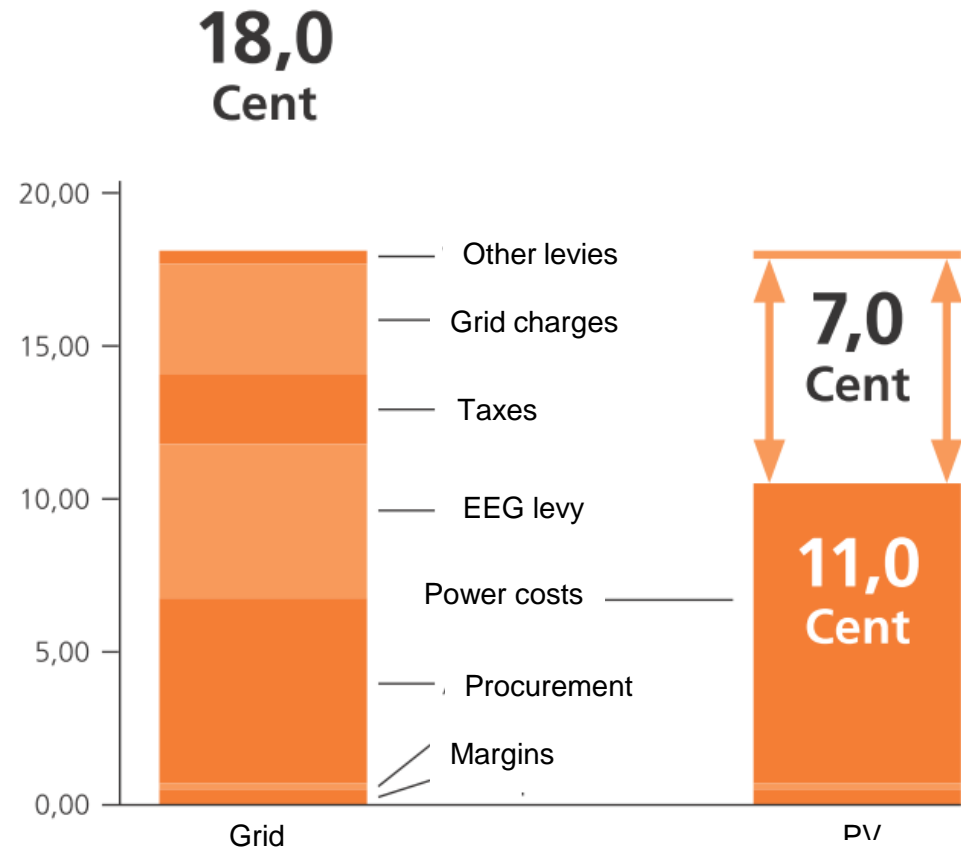
Closer look – PV self-consumption for industry and commercial sector



Source: SMA 2019

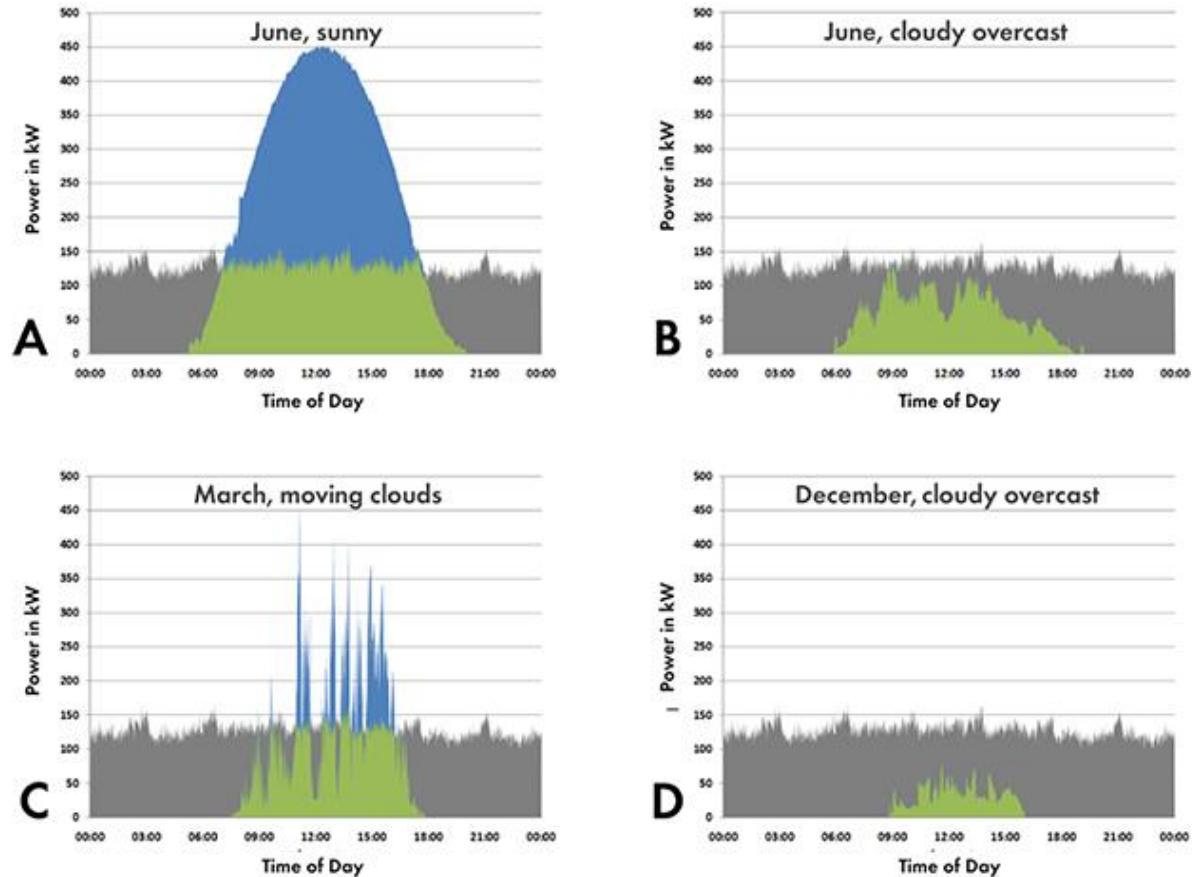
Closer look – PV self-consumption for industry and commercial sector

- PV self-consumption is more attractive due to reduced feed-in tariffs
- Power costs can be significantly reduced
- Commercial and industrial customers can improve their ecological impact



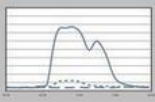
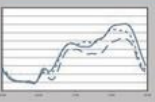
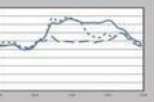
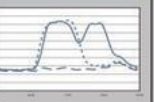
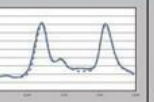
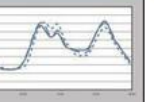
Source: WINAICO

Closer look – PV self-consumption for industry and commercial sector



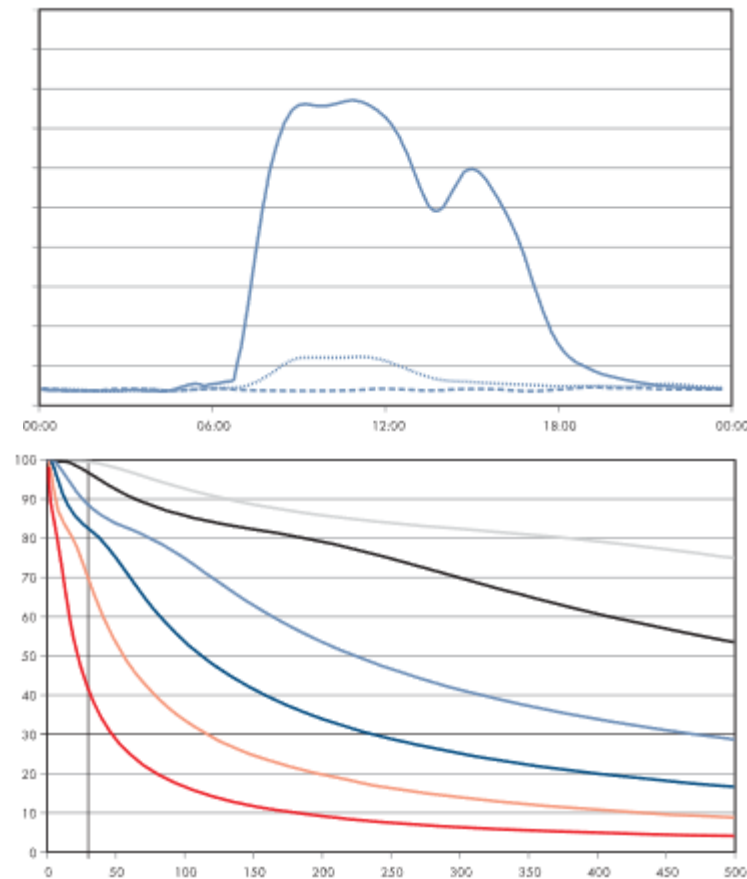
Source: SMA 2019

At a glance – fields of application in Germany

	Gewerbe werktags (8 - 18 Uhr)	Gewerbe überwiegend Abendstunden	Gewerbe durchlaufend	Gewerbe Ladenöffnungszeiten	Landwirtschaftsbetriebe mit Milchwirtschaft	Sonstige Landwirtschaftsbetriebe
	G1	G2	G3	G4	L1	L2
Charakteristisches Lastprofil						
Typischer Eigenverbrauchsanteil* <small>* basierend auf in diesen Anwendungen typischem elektrischem Energiebedarf und möglicher Photovoltaik-Leistung auf Gebäuden</small>	10 - 90 %	10 - 100 %	10 - 100 %	10 - 90 %	20 - 70 %	10 - 100 %
Anwendungen	Bürogebäude: <ul style="list-style-type: none"> • Bildung • Kantinen • Krankenhäuser • Verwaltungen • Behörden • Banken • Dienstleister • Praxen etc. Produz./verarb. Gewerbe: <ul style="list-style-type: none"> • Bau • Werkstätten und Autohäuser • Metall • Elektro • Holz • Fahrzeug • Ernährung etc. 	<ul style="list-style-type: none"> • Hotels • Restaurants • Cafes • Tankstellen • Kultur-, Sport-, Freizeitbetriebe • beleuchtungsorientierter Stromverbrauch 	<ul style="list-style-type: none"> • Läden mit starker Kühlung • Kälteanlagen • Zwangsbelüftung • Parkhäuser • IT-Infrastruktur • Kläranlagen etc. 	<ul style="list-style-type: none"> • Ladengeschäfte • Kaufhäuser • Möbelhäuser • Annahmestellen • Reinigung etc. 	Milchviehbetriebe (Stromverbrauch durch zweimaliges Melken und anschließendes Herunterkühlen)	<ul style="list-style-type: none"> • Landwirtschaftliche Betriebe mit Produktion und Haushalt • Schweinemast etc.

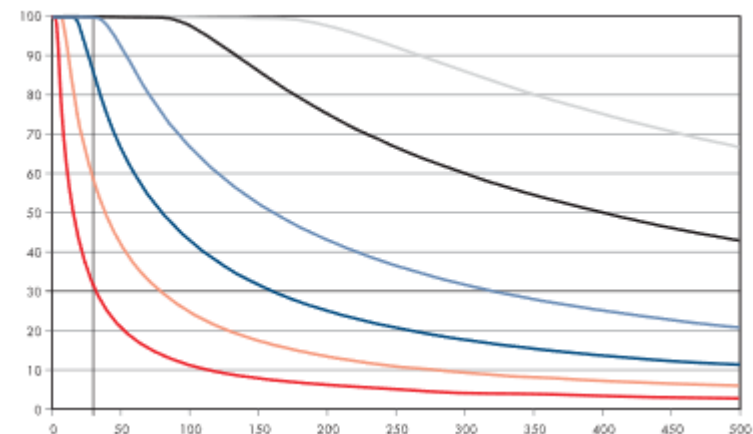
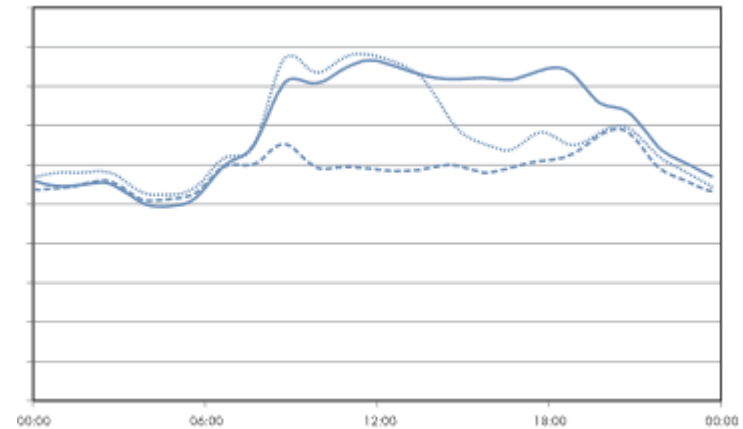
At a glance – fields of application in Germany – Commercial user

- In the commercial sector the profitability of PV self-consumption depends largely on the load profile
- Typical working hours usually correspond to sunshine hours



At a glance – fields of application in Germany – Industrial user

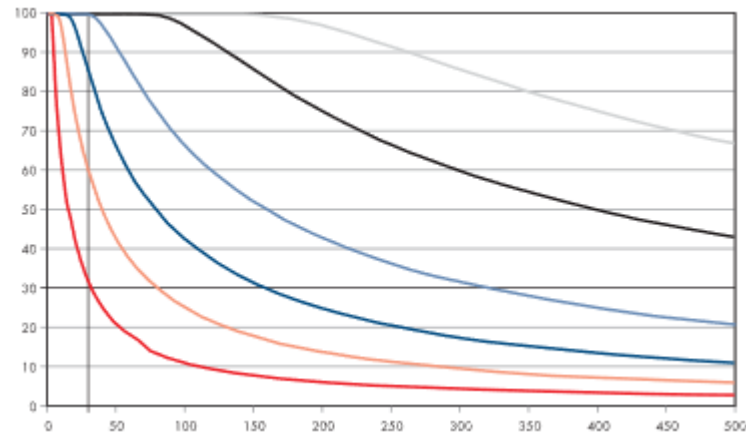
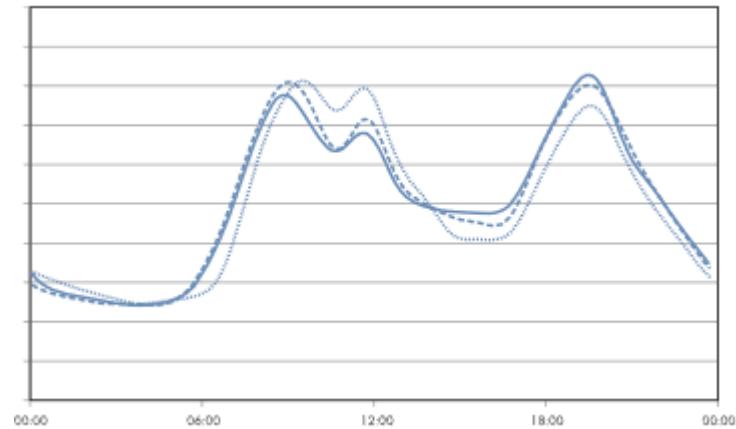
- High base load increase the economic potential for PV self-consumption
- Additionally huge spaces in in preferable exposure are available at industrial sites (e.g. roof top)



Source: SMA 2019

At a glance – fields of application in Germany – Agricultural user

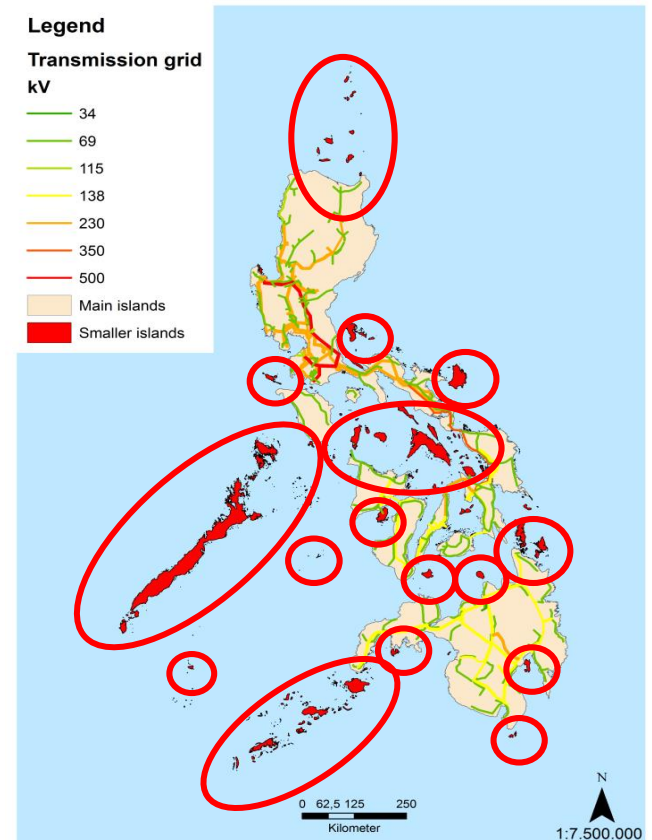
- Demand profiles in the agricultural sector are very site and activity specific
- Usually space for PV installations is available
- Besides PV other and more flexible RE technologies are applied (e.g. biogas)



Source: SMA 2019

Excursus – potential applications in the Philippines

- 60% of GDP generated in NCR and two neighboring provinces
- Electricity prices (Meralco) among the highest in the region
- Food industry with high electricity demand for cooling is a high potential customer
- Growing commercial, touristic and industrial activities in “off-grid” areas suffer from not reliable power supply
- PV combined with storage for high autarky very attractive



Thank you very much for your attention!



Your ideas?

- ... Partnerships
- ... Research cooperations
- ... Joint project proposals



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