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# FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS ISE

Round table about the relevance of electronic components  
and systems in the energy domain

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Round table DG Energy  
Brussels, 4. September 2017

[www.ise.fraunhofer.de/power-electronics](http://www.ise.fraunhofer.de/power-electronics)

# The Fraunhofer-Gesellschaft

## Our Mission



Applied research is the foundation of our organization. We partner with companies to transform original ideas into innovations that benefit society and strengthen both the German and the European economy.

Our employees shape the future – in ambitious positions at Fraunhofer or in other areas of science and business. Fraunhofer therefore places great importance on their professional and personal development.

# About the relevance of power electronics

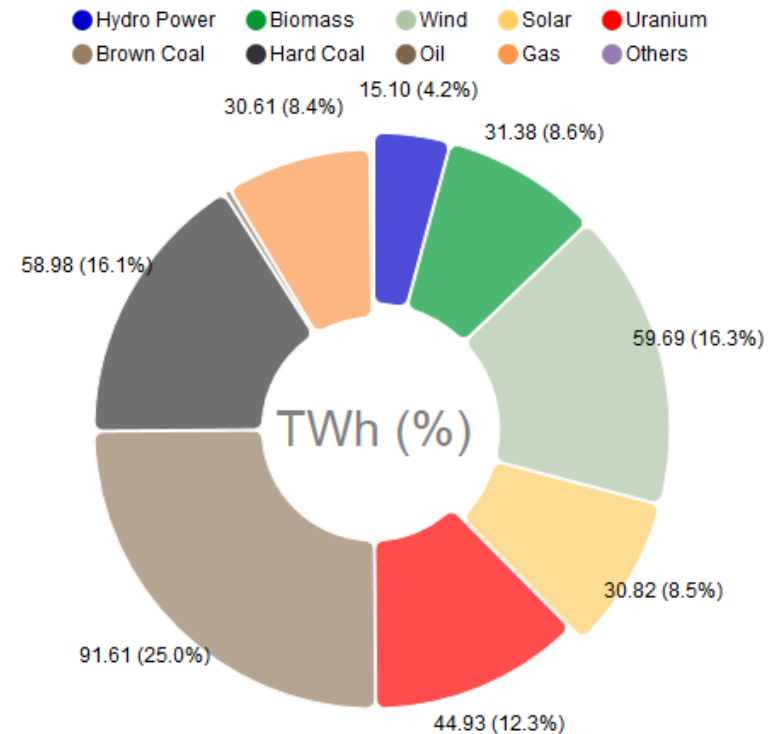
## In electrical energy production (figures for Germany)

### As of 4. September 2017

- 37.6% of renewable energy in net electricity generation since 01.01.17
- 41.75 GW installed PV capacity
- 52.86 GW installed wind capacity

### -85% CO<sub>2</sub> emissions in 2050 needs

- ca. 166 GW of photovoltaics (x4)
- ca. 200 GW of wind (x4)
- ca. 75 GW of batteries
- ca. 75 GW of electrolyzers



# About the relevance of power electronics

## In the control of future electricity grids

- Synchronous generators will be overwhelmed by grid-connected inverters with new features
- Inverters will have to take over
  - balancing of load-generation
  - control of voltage & frequency
  - micro-grid and black-start
- Also smart loads will have to participate to grid control (e-cars, heat pumps, data centers... etc. )

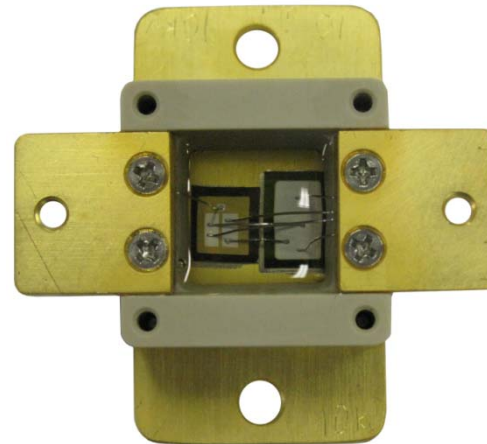
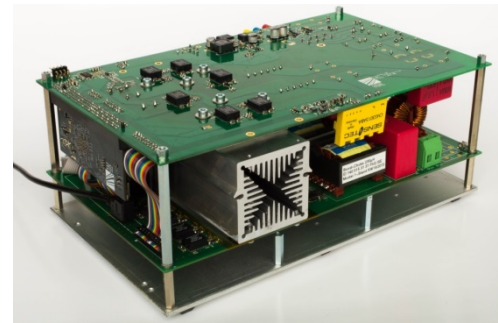




# About the future need for R&D in power electronics

## Further cost reduction and beyond

- Further develop and integrate wide band-gap semiconductors
- New generation of power electronics for medium voltage
- Many simplifications in PV and wind through higher voltages
- Self- or close-by-consumption of PV electricity (micro transactions within neighborhood)
- Intersectoral coupling, very concretely through PV-2-Vehicle
- Hybrid systems and micro-grids



# About the future need for R&D in power electronics

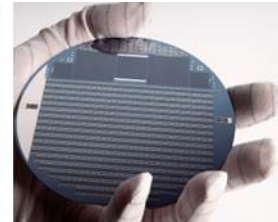
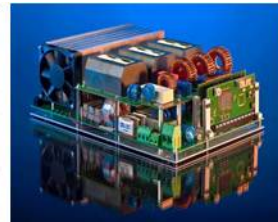
## Fraunhofer ISE preparing for these new challenges

- Multi-Megawatt-Laboratory in construction (finished T3-2018)
- 15 Mio. € investment
- R&D in power electronics, grid technologies and control
- Direct connection to 110 kV via dedicated 40 MVA transformer and own 20 kV line
- Development of new generations of small to large-scale power electronic converters and grid control



# Thank you for your Attention!

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