

Quality in Planning and Installation

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1. April 2025

Plan-E | Engineering for photovoltaics and energy systems



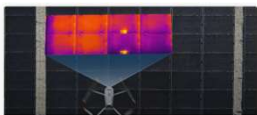
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PV- System Planning



Integral Energy Planning



Operation of Energy Systems



Innovation



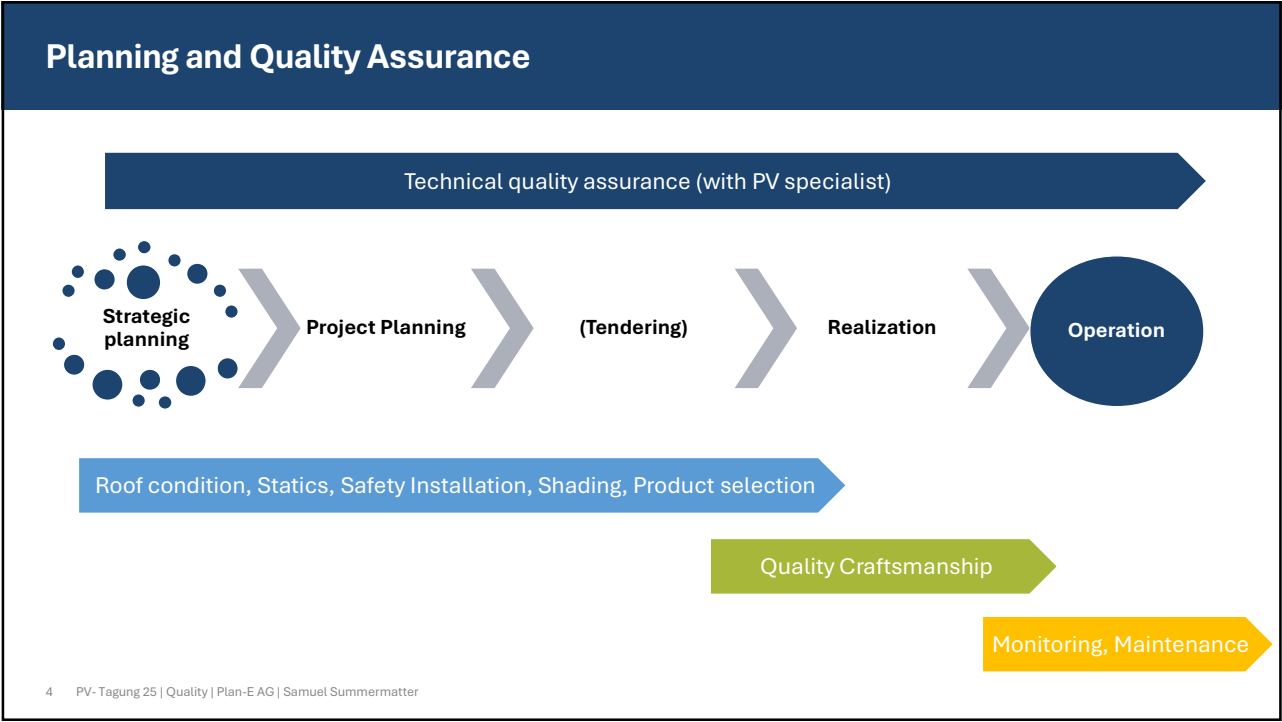
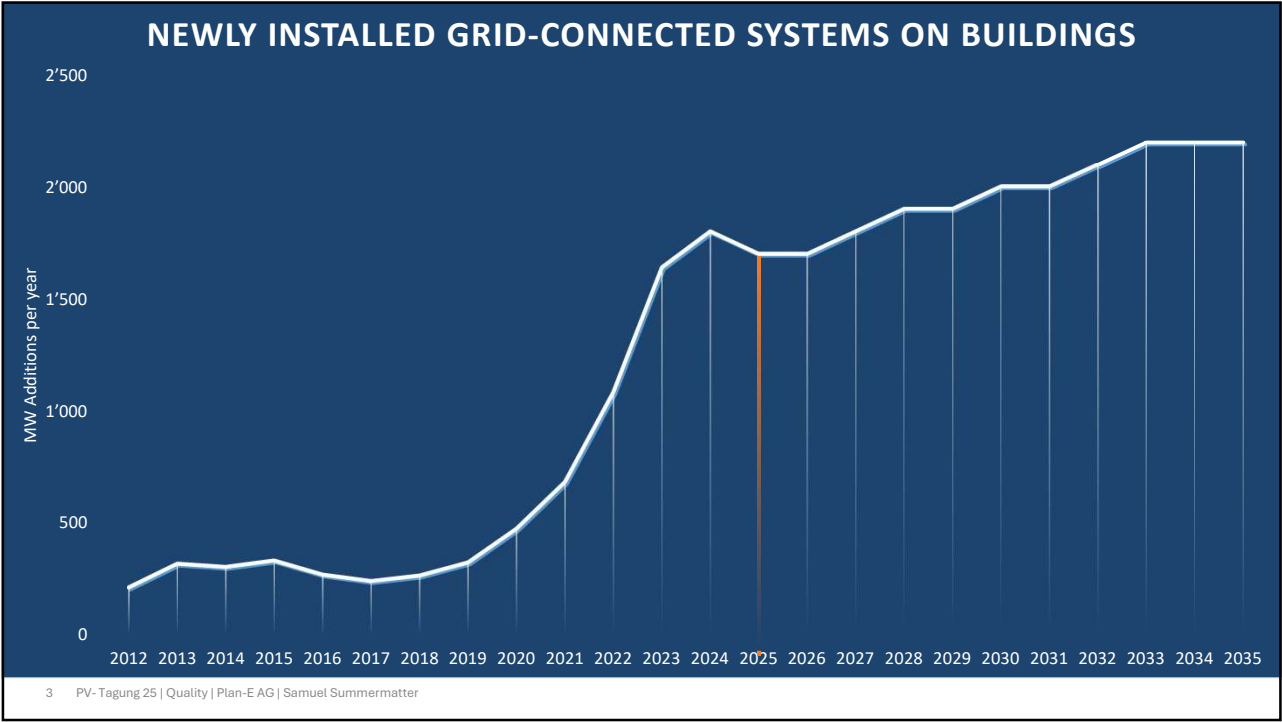
Experts



Infrastructure

Electrical engineers | Energy engineers | Structural engineers (façade technology) | Architect | Students





## Avoidable Errors



### Modules

- Hot Spots
- Shading
- Soiling
- Ageing



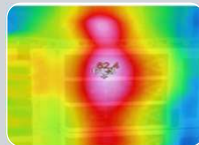
### Installation

- Statics
- Durability
- Function of the building envelope



### DC Cabling

- Durability
- Insulation faults
- Electric arc
- Electric shock



### AC- Installation

- Overheating
- Fire
- Permanence
- Electric shock



### Lightning protection

- Corrosion
- Electrical safety
- Lightning and overvoltage protection



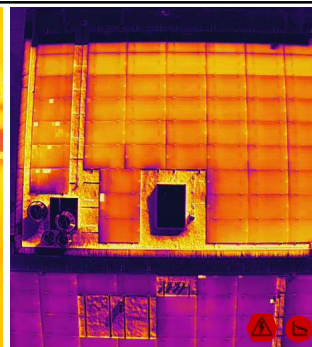
**Safety**



**Energy yield**

## Modules

- Avoid shadows
- Arcing and fire hazard due to hot spots
- Optimiser do not reduce hot spots
- Faster ageing
- Cell and glass breakage
- Soiling





## Mounting Surface

- Check roof condition before installation
- Select a suitable mounting system
- Green growth
- Avoid damage to the roof
- Follow the mounting system instructions



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## Mounting Fastening

- Check roof statics
- Check module statics with installation situation
- Observe ballasting plan
- Use the correct fastening material

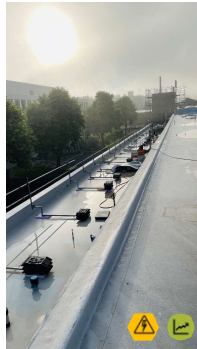


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## Mounting Safety

- Temporary, collective fall protection at all fall edges
- Keep roof area clear for installation
- Plan permanent fall protection
- Use personal fall protection correctly

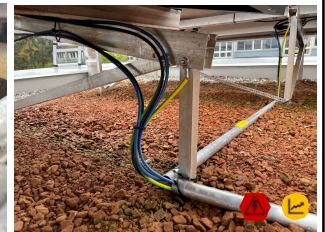
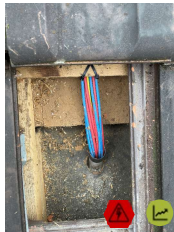


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## DC Cabling

- Edge protection (insulation faults)
- Cable protection (mechanical, fire protection and weathering)
- UV light protection



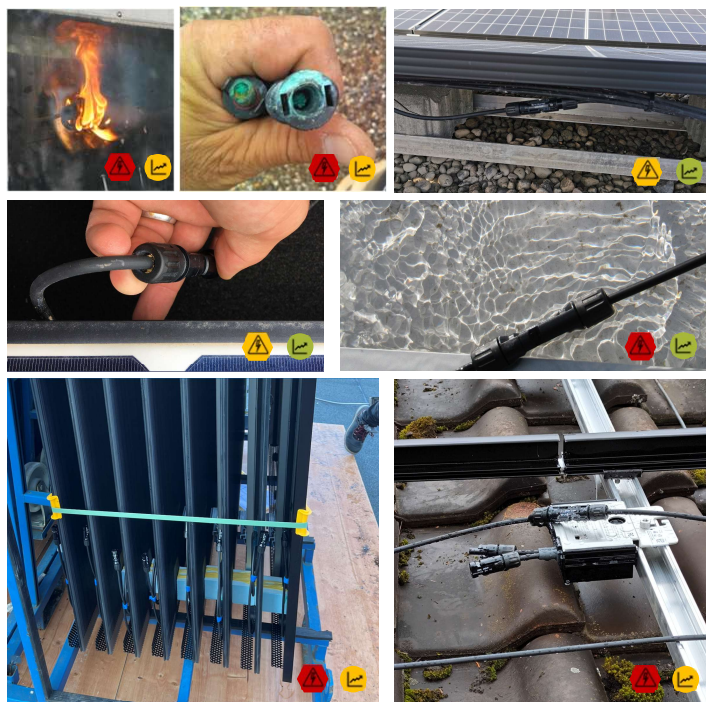
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## DC Plug

- Only compatible products from the same manufacturer
- Use the correct tools
- Tighten screw connections completely
- Protect against water ingress during installation

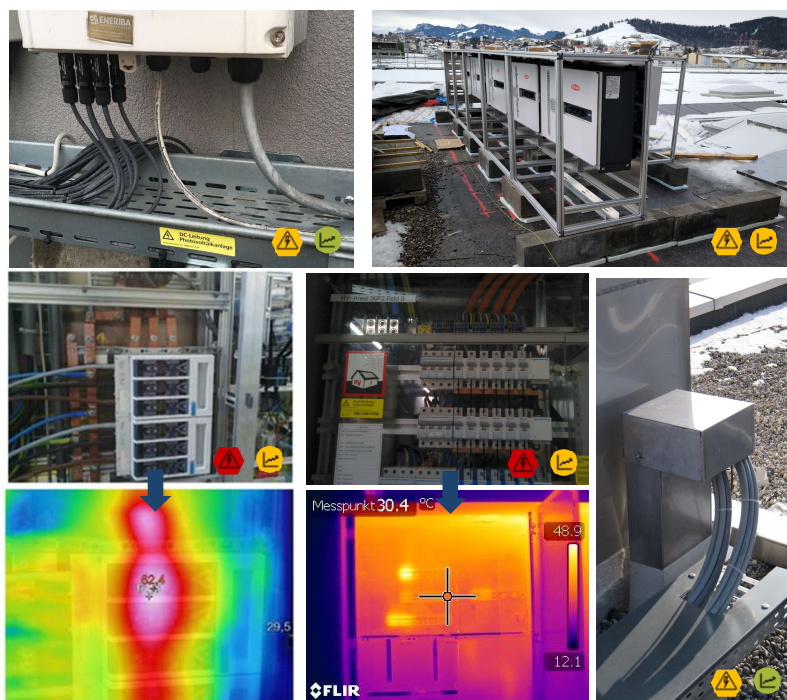


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## AC- Installation

- UV protection of installation cables
- Mechanical protection of cables
- Observe installation clearances for inverter ventilation
- Observe heat development of fuses (several hours of nominal load operation)

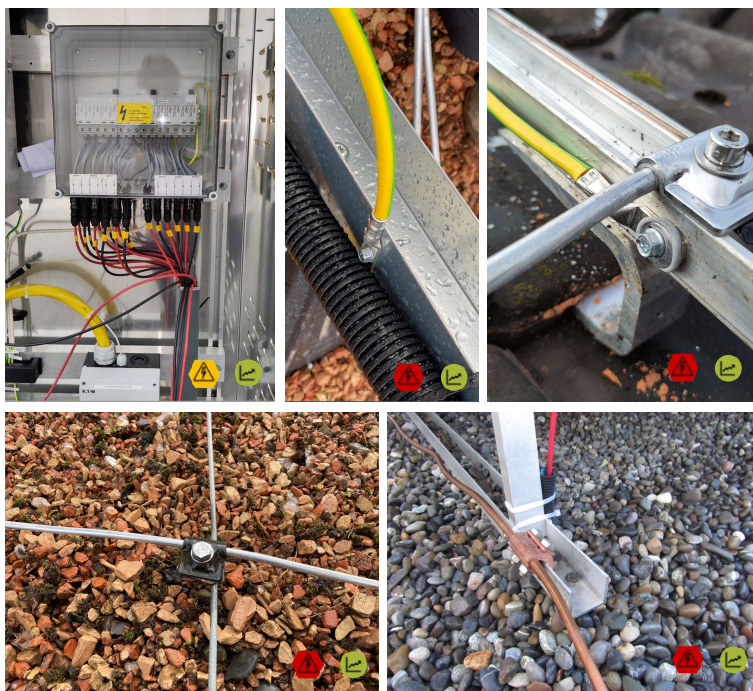


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### Lightning protection / potential equalisation

- Separate cable routing of protected and unprotected cables
- Fixed connection with suitable screws
- Galvanic oxidation when connecting aluminium and copper
- Lightning current carrying capacity of the mounting structure (manufacturer's specifications)



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## Summary

- Training often takes place via non-formal and in-house training
- Qualified specialists are in demand
- Quality assurance throughout the entire process: planning, execution and operation is important
- Not all quality-relevant defects are immediately recognised by the safety certificate.

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