Profitability Analysis of Renewable Energy Communities: Comparison of Selected European Countries

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Main drivers for renewable energy communities:

- Lower investment costs due to community investments
- More beneficial due to increased self-consumption
- Access to PV in case of building restrictions or rooftop limitations

Research question:

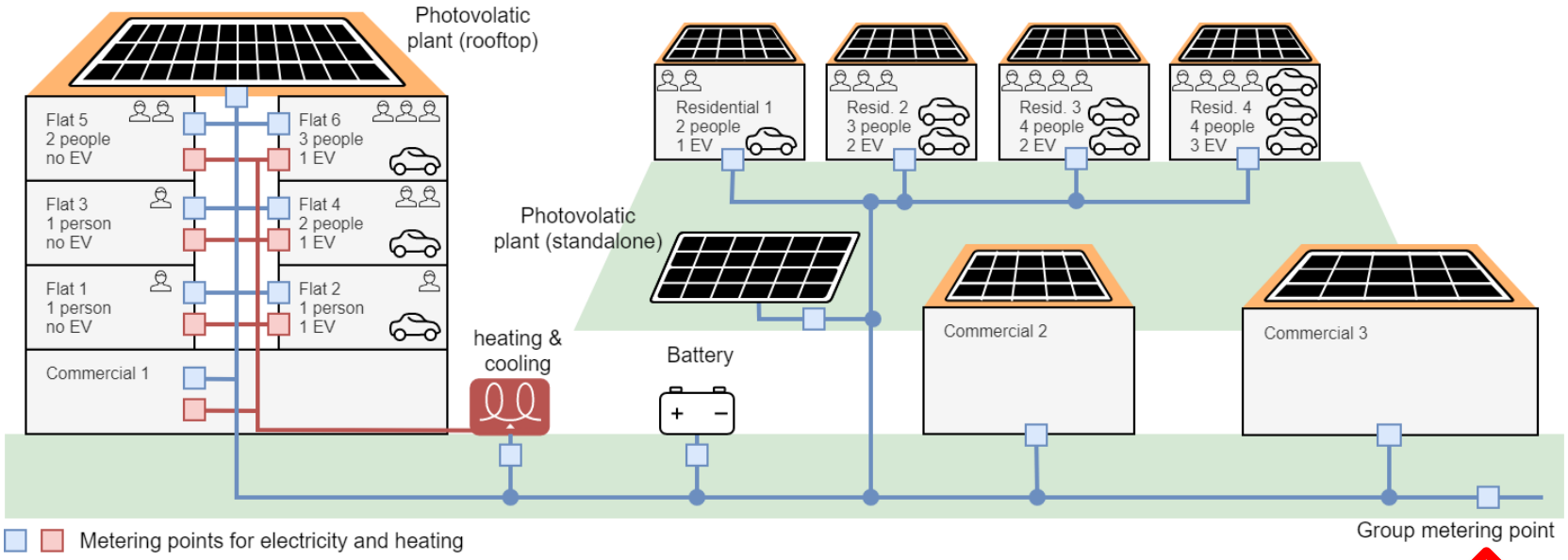
→ What is the optimal investment in PV and storages per country to reduce consumers costs?

Target Countries

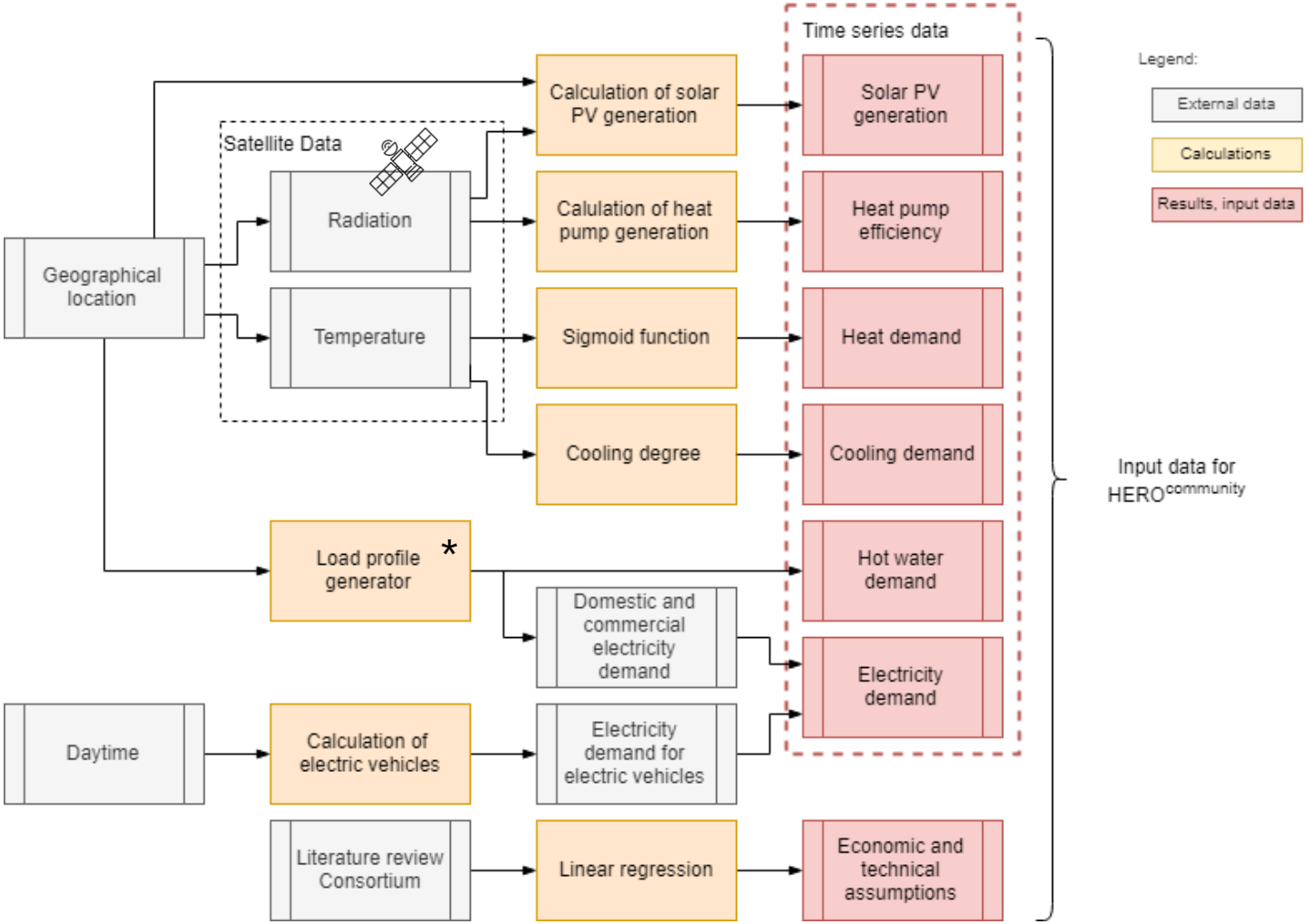
PVP 4Grid

Setup for the renewable energy community

- “European Village” represents average housing situation in Europe



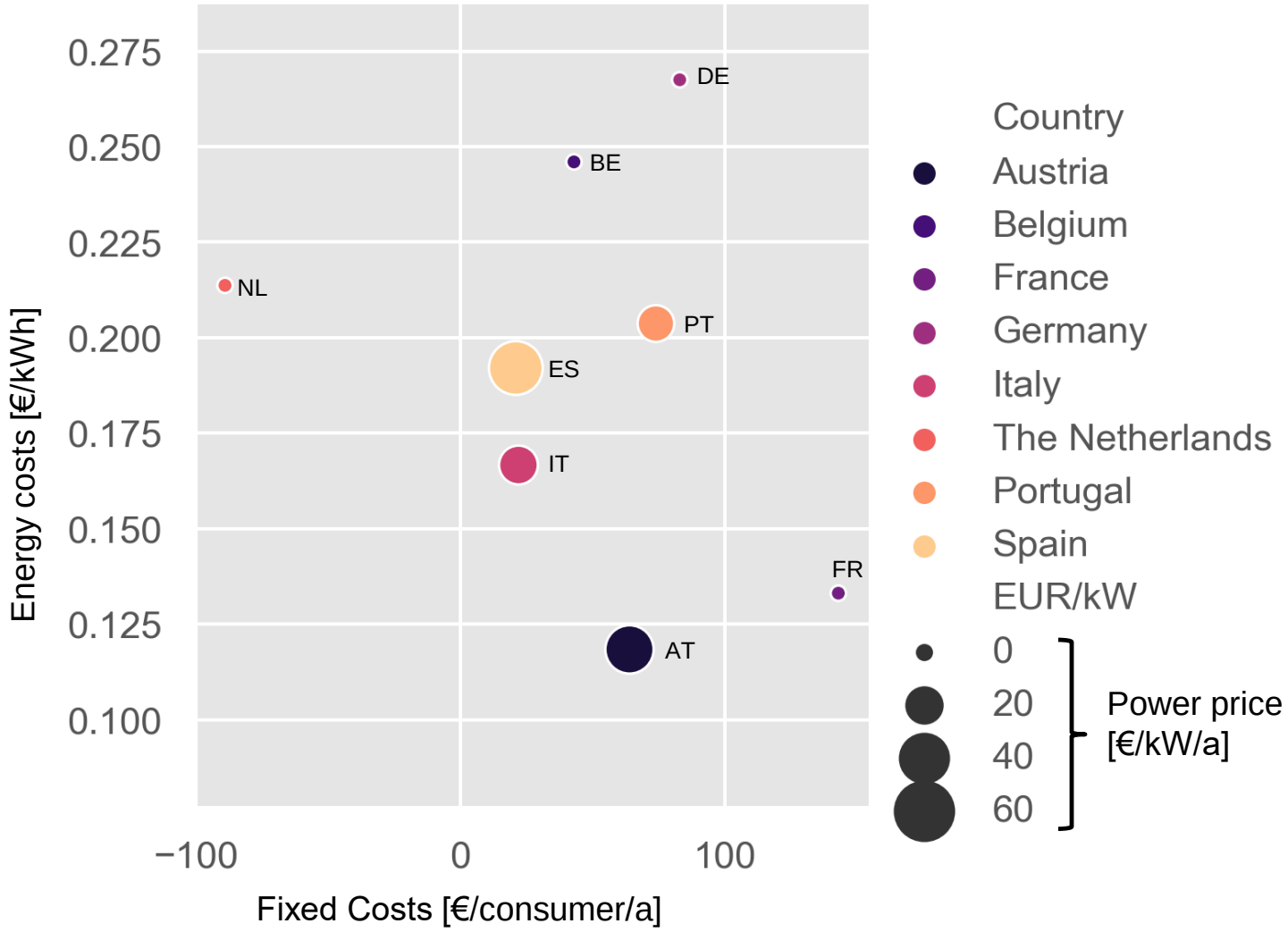
Calculation of the Input Data



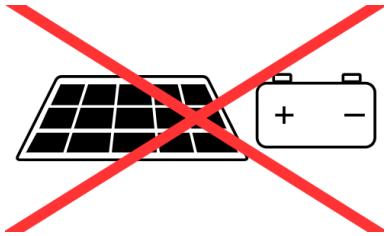
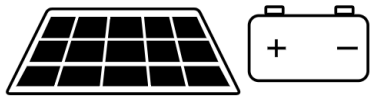
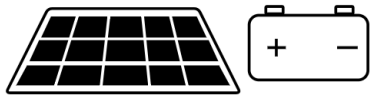
*Load profile generator source: Pflugradt N., 2019. https://www.loadprofilegenerator.de

Current tariff design in the target countries

Electricity costs = Energy costs + Grid tariffs + taxes and fees



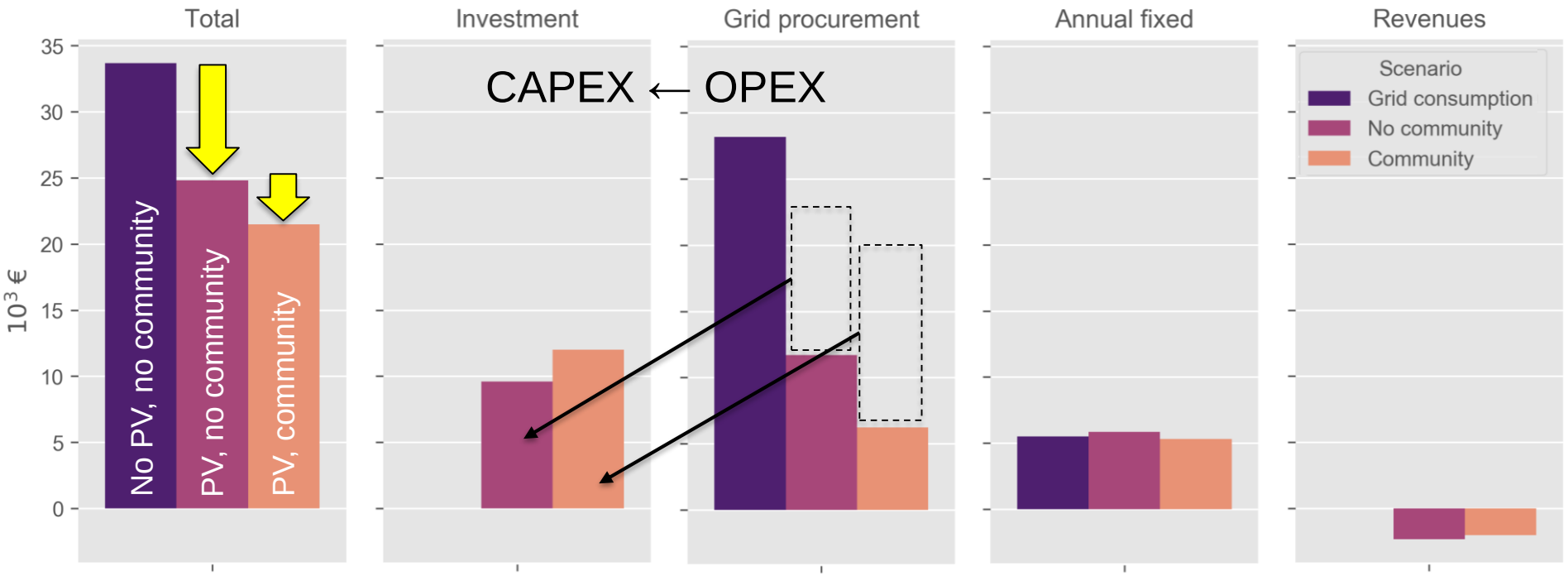
Community Scenarios

	Technologies	*Metering point*
▪ ***Grid consumption***: ▪ No investments in PV and storages ▪ Demand is satisfied via the grid		separately
▪ ***No community***: ▪ Investments in PV and storages are possible ▪ Energy sharing not allowed		separately
▪ ***Community***: ▪ Investments in PV and storages are possible ▪ Energy sharing allowed		aggregated

Results for “European Village“

Electricity costs with investments

$$Total\ Costs(Year) = \alpha * Investment + Grid + Fixed - Revenues$$

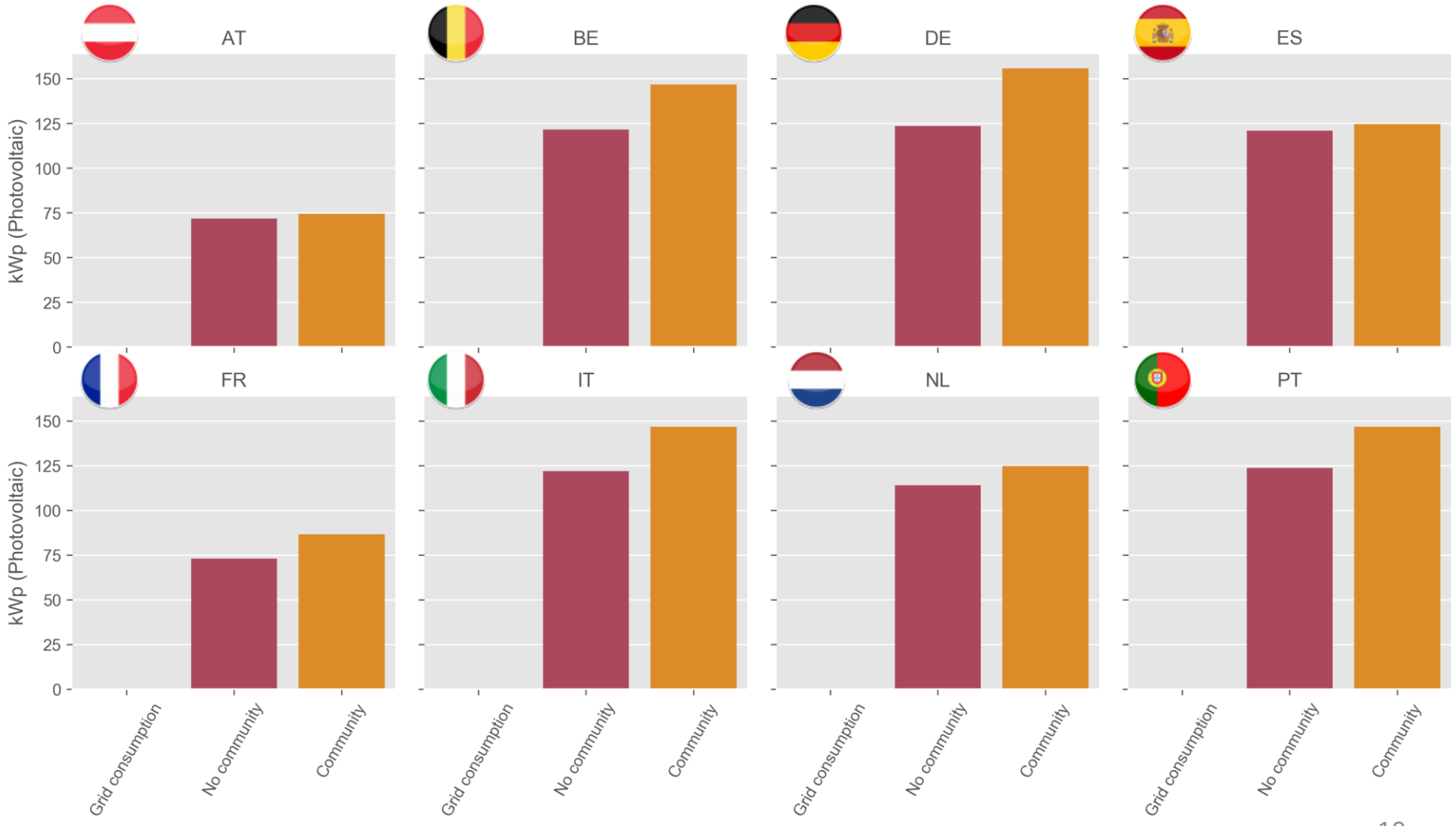


Results for “European Village“

Change in Total Costs (compared to Grid Consumption)

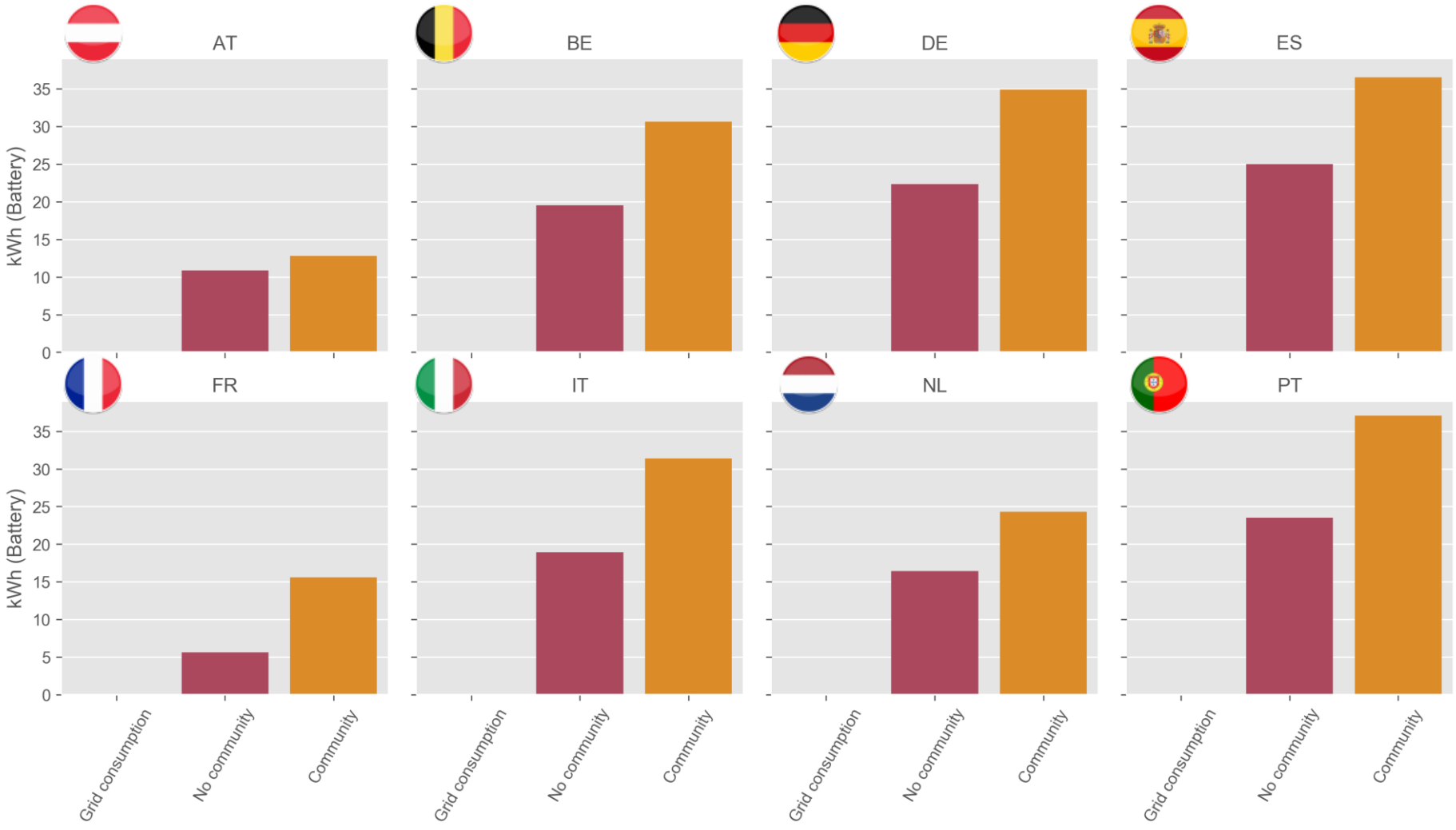
Results for “European Village“

Installed PV capacity in kWp



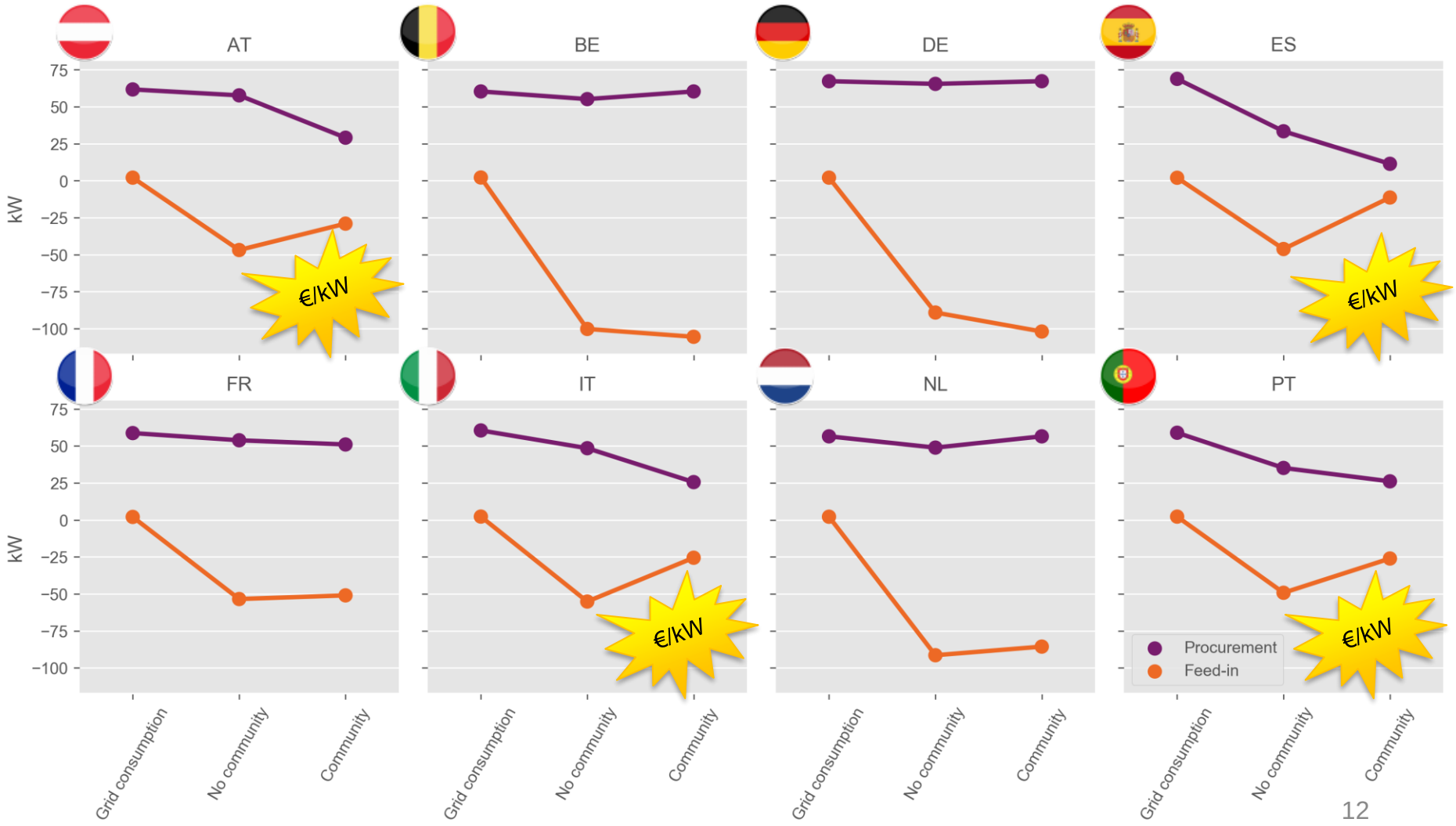
Results for “European Village“

Installed battery capacity in kWh



Results for “European Village“

Maximum / minimum residual load in kW



Conclusions

- The value of PV and energy communities depends not only on PV generation but as well on grid tariff design / electricity prices
- The energy community makes photovoltaics more profitable, reducing the need of subsidies.
- Households with no access to photovoltaics (roof limitation or building restrictions) have the opportunity to be part of a community.
- “Grid friendly” behavior must be incentivized by the tariff design. Appropriate tariff design (power component) may reduce peak feed-in of photovoltaics.
- Avoidance of grid fees and taxes (if legally implemented). The income for distribution system operators (and taxes) decreases → Financial support?

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