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Challenges & Opportunities for Self-Consumption Business Models in Europe

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PVFINANCING





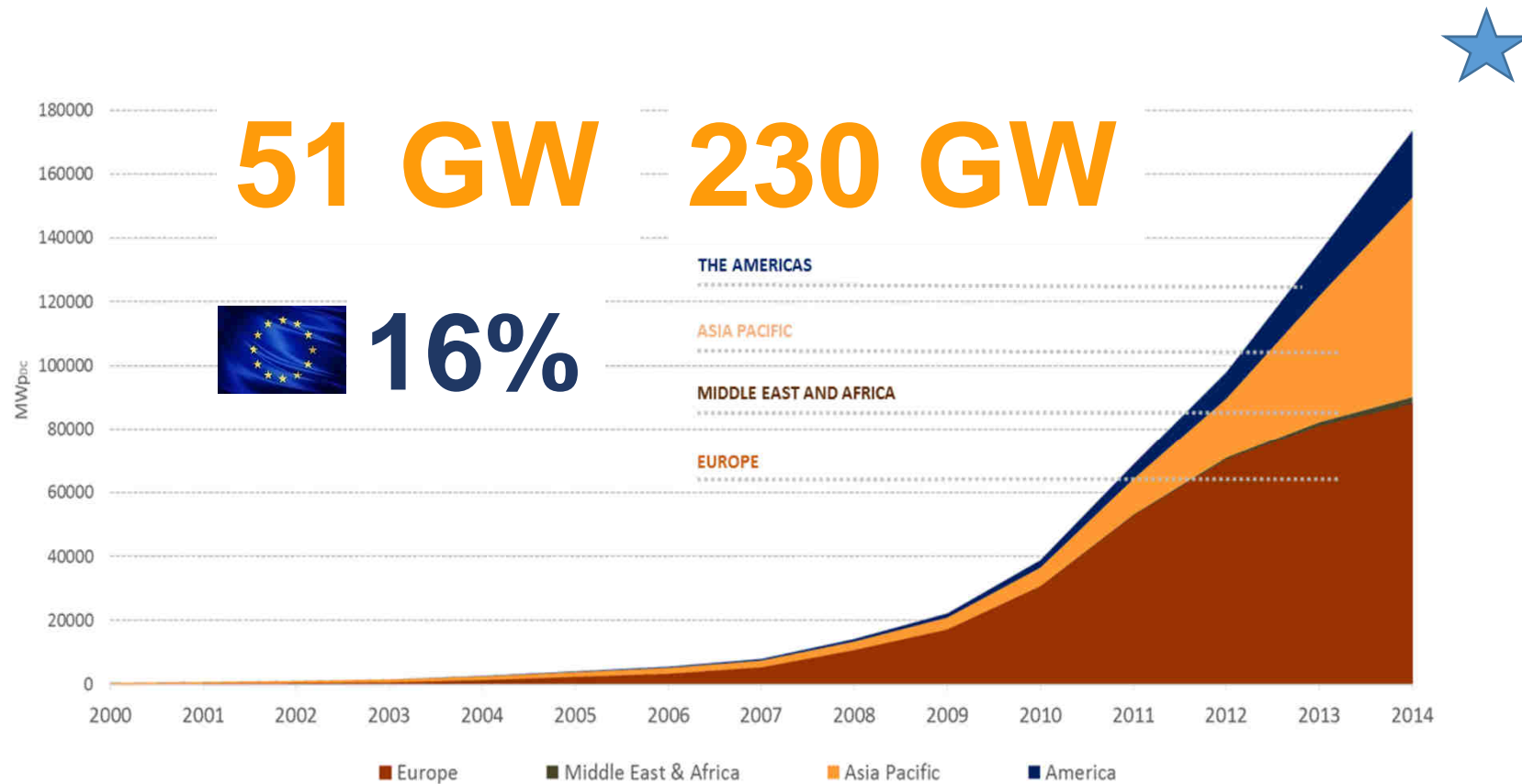
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BECQUEREL INSTITUTE

- Research oriented Institute and consulting company for Solar Technologies.
- Global PV Market Analysis including competitiveness
- Industry Analysis including quality & reliability
- Integration into electricity systems (grids and markets)
- In-house experts / Global network of experts and stakeholders
- PV Market Alliance partner

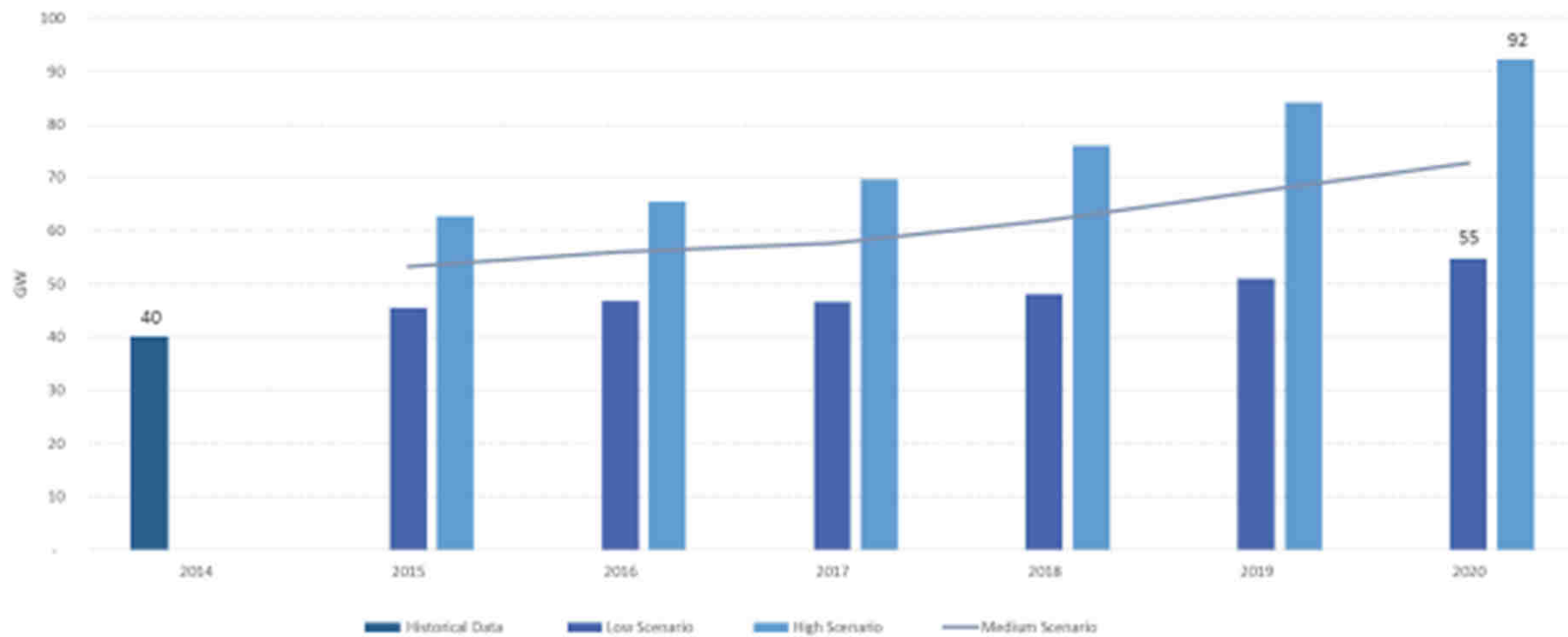


FROM 1.1 TO 50 GW IN 11 YEARS ?



WHAT TO EXPECT ?

GLOBAL PV MARKET EVOLUTION 2014 - 2020



PV Market Alliance – Global PV Market Report 2015 - 2020

2 PV WORLDS



Distributed PV

Self-consumption,
energy efficiency, grid
parity, competition
with utilities
distribution business

Prosumers

One
technology

Centralized PV

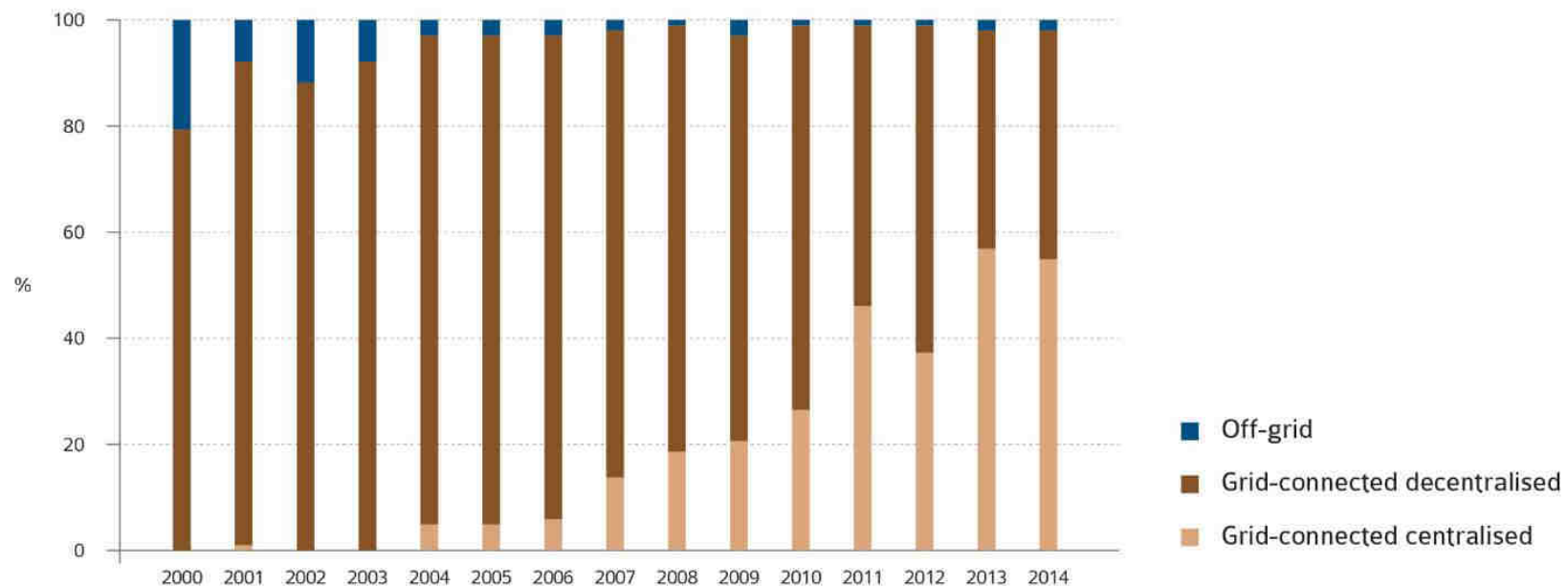
Producers

Grid injection, PPA,
competition with
utilities generation
business



THE EVOLUTION OF SEGMENTS

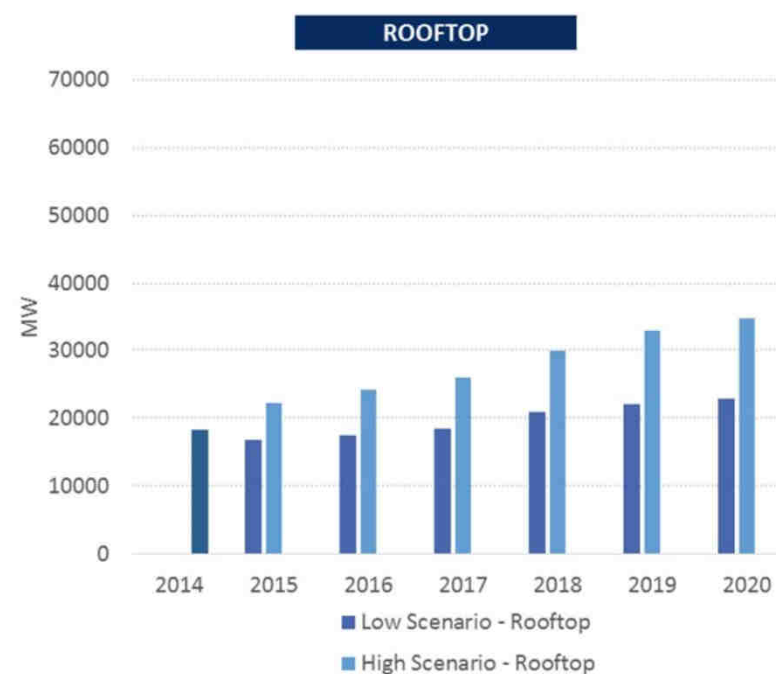
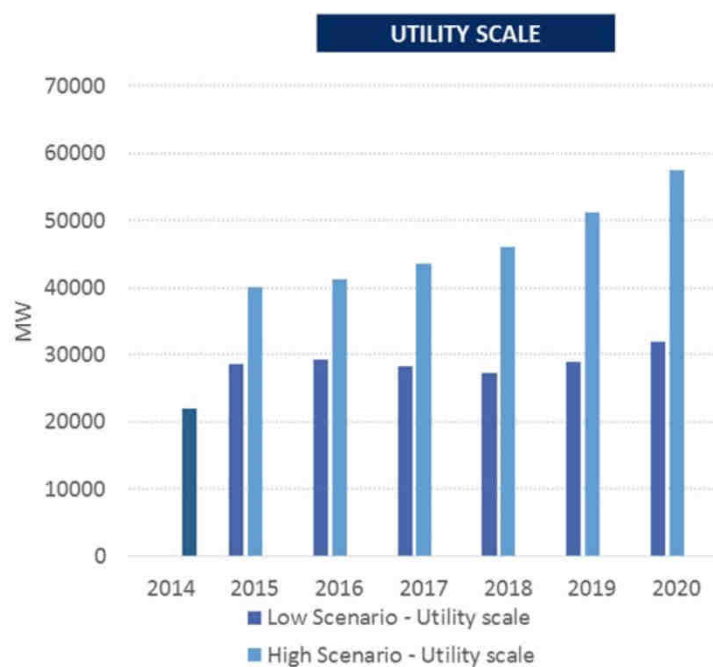
SHARE OF GRID-CONNECTED AND OFF-GRID INSTALLATIONS 2000-2014



SOURCE IEA PVPS.

ROOFTOP PV DEVELOPMENT

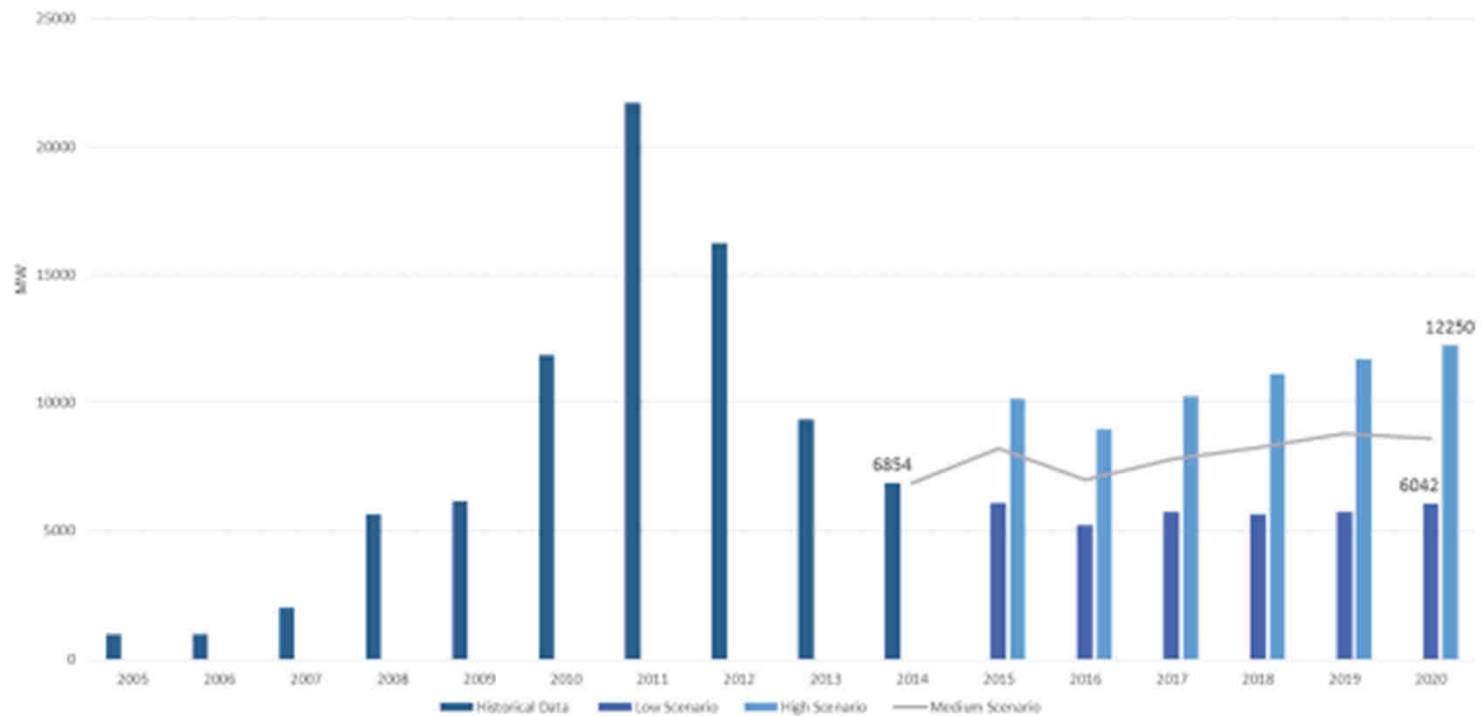
GLOBAL PV MARKET EVOLUTION BY SEGMENT UNTIL 2020



PV Market Alliance – Global PV Market Report 2015 - 2020

WHAT TO EXPECT IN EUROPE?

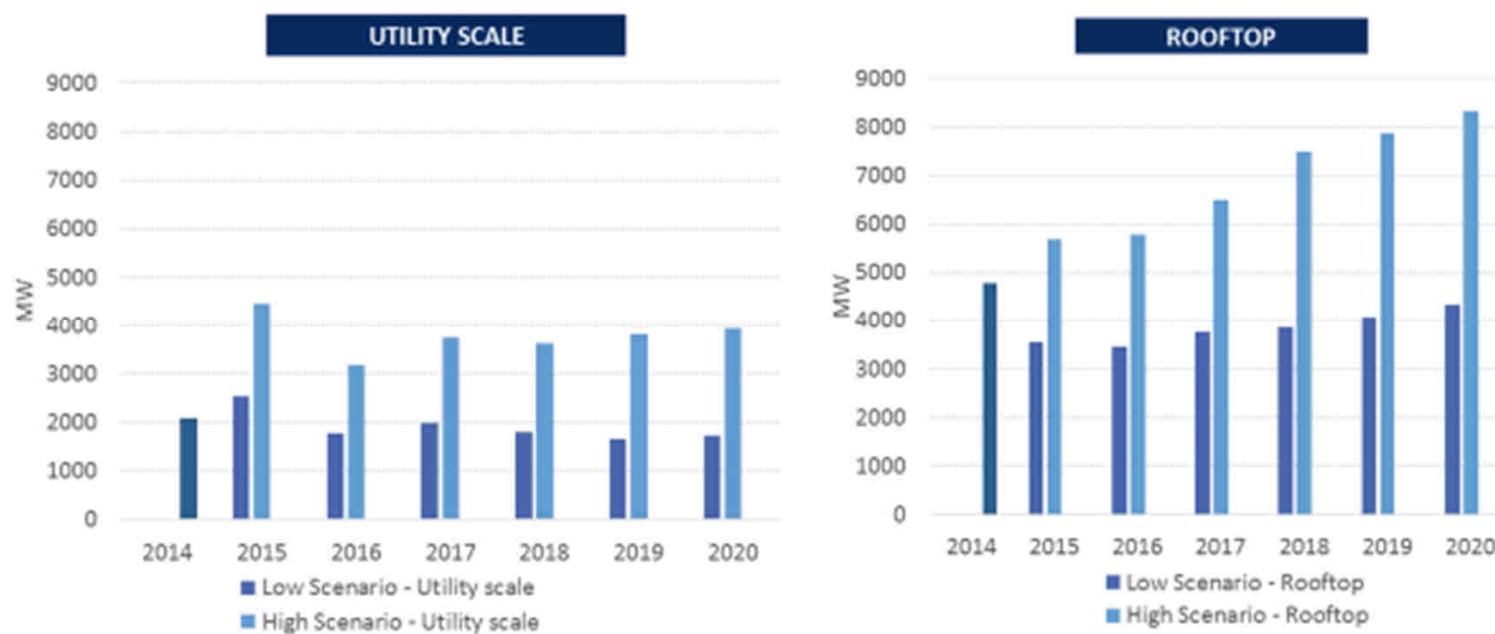
ANNUAL PV MARKET EVOLUTION UNTIL 2020 IN WESTERN EUROPE



PV Market Alliance – Global PV Market Report 2015 - 2020

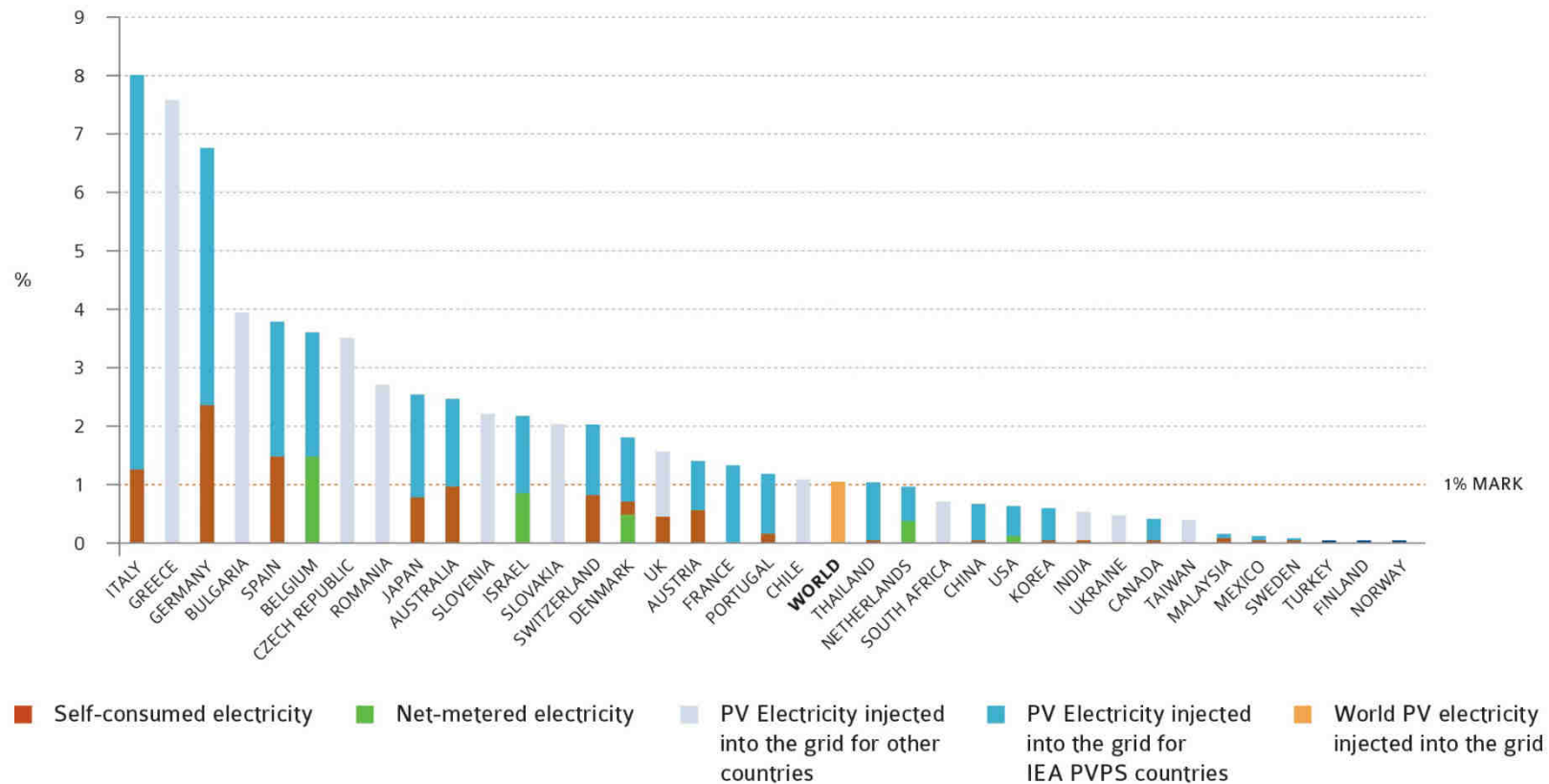
EUROPEAN FORECASTS PER SEGMENT

PV MARKET EVOLUTION BY SEGMENT UNTIL 2020 IN WESTERN EUROPE

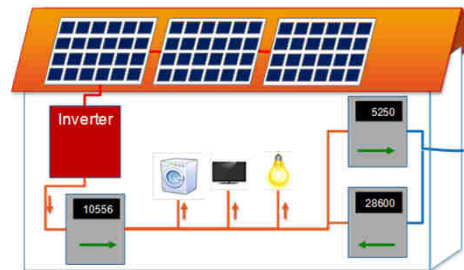


SHARE OF SC BUSINESS MODELS

PV CONTRIBUTION TO THE ELECTRICITY DEMAND IN 2014



SELF-CONSUMPTION



BUSINESS MODELS

Savings on the electricity bill
+
Sale of excess PV electricity



Prosumers

Net-metering

Self-consumption
+ market price
+ FiT/FiP

FiT / TGC

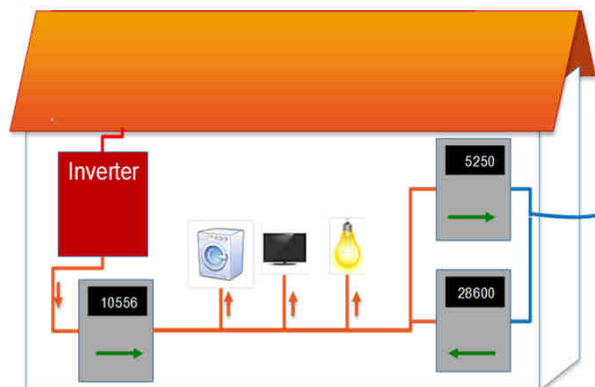
Market price
(+ premium?
FiP)

Producers



Sale of electricity

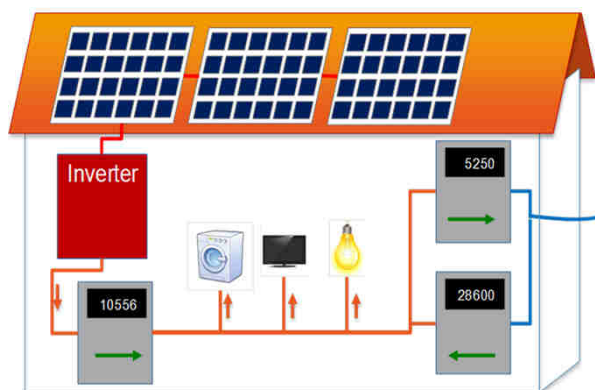
WITH OR WITHOUT PV



Building without PV

- Electricity comes from the grid

Electricity bill



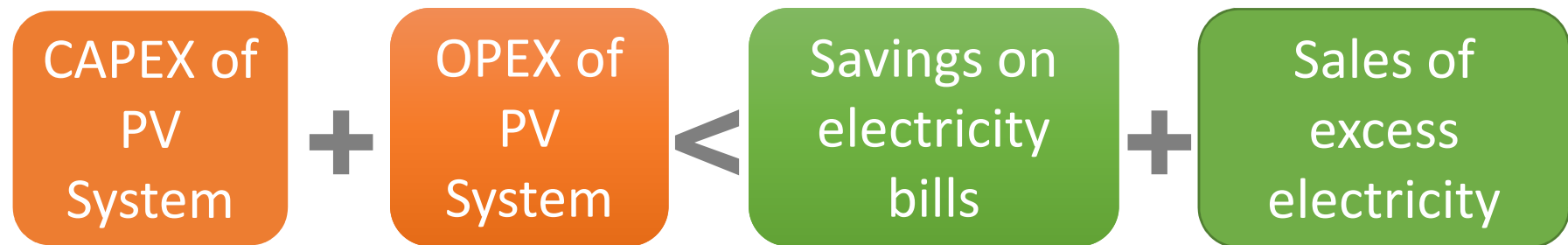
Building with PV

- Part of electricity produced by PV is consumed in the building (reducing the electricity bill)
- Non-consumed electricity goes to the grid and is sold
- When PV is not producing, the electricity comes from the grid

Sales of PV Electricity

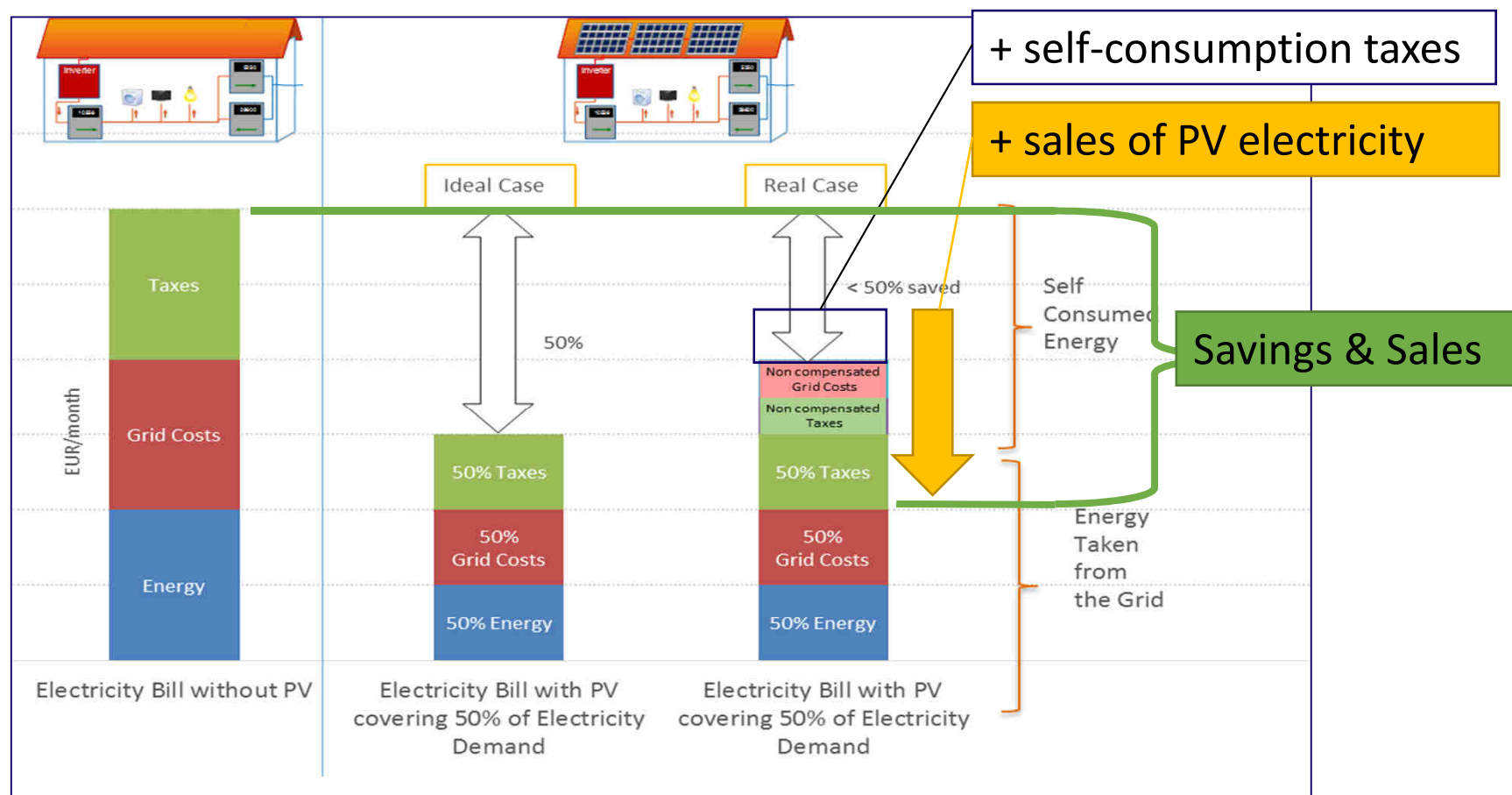
Electricity bill

COMPETITIVE PV ?

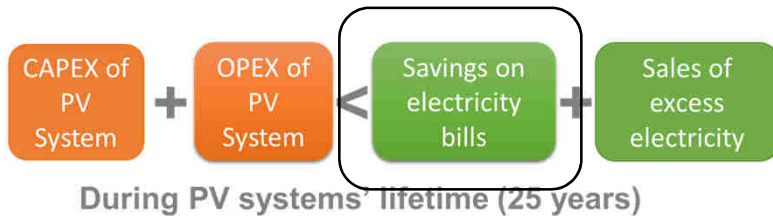


During PV systems' lifetime (20-35 years)

ECONOMICS OF SELF-CONSUMPTION

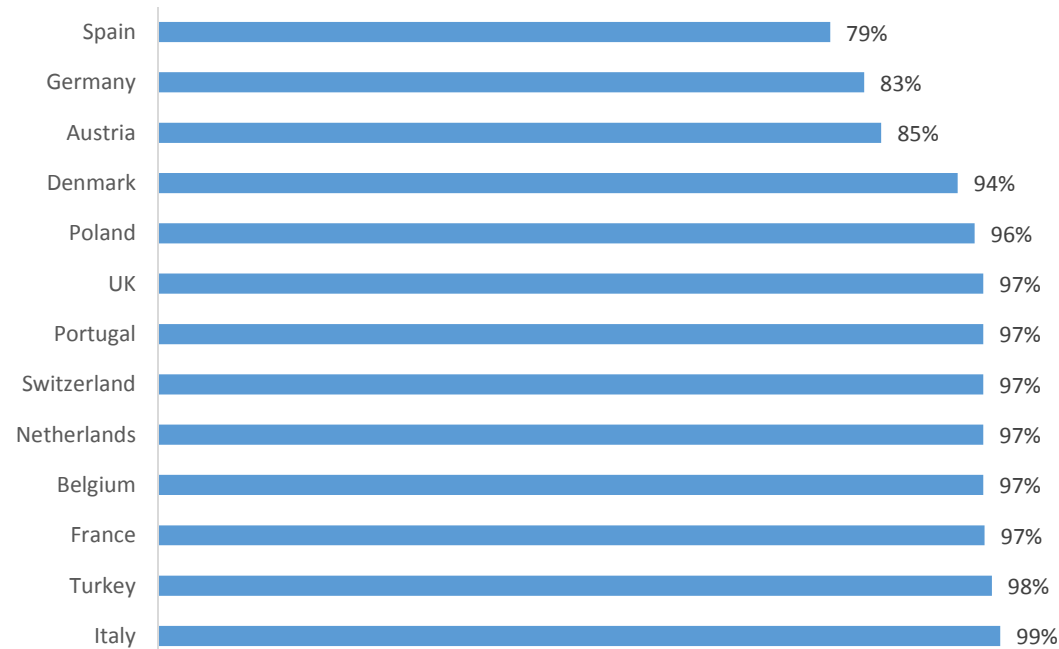


COMPONENTS OF ELECTRICITY

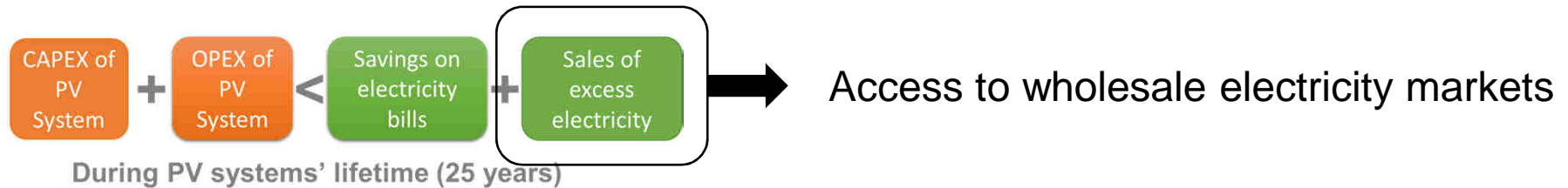


How much can be compensated from the electricity bill ?

Maximum savings on electricity bills (average)



SALES OF PV ELECTRICITY

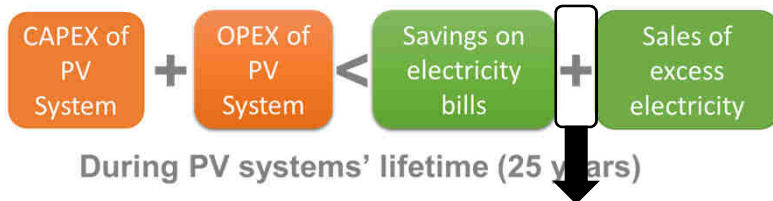


1. Current Excess PV electricity gets a FiT
2. Current Excess PV electricity gets a FiP above the market price
3. Future Excess PV electricity gets the market price though an aggregator
4. Future Excess PV electricity gets the market price directly



European Legislation pushed to integrate renewable
into wholesale electricity markets

SELF-CONSUMPTION RATIO



SC ratio = PV production locally consumed / total PV production

Hypothesis used: 50% SC - Commercial segment / 75% SC - Industrial segment

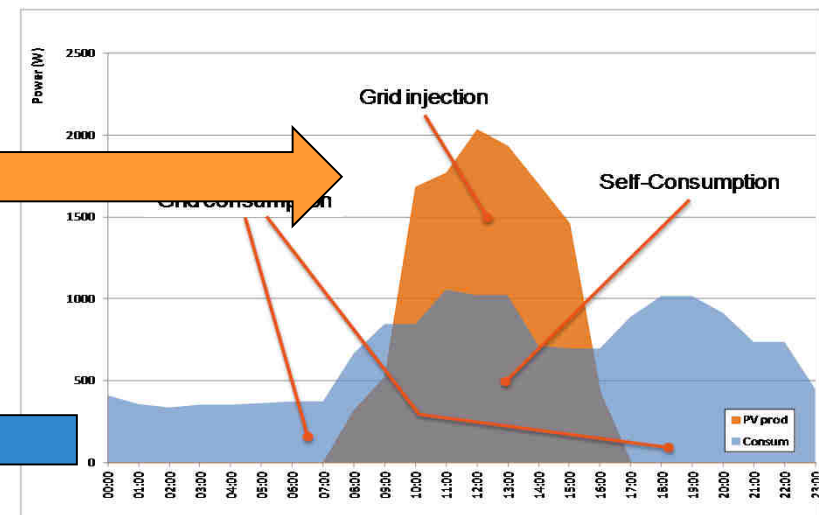
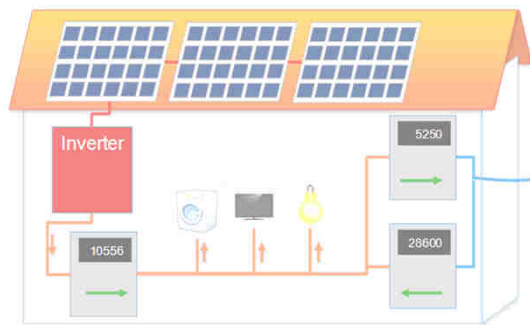
- Example: commercial segment in France 2015

- Retail electricity price: 0,144 EUR/kWh
- Wholesale market price: 0,045 EUR/kWh
- Average value of PV electricity compared to the LCOE of PV electricity (average): 0,10 EUR/kWh

25% SC	50% SC	75% SC	100% SC
0,061	0,083	0,116	0,144
EUR/kWh	EUR/kWh	EUR/kWh	EUR/kWh

THE SC RATIO CHALLENGE

Self-consumption of PV installations
20 to 100%



Challenge: minimizing grid injection

Solutions: decrease PV system size, DSM, Storage

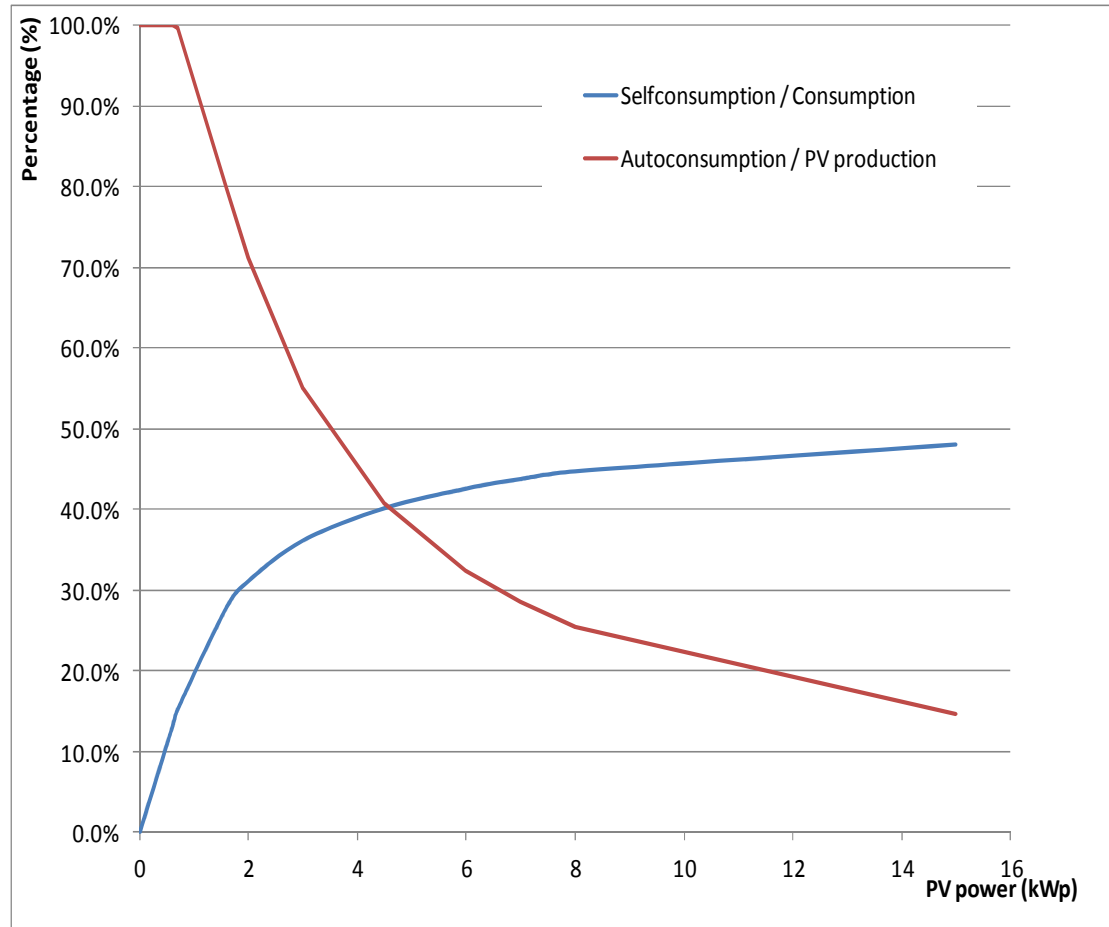
IMPACT OF SC RATIOS

Ratios are smaller in the residential sector (20-30%).

DSM, system size, storage can increased them.

Commercial and industrial applications can reach higher ratios.

But is local optimization of SC optimum from a system point of view ?

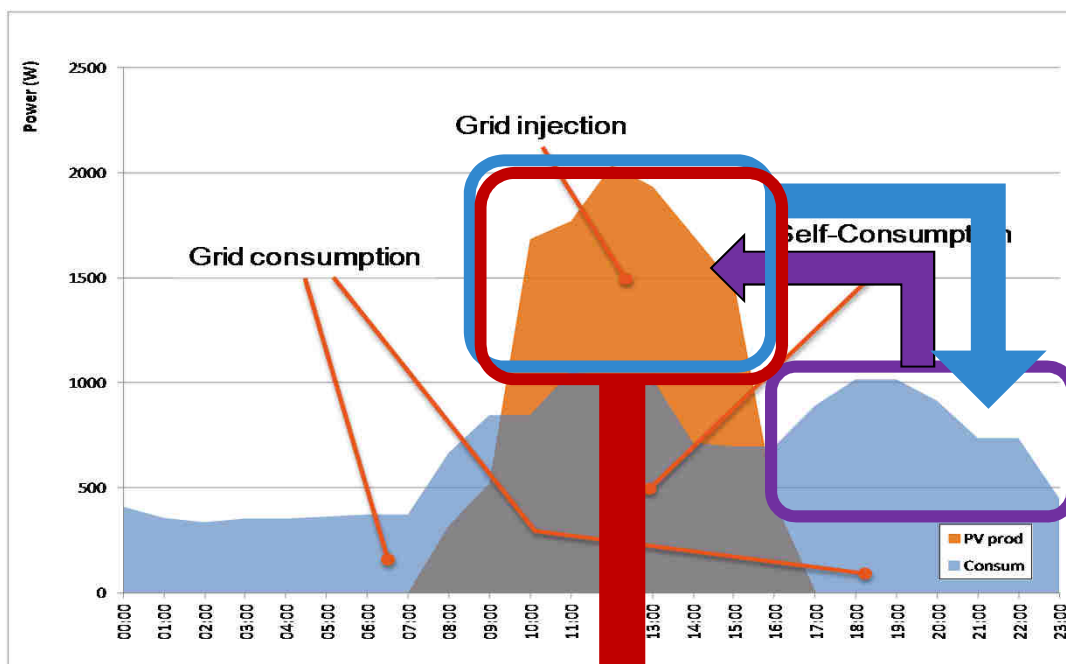


DSM & STORAGE SOLUTIONS

DSM

Electricity Storage

Other uses(out of the load)



H&C, Transport



SELF-CONSUMPTION BUSINESS CASE

- A simple (residential) business model in Belgium

PV electricity production cost: 0,12 EUR/kWh (950 kWh/kWp + 1,5 EUR/WP + WACC @ 4%)

Residential electricity prices 0,2 EUR/kWh (assuming 100% savings on electricity bill)

Value of injected electricity = 0,04 EUR/kWh

(Net-metering with grid tax: $+0,13 - 0,12 = +0,01$ EUR/kWh)

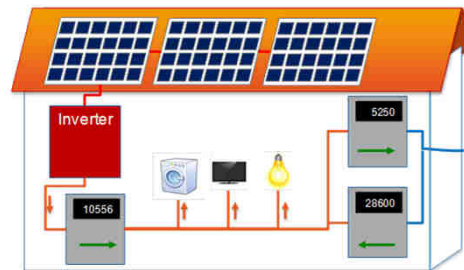
With 30% SC: $+0,09 - 0,12 = -0,03$ EUR/kWh

With 70% SC: $+0,15 - 0,12 = +0,03$ EUR/kWh

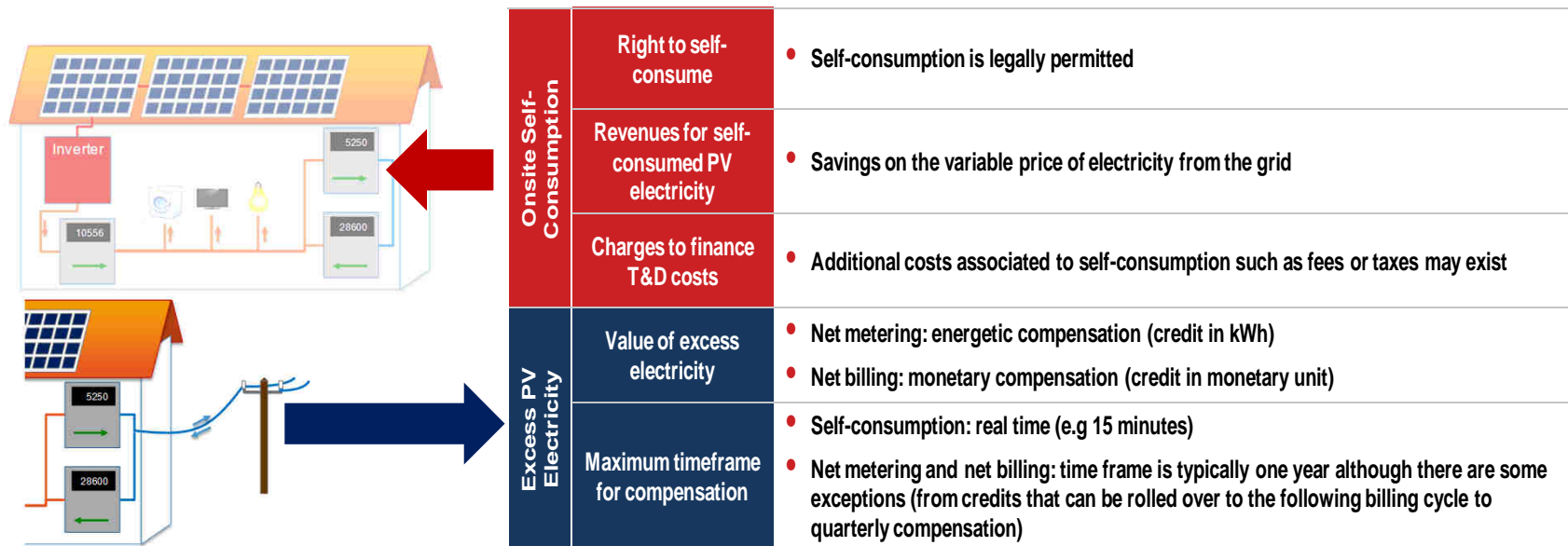
Margin for investment in Smart tools, storage or H&C

NPV_20years (i=2%) for a 5kWp PV system = 2400 EUR

REGULATIONS & PARAMETERS



A NEED FOR REGULATIONS



Key:

- Same between schemes
- Main differences

CATEGORIES OF SELF-CONSUMPTION

On-site PV self-consumption	1	Right to self-consume
	2	Revenues from self-consumed PV
	3	Charges to finance T&D costs
Excess PV electricity	4	Revenues from excess electricity
	5	Maximum timeframe for credit compensation
	6	Geographical compensation
Other characteristics of the system	7	Regulatory scheme duration
	8	Third-party ownership
	9	Grid codes and additional taxes/fees
	10	Other enablers of self-consumption
	11	System capacity limit
	12	Aggregate capacity limit

Clarify existing and future schemes,

Allow comparison from one scheme to another

Consider some emerging questions such as:

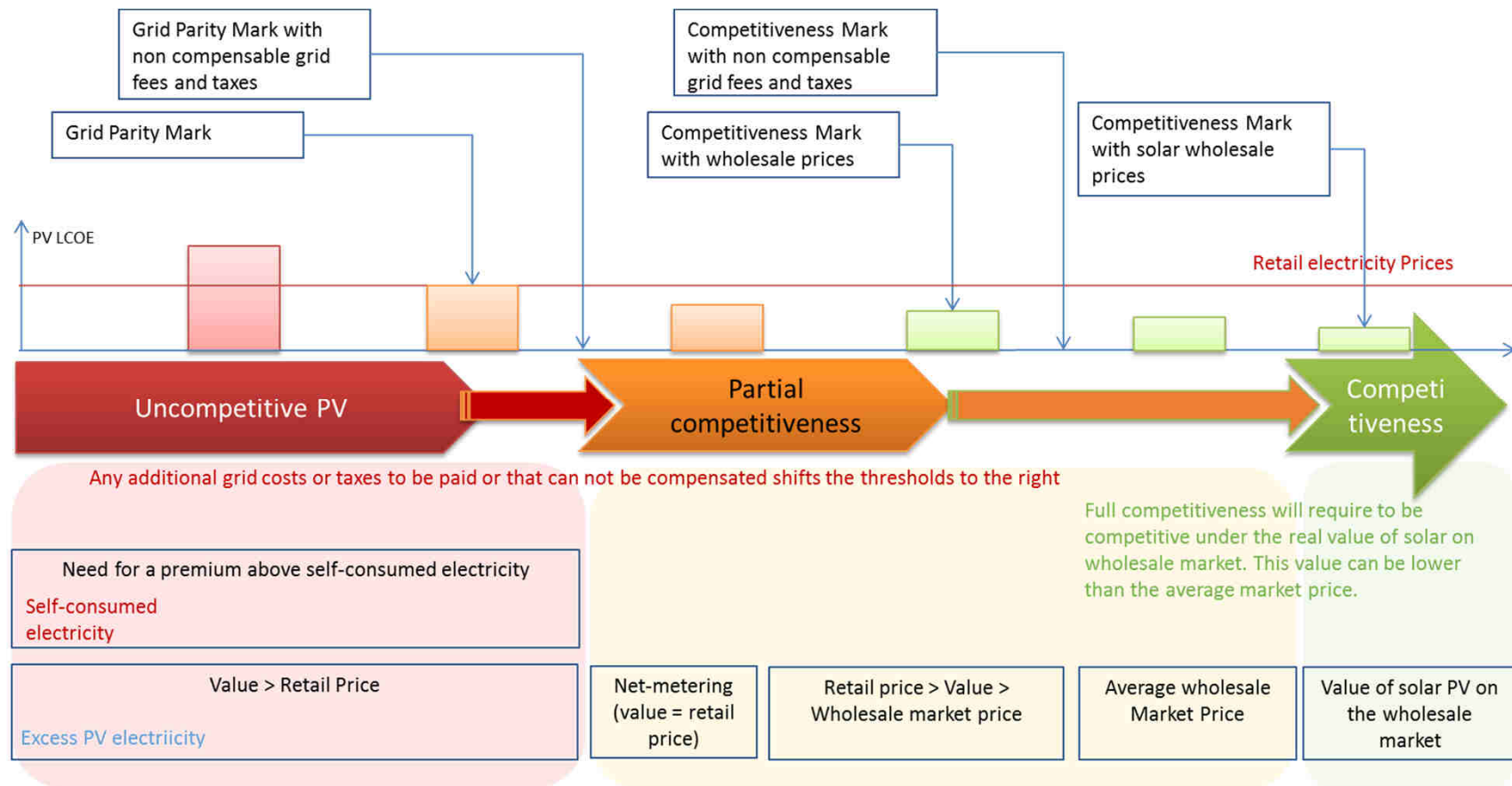
- How to finance the grid?
- How to keep government revenues stable?
- How to save utilities ?

WHICH POLICIES ?

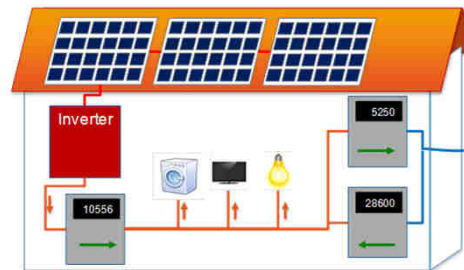
		Production based: classical "FiT" - style. No self-consumption	Self-consumption with constrains	Self-consumption + FiT GC, FiP	Net-billing	Net-metering	Self-consumption + Premium
1	Right to self-consume	Not Allowed	Yes	Yes	Yes	Yes	Yes
2	Revenues from self-consumed PV	N/A	Savings on the electricity bill	Savings on the electricity bill	Netting of production revenues and consumption costs	Savings on the electricity bill	Savings on the electricity bill
	Additional revenues on self-consumed PV	N/A	No	No	No	No	Premium
3	Charges to finance T&D cost	N/A	Yes	No	No	No	No
4	Revenues from excess electricity	N/A	Zero	< retail price	<= retail price	= retail price	> retail price
5	Maximum timeframe for compensation	N/A	Real-time	Real-time	Long period	Long period	Real time

THE DEBATE ON SELF-CONSUMPTION

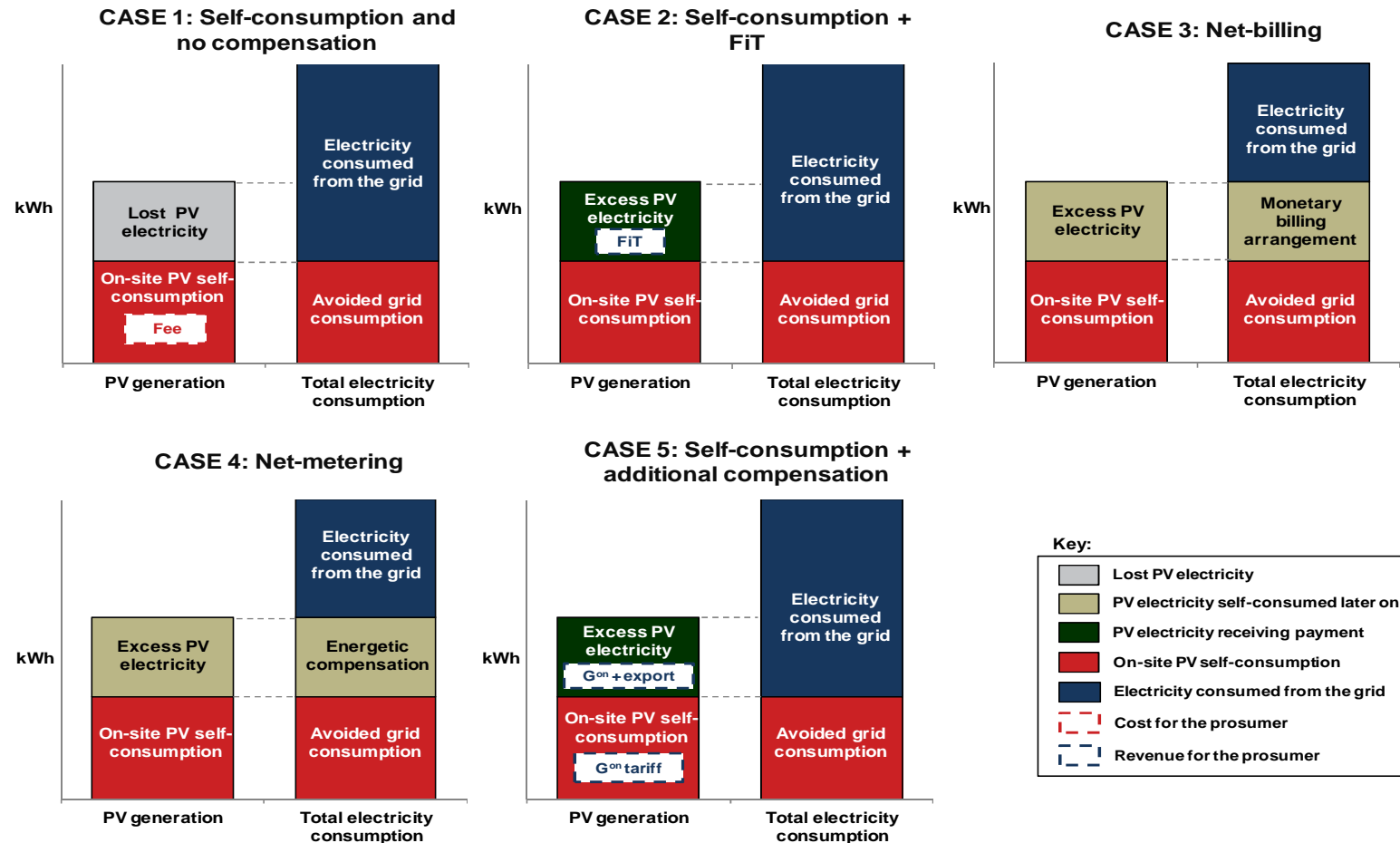
Self-consumption will be constrained due to limited savings on the electricity bill



BUSINESS MODELS

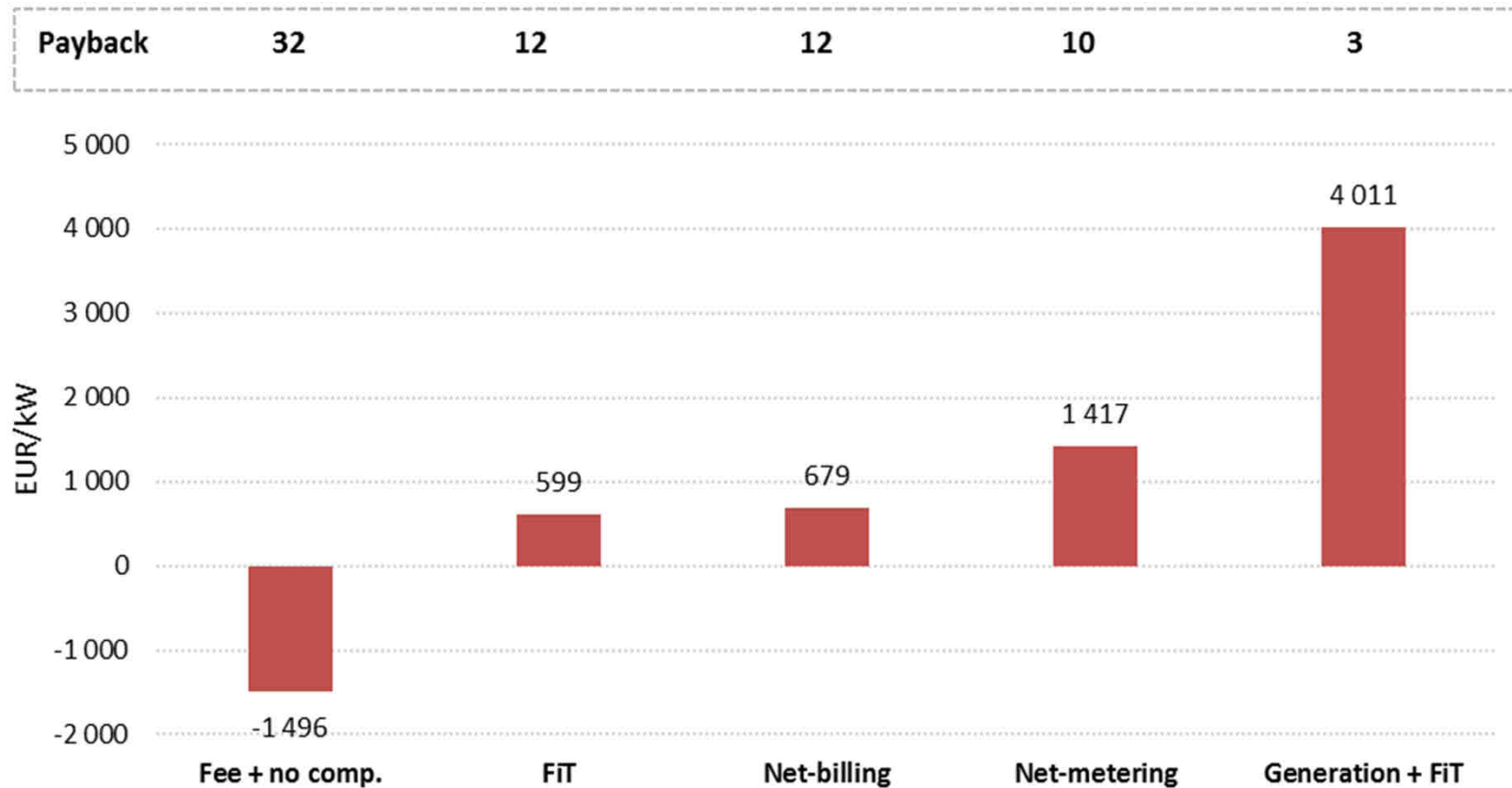


SELF-CO BUSINESS MODELS



Source: ECLAREON Analysis

SCHEME COMPARISON



Source: IEA-PVPS - Roma, Italy

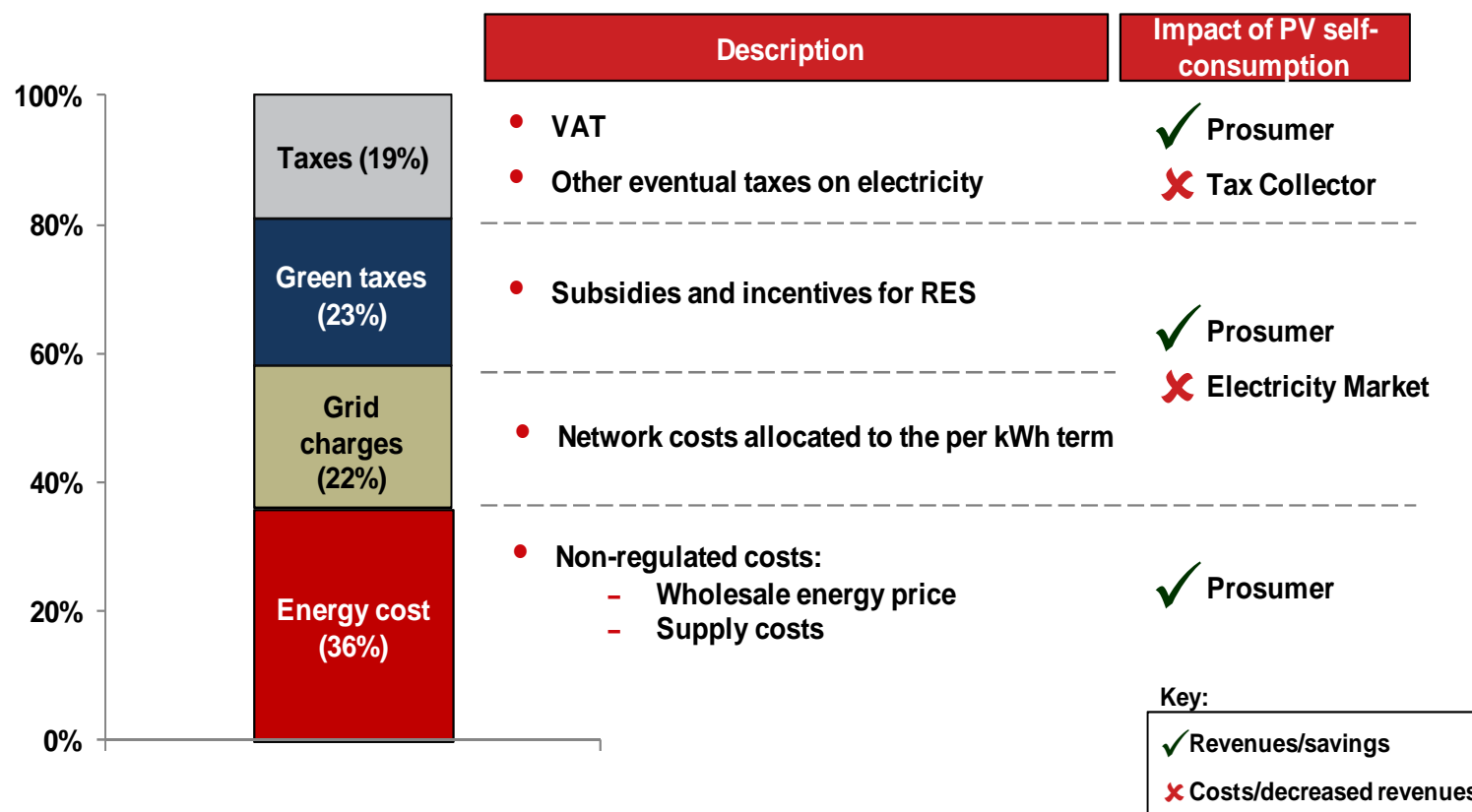
COMPETITIVENESS ASSESSMENT

Industrial segment

PV @ 1 EUR/Wp – 6% WACC (real) – 75% SC – electricity sold at wholesale market prices.

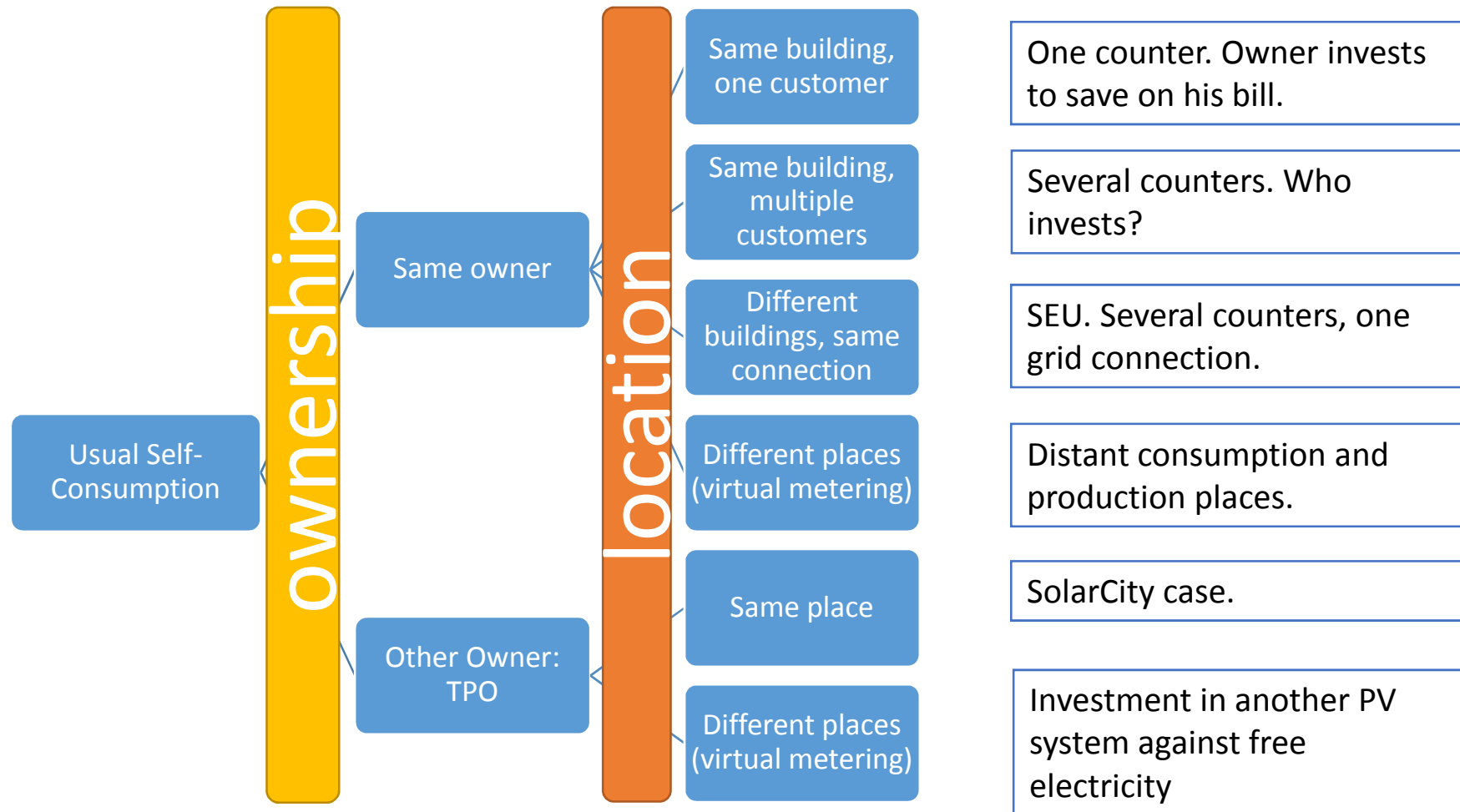
Austria	Uncompetitive before 2019
France	Competitive in the South / North in 2018
Germany	Competitive
Italy	Competitive
Spain	Competitive in the South / North in 2018
Turkey	Uncompetitive before 2019 in the South
UK	Competitive

SELF-CONSUMPTION IMPACTS



Source: ECLAREON Analysis

INNOVATIVE BUSINESS MODELS



OPTIONS FOR DISTRIBUTED PV

Different options for a new rooftop PV system

BUY

Equity (savings) - Low cost of capital (real WACC close to 0% or even negative)
Ownership

LOAN

Medium cost of capital (real WACC around 2-5%)
Ownership

LEASE

Fixed length - O&M included
Ownership to be debated

Third-party investment

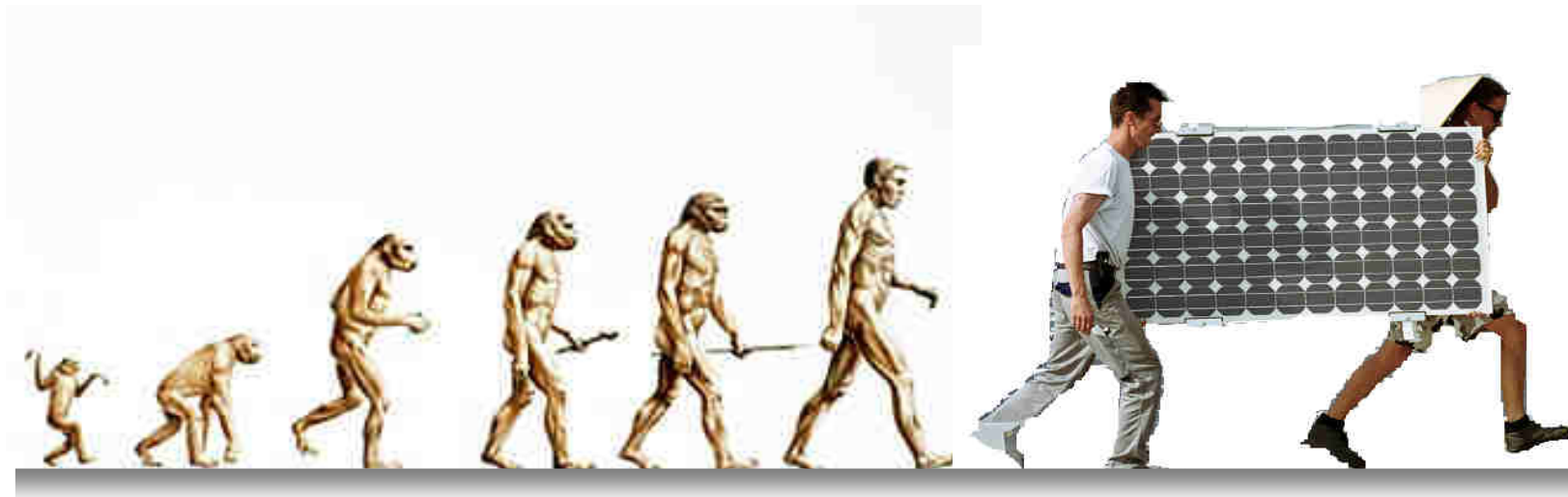
Fee paid to the third-party, under the retail electricity price (could be an utility)
O&M Included
No ownership
Possible contracts with utilities sold against guaranteed cheaper electricity prices



5 PROPOSALS FOR SC REGULATIONS

1. Guarantee the right to self-consume without additional taxes.
2. Compensation without limits of taxes and levies for prosumers.
3. Variable grid costs shouldn't be paid until PV reaches a critical penetration. Mutualization is accessible and fair.
4. Grandfathering clause for existing systems
5. Electricity markets are unstable, favour a stable value for solar electricity injected

NEXT STEP IN EVOLUTION





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Thanks for
your attention

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