



Tapping the Potential of Prosumers

Drivers and Policy options (RE-PROSUMERS)

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Renewable Energy
Technology Deployment

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IEA-RETD is part of the IEA's Energy Technology Network

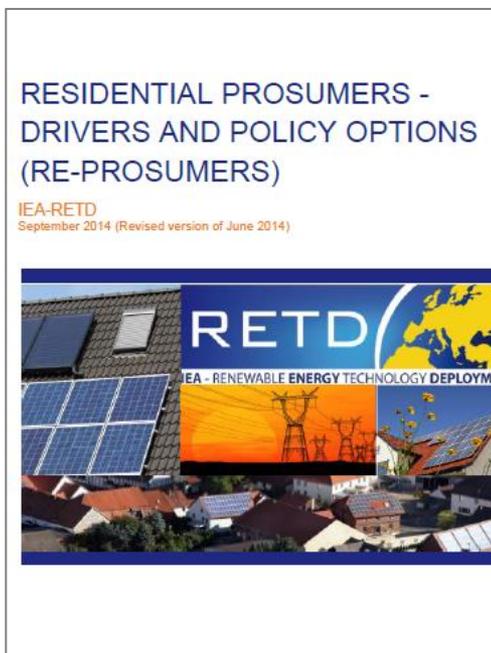
RETD stands for “Renewable Energy Technology Deployment”.

IEA-RETD is a **policy-focused Technology Collaboration Programme** under the legal framework of the International Energy Agency

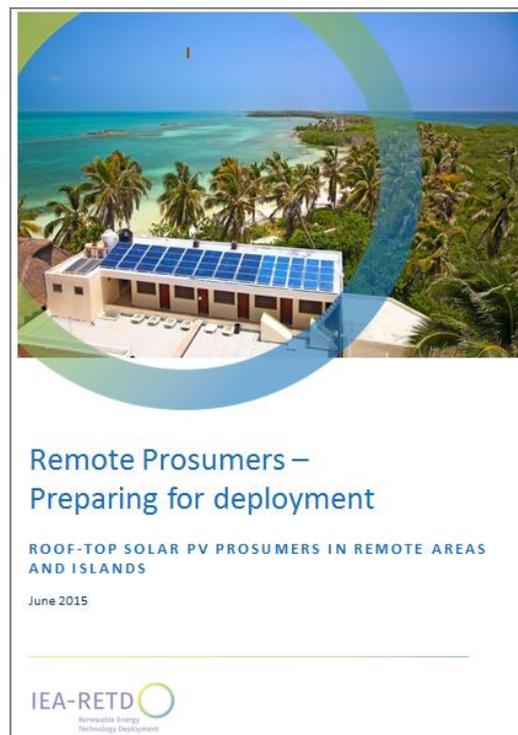
9 members: CA, DE, DK, FR, IE, JP, NO, UK + European Commission



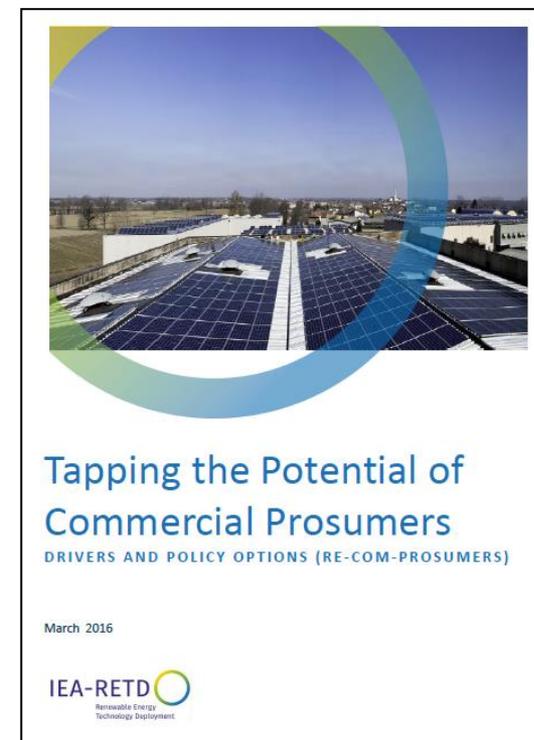
IEA-Reports on prosumers freely available at www.iea-rettd.org



2014



2015

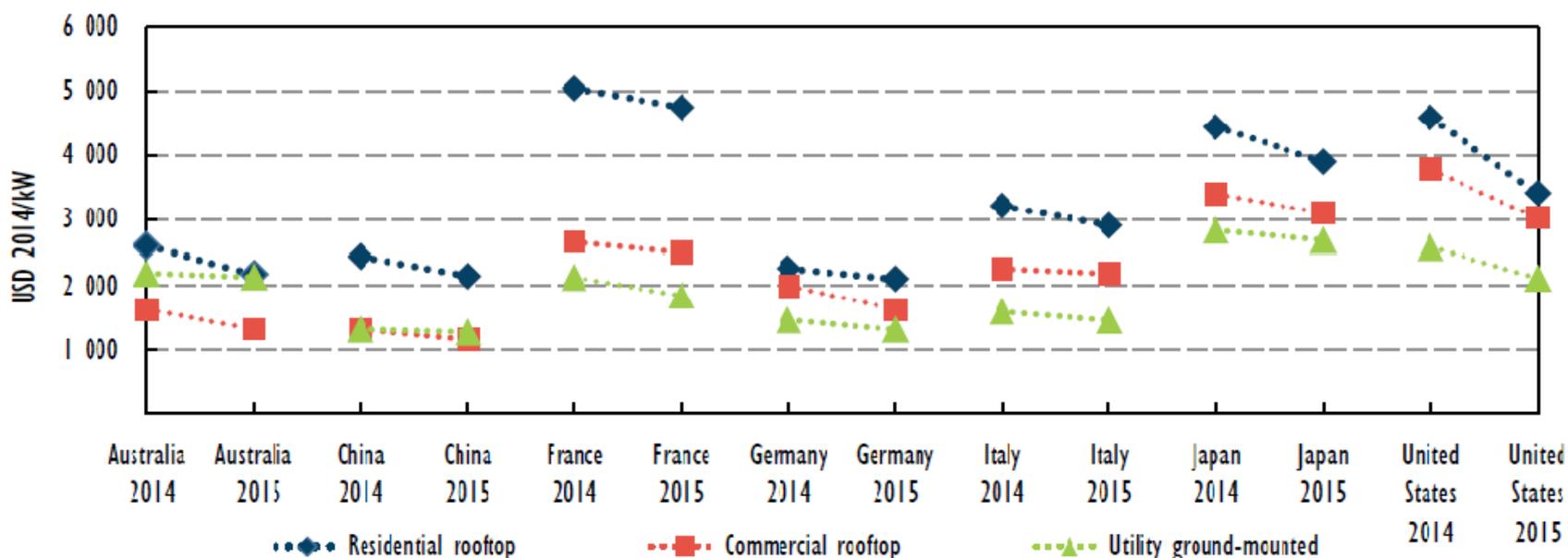


2016

Agenda

- Is a PV Prosumer Revolution Imminent?
- No – Not Yet (Without Incentives and Enabling Policies)
- But Policy Makers Need to Watch Key Drivers...
- ... and Lay Out Potential Strategies Going Forward

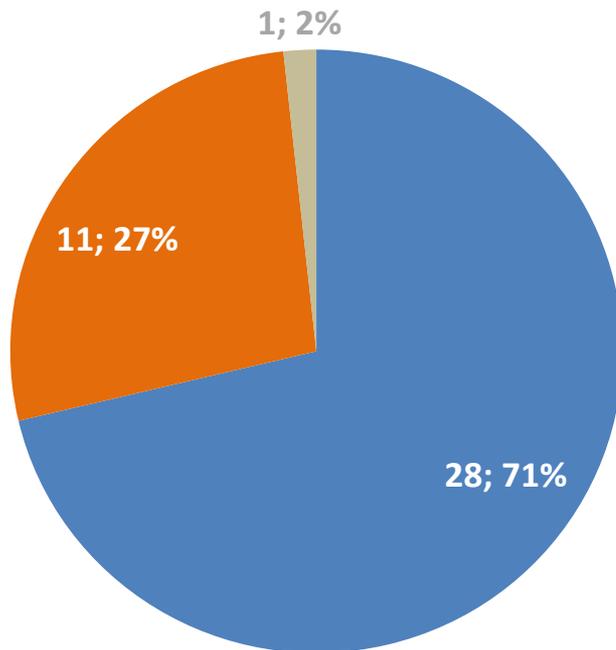
The cost to install PV has fallen dramatically, and is likely to continue to do so



Source: IEA(2015)

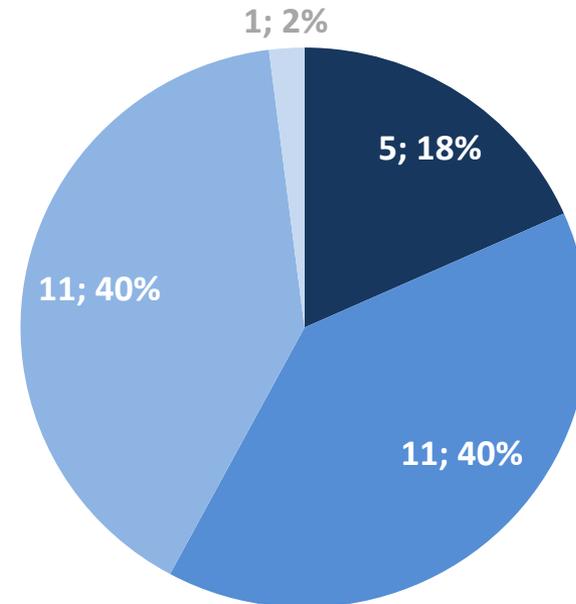
Roof-top PV can have an important share in some PV markets (71 % in Germany, thereof 58 % < 40 kW)

PV capacity installed (GW)
31.12.2015



■ Roof-top ■ Ground-based ■ unknown

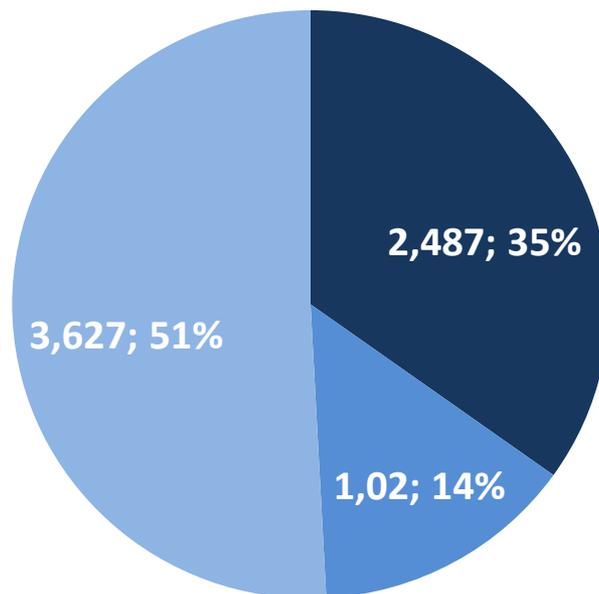
Roof-top PV capacity installed by size (GW)
31.12.2015



■ < 0,01 MW ■ 0,01 < 0,04 MW
■ 0,04 < 1 MW ■ 1 < 10 MW

In France the share of projects below 100 kW is at 35 %

Roof-top PV capacity installed by size (GW)
31.12.2016

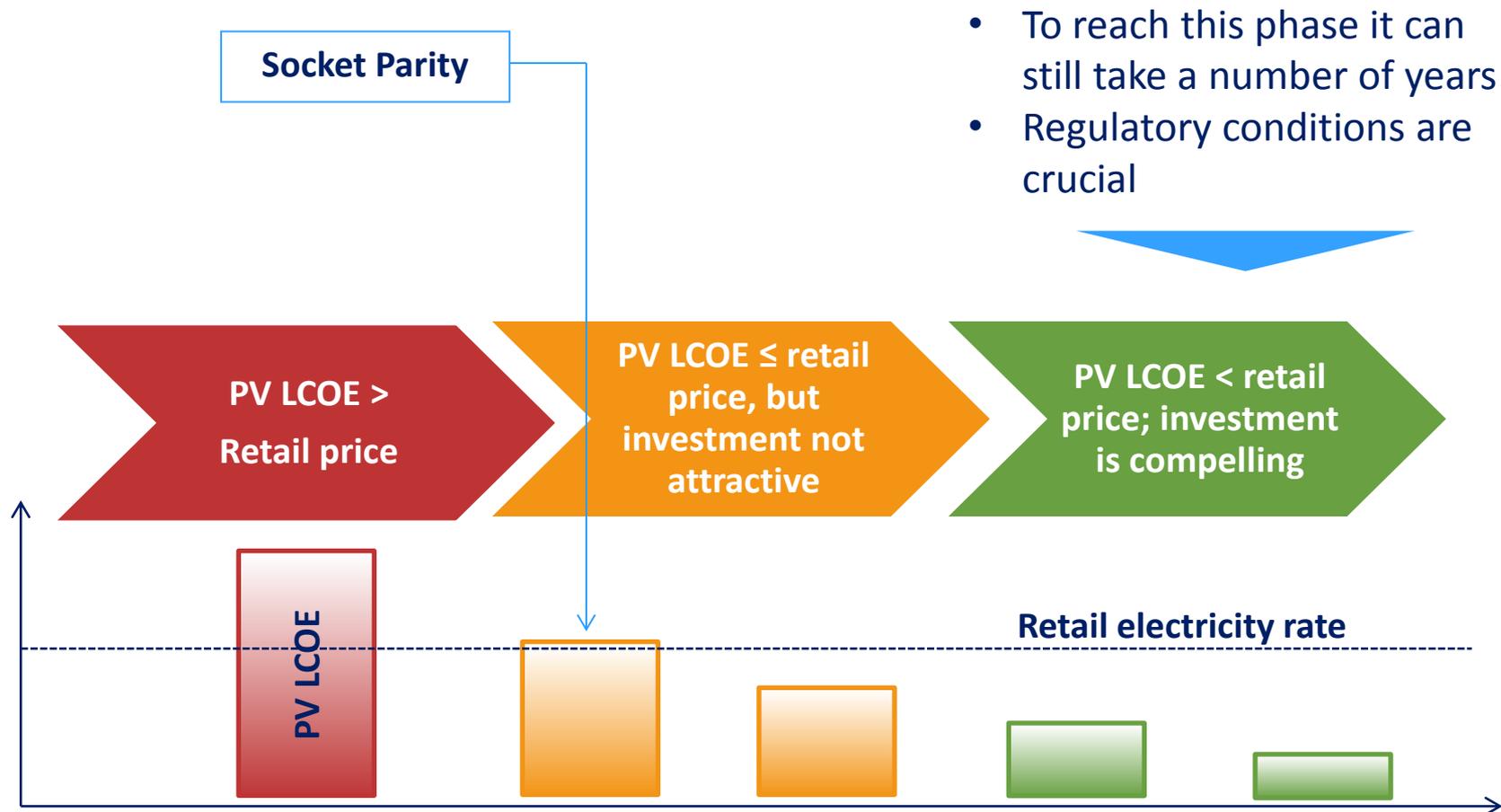


■ < 0,1 MW ■ 0,1 < 0,25 MW ■ > 0,25 MW

Agenda

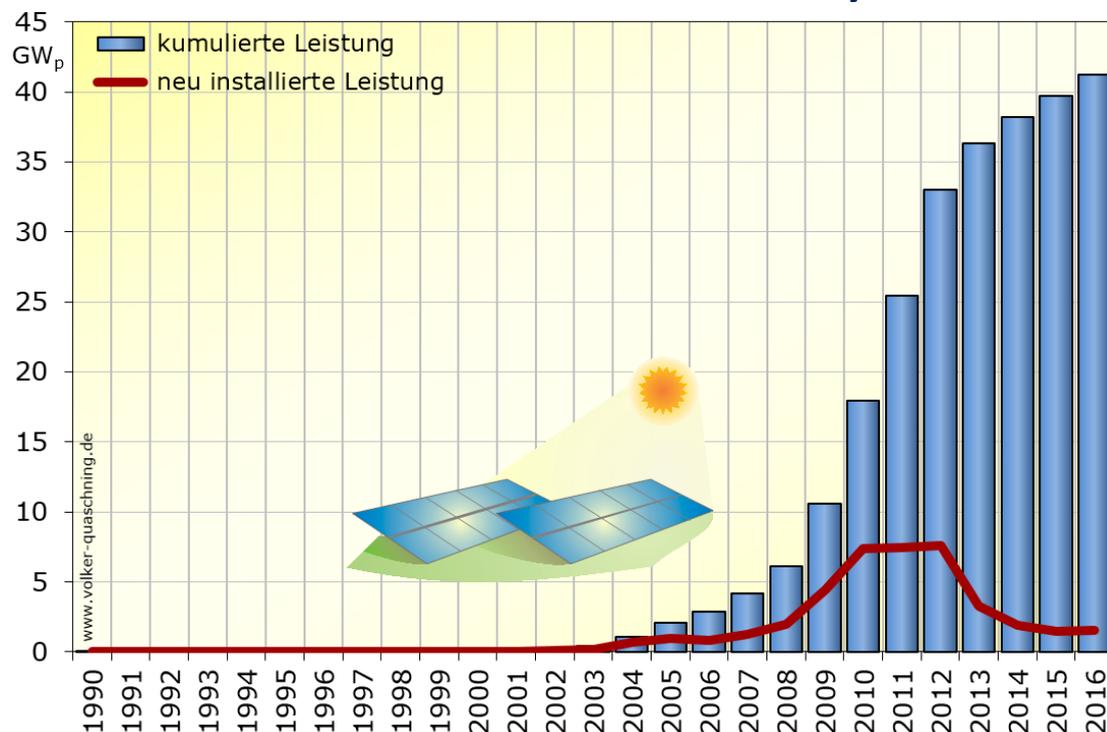
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PV costs must fall significantly below socket parity in order for non-incentivized growth to occur



Obvious that neither German nor French market are booming

PV Installations in Germany



New installations in 2016:

Only 1.5 GW PV in Germany

Only 559 MW PV in France (lowest value since 2009)

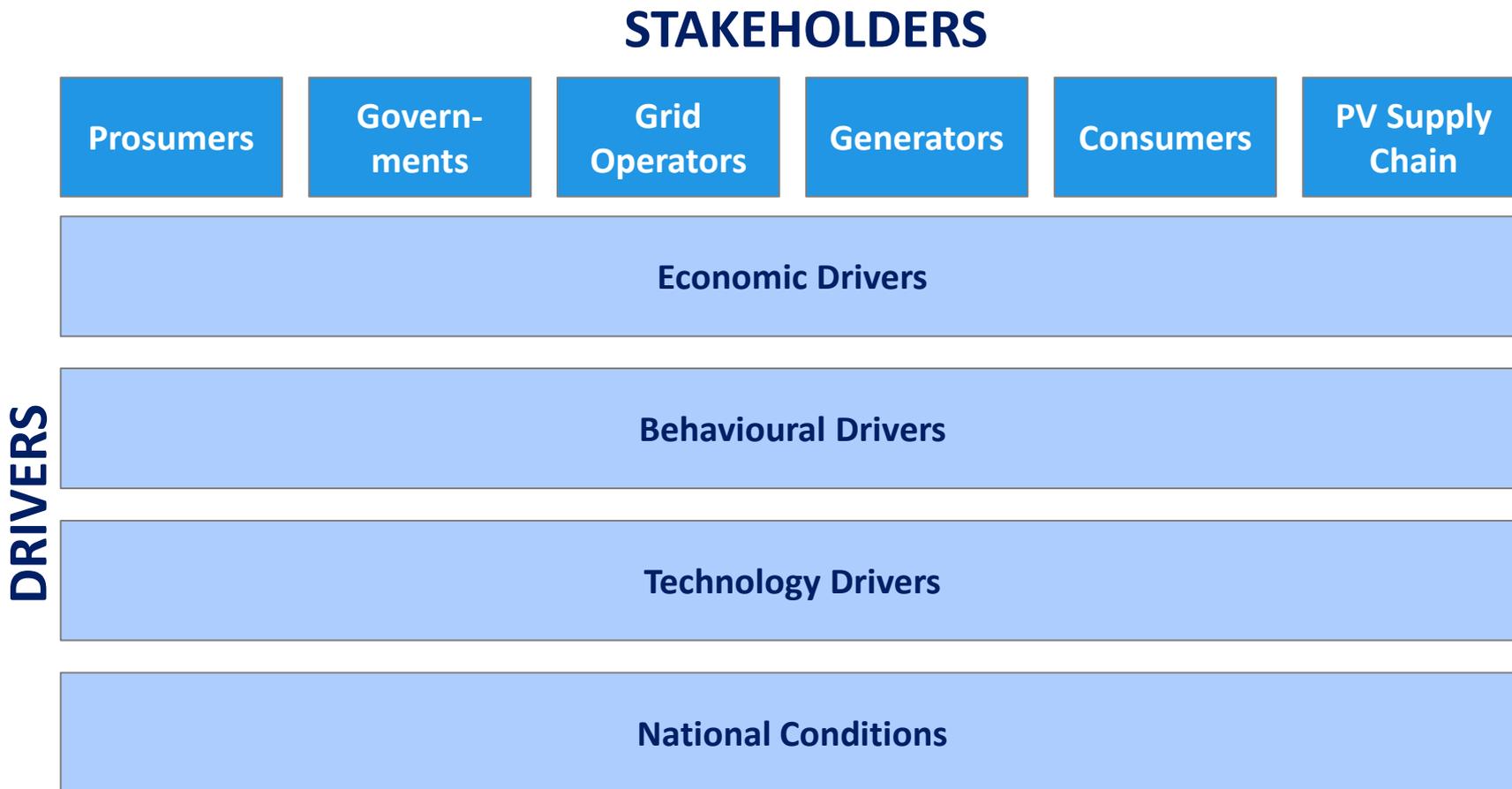
For the time being, prosumers still need incentives and favorable regulations -> support schemes remain key

- Mass non-incentivized prosumers are unlikely to arrive in the near-term
- Incentives (e.g. FITs) above the retail electricity rate have driven the prosumer revolution to date
- Mass prosumer expansion will require policies that compensate most/all of PV output (net metering, below-retail FITs, etc.)
- Without support schemes, storage will be required – which adds cost
- Non-incentivized mass defection from grids not to be expected soon.

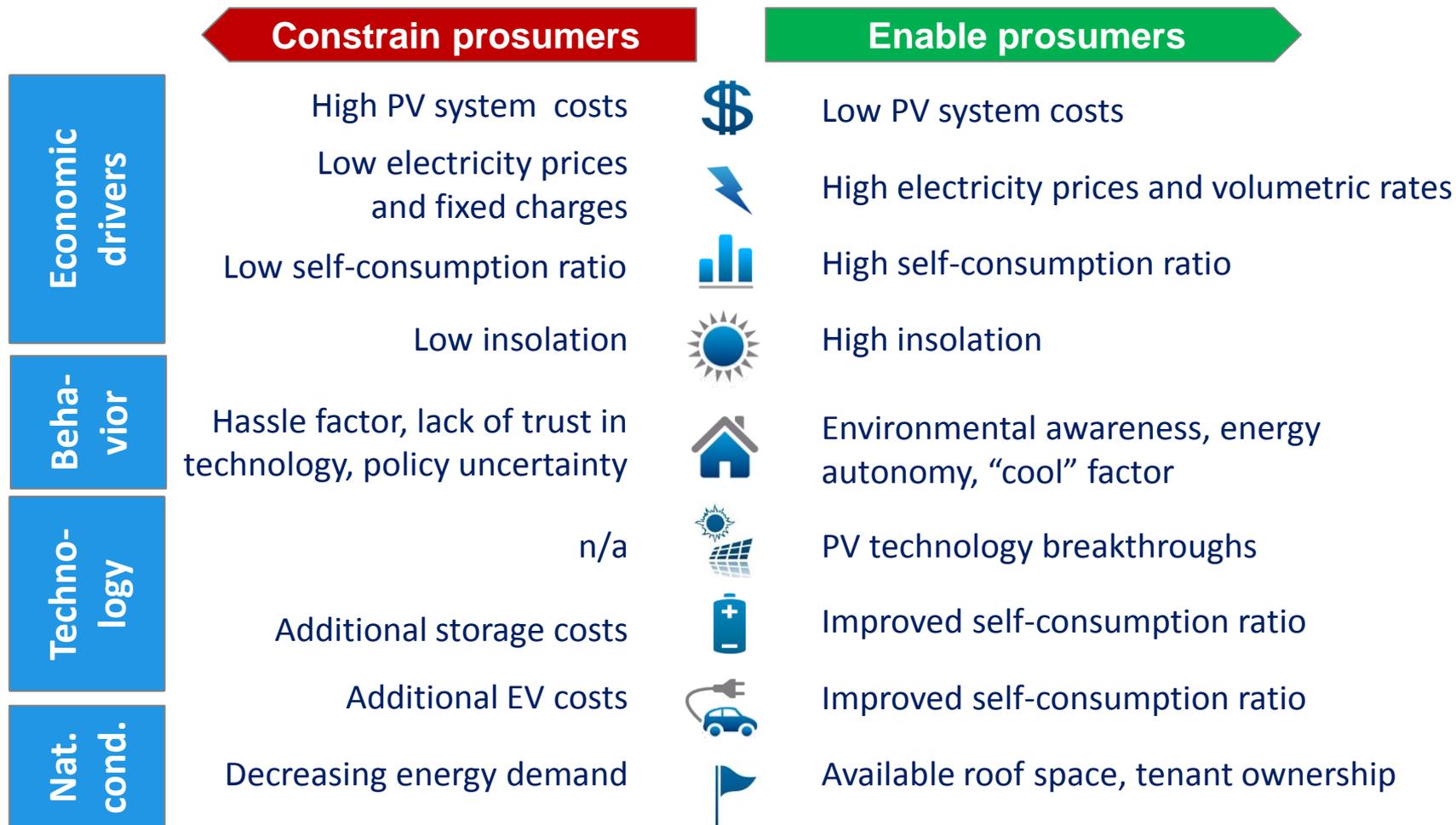
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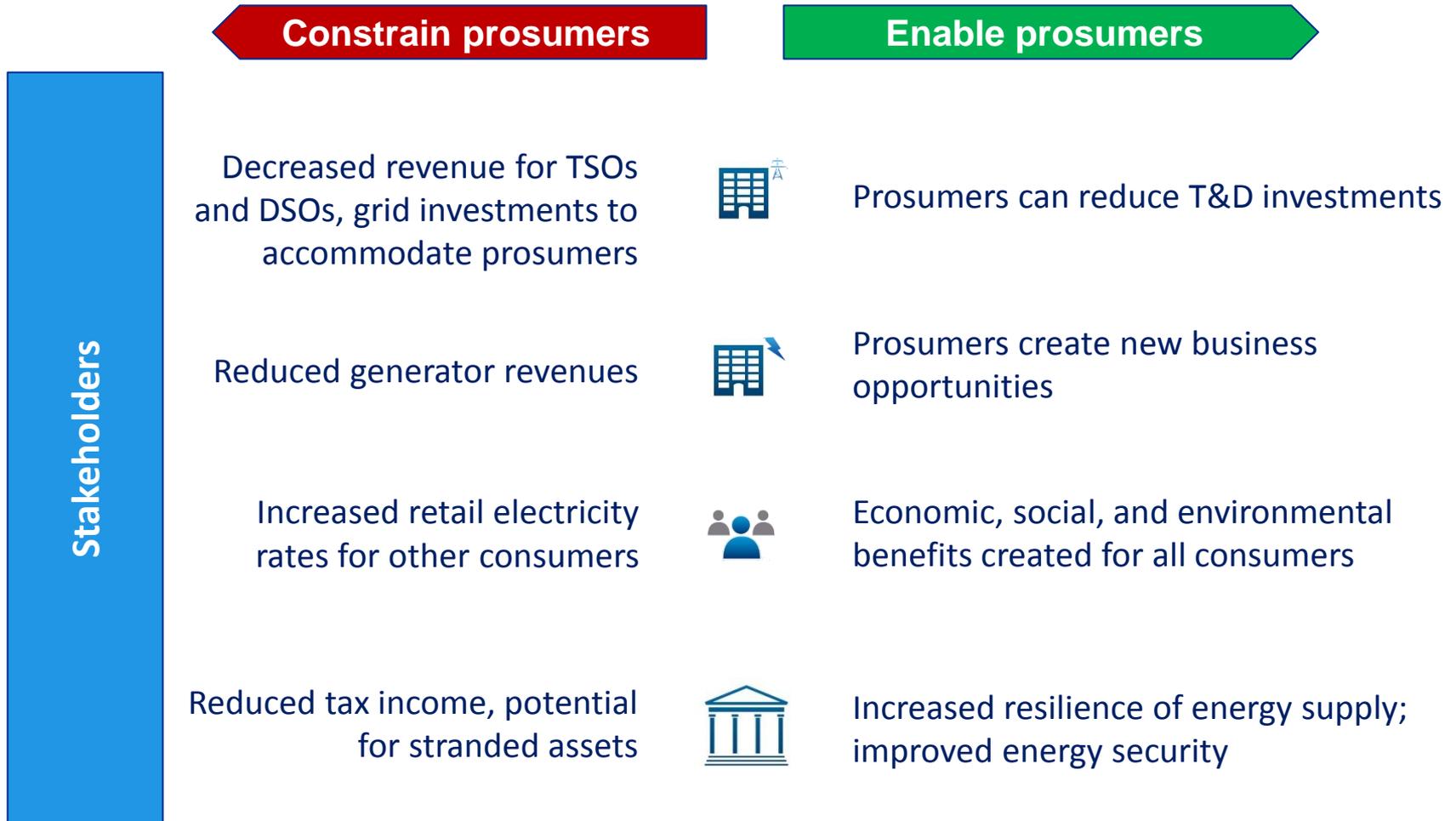
A complex picture of drivers and national specifics influence the different stakeholder groups



Drivers can have enabling or constraining effects on prosumer uptake...



... and Stakeholder Interest are crucial, too.



Opportunities and risks need to be clearly articulated and balanced – and stakeholder interests aligned

Opportunities / Benefits		Challenges / Costs / Risks	
<p>Political benefits</p> <ul style="list-style-type: none"> • PV popular with voters • “Energy Democracy” 	<p>Grid benefits</p> <ul style="list-style-type: none"> • T&D deferral • Avoided losses 	<p>Decreased TSO/DSO revenue</p> <ul style="list-style-type: none"> • Reduced revenue • Risk of “death spiral” 	<p>Grid expansion and upgrades</p> <ul style="list-style-type: none"> • Cost to expand grid • Risk of stranded assets
<p>Economic benefits</p> <ul style="list-style-type: none"> • Job creation • Decrease fuel imports 	<p>Environmental benefits</p> <ul style="list-style-type: none"> • Emissions reductions • Water conservation 	<p>Incumbent generator risks</p> <ul style="list-style-type: none"> • Generators lose revenue • Risk of bankruptcy 	<p>Decreased tax revenues</p> <ul style="list-style-type: none"> • Lower tax payment from the retail rate

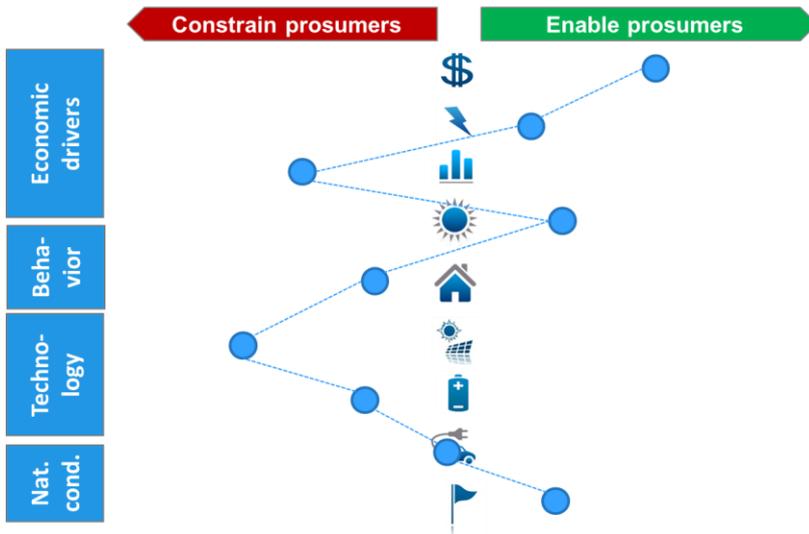
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To define a policy strategy, governments need to evaluate all drivers and balance opportunities and risks

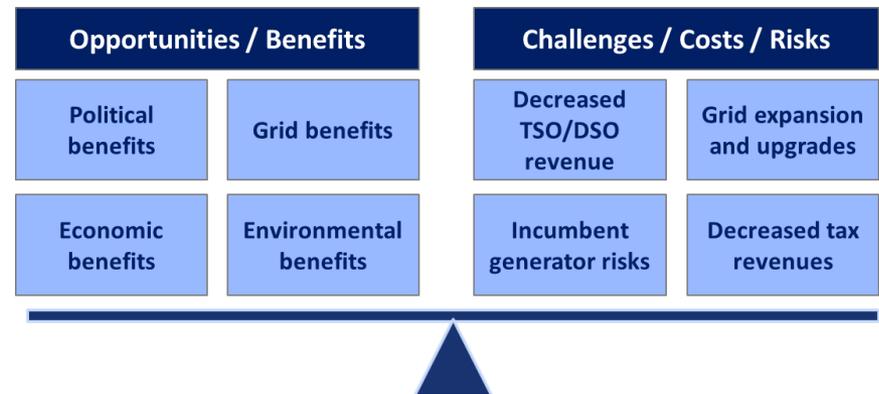
1. Evaluate drivers and conditions

Are the conditions in place to support non-incentivised consumer scale-up?



2. Balance opportunities and risks

Given the trade offs, is support for prosumers a national policy objective?



3. Define policy strategy

Prosumer strategies are required to sustain growth and to enable industry transition

Prosumer Strategy Choices

1. Constrain prosumers

Restrictive policies to avoid structural changes to utility business and regulatory paradigms

2. Enable prosumers

Enabling policies like compensation for surplus production and transparent interconnectoin rules

3. Transition to prosumers

A

Incremental

B

Structural

New regulatory and policy approaches / paradigms for utility regulation and grid management

Best choice of a prosumer strategy?

Danish government unveils bill to introduce tax on self-consumed PV power

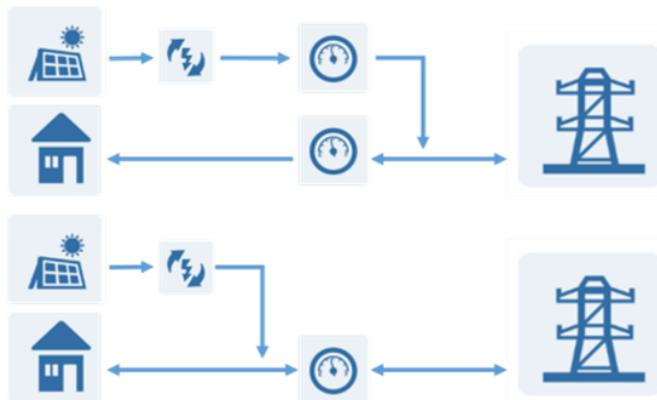
The government said the tax is expected to reduce budget expense from DKK 4.9 billion to DKK 3.7 billion, and to slow faster than expected development of solar.

MAY 22, 2017 EMILIANO BELLINI

2. Enable prosumers

Policies for Enabling Prosumers

- Connecting to the Grid
 - Permission to interconnect
 - Interconnection rules
 - Interconnect. application & review fees
 - Interconnection cost recovery
 - Interconnection transparency
- Feeding into the Grid
 - Connect “in front of” or “behind” meter



- Compensation for Electricity Fed into the Grid
 - Amount that will be compensated
 - Compensation level: Above, at, below retail rate
 - Certainty of compensation level: Fixed contracts, retail or wholesale compensation
- Efforts to Reduce Soft Costs
 - Remove or reduce cumbersome bureaucratic procedures
 - Reduce or eliminate fees and costs
 - Support PV marketing efforts in order to reduce installer acquisition costs

Policies for Transitioning to Prosumers

3.A Incremental Transition to prosumers

Incremental approach	Examples
Prosumer compensation mechanisms	<ul style="list-style-type: none"> • Buy-all/sell-all arrangements or hybrids with net metering • Net excess generation purchased at full retail rate, or (in islands) at, or near, the avoided cost rate
Rate Design	<ul style="list-style-type: none"> • Time-varying prices (this could be positive or negative, depending on the jurisdiction and level of PV penetration) • Pure volumetric tariffs (\$/kWh), i.e. without fixed charges
Ratemaking	<ul style="list-style-type: none"> • Decoupling utility revenues from power sales • Lost revenue adjustment mechanisms or performance-based incentives
Market Reforms	<ul style="list-style-type: none"> • Allowing peer-to-peer power sharing • Encouraging new, prosumer-friendly business models
Tax Reforms	<ul style="list-style-type: none"> • Shift electricity sales tax to other income sources • Tax incentives or credits for solar system components, or investments

Policies for Transitioning to Prosumers

3.B Structural Transition to prosumers

Structural approach	Examples
Innovative business models	<ul style="list-style-type: none"> Utilities become neutral managers of grid infrastructure, brokers of new customer relationships, partners with prosumer service providers, or even financiers of prosumer infrastructure
New product and service offerings	<ul style="list-style-type: none"> Instead of selling electricity as a universal bulk commodity, utilities could make differentiated offerings based on individual requirements. Selling specific “services” such as light, heat, or load management
New operational models	<ul style="list-style-type: none"> Strengthened and more sophisticated grid operators Distribution grids to adapt management mechanisms of transmission grids, e.g. locational pricing, forecasting, and real time visibility
Emerging technologies	<ul style="list-style-type: none"> E.g. smart grid infrastructure that will reconfigure the utility-customer relationship to be more integrated, interactive, and price responsive. Utilities will have more visibility and control at the distribution level, customers more opportunities to react to electricity market

Prosumer scale-up will require policies to sustain growth and to enable industry and markets transition

- A prosumer revolution is not here yet.
- Support policies are currently the primary determinant of prosumer emergence.
- But major drivers, especially economic ones, are accelerating the case for prosumers.
- Policy makers should duly evaluate drivers and conditions, as well as opportunities and challenges.
- And lay out the policies needed to enable and encourage prosumers.
- RE-PROSUMERS provides a framework to define these policies.





THANK YOU!

For additional information on IEA-RETD

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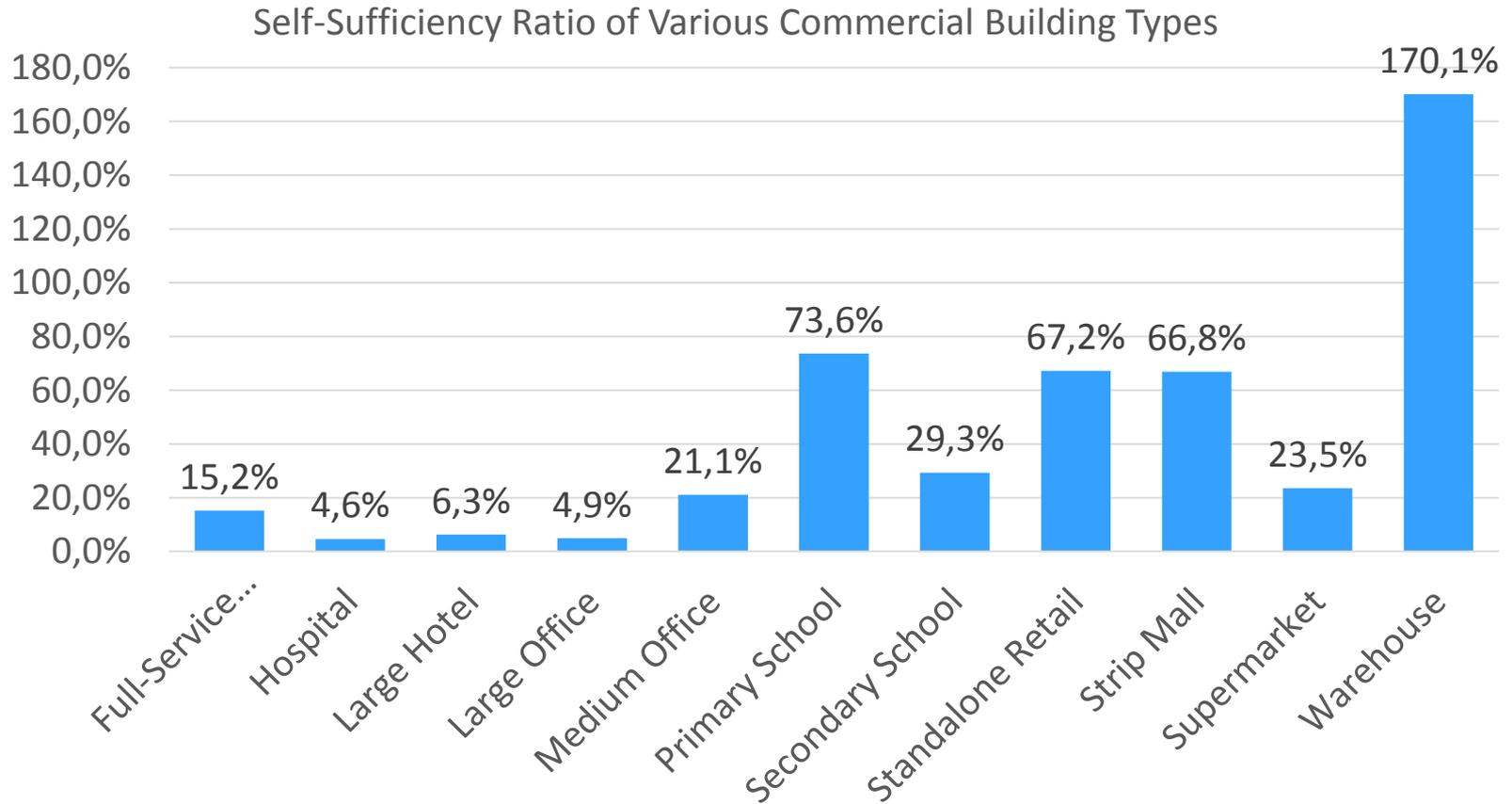


For other drivers it cannot be generalized as to whether they favour commercial over residential prosumers

	Behavioural drivers		<ul style="list-style-type: none"> • Commercial return on investment requirements are higher than residential • Commercial decision making processes are complex and may either enable or constrain PV adoption
	Technology drivers		<p>In jurisdictions with high demand charges, PV and battery systems configured to shave peak can improve the economic case for commercial prosumers.</p>
	National conditions		<ul style="list-style-type: none"> • There is significant commercial roof space available for PV development • The share of owner-occupied space in the commercial sector is lower than in the residential sector
	T&D operators		<p>Both residential and commercial prosumers may pose challenges to incumbent owners of electricity infrastructure, although commercial PV may have a lower negative impact while at the same time creating new opportunities for utility business models.</p>
	Incumbent generators		

-  Advantage for commercial prosumers
-  Unclear influence on commercial prosumers
-  Disadvantage for commercial prosumers

Study found that building types and level of self-sufficiency ratio are not the main drivers for uptake

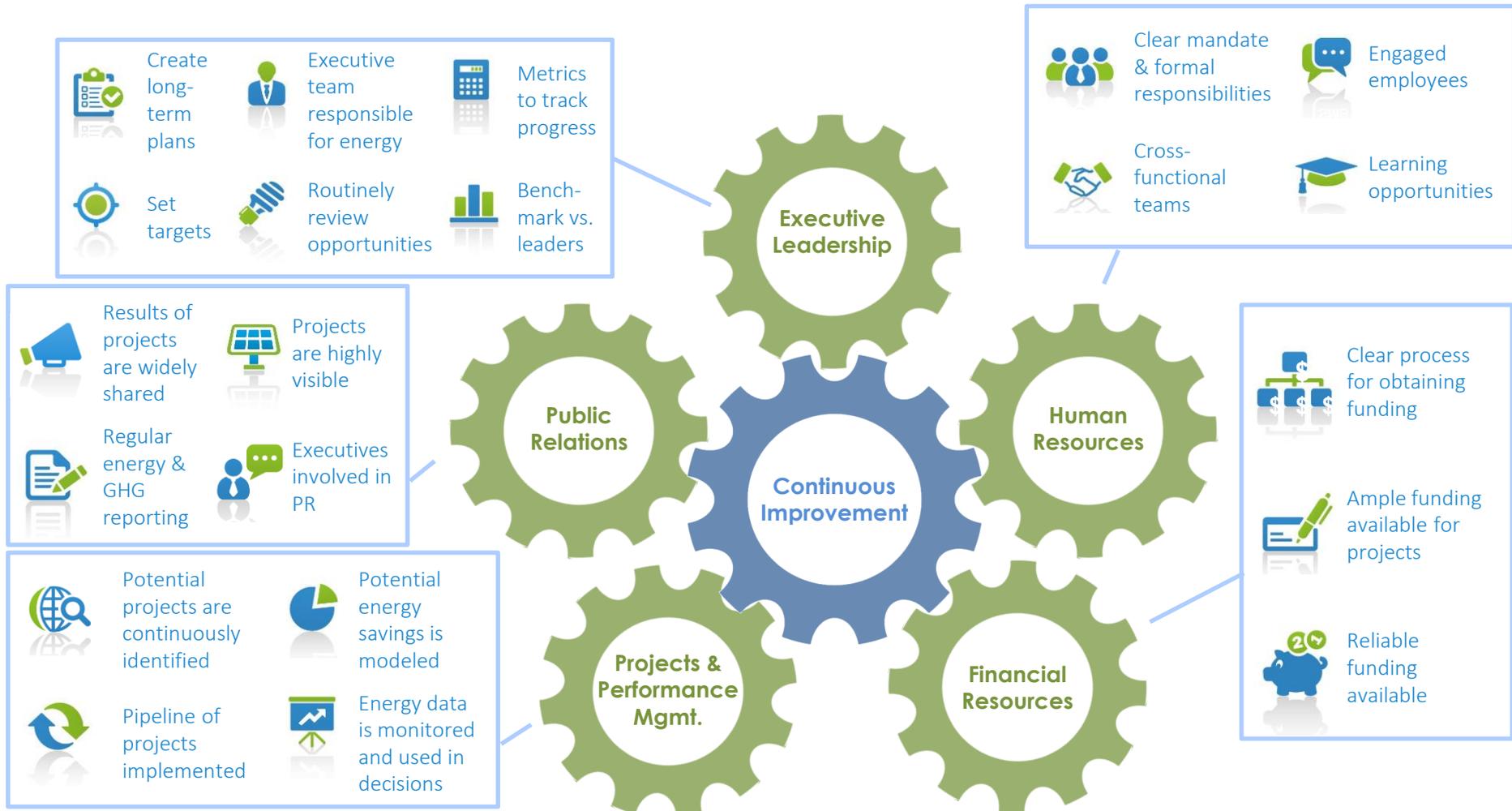


Source: Ong et al. 2012

Solar PV adoption may depend heavily on building ownership and property management strategy

Category of Building	Considerations
Commercial real estate	<ul style="list-style-type: none">• Leased and managed by the owner• Leased but managed by a property management company• Owner-occupied
Franchises and chains (e.g. supermarkets, retail, restaurants, and hotels)	<ul style="list-style-type: none">• Highly diverse ownership, management and corporate strategies)
Institutional (e.g. public buildings, universities, and hospitals)	<ul style="list-style-type: none">• Long-term occupancy• May be enabled or constrained by government policy

Organizational decision making is complex – and a key determinant of commercial PV adoption



Targeted interventions aimed at enabling a sustainable growth of commercial prosumers could include

- **Designing new policies for net excess generation.**
 - For markets where commercial retail rates are *below* LCOE of PV, any rate offered for excess generation would likely need to be designed as slight premium to the commercial retail rate paid in order to drive adoption.
 - For markets where commercial retail rates are *above* LCOE of PV, the rate offered for excess generation would likely need to be below the retail rate paid, in order to avoid excess compensation and encourage efficient use.
- **Facilitating improved data on national commercial building stock.**
 - Some countries conduct detailed surveys of the number and type of commercial buildings, as well as energy usage within those building types.
 - Research, update and share these statistics so that policymakers can make better informed decisions on how best to target their interventions and what the outcomes may be.

Targeted interventions aimed at enabling a sustainable growth of commercial prosumers could include

- **Developing programs that specifically target commercial decision making.**
 - Policymakers, local decision-makers and business developers can assess the institutional needs of specific commercial entities (e.g. supermarkets, shopping malls) and craft appropriate local regulation accordingly.
 - Provide focused training programs or on-call PV technical assistance
 - Deploy low-interest loan facilities
 - Create recognition campaigns, and other public-private awareness
- **Conducting broad characterizations of commercial building type according to the factors that may influence decision making.**
 - Project developers or industry associations to assess whether certain property ownership types can be broadly associated with specific building types, and whether policy interventions can be tailored accordingly.
 - Map different building ownership considerations and their implications for energy decision making.

Commercial prosumers are not yet “breaking loose”

- As a result of organizational decision-making and comparatively low commercial electricity rates, the commercial sector is less well-positioned for growth than residential prosumers.
- Traditional emphasis on the influence of commercial building type in driving prosumer behavior overlooks other more significant factors, such as rate structure.
- Commercial prosumers have been slow to emerge on an “incentive free” basis.
- The slow emergence of “un-incentivized” commercial prosumers has been largely due to poor economics

The commercial PV prosumers can play an important role if enabled by transition policies

- The significant potential of commercial PV prosumers in the markets examined remains largely untapped.
- As technological and market conditions for commercial prosumers continue to improve, policy makers – and other stakeholders – will need to think more carefully about how best to govern their rise.
- This may require assessing the commercial sector as a distinct factor in the evolution of the electricity sector
- The commercial sector could play a significant role in accelerating the transition toward a more decentralized, interactive, and highly networked system.
- **Policy makers, regulators, and affected utilities therefore need to develop strategies to better anticipate, integrate, and plan for a growing number of commercial prosumers.**

IEA-PVPS 2016 – Review and analysis of self-consumption policies

		Germany	
PV Self-consumption	1	Right to self-consume	Yes
	2	Revenues from self-consumed PV	Savings on the electricity bill
	3	Charges to finance T&D	None
Excess PV electricity	4	Revenues from excess electricity	FiT or FiP
	5	Maximum timeframe for compensation	Real time
	6	Geographical compensation	On site only
Other system characteristics	7	Regulatory scheme duration	20 years (FiT)
	8	Third party ownership accepted	All
	9	Grid codes and additional taxes/fees	Grid codes compliance and partial EEG-surcharge
	10	Other enablers of self-consumption	Battery storage incentives
	11	PV System Size Limitations	Minimum 10% of self-consumption
	12	Electricity System Limitations	52 GW of PV installations
	13	Additional features	EEG levy must be paid anyway by the prosumer (above 10kW)

Table 12. Germany's self-consumption schemes

IEA-PVPS 2016 – Review and analysis of self-consumption policies

			A	B	C	D	E
			Self-consumption with constraints	Self-consumption with a FIT	Net-billing	Net-metering	Self-consumption with premium
PV Self-consumption	1	Right to self-consume	Yes	Yes	Not compulsory	Yes	Yes
	2	Revenues from self-consumed PV	Savings on the electricity bill	Savings on the electricity bill	Production revenue minus consumption costs	Savings on the electricity bill	Savings on the electricity bill + premium
	3	Charges to finance T&D	Yes	No	No	No	No
Excess PV electricity	4	Revenues from excess electricity	No remuneration	Feed-in Tariff	Feed-in tariff	Retail electricity prices	Feed-in Tariff
	5	Maximum timeframe for compensation	Real-time	Real-time	Could be > 1 year	Could be > 1 year	Real-time
	6	Geographical compensation	-	-	Could be virtual	Could be virtual	-
Other system characteristics	7	Regulatory scheme duration	Unlimited	Limited (e.g. 20 years for the FIT)	Could be limited	Unlimited	Limited (e.g. 20 years for the FIT)
	8	Third party ownership accepted	-	-	-	-	-
	9	Grid codes and additional taxes/fees	-	-	-	-	-
	10	Other enablers of self-consumption	-	-	-	-	-
	11	PV System Size Limitations	-	-	-	-	-
	12	Electricity System Limitations	-	-	-	-	-
	13	Additional features	-	-	-	-	-

Table 23. Summary of Self-consumption Business Models

IEA-PVPS 2016 – Review and analysis of self-consumption policies

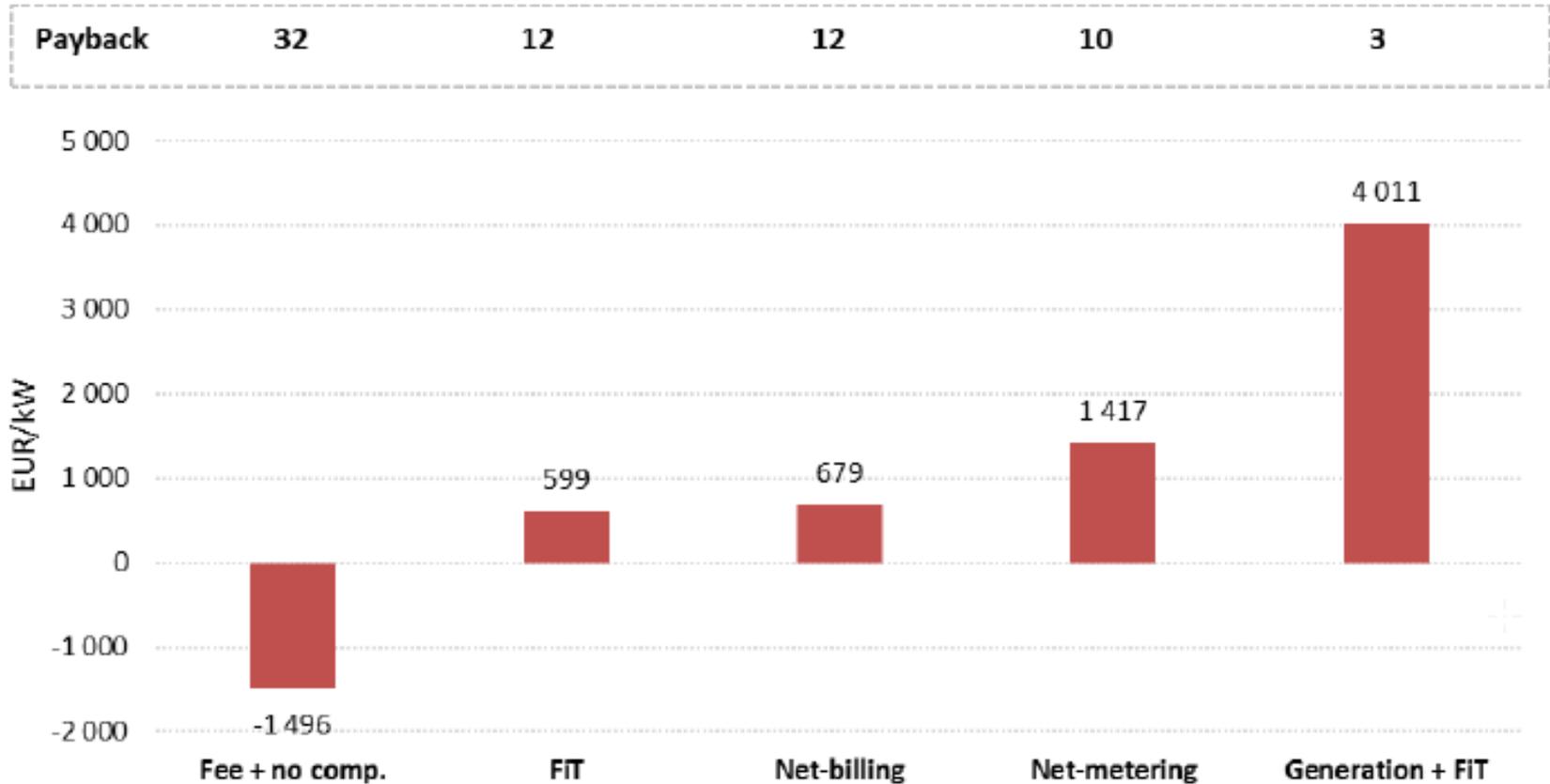


Figure 10. NPV per installed kW (30 years) for the prosumer per Business Case