

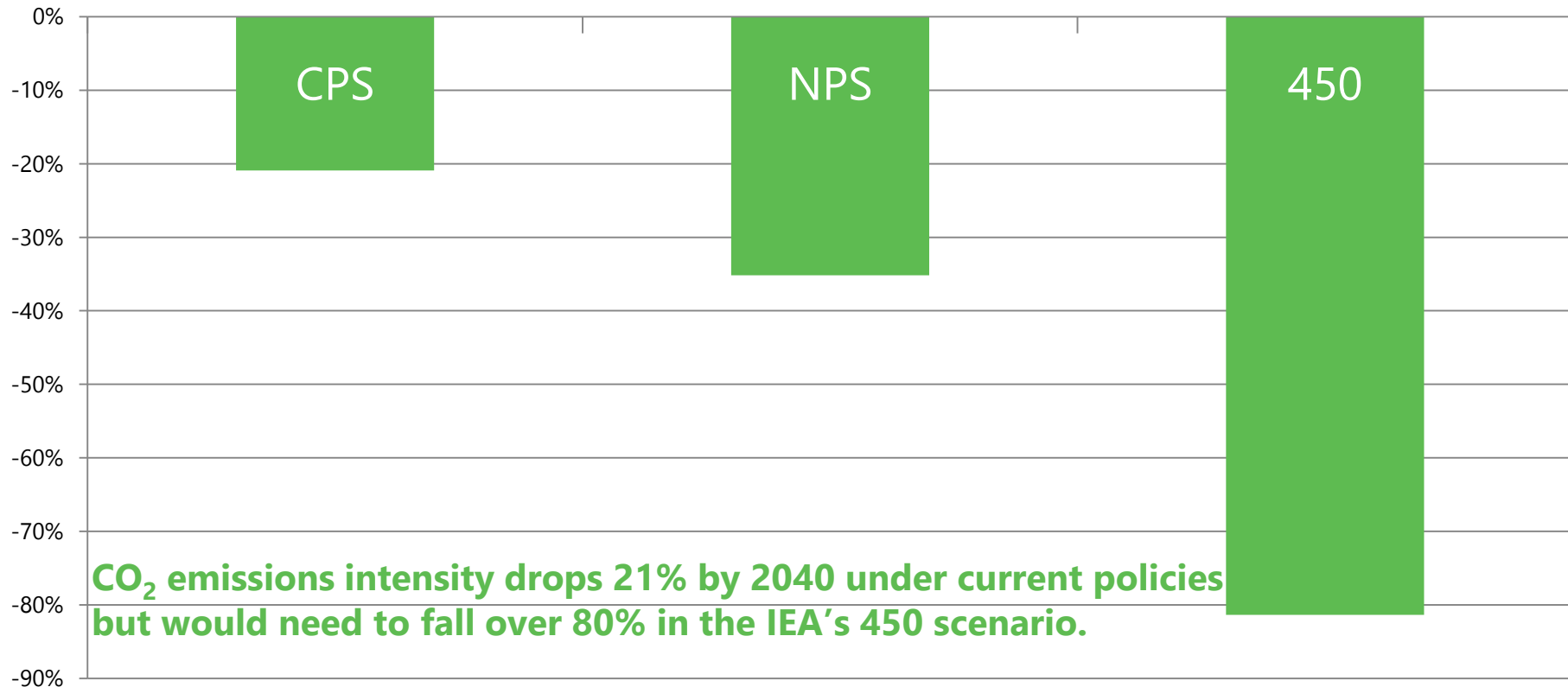


New business models for power: Setting the scene

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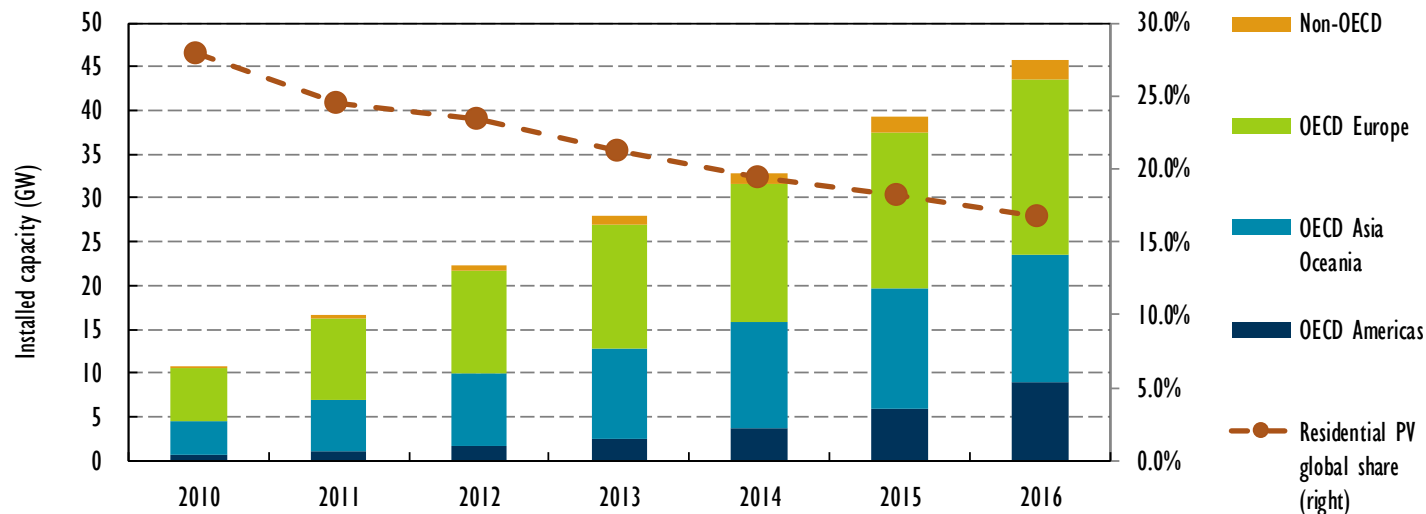
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Decarbonisation of electricity supply is important for a lower carbon future



But will decarbonized mean decentralized?

Global residential-scale solar PV installed capacity and share of total PV (right axis) , 2010-16



Source: (IEA 2016), Medium Term Market Report MRMR 2016. Note: residential projects are defined as <20 kW installed capacity

Utility-scale investments are driving PV capacity growth but selected IEA markets (EU, Japan, Australia) have seen high penetration.

Decentralized Power Generation

- Decentralized electricity generation has been a feature of the global electricity supply for a long time:
 - In remote locations
 - In any location where grid electricity supply is not reliable enough to meet a customer's needs. (estimated 90 GW of diesel gensets in India, growing at 5-8 GW per year)
 - (Often) not clean, not cheap but a reliable supply has a high value.
 - Can be economic and cleaner in CHP applications.
- Today solar PV has become the DG of choice.
- Falling solar costs (and especially solar + battery) may trigger bigger changes.
- What new business models are needed today and will be needed tomorrow?

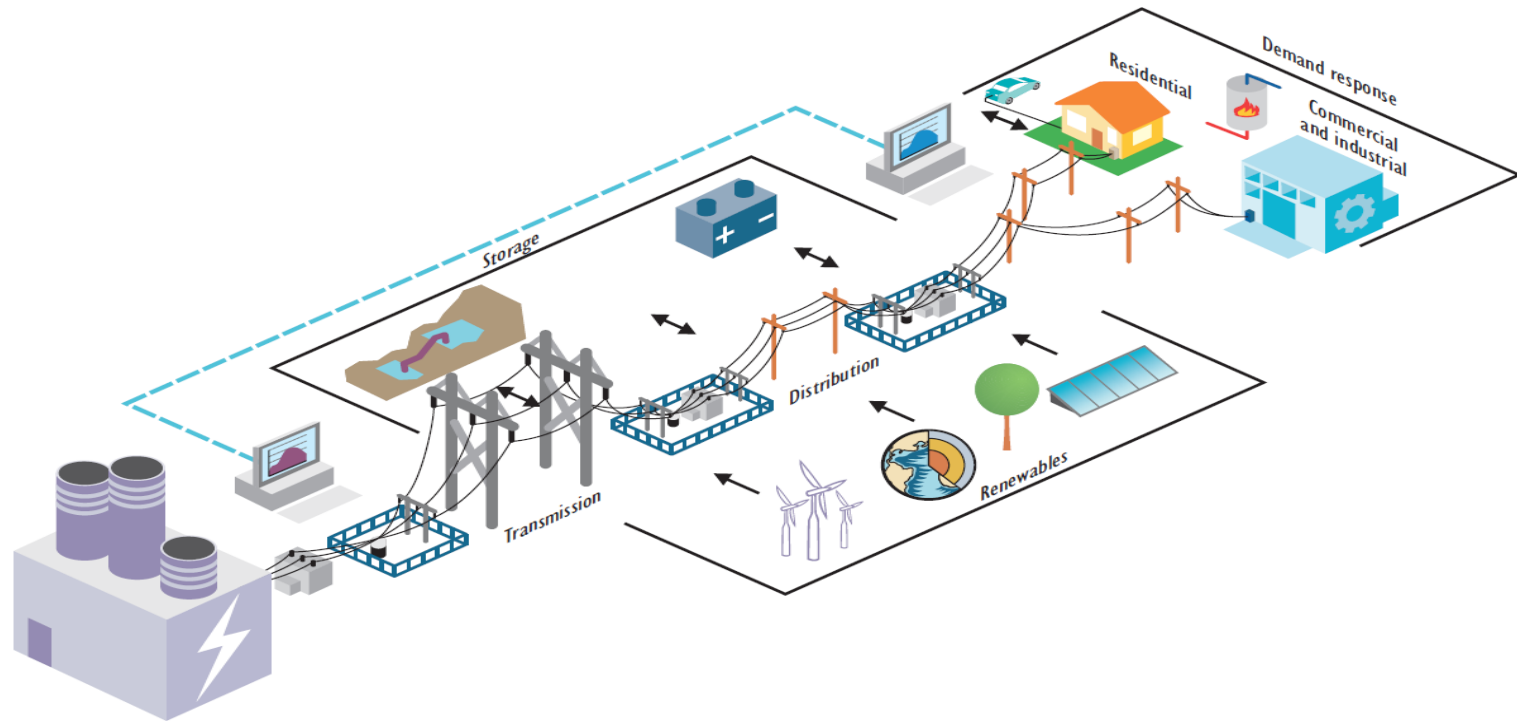
Sustainable business model for distributed generation does not exist in a vacuum

- Nearly all PV is grid-connected
 - Unlike conventional DG, PV (without storage) does not offer a significant reliability benefit to the customer.
 - Economics depend upon impact of PV on utility bill
- We have power systems that are able to take advantage of economies of scale.
- Business model for the developer and prosumer is not independent of the business model for the utility.
- The business model for the latter is determined by government policy and economic regulation.

Distributed energy in a regulated environment

- Utilities affect the business opportunities for distributed energy resources
 - Technical requirements for connection
 - Capacity restrictions
 - Rate design (per kWh, per kW, flat, “standby”, exit)
 - Services that the utility is able and willing to buy.
- Existence of DG can be a particular threat to vertically-integrated utilities.
- Policymakers and regulators face different interests in developing policies:
 - Developers;
 - Participating consumers;
 - Utilities;
 - Nonparticipating consumers.

Distribution: the evolving DSO



DSOs will need to more actively integrate distributed resources, manage increasingly complex demand patterns, and deepen collaboration with TSOs

Changing the utility business model

- Utilities will need to evolve to accommodate distributed resources. There are different opportunities to make money:
 - Investments in smarter infrastructure (with shorter lifetimes)
 - Coordinating operations of distributed resources
 - Operating platforms for system services
- Also need to redefine reliability role
 - Reliability is a service people will pay for – This can be a regulated \$/month rather than \$/kWh.
 - Reliability could become a product that the grid owner guarantees – or your money back!
 - Can the new providers give customers the same reliability – then cut the cord?

Some questions

- **How real is this?** Are regulated industries exaggerating the problem to get more money from their customers?
- **What do you expect governments and regulators to do about it?**
 - **Can you prove to me that the changes needed to encourage (not just accommodate) decentralization are consistent with traditional electricity policy goals?** Customers want access to reliable service from clean sources at a reasonable price.
 - **Will such changes be fair to the “average customer”?** Can we develop these changes in a way that benefits not only those with DER but those without. Any benefits for the nonparticipant or only for Tesla owners?

