The Economics of Demand Flexibility

Integrating DERs with sophisticated rates and demand flexibility: the good and the bad

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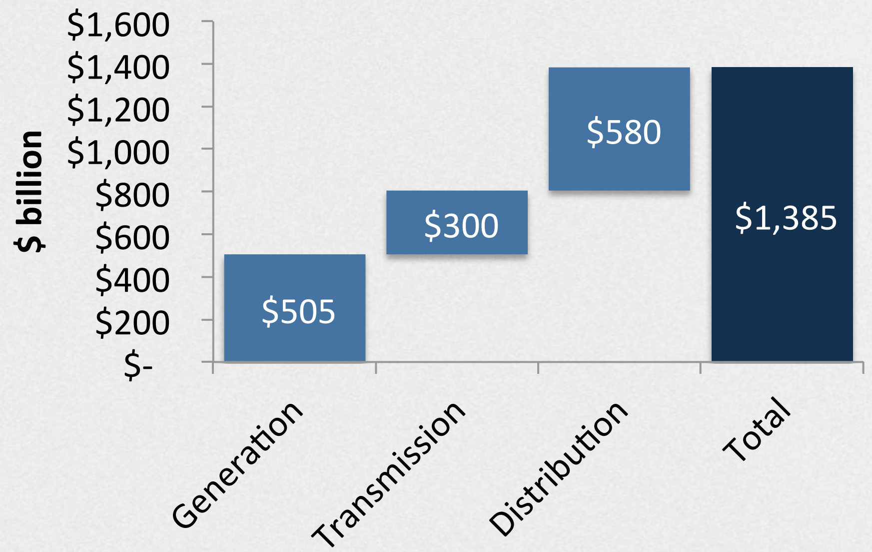
www.rmi.org/electricity_demand_flexibility

FURTHER, FASTER, TOGETHER

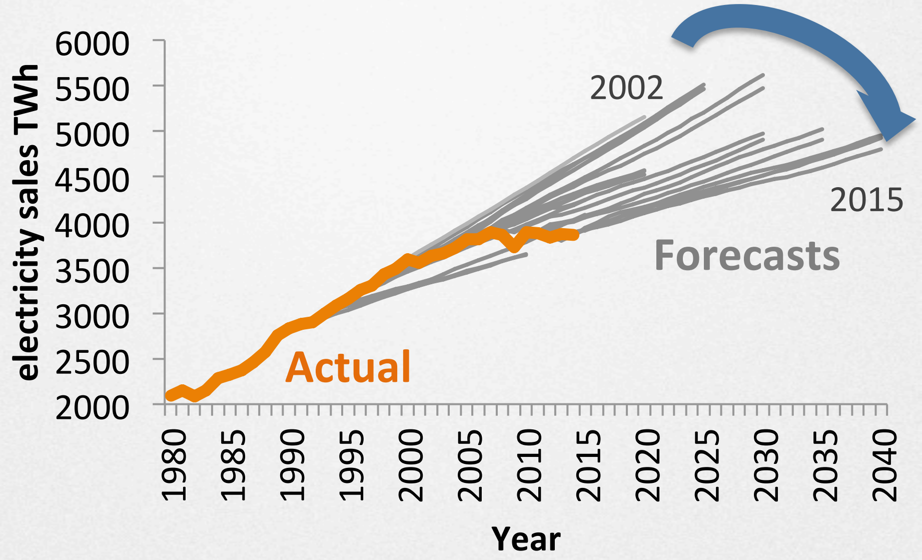
Background: rising spending, flat demand

Utilities plan to invest $1.4 trillion in infrastructure upgrades through 2030, but sales have declined 5 out of the last 7 years, and growth forecasts have been systematically lowered.

Grid investment forecast, 2015-2030



EIA electricity consumption projections

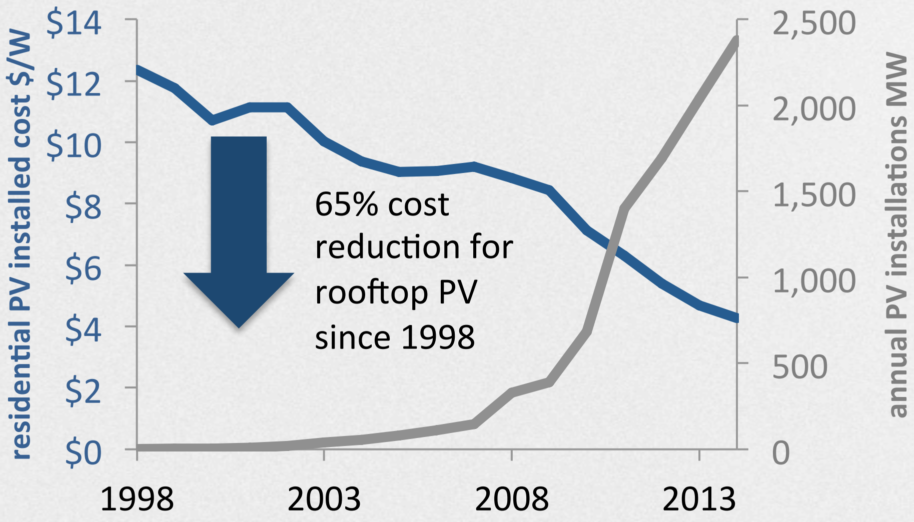


Source: DOE QER 2015; EEI; EIA EPM and AEO

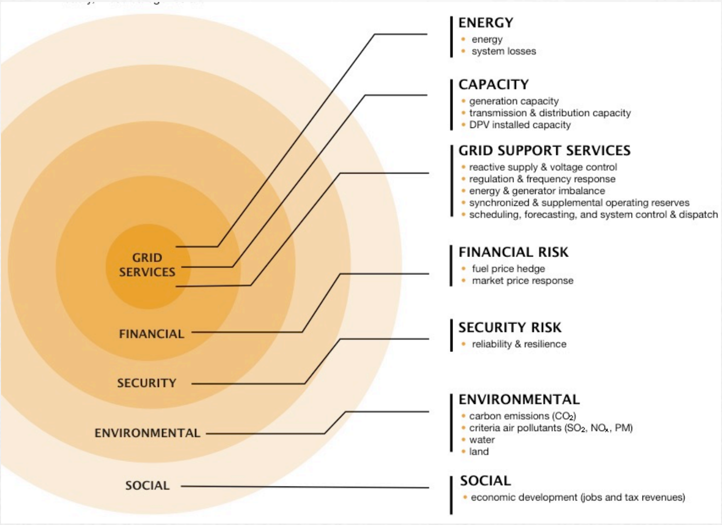
PV prices are falling and adoption is rising

As rates increase and PV prices fall further, more customers are adopting rooftop PV. Rooftop PV, if intelligently integrated, offers many benefits to the grid.

PV price and adoption trends



Categories of PV benefits & costs



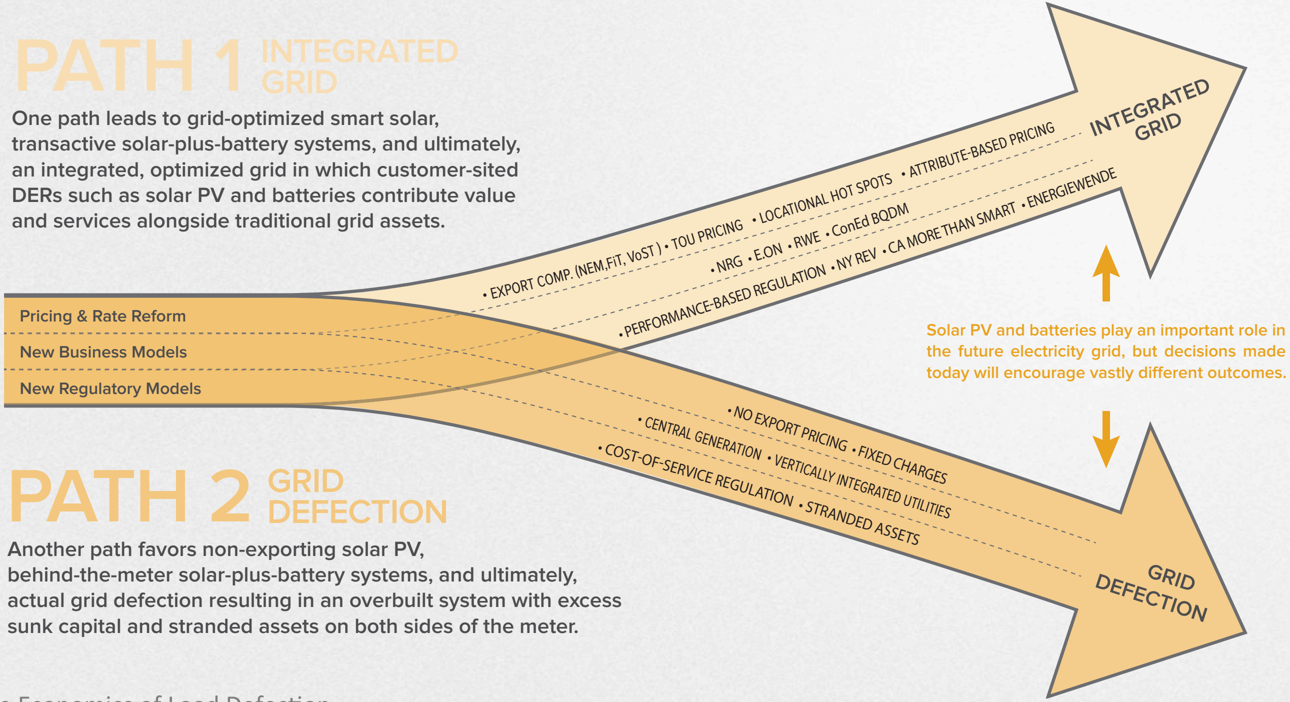
Source: LBNL Tracking the Sun VIII; RMI A Review of Solar PV Benefit and Cost Studies

A fork in the road

We are at a decision point for how DERs are integrated into the grid

PATH 1 INTEGRATED GRID

One path leads to grid-optimized smart solar, transactive solar-plus-battery systems, and ultimately, an integrated, optimized grid in which customer-sited DERs such as solar PV and batteries contribute value and services alongside traditional grid assets.



PATH 2 GRID DEFECTION

Another path favors non-exporting solar PV, behind-the-meter solar-plus-battery systems, and ultimately, actual grid defection resulting in an overbuilt system with excess sunk capital and stranded assets on both sides of the meter.

Source: RMI The Economics of Load Defection

Demand flexibility and demand response

Underlying technology is the same, but demand flexibility business models build on and complement the traditional demand response paradigm

Demand Response	**Demand Flexibility**
Grid focused	**Customer focused**
Wholesale drivers: price, reliability	**Retail drivers: tariffs, DER integration**
Slow to scale	**Consumer value increases scalability**
Infrequent / emergency	**Frequent / always on**

Trends in rate design value flexibility

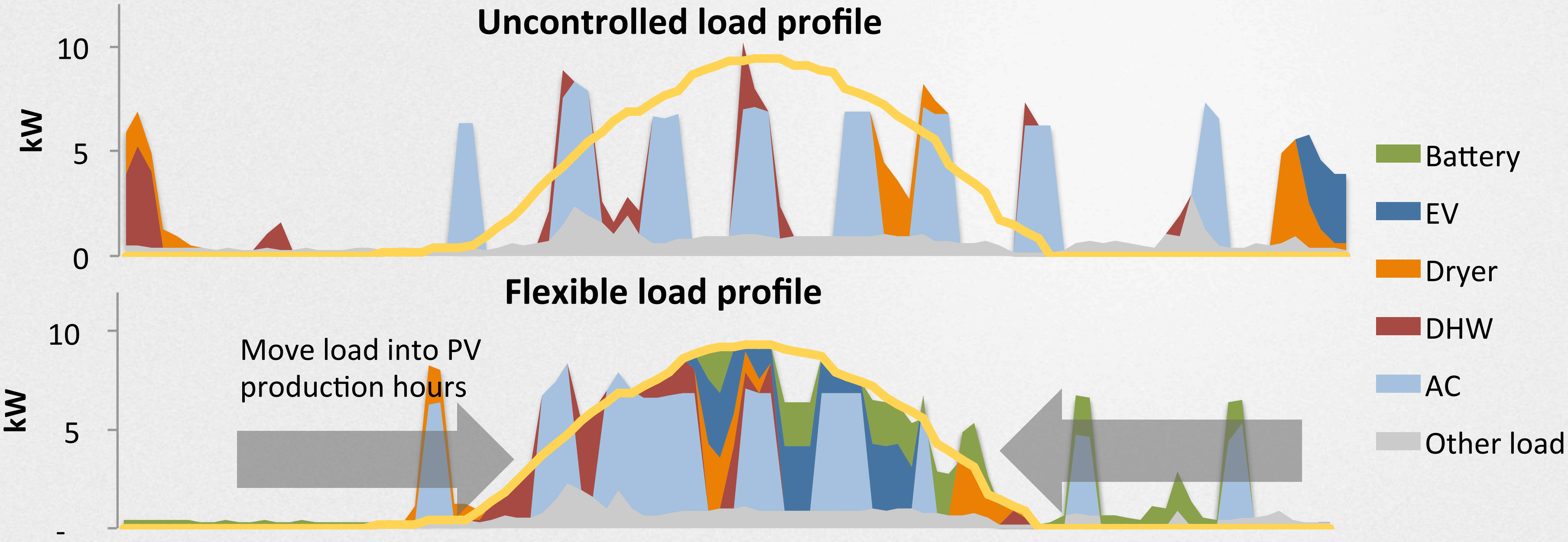
Nationwide, 65 million customers are already eligible to opt in to time-of-use pricing rates, and an increasing number of utilities are proposing non-volumetric default rates

Trend	Overview	Examples
Time-varying energy pricing	Prices for energy change, as often as hourly, depending on time of day.	ComEd, Ameren (IL), California, Massachusetts, >600 others
Demand charges	Customers pay a fee corresponding to maximum demand during a given period (e.g. monthly)	Salt River Project, Arizona Public Service, PG&E*, SDG&E*, Westar Energy, 10+ others
Reduced export compensation for PV	Exported PV is compensated at less than the retail rate	HECO*, Alabama Power, Xcel*, Tucson Electric*, SCE*
Increased fixed charges	Customers pay a non-bypassable fee, regardless of consumption	MG&E, We Energies, WPS, KCP&L, and 40+ more proposals

*proposal

Demand flexibility supports on-site PV use

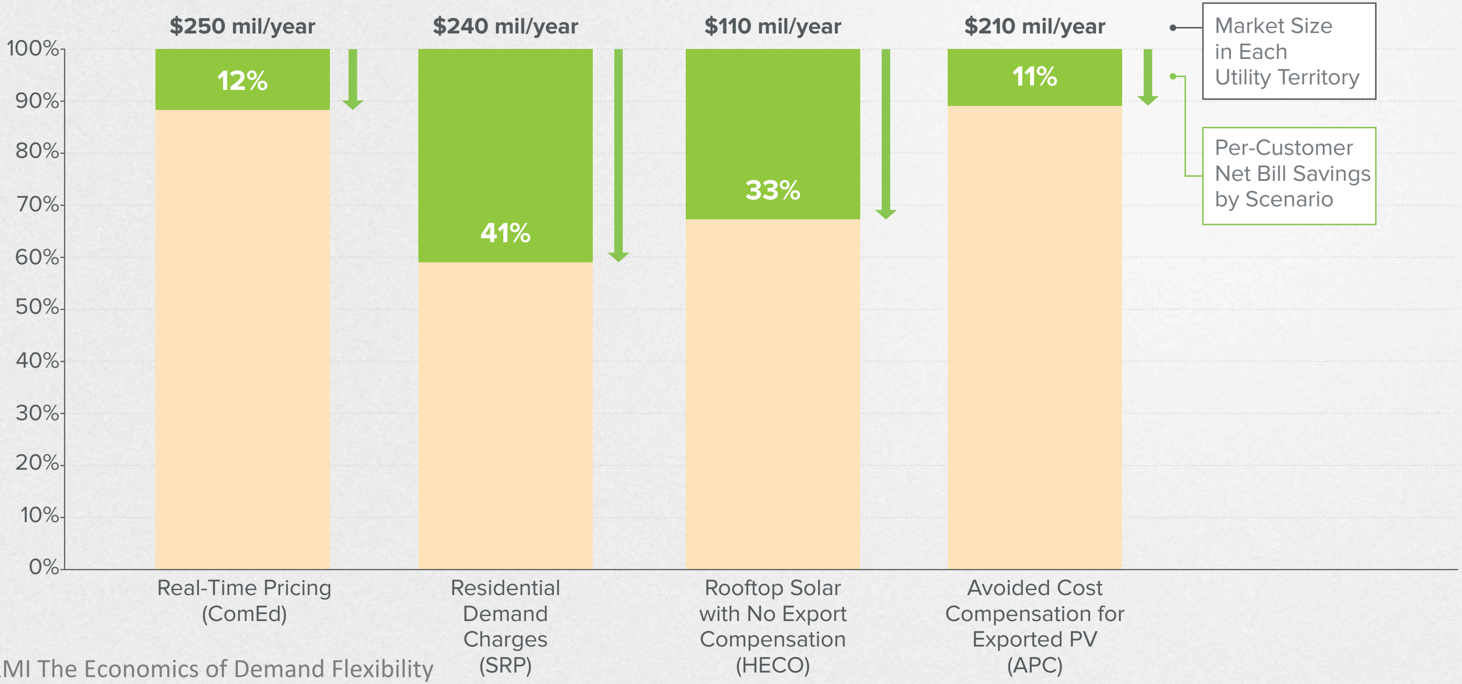
Load can be scheduled to coincide with PV generation in the absence of net energy metering



Source: RMI The Economics of Demand Flexibility

Customers save 10-40% net with DF

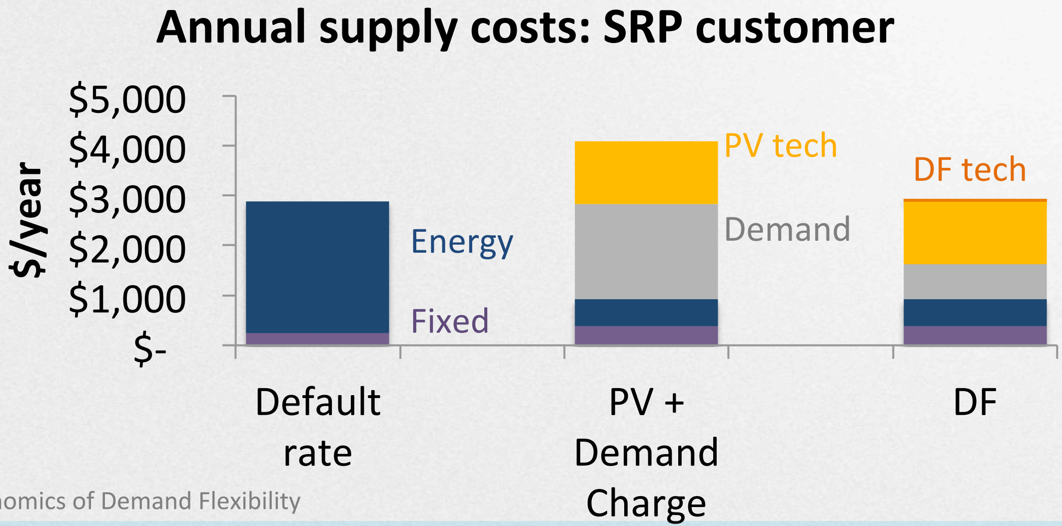
Under rates that exist today, residential customers can achieve 10-40% annual bill savings. Across just four markets, there is an $800 million/y savings potential for eligible customers.



Source: RMI The Economics of Demand Flexibility

Case details: Salt River Project

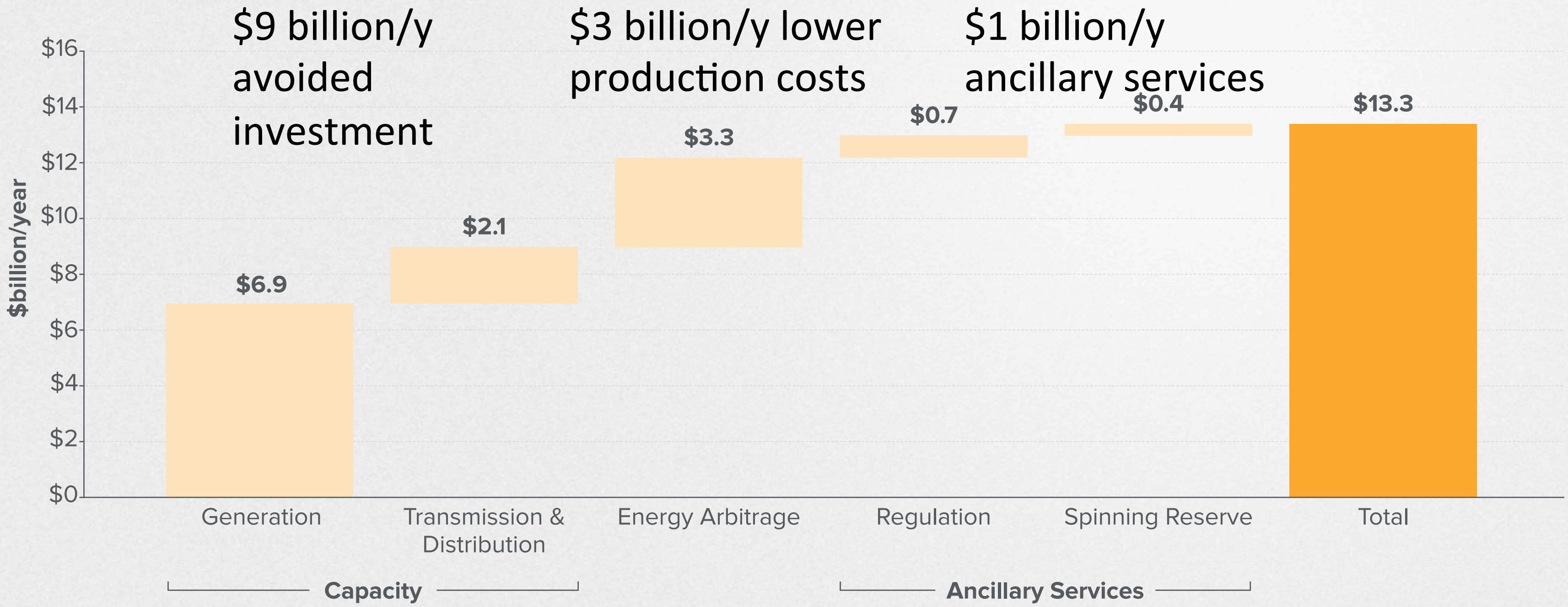
- DF reduces peak demand by 48%
- PV customer saves 41% net on bills
- A new customer breaks even, including cost of PV at today's prices
- >350,000 eligible customers
- $240 m/y savings for eligible customers
- Unlocks $6 billion rooftop PV market



Source: RMI The Economics of Demand Flexibility

Demand flexibility can avoid >$13 billion/y

By controlling the demand of a few common residential loads without significant service interruption, peak grid demand can be reduced by 8% and capacity investment by 10%+

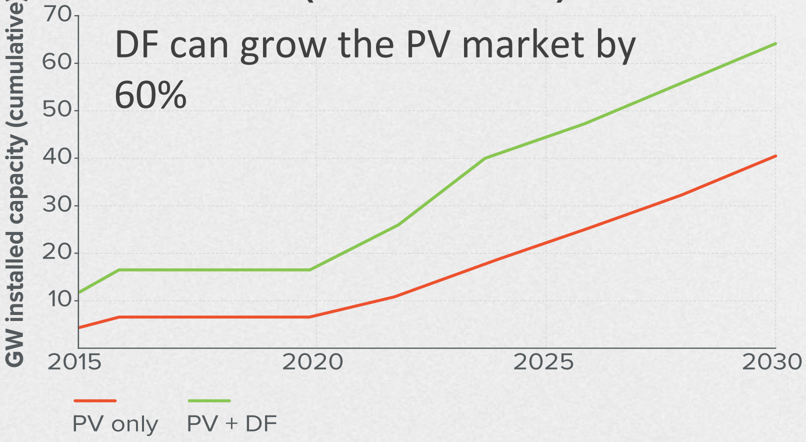


Source: RMI The Economics of Demand Flexibility

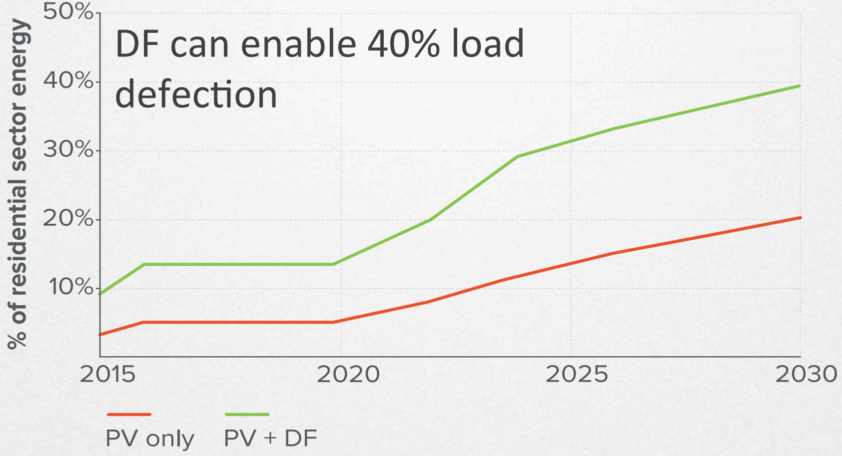
Demand flexibility may also enable load defection

If reduced export compensation for rooftop PV gains traction, demand flexibility can hasten load defection dramatically by increasing PV market size and on-site use of PV energy

Northeast US: Residential PV market (without NEM)



Load defection potential



Under this pricing scheme, do utility *costs* fall by as much as utility *revenues*?

Source: RMI The Economics of Demand Flexibility

Implications

Good retail pricing and new business models can unlock massive value from demand flexibility, and reduce customer bills while lowering grid costs.

Utilities & regulators

- Capture the grid value of flexibility + PV with rate design that aligns incentives by lining up customer prices with utility costs
- Seek partnerships to unlock innovation and drive the scale of the flexibility resource

DER developers

- Take advantage of business opportunities that exist today across the US and abroad
- Focus on the customer, but seek to monetize additional grid values of demand flexibility