

Clean Coalition

Energy Tetris

Leveraging DER to Optimize the Grid of the 21st Century



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Mission

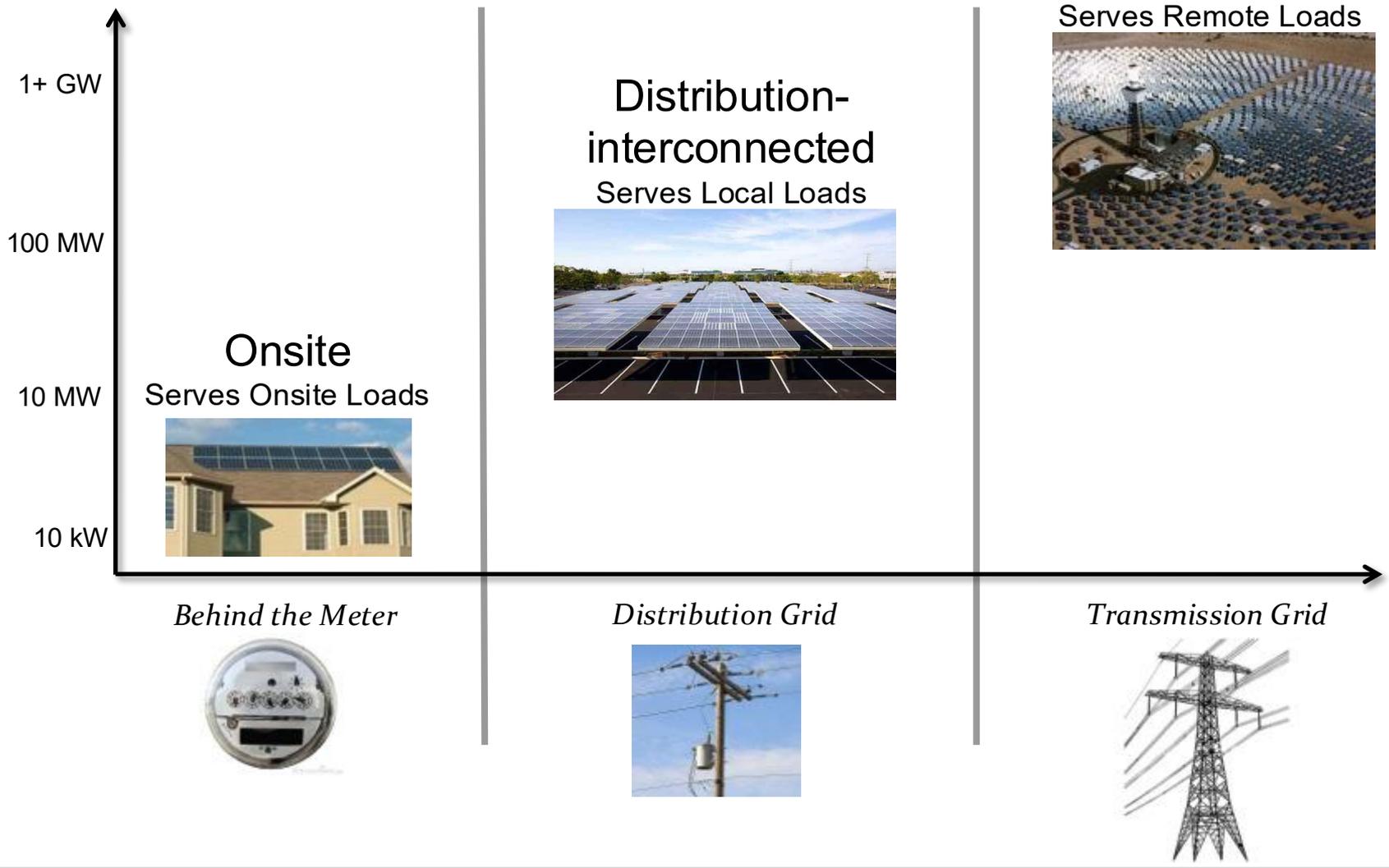
To accelerate the transition to renewable energy and a modern grid to deliver an unparalleled trifecta of economic, environmental, and resilience benefits.

High DER required for optimal outcomes

Distributed Energy Resources are required to optimize the grid of the 21st century.

The grid is delineated into three segments

DER Project Size



Service	Key to Delivering Service
Energy Balancing	<u>Capacity</u> of real power (W)
Voltage Balancing	<u>Location</u> of reactive power (VAr)
Frequency Balancing	<u>Speed</u> of sourcing or sinking real power (W)

The Duck Chart only addresses Energy Balancing, but Inverter-Based Distributed Energy Resources (IBDER) can provide unparalleled balancing of all three dimensions.

Grid costs are 70% of electric rates – and growing



- Transmission Access Charges (TAC):** These are volumetric (\$/kWh) charges assessed to customers to recover costs of historical and present investments in transmission infrastructure.
 - The chart below shows that the average TAC rate in the IOU service territories has more than tripled over the last 11 years.
 - Since 2008, the IOU's base annual Transmission Revenue Requirement (TRR) has increased from \$4.6 billion to \$21 billion.
- Future Transmission:** CAISO estimates that \$30 billion in transmission capex will be needed over the next 20 years (for the high-voltage system only, not including low-voltage).
- The upfront capital cost of a transmission project is only 10% the full cost in nominal dollars shouldered by the ratepayers when considering profit and O&M over 50-year transmission depreciation schedules.

Nominal costs

Asset value capital cost (\$100 base)	\$100
Return	\$197
O&M	\$631
Total nominal ratepayer cost per \$100 investment (50 years)	\$928

Real costs, discounted for inflation

Discount rate	2.19%
Asset value capital cost (\$100 base)	\$100
Return, discounted	\$140
O&M, discounted	\$296
Total discounted (real) ratepayer cost per \$100 investment (50 years)	\$536

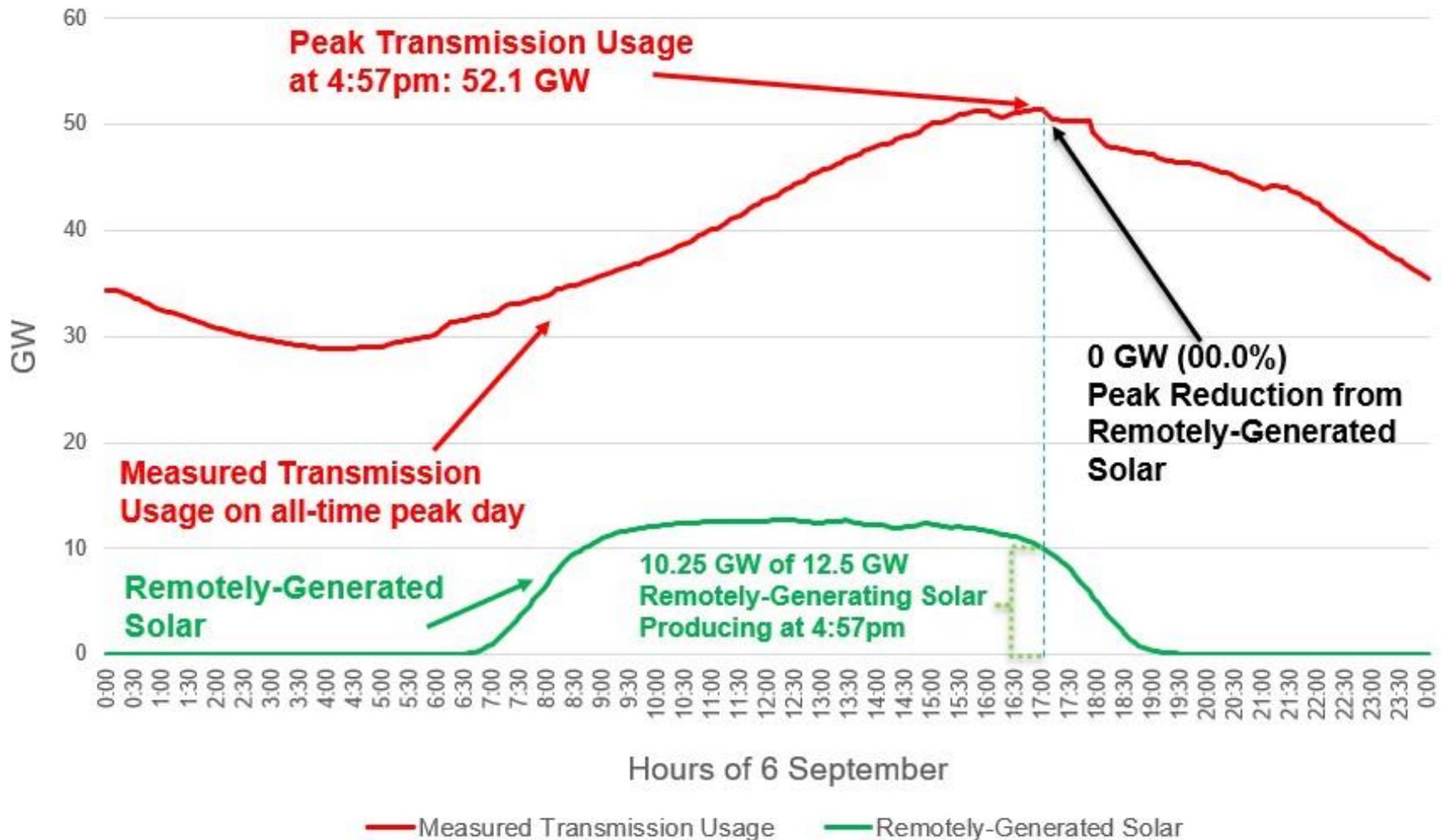
In nominal dollars, total lifetime ratepayer cost is nearly 10x the initial capital cost; O&M accounts for 68% of this because it increases much faster than inflation. In real dollars (constant value dollars, accounting for inflation), the total lifetime cost is 5x the initial capital cost, and O&M accounts for 55% of this.

2025 TAC (wholesale rates)

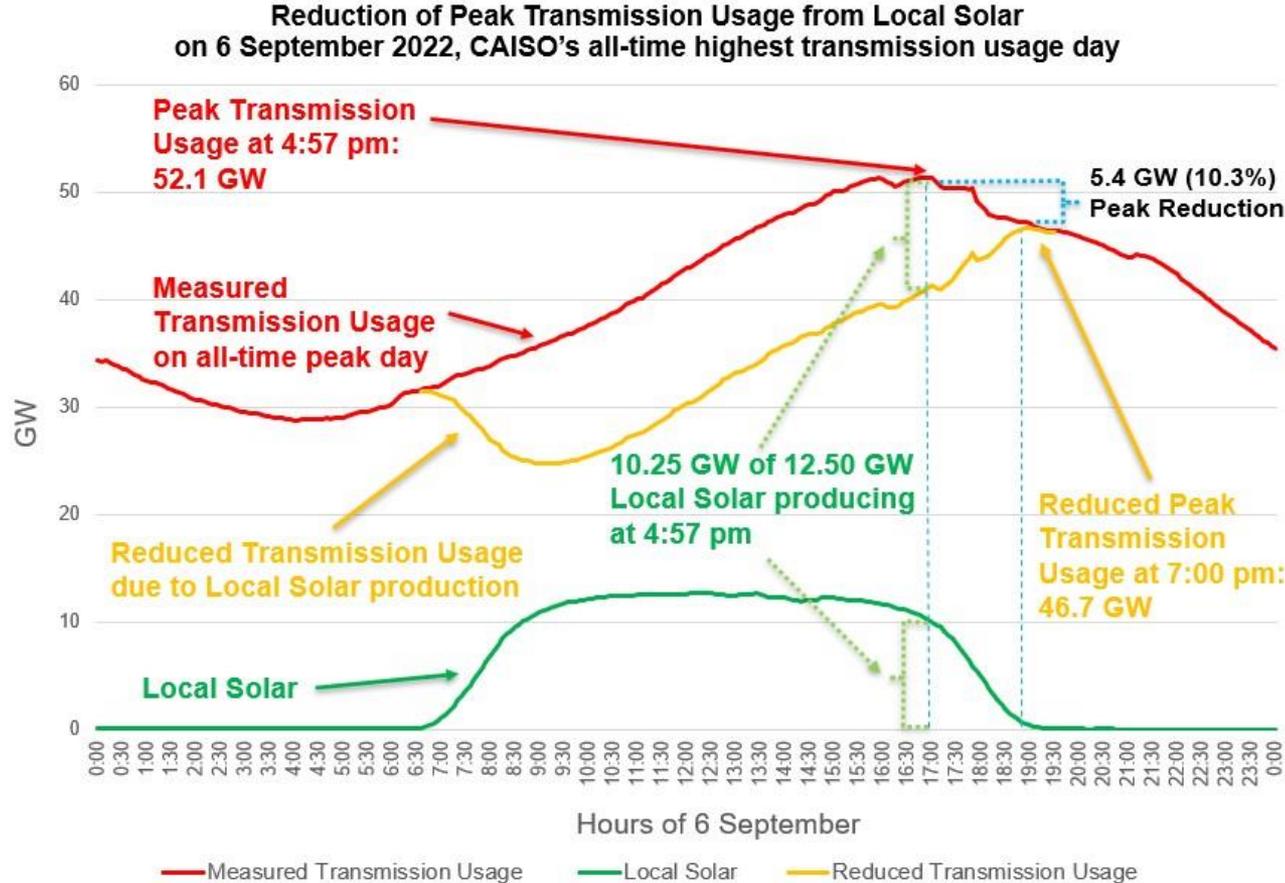
PG&E	\$0.037/kWh
SCE	\$0.0153/kWh
SDG&E	\$0.066/kWh

Transmission stress & cost is a massive problem

No Reduction of Peak Transmission Usage from Remotely-Generated Solar on 6 September 2022, CAISO's all-time highest transmission usage day



Local Solar reduces transmission stress & costs



1. Local Solar reduces Peak Transmission Usage by close to 50% of the installed local solar capacity. The effect is amplified by energy storage.
2. Bringing down the peak with distributed generation and demand flexibility will reduce transmission investments, saving ratepayers hundreds of billions of dollars over the next two decades.
3. Reducing the Peak Transmission Usage by around 10% is enough to prevent most major outages

SCE Share of 12,000 MW Goal

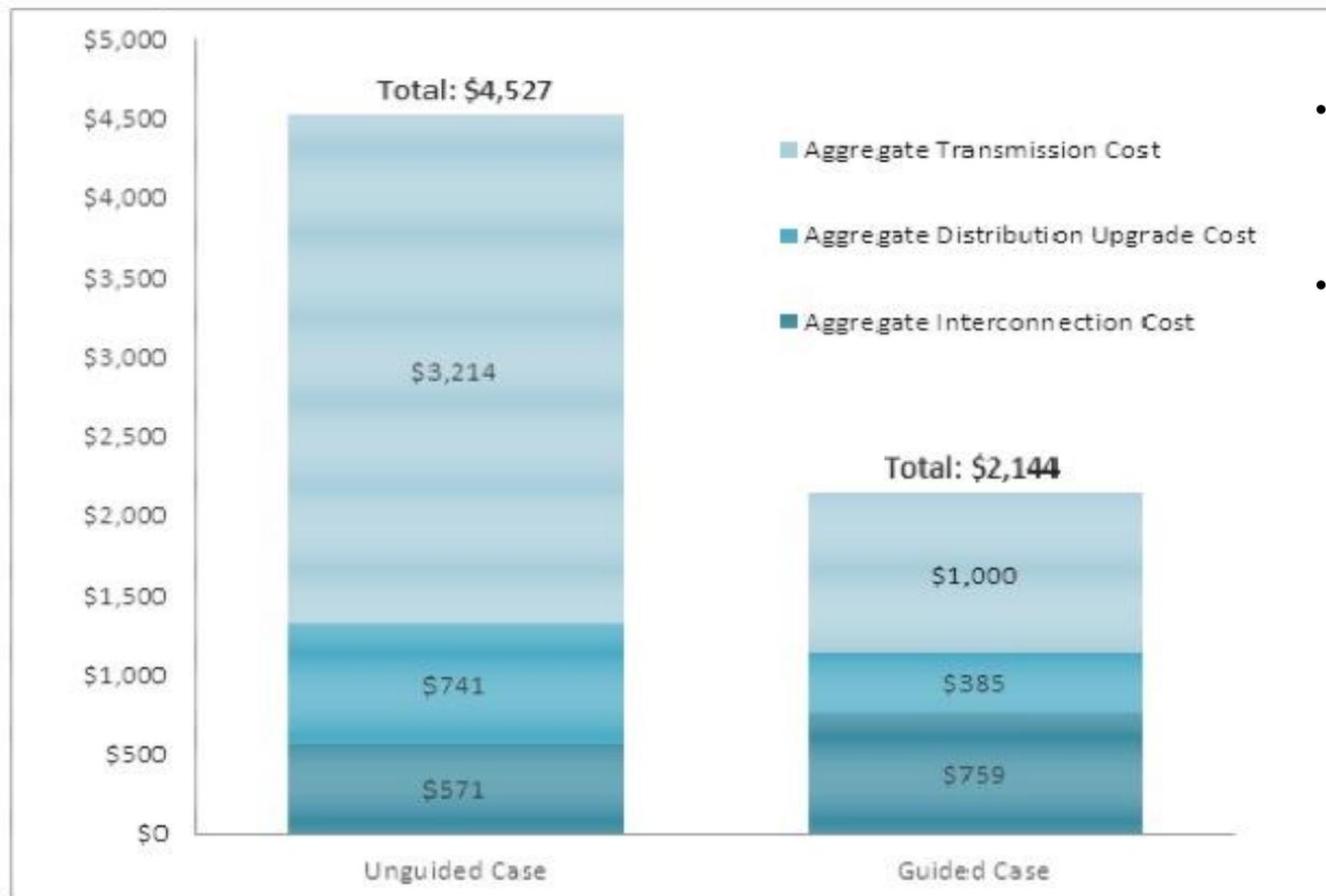


Figure 8: Total SCE System Costs of LER Proposal (Million USD)

- **Locational Value** methodology should include transmission costs.
- **Interconnection** policies should favor high value locations, reduce cost uncertainty for developers.

Thoughtful grid siting of Local Solar alone saves ratepayers 50%

Source: SCE Report May 2012

San Onofre Nuclear Generating Station (SONGS) replacement case study: 261 MVar needed for Voltage Balancing in 2012



290 MVars of synchronous condensers
in Huntington Beach (minus line losses
= **261 MVar**)

or



570 MW of local solar alone with grid-forming
inverters, oversized by 10% set at 0.9 Power
Factor = **261 MVar**