REINVENTING FIRE IN SOUTHERN CALIFORNIA: ACHIEVING 50% RENEWABLE ELECTRICITY SUPPLY BY 2030

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RMI EXPLORED THE FEASIBILITY OF 50% RENEWABLE ELECTRICITY BY 2030 IN SOUTHERN CALIFORNIA

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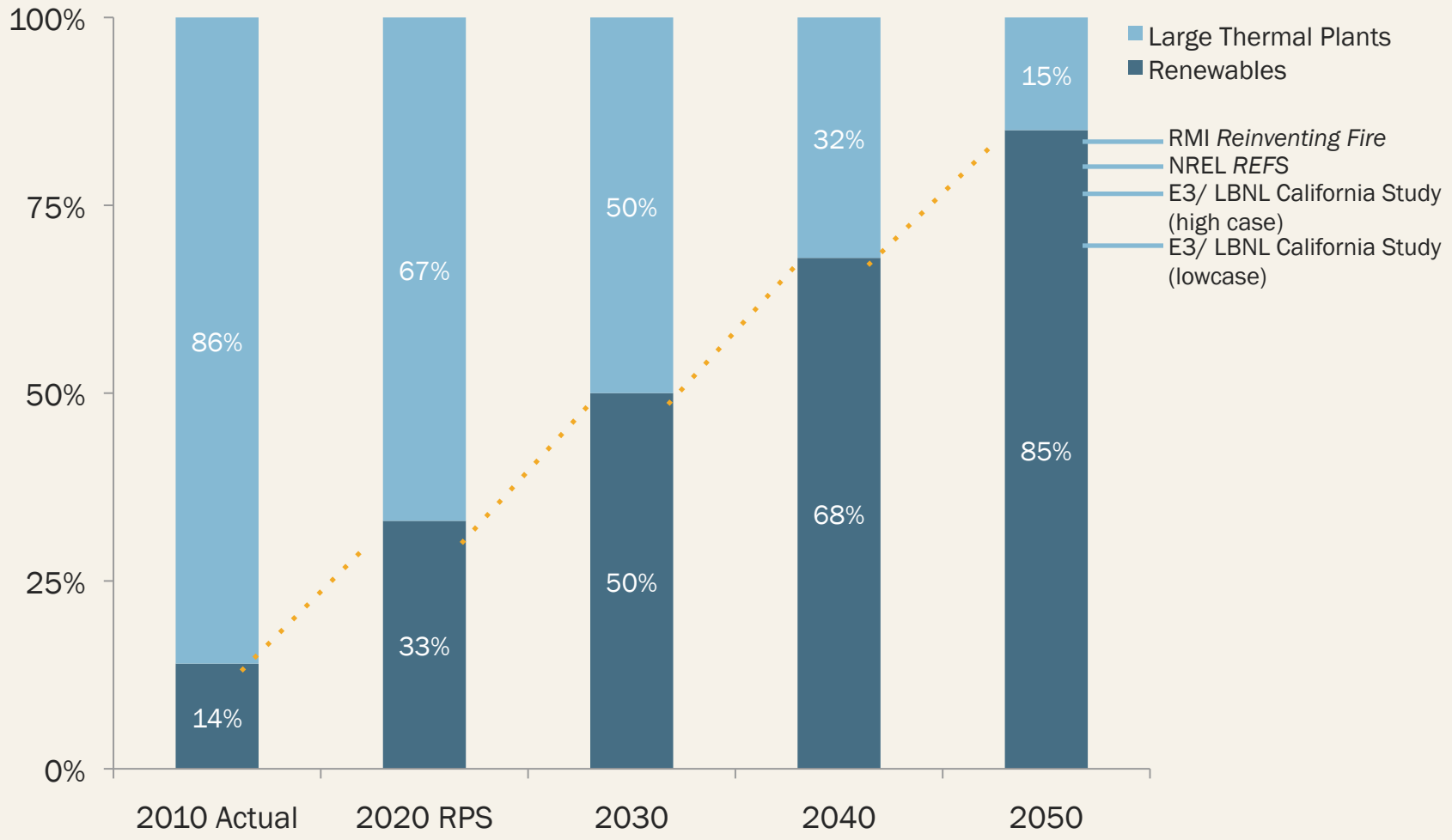
50% RE BY 2030: A NEXT STEP TOWARD MEETING CALIFORNIA'S LONG-TERM CLIMATE GOALS



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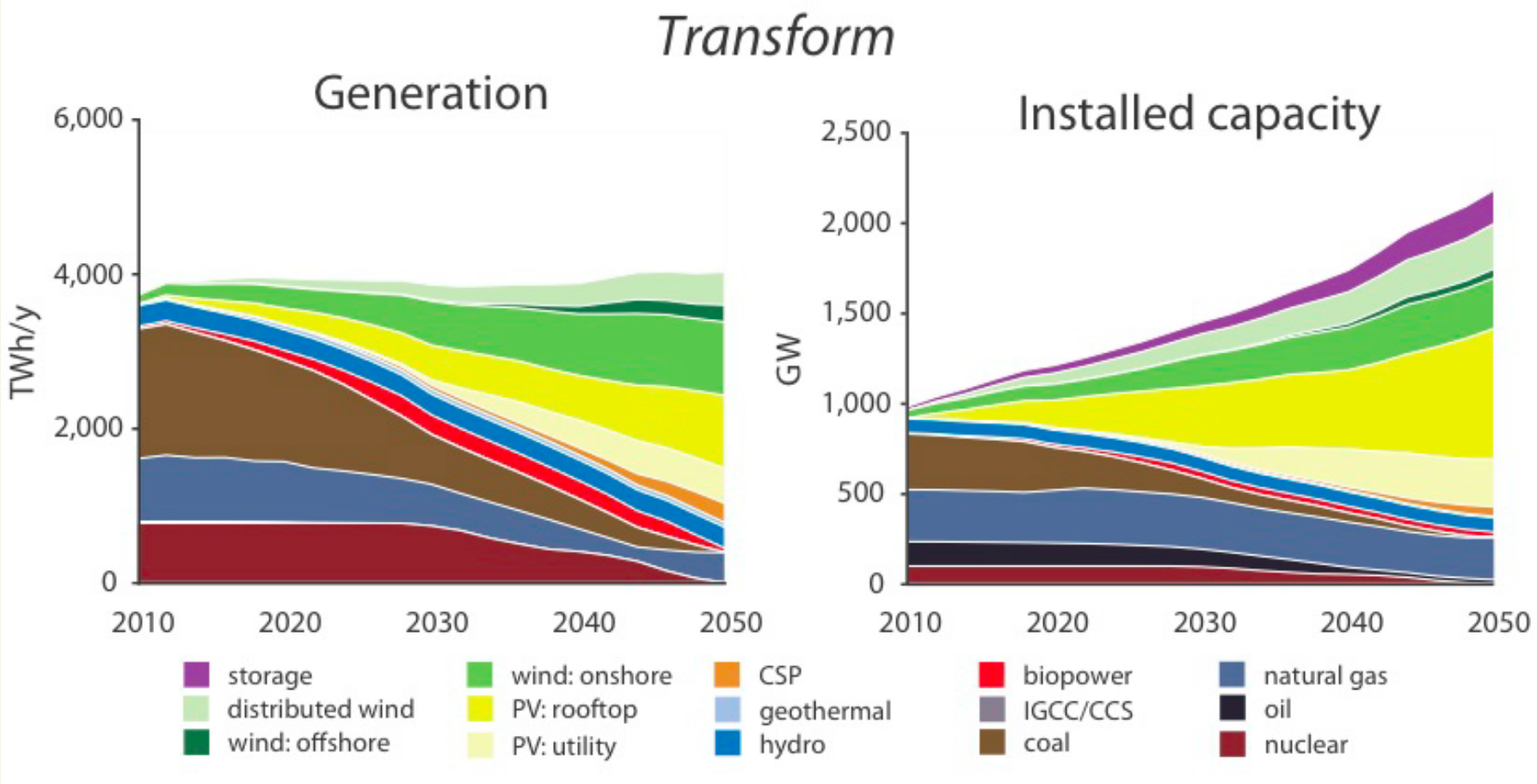
REINVENTING FIRE: U.S. ELECTRICITY TO 2050



Source: *Reinventing Fire*, Rocky Mountain Institute, 2011

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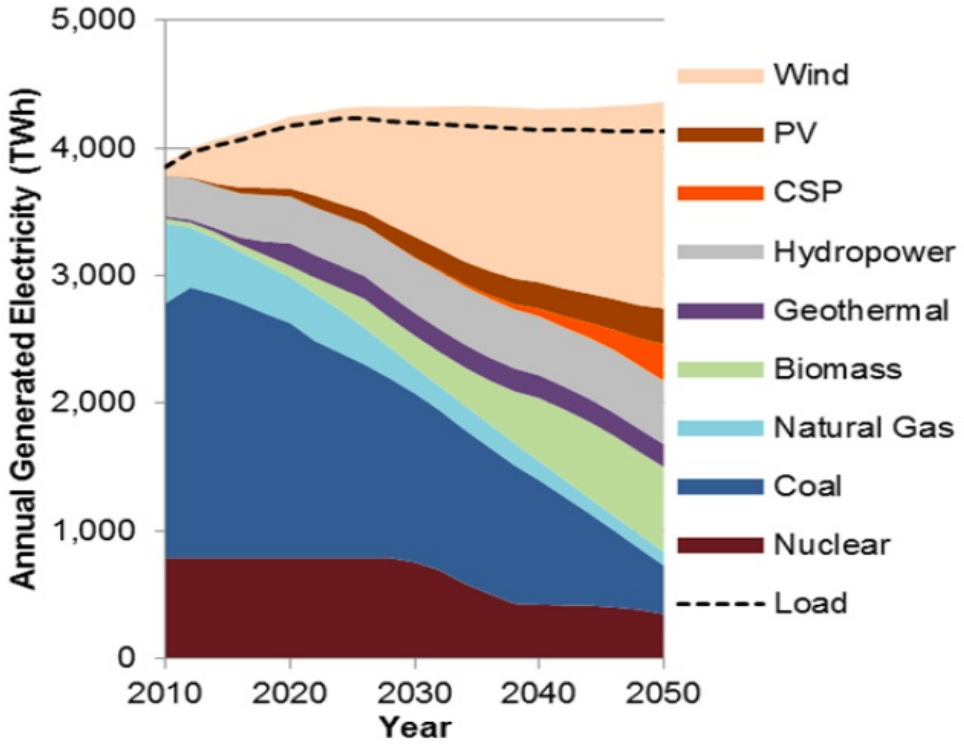
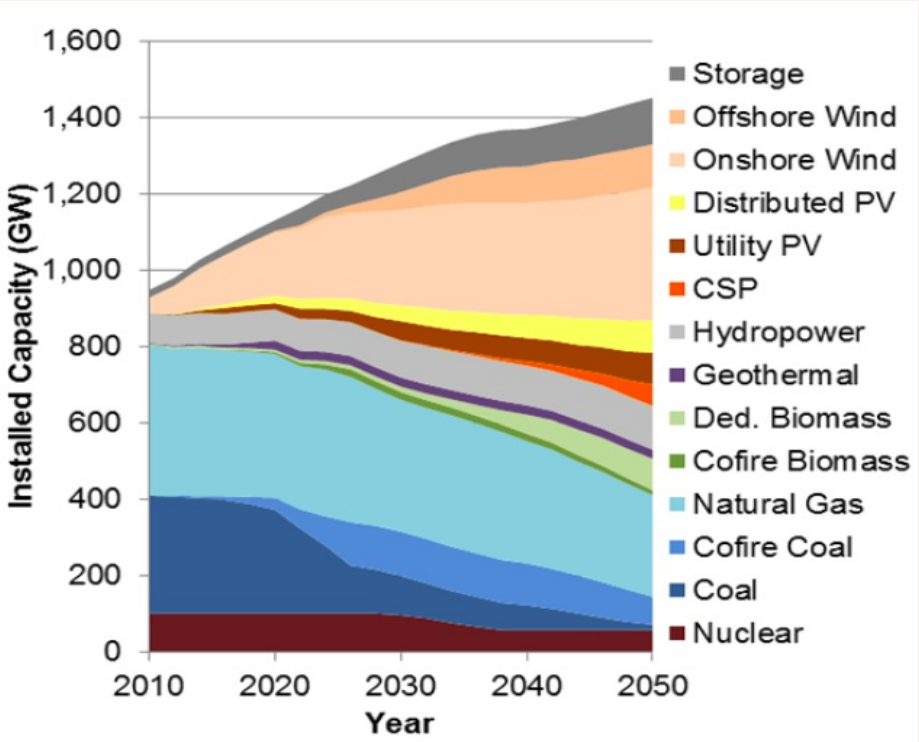
NREL: RENEWABLE ELECTRICITY FUTURES





Source: NREL Renewable Electricity Futures Study, June 2012

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ANALYSIS APPROACH

- Extend CPUC RPS Calculator to 2030 (state-wide)

- Develop model assumptions about load forecast and resource potential:
  - Load forecast
  - Vehicle electrification
  - Incremental uncommitted energy efficiency
  - Demand response
  - Combined heat and power
  - Distributed solar PV potential

- Forecast renewable resource costs

- Adapt tools for system-level capacity balance
  - Reserve margin approach
  - Capacity credits for intermittent renewables
  - Nuclear retirements

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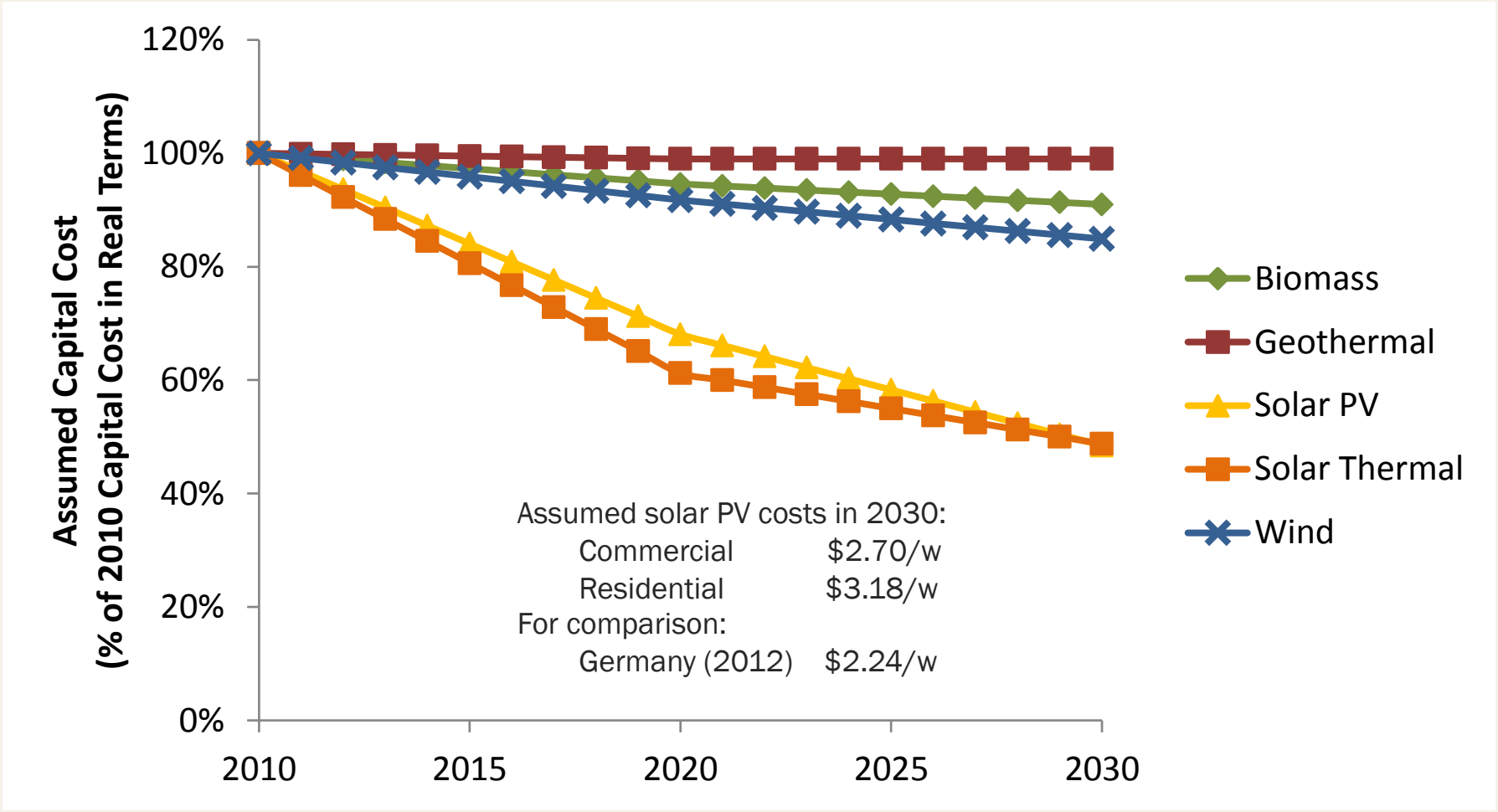
RENEWABLE ENERGY COST ASSUMPTIONS



Source: Rocky Mountain Institute

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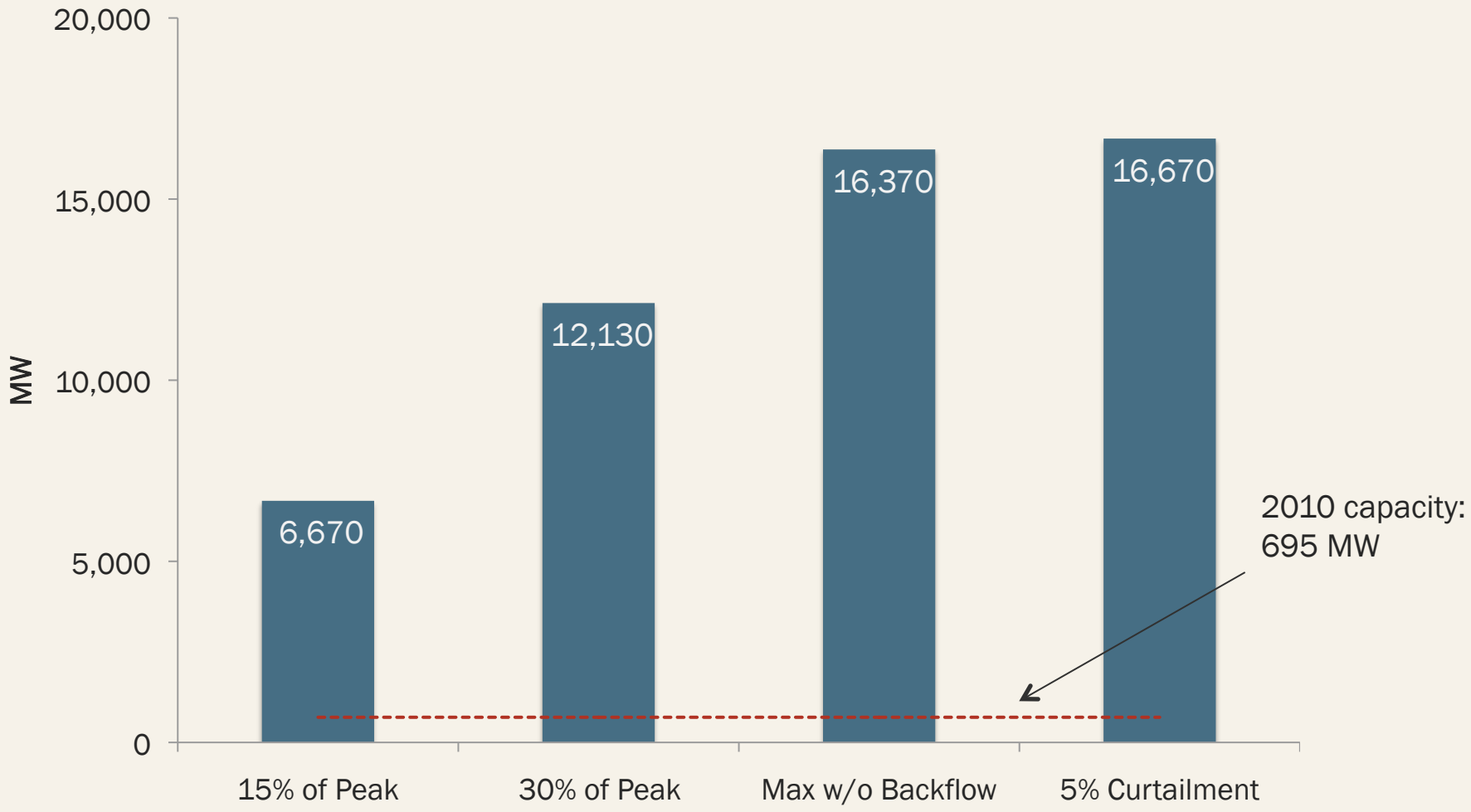
TECHNICAL POTENTIAL FOR DISTRIBUTED SOLAR PV UNDER ALTERNATE INTERCONNECTION CRITERIA



Source: CPUC 2012

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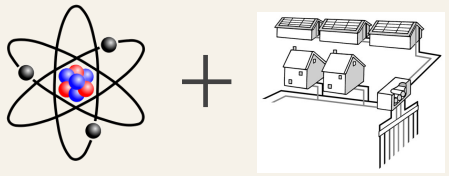
FOUR SCENARIOS FOR THE FUTURE

Relicensed

Scenario 1: Advance

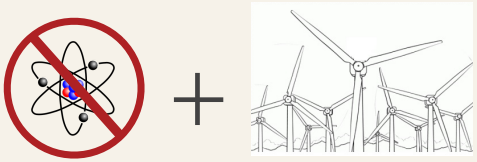


Scenario 2: Localize

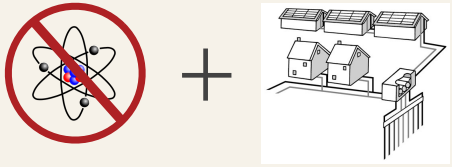
Centralized

Distributed

Renewables



Scenario 3: Replace



Scenario 4: Transform

Nuclear Power

Retired

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SCENARIO ASSUMPTIONS

	Advance	Localize	Replace	Transform
Distributed renewables	Moderate	High	Moderate	High
Nuclear plants	Relicensed	Relicensed	Decommissioned	Decommissioned
Energy efficiency	Moderate	Moderate	High	High
Demand response	Moderate	Moderate	High	High
Electric vehicles	Moderate	High	Moderate	High
CHP	Moderate	Moderate	High	High

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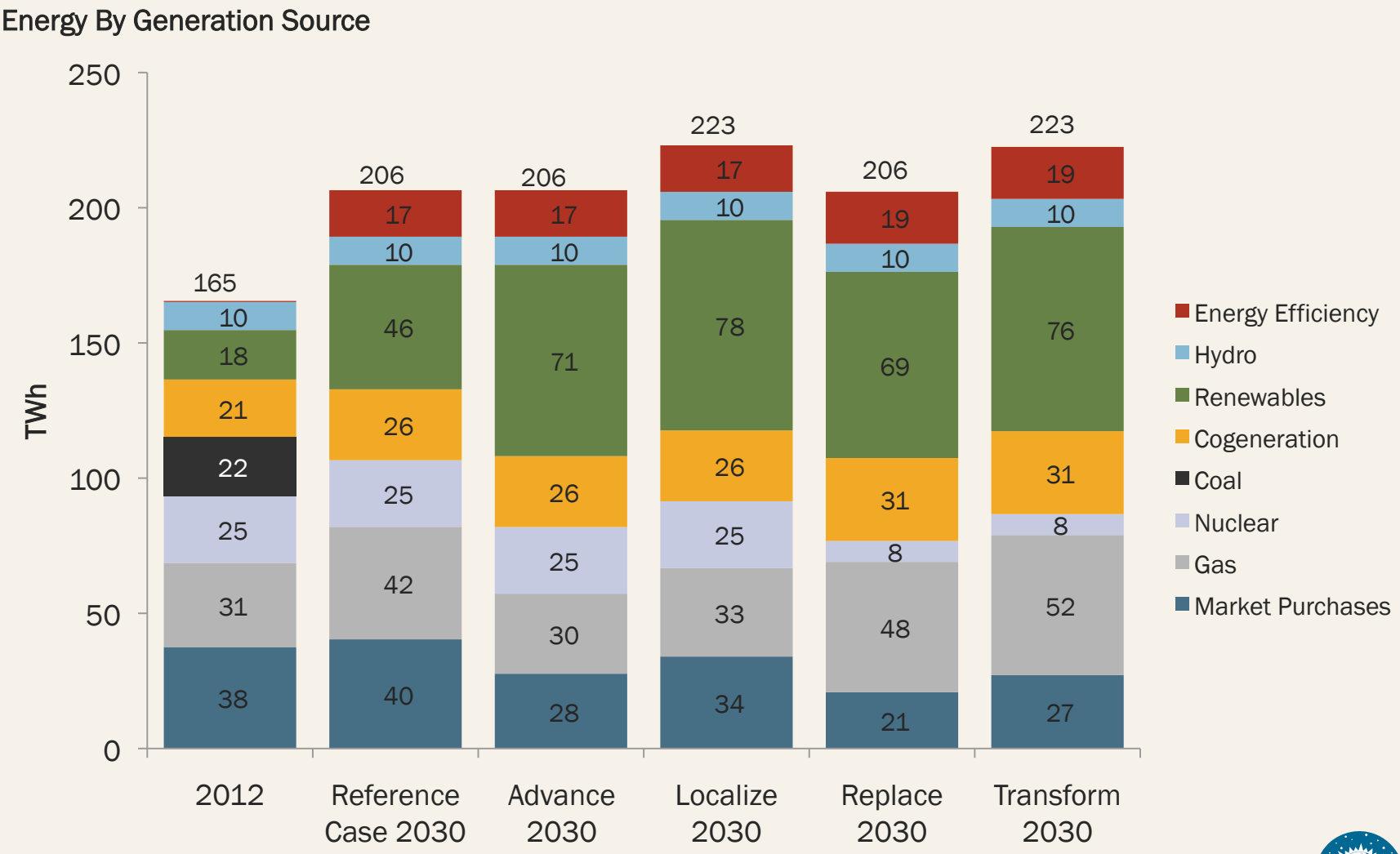
SOUTHERN CALIFORNIA CAN MEET 50% TARGET WITH VARIOUS RESOURCE PORTFOLIOS



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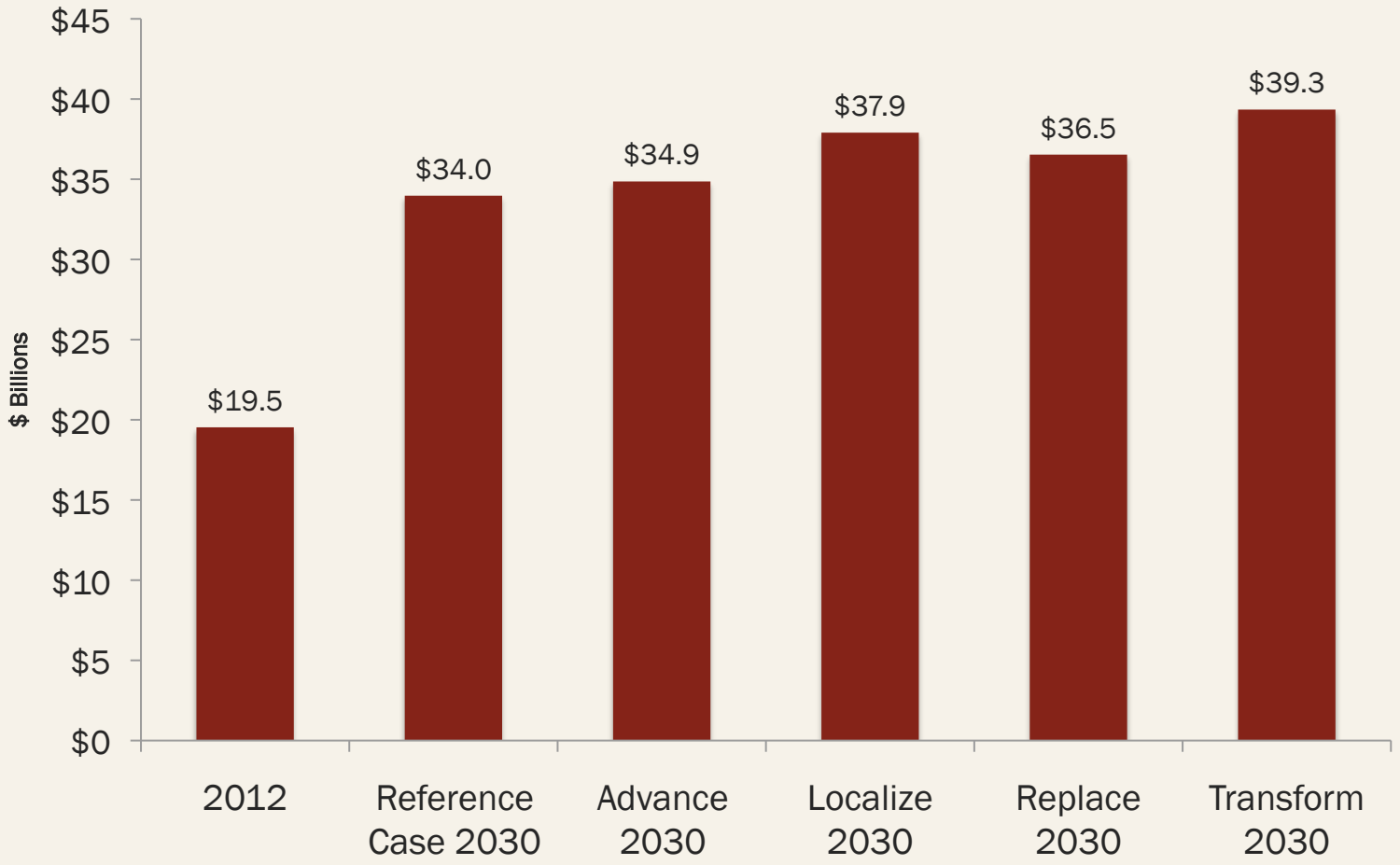
TOTAL RESOURCE COSTS (TRC) IN 2030 VARY FROM $35–39 BILLION



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COST AND EMISSIONS SUMMARY—2030

	Advance	Localize	Replace	Transform
Total resource cost (billions of 2010 dollars)	$34.9	$37.9	$36.5	$39.3
Average Cost of Load Served (2010 cents/ kWh)	20.5¢	20.4¢	22.0¢	21.7¢
Total carbon emissions (million metric tons)	25.3	24.0	31.6	30.4

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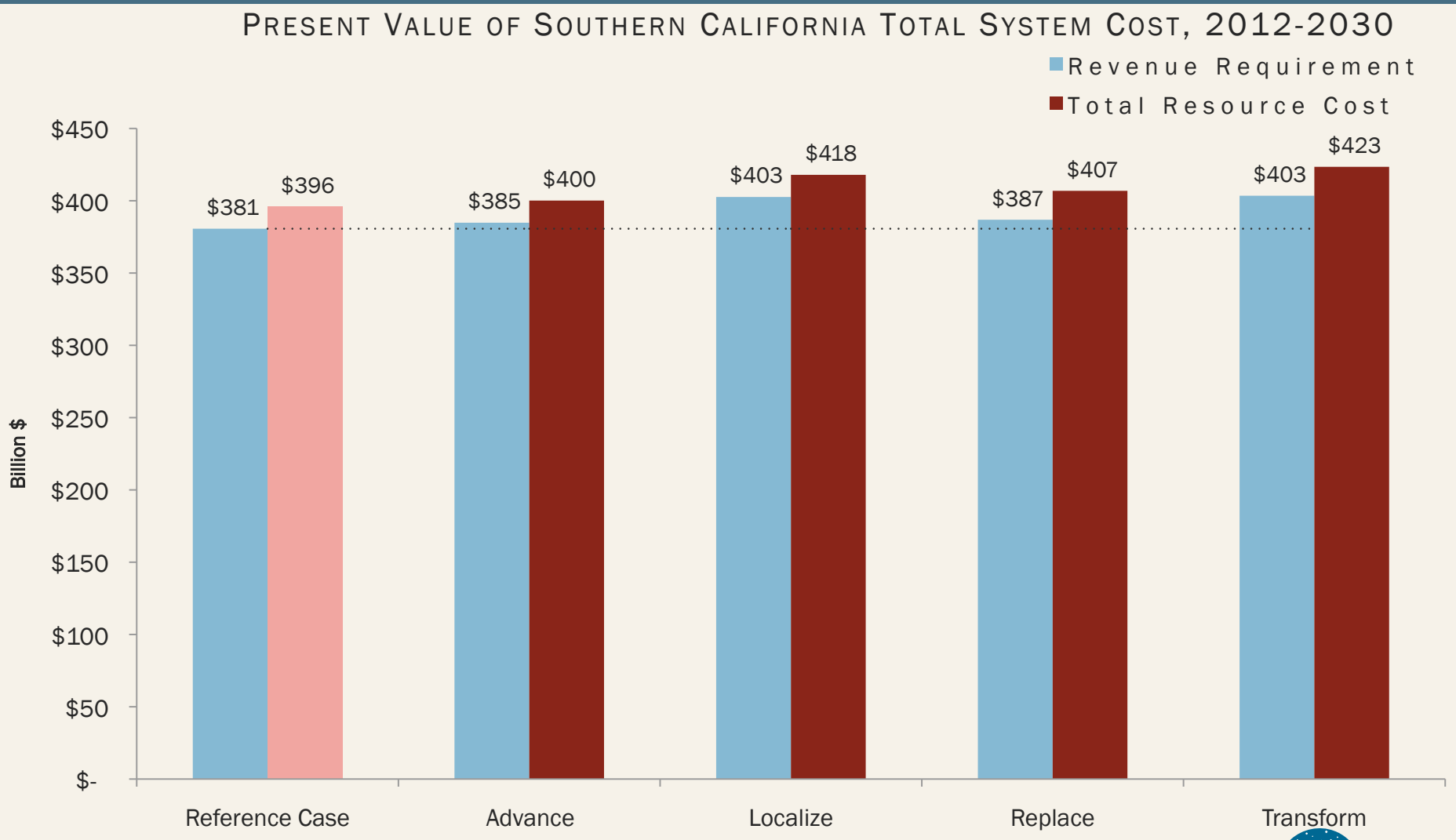
PRESENT VALUE OF ANNUAL COSTS 2012–2030



Net present value of annual costs using a 3% social discount rate.

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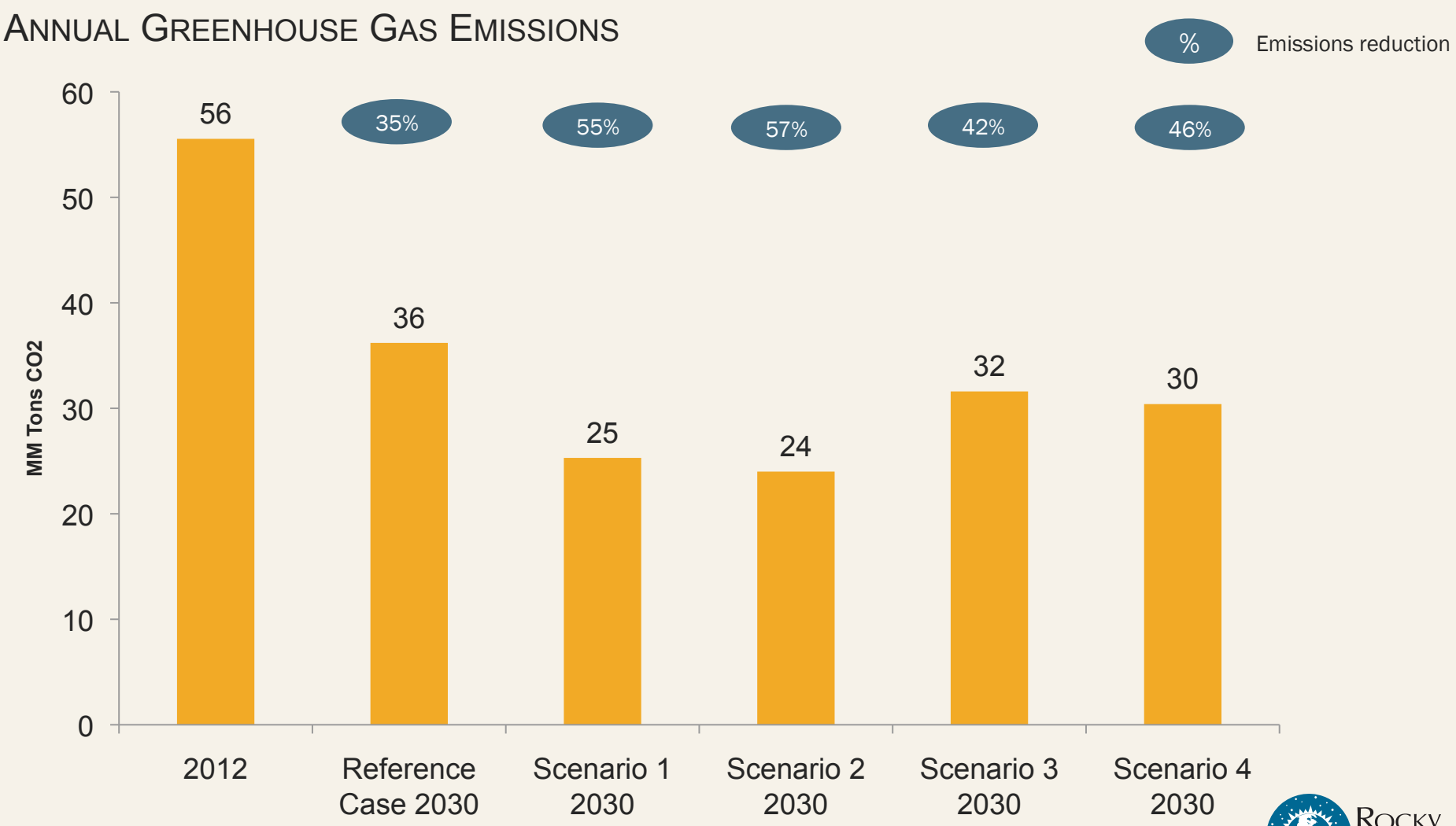
50% RENEWABLE ELECTRICITY SCENARIOS ACHIEVE GHG EMISSIONS REDUCTIONS OF 42–57%



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SOME IMPORTANT COSTS AND BENEFITS *NOT* CONSIDERED IN THE MODEL

- Extraordinary costs for repairing, maintaining, or decommissioning SONGS
- Fuel price- and supply-risks
- Potential costs or benefits of changes in reliability or resilience of the electricity system
- Economic development and local job creation
- Cost of curtailment of renewable supply during periods of "over generation"

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ANALYTICAL CAVEATS

- SONGS retirement scenarios conservatively assume addition of an equivalent amount of gas-fired capacity in the LA basin
  - Further analysis is necessary to evaluate the potential and relative costs of supply- and demand-side alternatives to SONGS Presence of SONGS that would maintain in-basin reliability without compromising local air quality
  - The short-term implications of SONGS outage are not analyzed in RMI's study

- Increased ramping requirements in high penetration scenarios are represented through an "integration adder," but are not modeled in detail
  - Additional work is necessary to understand the increased system flexibility and ramping requirements under alternative resource scenarios

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FOR FURTHER INFORMATION, OR TO REQUEST A COPY OF RMI'S FORTHCOMING REPORT, CONTACT MATHIAS BELL: MBELL@RMI.ORG

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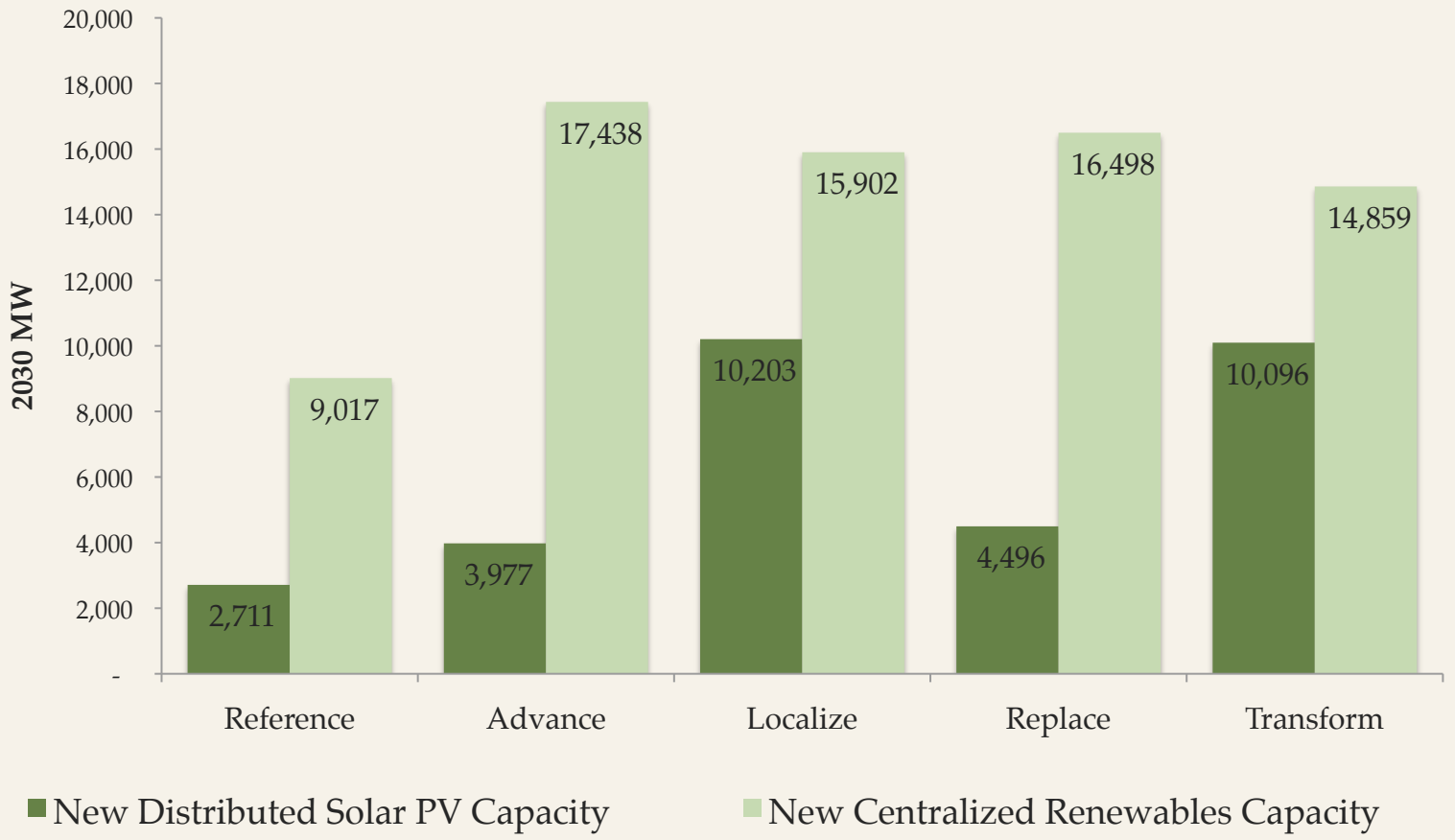
DISTRIBUTED PV VS. CENTRALIZED RENEWABLES: 2030 CAPACITY



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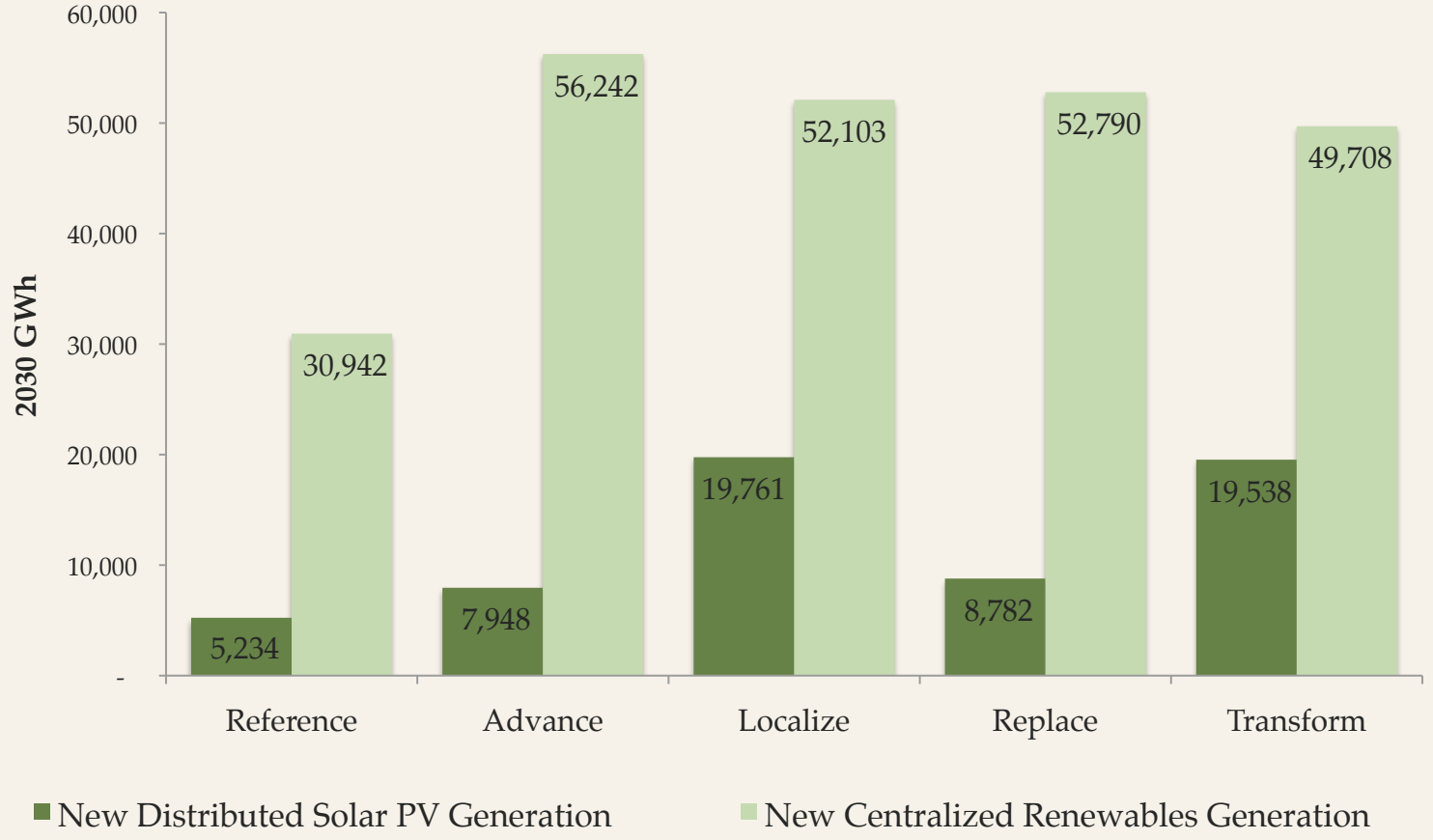
DISTRIBUTED PV VS. CENTRALIZED RENEWABLES: 2030 ENERGY



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