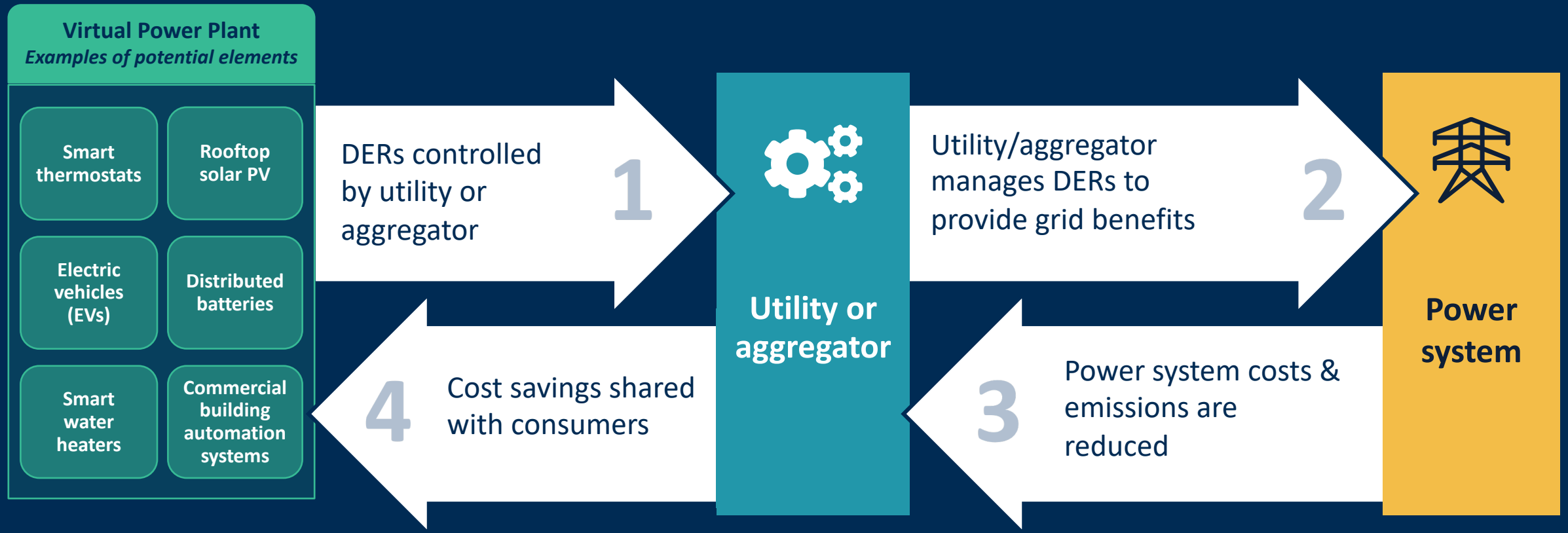
Virtual Power Plants

Regional Issues Forum June 2024

GridLAB

What Is a VPP?

A VPP is portfolio of distributed energy resources (DERs) that are actively controlled to provide benefits to the power system, consumers, and the environment.



VPPs are at a deployment inflection point

Drivers

- Declining DER costs
- Technological advancement
- Inflation Reduction Act
- FERC Order 2222
- Growing model availability
- The decarbonization imperative

Homes with Smart Thermostats

PRESENT	2030
10%	34%

Homes with Electric Water Heating

PRESENT	2030
49%	50%

Residential Rooftop Solar

PRESENT	2030
27 GW	83 GW

Behind-the-Meter (BTM) Batteries

PRESENT	2030
2 GW	27 GW

Light-Duty Electric Vehicles

PRESENT	2030
3 mil.	26 mil.

Modeled Benefits and Costs

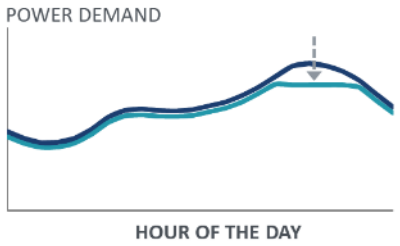
We analyze VPP benefits and costs from the perspective of the utility. This puts VPPs on a level playing field with other resource investment decisions.

Modeled Sources of VPP Operational Value

	Peak Demand Reduction	Load Shifting	Energy reduction
Smart thermostats	•		•
Batteries	•	•	
Electric vehicles	•	•	
Electric water heating	•	•	
Auto-DR	•		•

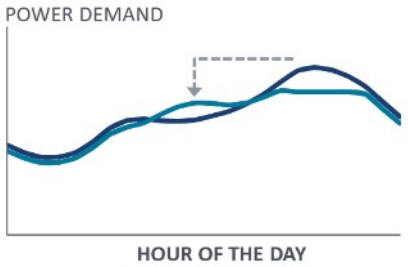
Modeled costs include program administration, marketing and recruitment, equipment, Distributed Energy Resource Management System (DERMS) licensing, and participation incentive payments. See technical appendix for details.

Defining Sources of VPP Operational Value



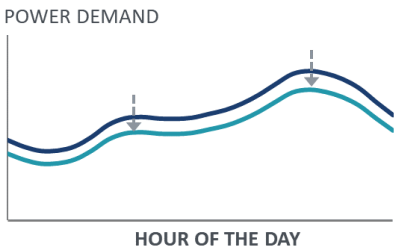
Peak Demand Reduction

Dispatchable and event-based, with a limited number of events per season. Primarily provides capacity value.



Load Shifting

Occurs frequently. Provides capacity and energy value, and potentially GHG emissions reductions. Helps to integrate renewables by reducing curtailments.



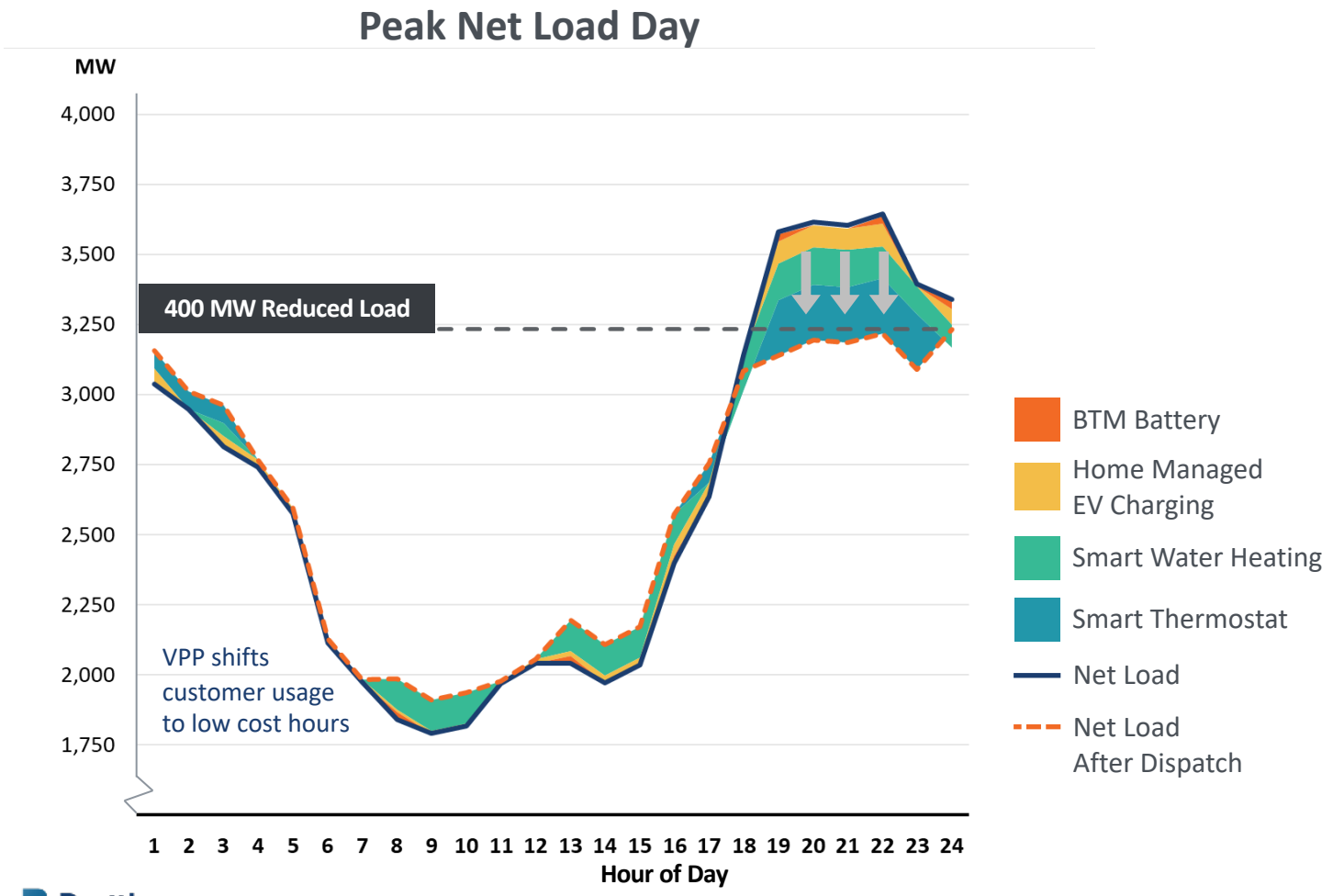
Energy Reduction

Our analysis includes the complementary energy savings benefit enabled by dispatchable VPP technologies where applicable; standalone energy efficiency measures are outside the scope of this study.

NOTE: While a potentially considerable additional source of value, we do not model the ability of VPPs to provide ancillary services.

The modeled VPP can fully provide 400 MW of resource adequacy for a moderately-sized utility

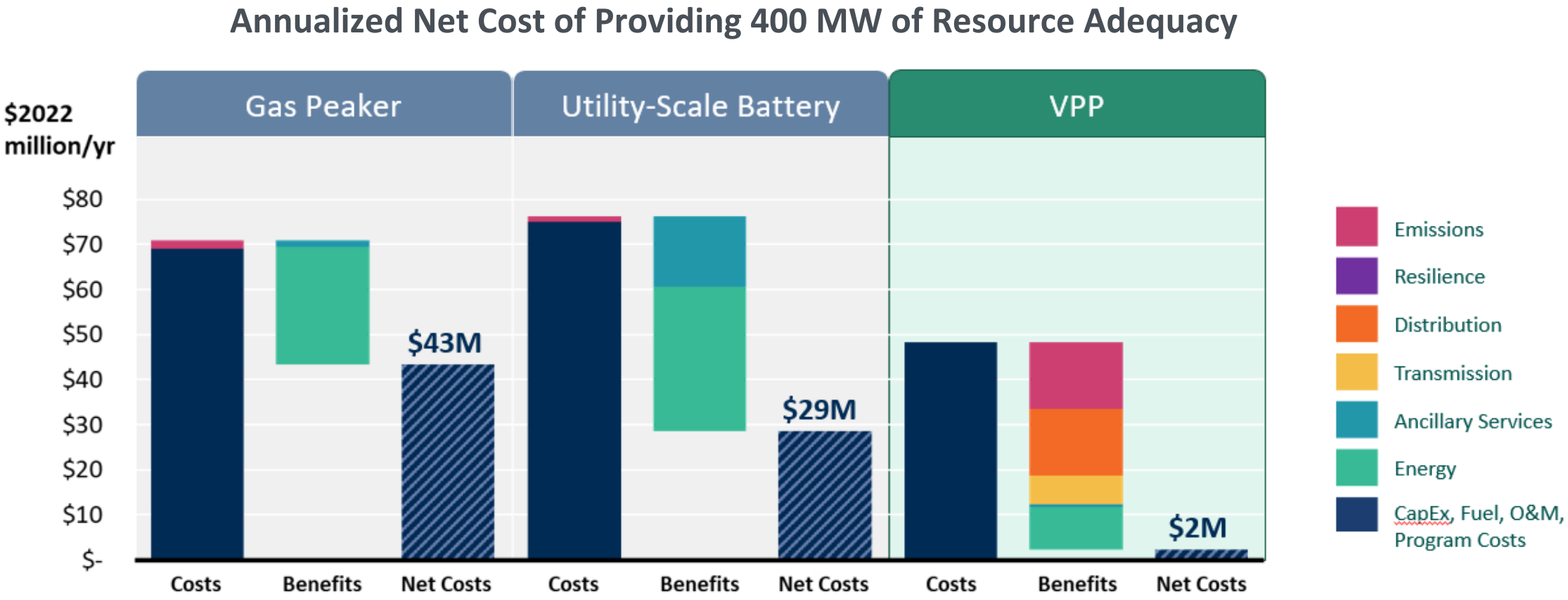
We modeled four commercially available residential demand flexibility technologies for an illustrative utility composed of 1.7 million customers and 50% renewables



The VPP reduces load in:

- Summer and winter
- 7 months
- 63 hours of the year
- 7 consecutive hours

Resource Adequacy… For Cheap

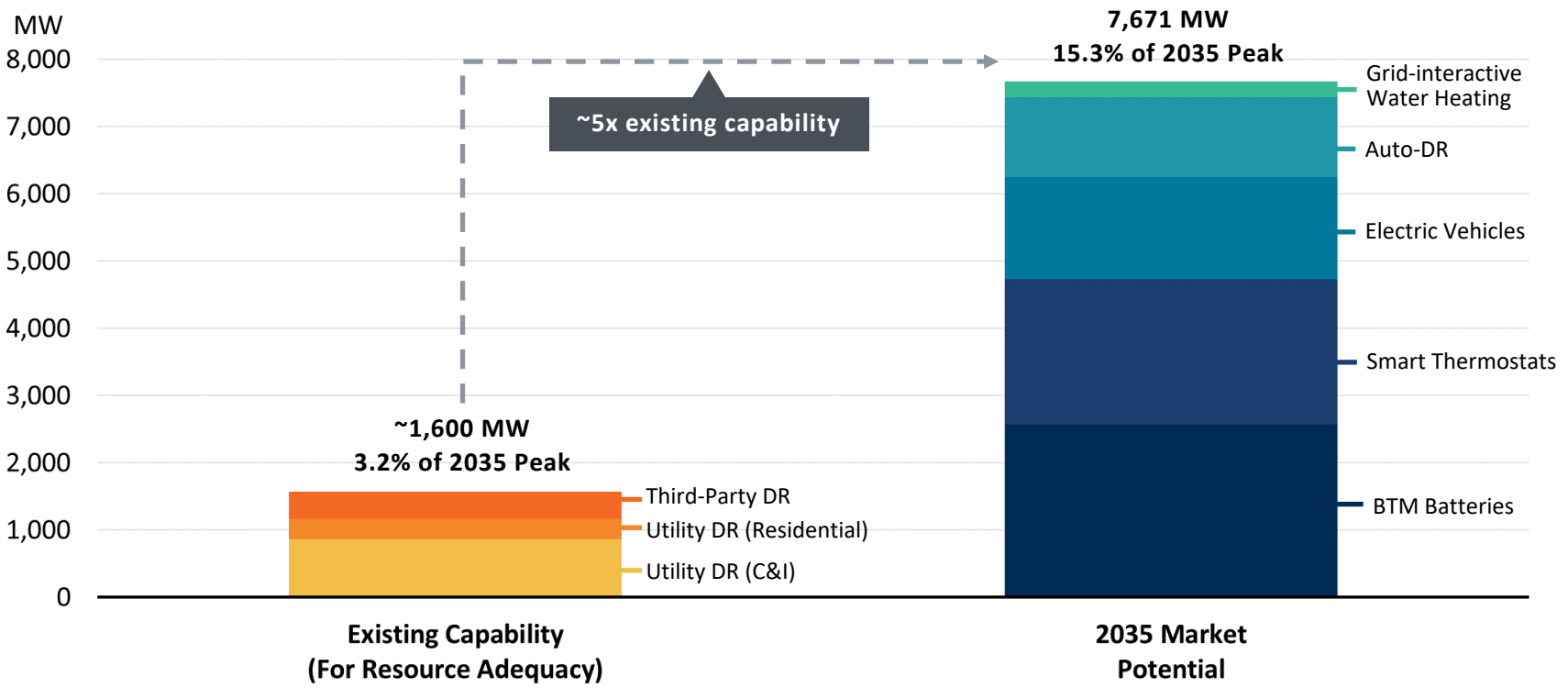


RMI estimated that 60 GW of VPPs could be deployed nationally by 2030. At that scale, VPPs would save $15 to $35 billion in resource costs relative to the alternatives over 10 years … plus $20 billion in societal benefits

Total California VPP Potential

California's 2035 VPP market potential is over 7,500 MW, representing more than 15% of system peak demand. That is roughly five times larger than the DR capacity currently used for resource adequacy.

2035 California Statewide VPP Market Potential

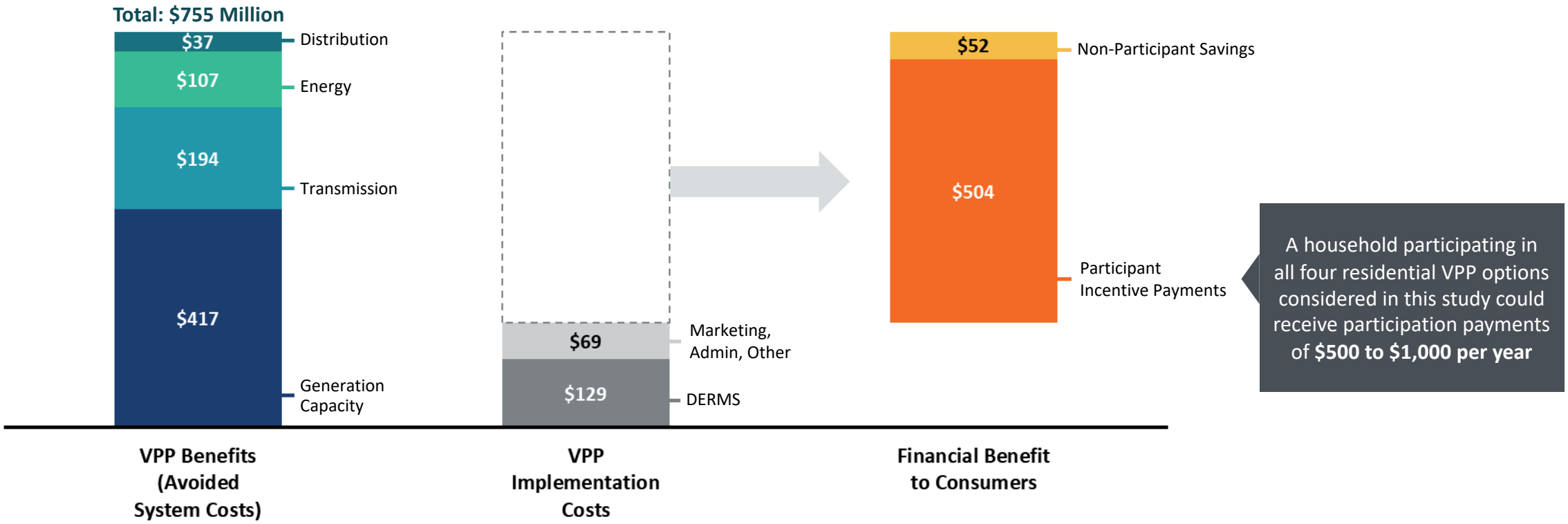


NOTE: VPP capacity is presented as a percentage of maximum system peak demand during the resource adequacy window of 6 to 11 p.m. (March–July) and 5 to 10 p.m. (other months).

The Economics of VPP Market Potential

By 2035, California VPPs could avoid over $750 million/year in traditional power system investment. Roughly $550 million of those savings would be retained by consumers.

2035 Benefits and Costs of Statewide VPP Market Potential ($ Millions)



NOTE: Values shown in 2023 dollars. Split between participant incentives and non-participant savings will vary depending on program design.