

DR17.11 Assessment of DR-Enabling Technologies Roadmap

OVERVIEW

Southern California Edison (SCE) worked with Navigant and the Lawrence Berkeley National Lab (LBNL) to develop a Demand Response (DR) enabling technology roadmap that focuses on facilitating customer engagement for participation as fast and flexible DR services.

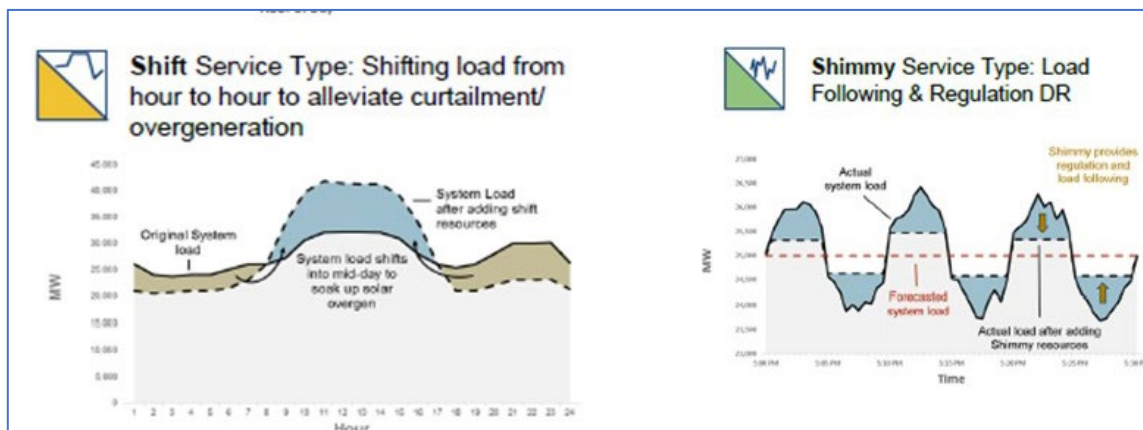
The roadmap provides prospective guidance to SCE on developing innovative research in its Emerging Markets and Technology program during the next five years to possibly realize the benefits that these advanced technologies could provide for SCE’s DR programs. SCE and Navigant next plan to solicit input from multiple stakeholders to ensure the Roadmap is in alignment with their strategic objectives, and to receive suggestions on tactical next steps towards implementing future SCE DR research activities in coordination with the roadmap.

DR Service Types

The roadmap represents four different types of DR services – shape, shift, shed and shimmy. The study focused on the technologies that could provide fast and flexible DR under the “shift” and “shimmy” service types (see figure below).

The roadmap identified the need for enabling technologies for “shift” and “shimmy” service types. Shift represents DR that encourages the scheduled movement of energy consumption from one period to another based on retail price or market rates, and shift has been recommended as a strategy that could help smooth daily net load ramps associated with solar. The shimmy service type is a form of fast responsive DR that operates on a seconds-to-minutes (“regulation”) and minutes-to-hours (“load following”) timescale that has high value for managing short-term fluctuations in the net load.

Shift and Shimmy Demand Response Service Types



Source: 2015 California Demand Response Potential Study, Phase II Report; Final Study Results.

The Shift service type resource is by far the largest opportunity identified for DR to provide system-level value (up to ~\$700 million/year) within the 2025 DR Potential Study. This value is derived from dispatchable daily energy shifts enabled with advanced control technology; economically effective DR amounts to up to ~10 percent of daily energy shifted in 2025. **Industrial Process loads and Commercial HVAC units, all fully automated, are the main contributors to Shift DR Resources** in SCE territory for both 2020 and 2025.

TECHNOLOGY ASSESSMENT

LBNL provided DR potential supply curves for SCE's service territory that help identify the greatest contributors to DR potential across different sectors and end-uses and their levelized costs. The technology assessment not only covered conventional electrical end-uses such as HVAC, lighting and pumps, but also included innovative development and applications of electric vehicles and behind-the-meter (BTM) storage as DR resources.

In addition to the technology assessment, the roadmap reviewed technologies for residential, commercial, industrial and agricultural that had the potential to provide shift or shimmy services. This review identified the drivers and challenges that could influence the deployment of the technologies and how possibly some of these could be overcome and packaged as a value-added offering to the customers to enhance adoption.

SECTOR	ENABLING TECHNOLOGY	SHIFT	SHIMMY
Residential	Two-way communicating thermostat	x	
	Auto-DR for batteries	x	x
	Battery Electric Vehicles (BEVs) and Plug-In Hybrid EVs (PHEVs)	x	x
Commercial	HVAC	x	
	Energy Management System (EMS)	x	x
	Zonal and luminaire lighting		x
	Auto DR for refrigeration	x	x
	Auto DR for batteries	x	x
	BEVs and PHEVs	x	x
Industrial	Data centers	x	
	Wastewater treatment and pumping	x	x
	Processes and large facilities	x	
	Batteries	x	x
Agricultural	Pumping	x	
	Variable frequency pumping	x	x

Did you know? Timely access to customer data is a key driver for expanding DR services by third-party providers. A recent CPUC resolution approving the click-through authorization process to release customer data to third-party DR service providers is likely to expand the customer participation base and boost DR expansion.

TECHNOLOGY DEPLOYMENT DRIVERS

The roadmap identified factors that currently influence DR deployment and are likely to affect market uptake of DR-enabling technologies in future including: standards and interoperability, customer awareness and value proposition, and market/regulatory requirements. One of the underlying premises for realizing the potential associated with advanced fast and flexible DR services is that the various control and communications technologies for enabling DR are based on open standards and communication protocols and that the various devices out in the field are interoperable. Timely access to customer data is a key driver for expanding DR services by third-party providers. Even though "Plug-and-Play" will continue to evolve, and enabling technologies will be able to communicate and interface, challenges remain such as the lack of interoperability in control technologies and communications platform.

The following table is an example of the technology assessment used in formulating a DR enabling Roadmap.

Technology	Topic	Description
Residential Energy Management Solutions (Transactive Energy)	Areas of Technology Development & Demonstration	Demonstration of intelligent residential energy management system for aggregated control of a variety of residential end-use loads is currently underway; utilizes transactive energy signals.
	Fast and Flexible DR Contribution (Shift & Shimmy)	Successful demonstration of residential EMS that integrate control strategies over a variety of load types and respond to transactive signals can significantly open possibilities of contribution from a variety of residential end-use loads.
	Co-benefits	Substantial co-benefits through optimization of price and comfort under real-time market conditions.

CONCLUSION

The technology assessment summary highlights key areas of technology development and demonstration required for enhancing DR capabilities to provide fast and flexible DR services (shift and shimmy services in the potential study), and accordingly suggests a technology roadmap. The study found that there are a number of ongoing technology development and demonstration activities that show potential as future technologies with enhanced DR capabilities.

Most of these demonstrations are expected to be complete within the next three years approximately and could provide specific guidance on prioritization and selection of technologies for realizing fast and flexible DR services.

These Findings are based on the report "Assessment of DR-Enabling Technologies Roadmap," which is available on the Demand Response Emerging Technologies website: <https://www.dret-ca.com/>