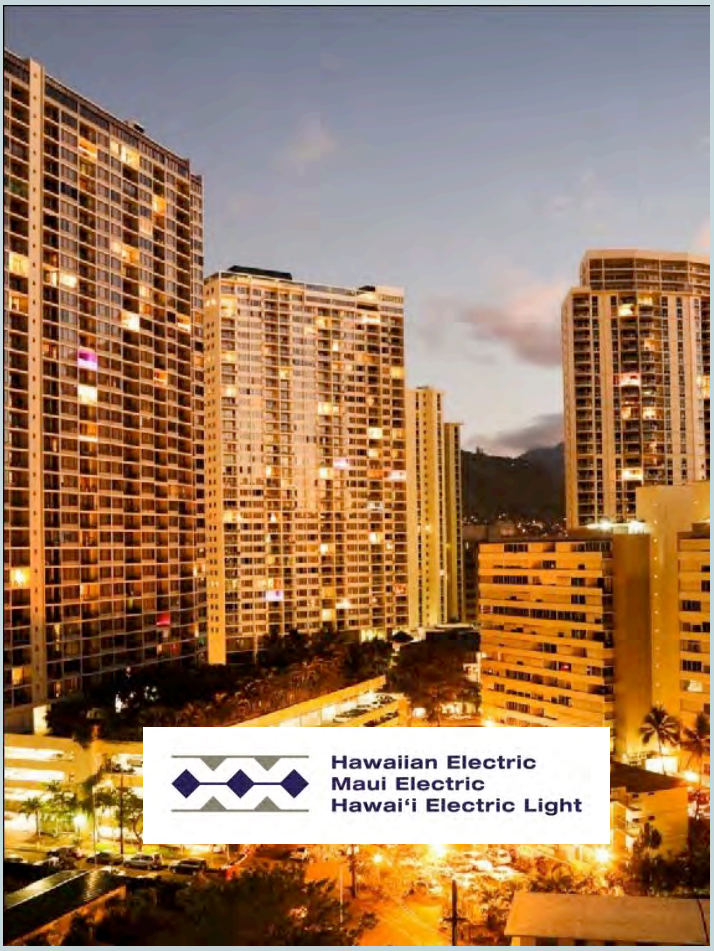
Integrated Demand Response Portfolio Plan

July 2014





Hawaiian Electric
Maui Electric
Hawai'i Electric Light

The Hawaiian Electric Companies submit this document to comply with the Decision and Order issued by the Hawai'i Public Utilities Commission on April 28, 2014 in Docket No. 2007-0341, Order No. 32054.

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Overall Strategy

The Hawaiian Electric Companies propose to implement a portfolio of demand response programs that appeals to a wide variety of residential and commercial customers, reduces the cost of electricity, and enables higher levels of renewable energy without compromising service reliability.

With the continued growth of rooftop solar photovoltaics in our systems, our customers play an increasingly important role in energy supply. With the demand response programs introduced in this Integrated Demand Response Portfolio Plan (IDRPP), we are providing our customers with additional options to both manage their energy costs and provide valuable services to the grid that will benefit all customers.

Our overall goal is to aggressively pursue all demand response programs that best serve the interests of our customers across all five island grids.

Our Intense Focus on Demand Response

The Hawaiian Electric Companies firmly believe that demand response should be an integral part of our power supply toolkit—and it will be. We will be employing our demand response portfolio on the supply side—implementing thermal energy storage and customer-sited generators to meet capacity—as well as on the demand side—to meet several essential ancillary services. And we will use the competitive marketplace to acquire cost effective demand response resources that benefit all customers.

Grid Service Requirements Met by Our Demand Response Portfolio

Transitioning to using variable renewable generation has created opportunities for demand response to contribute in meaningful ways to meet grid services needs. Demand response can contribute to capacity, several ancillary services (including regulating reserve, contingency reserve, non-spinning reserve, and non-Automatic Generation Control (AGC) ramping), and accelerated energy delivery. A primary focus of our demand response programs will be to provide ancillary services, a leading-edge initiative which represents a great opportunity on our islanded power grids.

We are proposing a portfolio of demand response programs—each meeting several Commission objectives—that fall into seven targeted categories:

1. **Residential and Small Business Direct Load Control program:** Expanding on the existing Residential Direct Load Control and Small Business Direct Load Control programs, program participants allow us to control certain equipment to better manage load demand fluctuations.
2. **Residential and Small Business Flexible program:** This program enables control of targeted devices to meet ancillary service requirements.
3. **Commercial & Industrial Direct Load Control program:** Participants in this updated program allow us to control certain equipment to shift load.
4. **Commercial & Industrial Flexible program:** This flexible program enables the use of targeted equipment to meet ancillary service requirements.
5. **Commercial & Industrial Pumping program:** This program enables control of certain water pumping facilities to better balance supply and demand.
6. **Customer Firm Generation program:** This program enables dispatching on-site customer generators to meet demand.
7. **Dynamic & Critical Peak Pricing program:** This program enables load shifting to "smooth" the daily system load profiles based on demand and price.

Marketing to Ensure Success

Our plan calls for marketing to a wide circle of commercial businesses with an expanded focus on residential customers.

The "maximum price" paid for a DR program would be the difference between the avoided cost and the program's operational cost. The "avoided cost" is the cost of an alternative resource (energy storage or a generator) providing the equivalent service. At the "maximum price," the overall rate impact to customers would be economically neutral. To create the maximum benefit and participation, we will bring our DR programs to the open market to best determine price and appeal, and drive their adoption through third-party agents selected for their expertise and experience. Whenever the market price paid for DR is less than the "maximum price," all customers benefit, and the participating DR customer receives an additional credit or payment.

We plan a company-wide implementation, transitioning from existing programs into our new DR portfolio, including establishing a centralized DR staff who will focus solely on administering the programs. We also look forward to working with others companies offering DR expertise and technologies to facilitate the pace and effectiveness of the DR programs. The implementation timeline calls for immediate action across O'ahu, Maui, and Hawai'i Island, with planned future implementations on Lana'i and Moloka'i. As the implementation unfolds, we will measure performance and adjust as needed to maximize the impact of our programs.

Abstract

Executive Summary

The Hawaiian Electric Companies propose to implement a portfolio of demand response programs that appeals to a wide variety of residential and commercial customers, providing more options to reduce the cost of electricity, and enabling higher levels of renewable energy without compromising service reliability.

ROLE OF DEMAND RESPONSE IN HAWAIʻI'S ENERGY FUTURE

Our Integrated Demand Response Portfolio Plan (IDRPP) recognizes and formalizes our customers' changing role in the power grid. In the past, controllable generation supply was dispatched to meet the fluctuating load demand of the power system. Because our customers' energy needs are increasingly supplied by variable renewable energy resources, an important solution for balancing supply with demand is to enable customer demand to be more dispatchable.

With the continued growth of rooftop solar photovoltaics in our systems, our customers play an increasingly important role in energy supply. With the new and expanded demand response programs introduced in this IDRPP, we are pleased to offer our customers additional opportunities to both manage their energy costs, and provide valuable services to the grid that benefit all customers.

OVERALL STRATEGY

This IDRPP presents a number of demand response (DR) programs that benefit all customers. These benefits include reduced energy supply costs, reduced energy curtailment, and increased system reliability. Customers who participate in demand response programs also benefit from incentive payments or credits on their energy bills.

Overall, our DR portfolio provides a "higher level of operational flexibility so as to support, among other things, integration of additional renewable resources, such as solar and wind".[1] We will use our DR portfolio as an essential tool in our system operation tool kit to address the changing profile of energy demand created by the growth in solar energy resources.

Our IDRPP calls for immediate action across O'ahu, Maui, and Hawai'i Island with plans to extend the DR programs as they mature to Lana'i and Moloka'i. We propose updating and refreshing the existing DR programs to more clearly and cost-effectively fulfill grid service requirements. We propose to launch the full portfolio of DR programs in 2015, and to deliver grid services from these new programs by early 2016. We also plan to launch an expedited Customer Firm Generation program for Maui to deliver capacity in 2015.

Mission Statement

We have adopted the following mission statement to guide us in our continued development of innovative and useful DR programs:

> "The Hawaiian Electric Companies will aggressively pursue all demand response programs that best serve the interests of our customers across all five island grids."

[1] Docket No. 2007-0341, Order No. 32054, *Policy Statement and Order Regarding Demand Response Programs*, at 4.

Guiding Principles for Implementing Our Demand Response Portfolio

We intend to adhere to these guiding principles for designing, implementing and managing our demand response portfolio:

Meet the Need: Ensure that the grid services requirements (capacity and ancillary services) are met to the maximum extent that is practical and cost effective using demand response.

Seek Diversity: Pursue demand response programs that can be readily implemented, comprise a diverse set of features, employ customer equipment, meet grid service requirements, and can be adroitly administered to maintain system reliability.

Defer to the Market: Determine the optimal compensation that maximizes participation in our demand response portfolio without compromising cost effectiveness for customers.

Enlist Expert Assistance: Take advantage of third-party expertise—including that of Hawai'i Energy[2]—to recruit participants, and to launch and implement demand response programs.

Continue Evolving: Aggressively research new ways for customers to participate, evaluate their applicability in our unique environment in Hawai'i, identify and quantify their benefits, and quickly implement them.

HOW WE DEVELOPED OUR DEMAND RESPONSE PROGRAMS

To develop our Integrated Demand Response Portfolio Plan, we adhered to a foundational definition of demand response, accounted for Hawai'i's unique operating environment, and relied on a methodical process.

Uniqueness of Hawai'i's Island Grids

Demand response programs implemented elsewhere may need to be modified to meet our unique island needs. Here are several reasons why this is true:

- Unparalleled amounts of variable renewable generation, due mostly to growing amounts of distributed generation.

[2] The Hawai'i Public Utilities Commission (PUC) has contracted with Hawai'i Energy to administer Hawai'i's energy efficiency programs.

- Value of demand response compared to alternatives (for example, centralized generation or energy storage) to cost-effectively provide ancillary services needed for secure system operation.
- Independent island grids that are not interconnected and the resulting inability to rely on short-term assistance from other utilities or a regional power pool.
- No significant seasonal demand fluctuations and relatively consistent daily load demand profile.
- Larger generating unit sizes relative to system demand, requiring significantly different system security and reliability criteria.[3]
- Significant load shedding is utilized to prevent system collapse (i.e., island-wide blackouts) during major disturbances.

We considered all of these factors in designing a demand response portfolio that is appropriate for Hawai'i.

Method for Developing the IDRPP

We followed three key steps in developing our IDRPP. We:

1. Established the grid service requirements for O'ahu, Maui, and Hawai'i Island, and used them to identify the services and specifications required for our DR portfolio.
2. Examined sector-specific end-uses and overall load potential to identify loads that could be interrupted to meet grid service requirements and were acceptable to the customers providing those loads.
3. Designed DR programs in a common format to satisfy both grid service requirements and the availability of customer-specific end-uses.

As a result, we modified some existing DR programs and designed new ones that meet our specific grid service requirements, and which are complementary within the overall portfolio. We have also designed a procurement process that ensures any DR program offers real benefit and value to customers, offers benefits greater than the estimated program costs, and benefits all customers including non-participants.

[3] The maximum size of individual generating units is currently being evaluated by the Companies as part of their development of Power Supply Improvement Plans (PSIP) in the contexts of system security and overall cost for system operation. Therefore, this factor that contributes to the uniqueness of the Hawaiian power systems is subject to change.

THE DEMAND RESPONSE PROGRAMS WE DEVELOPED

The Hawaiian Electric Companies have reviewed and overhauled our existing demand response programs. We have also designed a number of new and beneficial DR programs that have been consolidated into a single integrated DR portfolio.

We plan to increase our collaboration with Hawai'i Energy to maximize the availability, timeliness, and use of cost-effective DR resources throughout Hawai'i. We also plan to continue to build on our partnership with Energy Excelerator, a clean energy startup accelerator program to incorporate the use of emerging technologies to continuously enhance our DR portfolio.

Grid Service Requirements Met by Demand Response

Firm generation that has traditionally been used to provide ancillary services is increasingly being replaced by variable renewable generation that has markedly less capability to provide these services. This creates opportunities for demand response to contribute in meaningful ways by providing ancillary services.

As summarized in Table ES-1, demand response can contribute to grid service requirements, including capacity, several ancillary services (including regulating reserve, contingency reserve, non-spinning reserve, and non-Automatic Generation Control (AGC) ramping), and accelerated energy delivery.

Grid Service Requirements	Response Speed* (Mainland)	Response Speed* (Hawaii)	Response Duration	Potential for DR?
Capacity				
Capacity Used to meet demand plus reserve margin; supplied by on-line and off-line resources, including interruptible load	Minutes	scheduled in advance by system operator	If called, must be available for at least 3 hours	✓
Ancillary Services				
Contingency Reserve** Reserves to replace the sudden loss of the single largest on-line generator; supplied from online generation, storage or DR	Seconds to <10 min	Within 7 cycles of contingency event	Up to 2 hours	✓
Regulating Reserve Maintain system frequency; supplied from on-line capacity that is not loaded	<1 min	2 seconds, controllable within a resolution of 0.1 MW	Up to 30 min	✓
Non-Spinning Reserve Used to restore regulating reserves and contingency reserves; supplied by off-line fast start resources or DR **Non-AGC Ramping** Resources that can be available prior to quick start generation and can add to system ramping capability	10-30 min N/A	<30 min <2 min	2 hours Up to 2 hours	✓
Black Start Capability The ability of a generating unit to start without system support	N/A	<10 min	Duration of system restoration time	✗
Inertial Response Local (i.e. at a generator) response to a change in frequency; supplied by rotational mass of generators, or power electronics of inverter-based resources	N/A	2-3 seconds	2-3 seconds	✗
Other				
Accelerated Energy Delivery*** Shifting the demand for energy from high demand evening peak periods to lower demand midday periods, or higher demand morning periods to lower demand overnight periods	N/A	N/A	N/A	✓

* Response speed refers to the time needed to "dispatch" a resource, automatically or manually, once it is known it is needed.
** Contingency reserves that cannot meet the 7 cycle operation requirement are not fast enough to serve as primary protection resources (e.g. spinning reserves), but may be able to meet the contingency reserve requirements consistent with the "kicker block" of secondary resources.
*** Accelerated Energy Delivery is not an ancillary service product of the Hawaii system, but will help meet the need to reduce peak loads and especially to increase overnight and midday demand.

Table ES-1. Demand Response Role in Providing Ancillary Services

Ultimately, we will consider customer and end-use resources that can effectively and efficiently be targeted for DR program participation. Examples include Variable Frequency Drives (VFDs) for water pumps and other motor loads, Light-emitting Diode (LED) lighting, refrigeration, ventilation, standby generators, and Grid Interactive Water Heaters (GIWHs).

Portfolio Approach

Each DR program in our proposed portfolio accomplishes a range of objectives that collectively address our grid service requirements. The programs fall into two groups:

- **Direct Load Control Programs:** where we can remotely shut down or cycle customers' electrical equipment (such as air conditioners, water heaters, and lighting).
- **Flexible Programs:** where we can remotely adjust (directly or through a third-party DR administrator) the operation of customers equipment, up or down, to meet grid ancillary services.

Evolution of Our Demand Response Programs

In developing our IDRPP, we determined that our plan needs to take better advantage of some existing direct load control programs such as Residential Direct Load Control (RDLC), while devising new programs to more effectively provide customer options that contribute to ancillary services, enable peak loads to be shifted to lower demand periods, reduce curtailment, incorporate greater amounts of renewable energy, and create better customer incentives for increased participation (depicted in Figure ES-1).

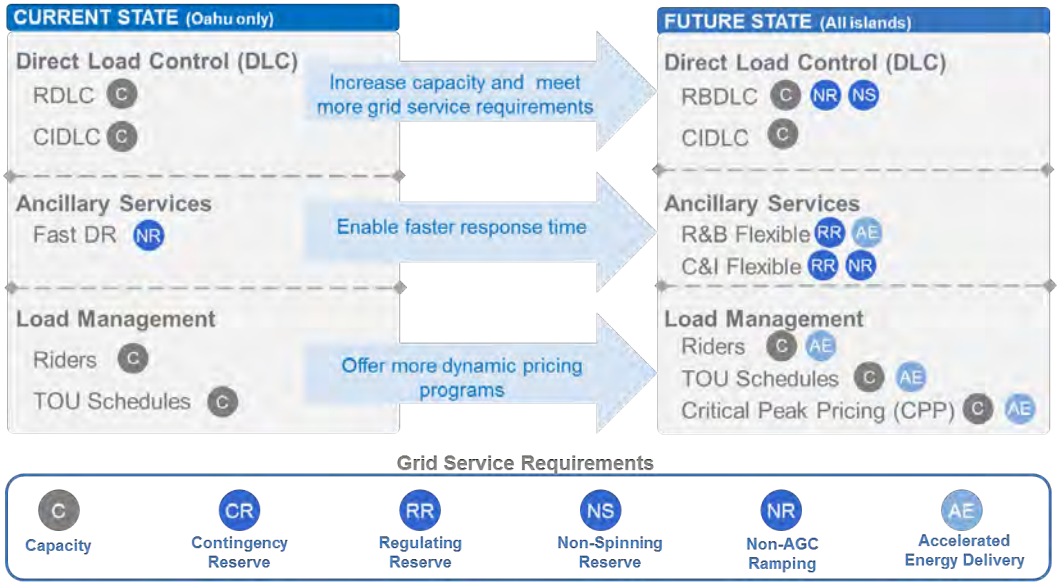

Figure ES-1. Current and Future Demand Response Expanded Benefits

The Demand Response Programs

We are proposing demand response programs that fall into seven categories:

1. Residential and Small Business Direct Load Control (RBDLC)
2. Residential and Small Business Flexible
3. Commercial & Industrial Direct Load Control (CIDLC)
4. Commercial & Industrial Flexible
5. Commercial & Industrial Pumping
6. Customer Firm Generation
7. Dynamic and Critical Peak Pricing

DR Program Descriptions

New, Residential and Small Business Direct Load Control Program (RBDLC)

This new RBDLC program continues and expands upon the existing RDLC and Small Business Direct Load Control (SBDLC) programs. RBDLC enables new and existing single-family, multi-family, and master metered residential customers, in addition to small businesses, to participate in an interruptible load program for electric water heaters, air conditioning, and other specific end uses.

New, Residential and Small Business Flexible Program

This new program enables residential and small business customers with targeted devices (such as controllable grid-interactive water heaters) to meet ancillary service requirements by providing adjustable load control and thermal energy storage features over various timeframes.

Updated, Commercial & Industrial Direct Load Control Program (CIDLC)

The updated CIDLC program allows commercial and industrial customers to help shift load, usually during peak periods, by allowing their central air conditioning, electric water heaters, and other applicable appliances to be remotely cycled or disconnected.

New, Commercial & Industrial Flexible Program

This new program enables commercial and industrial customers with targeted devices (such as air conditioning, ventilation, refrigeration, water heating, and lighting) to meet ancillary service requirements by providing adjustable load control and/or thermal energy storage features over differing timeframes.

New, Commercial & Industrial Pumping Program Overview

The Commercial & Industrial Pumping program enables county and privately owned water facilities with pumping loads and water storage capabilities to be dynamically controlled. This will be accomplished by using variable frequency drives and emergency standby generation to adjust power demand and supply at the water facilities, and better balance supply and demand of power system loads.

New, Customer Firm Generation Program

Commercial and industrial customers who participate in this program allow system operators to dispatch their on-site standby generators to help meet power system load demand. Monitoring equipment on the standby generators tracks the usage of program participation, testing, and assures environmental permit compliance.

Updated, Dynamic and Critical Peak Pricing Program

The Dynamic and Critical Peak Pricing programs are designed to shift loads from peak-demand to lower-demand periods to effectively "smooth" the system daily load demand profile. These pricing programs would adjust specific prices for electricity power from the grid throughout the day, sending price signals to customers to encourage shifting of their load demands.

Using Demand Response as a Grid Resource

Due to system security considerations on our island-based power grids, the Companies' system operators would be able to employ demand response programs for up to approximately 15% of the electric system load to regulate capacity and serve ancillary services throughout the day and night. The DR program subscriptions, in total, are expected to substantially exceed 15% of the estimated peak load for the system—an adoption goal of our DR portfolio. System operators should be able to serve up to 15–20% of system load at any time using DR to balance the power system. It's necessary to serve the remaining 80–85% of system load by other resources to ensure the system can recover from a major disturbance.

DR Program Objectives and Potential Load Resources

Demand response programs can meet grid services—capacity and ancillary services—in several ways. The objectives for each DR program and the associated potential load resources for each program are summarized in Table ES-2.

Actual implementation of the DR programs will further confirm how these programs and their associated resources can best contribute to grid services.

DR Program	Grid Service	Potential Load Resources
Residential and Small Business Direct Load Control	Capacity	Water heaters Central air conditioning
	Non-AGC Ramping	Water heaters Central air conditioning
	Non-Spinning Reserve	Water heaters Central air conditioning
Residential and Small Business Flexible	Regulating Reserve	Grid interactive water heating Central air conditioning
	Accelerated Energy Delivery	Grid interactive water heating
Commercial & Industrial Direct Load Control	Capacity	Commercial & industrial curtailable Water heaters Central air conditioning
Commercial & Industrial Flexible	Regulating Reserve	Central air conditioning Refrigeration Ventilation Grid interactive water heating
	Non-AGC Ramping	Central air conditioning Refrigeration Ventilation Lighting
Commercial & Industrial Pumping	Regulating Reserve	Commercial/muni water & wastewater pumping
	Non-AGC Ramping	Commercial/muni water & wastewater pumping
Customer Firm Generation	Capacity	Customer-sited stand-by generators
Dynamic and Critical Peak Pricing	Capacity	Unspecified customer load
	Accelerated Energy Delivery	Unspecified customer load

Table ES-2. Demand Response Programs and Resources to Meet Grid Services

Overview of the DR Programs

The brief overview of each DR program (Table ES-3) describes how the performance of each program will be measured, their cost, and their availability. Based on the grid service requirements to be satisfied, response speed and duration requirements will vary by program and load resource.

DR Program	Performance Measurement	Cost per Event	Availability
Residential and Small Business Direct Load Control	Difference between pre-event and post-event load	None	Always available, no notification, no limits
Residential and Small Business Flexible	Difference between pre-event and post-event load	None	Continuous
Commercial & Industrial Direct Load Control	Difference between pre-event and post-event load	$0.50 per kWh	Up to 300 hours annually
Commercial & Industrial Flexible	Difference between pre-event and post-event load	None	Continuous
Commercial & Industrial Pumping	Difference between pre-event and post-event load	None	Continuous
Customer Firm Generation	Amount of self-supply and/or exported power to the grid provided during the event	$0.50 per kWh	Up to 100 hours annually

Table ES-3. Overview of the DR Programs

PROJECTED RESOURCE POTENTIAL BY DR PROGRAM

Load Resources Meeting Grid Services

We have assessed the types of resources likely to best meet specific grid services (see Table ES-4). We believe, however, that the market will best determine the optimal resource mix for meeting each grid service. To confirm these optimal uses, we will clearly state the specifications for meeting each grid service (for example, the required response time and response duration), and test the market to determine availability and costs.

Resources	Capacity	Regulating Reserve	Contingency Reserve	Non-AGC Ramping	Non-Spinning Reserve	Accelerated Energy Delivery (Intraday)
Water Heater and A/C	✓	✓	✓	✓	✓	
C&I Curtailable	✓					
Ventilation		✓		✓		
Refrigeration		✓		✓		✓
Lighting				✓		
GIWH				✓		
Water Pumping		✓		✓		✓
Customer Generation	✓					✓
Electric Vehicles*	✓					✓

* Electric vehicles have not been included in current program projections, but will be leveraged for DR as the market matures.

Table ES-4. Target Resources for Meeting Grid Services

Projected DR Potential

The estimated megawatt (MW) potential associated with each program and grid service is summarized in Table ES 5. Without exception the potential is expected to initially increase over time. These projections then plateau and begin to decline in the 2020 time frame due primarily to the effectiveness of Hawai'i Energy's energy efficiency programs.

We are committed to aggressively pursue demand response solutions and continually reevaluate their potential based on changing circumstances and emerging technologies. We expect that emerging technological advances, market conditions, and ongoing recruitment will keep DR participation levels steady beyond 2020.

Our DR portfolio is based on our current understanding of the limits of the technology for implementation. Accordingly, demand response under-frequency resources currently are not considered to respond fast enough to provide contingency reserve; and thus the entries of zero for contingency reserve in Table ES 5. Nonetheless, we are pursuing DR resources with this valuable capability, and would utilize DR resources for this purpose should the market be able to provide them in the future.

DR Program	*O'ahu Island Grid*				*Maui Island Grid*				*Hawai'i Island Grid*			
Grid Service	*2014*	*2019*	*2024*	*2034*	*2014*	*2019*	*2024*	*2034*	*2014*	*2019*	*2024*	*2034*
RBDLC												
Capacity	10.0	30.4	33.3	33.3	0.0	5.7	7.1	7.1	0.0	4.9	6.0	6.0
Contingency Reserve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-AGC Ramping	10.0	30.4	33.3	33.3	0.0	5.7	7.1	7.1	0.0	4.9	6.0	6.0
Non-Spinning Reserve	10.0	30.4	33.3	33.3	0.0	5.7	7.1	7.1	0.0	4.9	6.0	6.0
R&B Flexible												
Regulating Reserve	0.0	3.3	5.1	5.1	0.0	0.7	1.1	1.1	0.0	0.9	1.4	1.4
Accelerated Energy Delivery	0.0	1.7	2.7	2.7	0.0	0.4	0.6	0.6	0.0	0.5	0.7	0.7
C&I DLC												
Capacity	10.0	23.8	25.4	25.4	0.2	2.5	3.0	3.0	0.0	1.8	2.2	2.2
Contingency Reserve	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C&I Flexible												
Regulating Reserve	0.0	2.6	4.1	4.1	0.0	0.4	0.6	0.6	0.0	0.3	0.4	0.4
Non-AGC Ramping	0.0	9.0	14.1	14.1	0.0	1.3	2.1	2.1	0.0	0.9	1.4	1.4
C&I Pumping												
Regulating Reserve	0.0	1.2	1.9	1.9	0.0	0.2	0.3	0.3	0.0	0.1	0.2	0.2
Customer Firm Generation												
Capacity	0.0	5.0	5.0	5.0	0.0	3.0	3.0	3.0	0.0	3.0	3.0	3.0
Total Load Under Control*	26.0	70.2	82.4	82.4	0.2	13.1	16.1	16.1	0.0	11.1	13.6	13.6

** Total number reflects the sum of the potential obtained from each load resource used to calculate these projections (which is not equal to the sum of the potentials identified under each grid service requirement in the table because of program overlap and the ability of some end use resources to meet multiple grid service requirements).*

Table ES 5.Potential MW Benefits for Demand Response Programs

Mapping Planned Demand Response Programs to Objectives of the Commission's Order

Each DR program's design has been driven by and crosschecked against the guidelines and directives issued by the Commission (Table ES-6) in Docket No. 2007-0341, Order No. 32054. Every DR program meets more than one Commission objective; and every Commission objective is met by at least three programs.

The DR programs will compensate customers for their participation and the value they add to the system, and provide them with opportunities for reducing their total electricity bills. The programs will also provide the Companies with a range of options for meeting a portion of the grid services requirements, while reducing reliance on fossil fuel and increasing the system's ability to take the greatest advantage of renewable energy resources.

Mapping Programs to Order Objectives	Residential & Small Business		Commercial & Industrial			Muni/C&I	Pricing
The commission established the following as the stated objectives for the current and future DR programs	DLC	Flexible	DLC	Flexible	Customer Generation	Water Companies*	Dynamic, CPP
1. DR programs should provide quantifiable benefits to ratepayers	H	H	H	H	H	H	H
2a. A reduction in total kWh consumed or a change in how kWhs are consumed that is beneficial to overall system operations	H	H	H	H		H	H
2b. A reduction in peak loads, and the deferral of new generation capacity	H		H		H	H	H
2c. Assistance in meeting PV and wind variability	M	H		H		H	
2d. A shift of a portion of system load to off-peak times (which may be mid-day in the near future for systems with high PV penetration) to among other things increase consumption of minimum load generation and to reduce curtailments of renewable generation		H		M		H	H
2e. Assistance in assuring the reliability of the system through among other things programs that permit fast response of short duration to meet contingency conditions prior to utility emergency diesel generations coming on line	M	H	M	H		H	
2f. A non-fossil fuel source of ancillary services, such as frequency management, up and down regulation, and dispatch able energy	M	H		H		H	
2g. Customer benefits such as greater control over energy use and opportunities to lower electricity bills**	H	H	H	H	H	H	H
2h. A potential means for addressing greenhouse gas emissions standards established by the state of Hawaii and federal government.	H	M	H	M	H	H	H

H = Highly Satisfies M = Moderately Satisfies

* Water Companies category includes pumping as load resources and on-site emergency generators, both considered as potential DR options.
** All program participants (i.e. DR providers) will be paid for participating and will thus be able to lower their electricity bills; only pricing program participants would be viewed as having more control over their energy use.

Table ES-6. Mapping DR Programs to the Objectives (Order, p. 82-83)

PRICING THE DEMAND RESPONSE PLANS

The value of a DR program is directly associated with the costs it otherwise avoids if other resources provide the equivalent service. The compensation paid (or credited to his/her energy bill) to a customer participating in a DR program, is a direct benefit for that customer. All customers benefit from the overall value of the DR program.

Cost of DR Programs

Avoided cost for a grid service could be based on several factors, including installed capacity costs, fuel costs, and cost of alternatives, each of which depends on the current state of the system. Potential avoided cost calculations include:

Capacity: The cost of new capacity.

Regulating Reserve: The cost of a frequency support energy storage device, or the savings from reduced regulating reserve requirements.

Contingency Reserve: The fuel cost savings resulting from a reduction in the contingency reserve requirement (for O'ahu) or to offset under-frequency load shedding savings (for Maui and Hawai'i Island).

Non-AGC Ramping: The installed cost of new quick start generation or the fuel cost and maintenance savings resulting from not having to start units to compensate for wind volatility.

Non-Spinning Reserve: The cost of maintaining existing resources that currently meet non-spinning reserves.

Advanced Energy Delivery: The installed capital cost of a load shifting energy storage device.

When a resource or program meets more than one grid service requirements, but not simultaneously, the higher avoided cost will be used.

Compensation for DR Programs

The "maximum price" paid for a DR program would be the difference between the avoided cost and the program's operational cost. The "avoided cost" is the cost of an alternative resource (energy storage or a generator) providing the equivalent service. At the "maximum price," the overall rate impact to customers would be economically neutral. To create the maximum benefit and participation, we will bring our DR programs to the open market to best determine price and appeal, and drive their adoption through third-party agents selected for their expertise and experience. Whenever the market prices paid for DR is less than the "maximum price," all customers benefit, and the participating DR customer receives an additional credit or payment.

IMPLEMENTING DEMAND RESPONSE PROGRAMS TO BE SUCCESSFUL

Successful DR programs save more than they cost, because the DR resources are acquired at a lower cost than the costs they avoid. They have inherent appeal that attracts customer participation, consistently meets the needs of the electric grid, and maintains a high level of system reliability.

DR Portfolio Delivery Roadmap

We have developed an implementation plan to manage the delivery of our DR portfolio that includes standards and approaches on how to measure the performance and overall benefits that can be achieved from our DR portfolio.

DR Portfolio Implementation Timeline

The implementation timeline calls for immediate action across all three islands (Figure ES-2), with planned future implementations on Lana'i and Moloka'i. The full portfolio of DR programs would be launched in 2015, with the actual delivery of grid services expected to occur by January 2016.

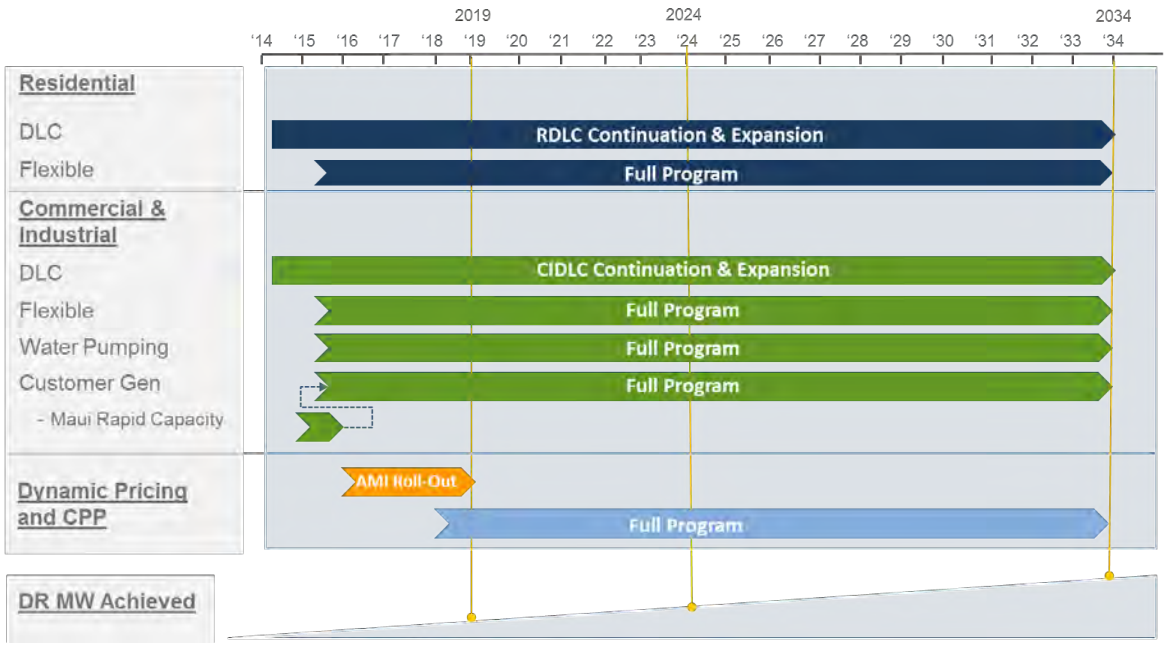

Figure ES-2. Timeline for the DR Portfolio Action Plan

Using Third-Party Agents and Aggregators

To implement our DR programs as quickly as possible, at the outset we anticipate contracting with third-party agents and aggregators to act as service providers on our behalf. They are the end use and control system experts whose expertise can be leveraged to expedite aggressive implementation of our plan. This approach seeks to enable our customers to benefit quickly and effectively from a robust and diversified DR portfolio that can provide the required grid services.

We will evaluate potential service providers based on their abilities across a range of criteria including cost of service, experience, ability to perform at a high level, knowledge of specific project needs, technology offerings, and the terms and conditions of their engagement.

Technical Considerations

We will apply several technical design principles to ensure that the DR architecture and solutions can be implemented across a wide scale, and are lasting and cost effective. These principles include:

- Incorporating the latest cyber security techniques into the architecture.
- Implementing scalable solutions that allow for the management of hundreds of thousands of endpoint devices and customer loads.
- Taking advantage of open and best practices to establish processes, patterns, and templates that can be repeated for all DR programs.
- Establishing interoperability to maintain the greatest amount of flexibility and independence for implementing DR solutions.

We will be installing and implementing a number of key technical requirements.

- A Demand Response Management System (DRMS) to better manage all aspects of our DR portfolio.
- Communication networks and protocols to better manage the DR programs and remotely manipulate customer equipment.
- Control devices for the desired end uses (such as multiple load control switches and programmable communicating thermostats).
- Engineering and operational consulting assistance to assess customer DR sites.

Company-Wide Implementation

Implementing our DR portfolio across all three operating utilities will be a major undertaking and a high priority. The Companies believe that it is important to expeditiously move forward on the implementation, and would welcome guidance from the Commission on how best to proceed following the filing of this IDRPP. We plan to immediately launch our efforts on the DR portfolio. We are proposing a step-by-step process.

1. Expedite the procurement process for those DR responses necessary to provide immediate capacity needs on Maui.
2. Establish a new DR regulatory framework, mainly to develop a new approach to recovering DR-related costs through base rates and a demand response cost recovery clause.
3. Adjust the existing DR program portfolio for 2015 by enhancing the current RDLC program, refocusing the CIDLC program, transitioning the Fast DR programs to the proposed commercial DR programs, and adjusting rider and TOU programs.
4. Establish new DR services, standards, and operational protocols, such as determining the quantities of grid services to be procured by O'ahu, Maui, and Hawai'i Island; creating business processes and pro forma contracts for working with third-party vendors; and creating operational protocols and communications requirements.
5. Design a market-based procurement process to determine the market price for DR programs so that we can attain the best value for our customers.
6. Procure DR resources from pre-qualified customers and third-party DR providers through a reverse auction process to achieve the best market price for each service.
7. Grow the RBDLC program on O'ahu to expand its participation (especially by residential customers) and launch parallel programs on Maui and Hawai'i Island, and to evaluate the efficiency and effectiveness of transferring the program's operation to a third-party vendor.
8. Establish a centralized DR organization to focus on planning, designing, engineering, administering, and reporting on the DR portfolio plan across all three operating utilities to ensure its success and shepherd its growth.
9. Establish variable pricing programs based on the AMI component of our smart grid implementation.

Integration with Other Resource Plans

We are confidently moving forward on a number of efforts that will shape the future of electric generation, electric delivery, and customer service for years to come. These efforts include Power Supply Improvement Plans (PSIP) for all three operating utilities, a Distributed Generation Interconnection Plan (DGIP), this IDRPP and our smart grid plan. These plans, and the strategic direction and implementation actions they separately establish, are highly interrelated. The PSIP analyses, currently in progress, will evaluate the cost-effectiveness of our DR portfolio.

The integrated DR portfolio, while just one part of the overall plan, will provide more options for customer benefits, better meet grid service requirements, and will be flexible enough to adjust to the demands of our evolving power system.