CLASSIFICATION OF CONTROL FOR DEMAND-SIDE PARTICIPATION

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Abstract

This document compares the classifications of controls for demand-side participation in United Kingdom and United States

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1. INTRODUCTION

Demand-side participation could be defined as a set of strategies used in competitive electricity market by end-use customers to contribute to the economic, system security and environmental benefit. They have been implemented in many competitive electricity markets. These programs can provide and enhanced system security and many benefit to participant. This document reviews and compares different classification of controls for demand-side participation that has been implemented in United Kingdom and United States.

2. Classification of Demand-side Participation Programs in United Kingdom

In United Kingdom, the types of demand-side participation programs are shown in the following table: -

Table 1: Demand-side participation program in United Kingdom

Program	Purpose	Pre-requisites	Targeted load	Duration	Activation time	Payment	Penalties
Economy Seven Tariffs	Energy shifting	2-register radio tele-switched meter	Domestic customers - area not served by gas networks	Any	Normally from 1am – 8am.	Cheaper rate at night, more expensive during day times.	N/A
Balancing mechanism (NETA)	Utilising NETA mechanism	Half-hourly meter	Aggregation of smaller customers, mainly supplier	No obligation	1 hour before real time	Offer / Bid price	Imbalance charges in Balancing and Settlement Code
Provision of Frequency response	Ancillary Services	Loads with low frequency relays	Large flexible industrial load	30 minutes for several times a week	When frequency drops below relay setting	Base on the relay setting in £/MWh	Terminated from Firm Frequency Response agreement
Provision of Fast Reserve	Ancillary Services	Ability to deliver in excess of 25MW / minutes	Very large customers	Sustainable for at least 15 minutes	Within 2 minutes of the instruction	Specified by tenderer	Terminated from fast reserve agreement
Provision of Standing reserve	Ancillary services	Reduce demand by at least 3 MW	Large customer	Sustainable for at least 2 hours with recover time of less than 20 hours and able to do this at least 3 times a week	Within 20 minutes of the instruction	Specified by tenderer	Terminated from standing reserve agreement
Reduce payments of TNUoSC	Network initiatives	HH metered	Suppliers	N/A	November – February in a financial year	Based on their value at system peak condition – triad multiplied by the current £/kW tariff	N/A
Avoidance of distribution network investment	Network initiatives – defer or replace expenditure on the distribution network	N/A	Customers within the affected distribution network	N/A	N/A	N/A	N/A
Post Fault Services	Manage voltage constraint	Load with voltage relays	N/A	N/A	When voltage drops below relay setting	Normally low availability rate and high utilisation rate	N/A

Economy Seven Tariffs

All of the major UK electricity suppliers offer the Economy Seven Tariffs program to their customers, providing their customers the option to obtain discounted electricity night time rate. The 7 hours discounted rate normally started from 1am and end at 8am. The wholesale prices of electricity are always a lot cheaper within this period of time. Customers can shift their day time storable load, for e.g. laundries, drying and heating in order to be benefited from the discounted night time rate. It is more common for electric heating to be taken during the off peak tariffs especially to the areas which are not served by gas supplies. Customers require a 2-register meter, which often is a radio tele-switched meter in order to participate in Economy Seven Tariffs program. It is estimated that there are around 4.5 millions of UK customer are with multi-rate energy tariff. In addition, there are 3.5 millions of prepayment customers which have the possibility of using Economy 7 type tariffs.

Balancing Mechanism

Balancing Mechanism is a process in NETA where the NGT, as a system operator, balance the system by accepting offers of and bids for electricity. A major feature of NETA is that the demand side will be fully incorporated into the new arrangements.

The increase role of the demand side in the new arrangements includes the possibility of making offers and bids to the system operator for short timescale response via Balancing Mechanism. Suppliers and customers can bid load reductions into the Balancing Mechanism in direct competition with generators. The suppliers, in seeking to manage their 'out of balance' position, are likely to be more responsive to their customers.

Balancing Mechanism opens for a trading period at 1 hour before real time. The market participant need to notify their expected physical position for each half hour trading period and final submission of physical notification will take place as the balancing mechanism opens. They will be required to sign the Balancing & Settlement Code in order to participate. However, nobody will be obliged to make bids or offers into the Balancing Mechanism.

Provision of Frequency Response

Frequency response is one of the ancillary services that are essential for the management of power system to ensure the quality of electricity supplies are of acceptable level. NGT has arrangements with some large flexible industrial loads who are prepared to be interrupted for short period. In order to participate, the loads are required to be equipped with low frequency relays, and be prepared to be interrupted between 10 and 30 times a year when the system frequency drops below the relay setting.

Provision of Fast Reserve

Fast reserve is the rapid and reliable delivery of active power provided as an increased output from generation or a reduction in consumption from demand side, following receipt of an electronic despatch instruction from NGT. In order to provide fast reserve, the demand side must have the ability to reduce their loads within 2 minutes of the despatch instruction at a delivery rate in excess of 25MW/minute and be sustainable for a minimum of 15 minutes. The size of the ramp rate has clearly shown that this service is typically very limited to a few very large customers.

Provision of Standing Reserve

Standing reserve is a manually instructed delivery of active power from generation (non-synchronised) and/or demands reduction (synchronised) plant and which is fully available within a maximum response time. It is procured on a commercial basis as part of National Grid's overall Reserve requirements. In order to provide standing reserve, the demand side must have the ability to reduce their load by at least 3MW within 20 minutes of the instruction. It should be sustainable for at least 2 hours with recover time of less than 20 hours and able to perform this at least 3 times a week.

Transmission Network Use of System Charging (TNUoSC)

TNUoSC reflects the cost of installing, maintaining and operating the transmission system. The charges are split between the generation and the demand. The half-hourly meter customers are charged at triad multiplied by the current £/kW tariff. Each triad is defined as the three half hour settlement periods of highest transmission system demand in between November and February in a financial year, and each other need to be separated by at least 10 working days. This creates an opportunity for customers to manage their demand by operate programs that are designed to reduce payment of

TNUoSC. The programs have an incentive to encourage demand to reduce their load during the Triad periods to lower the TNUoS charges.

Avoidance of Distribution Network Investment
In the early 1990's Manweb carried out a DSM project for Holy Island located at the island of Anglesey in North West Wales with the aim to reduce peak demand in order to avoid investment of £850k on a new transformer. The mechanisms for power saving in the scheme included

(a) Two energy efficient light bulbs per household sold and installed at 75p compared with a retail cost of £10.60
(b) Low cost insulation, hot water tank lagging and comprehensive draught proofing
(c) Trade in for old electrical appliances to energy efficient models
(d) Free energy audits for industry and commerce and subsidies for energy saving measures.

The project was completed with just under £250k expenses. This is a famous example where distributors have invested in DSM to defer or replace expenditure on the distribution network.

Voltage Constraints – Post Fault Services
For voltage post fault services, NGT provide the voltage relay to control load management at site and so would need to identify value in the service before proceeding. The payments are based on a low availability rate while the relay is armed and a higher utilisation rate.

3. Classification of Demand-side Participation Programs in United States

In United States, "demand-side participation program" is more commonly known as "demand response program". It has been implemented in many competitive power markets. The types of programs offered vary from market to market. Generally the demand response programs are categorised to two different types, i.e. "reliability-based" demand response and "price-based" demand response programs. Some literature papers named these categories as "system-led" and "market-led", "emergency-based" and "economic-based" or "stability-based" and "economic-based" demand response program.

Price-based demand response programs refer to changes in usage by customers in response to changes in the prices of electricity. Customers could be benefited from the program with significant change in energy use, i.e. reduce or shift their load from the period of high price to the period of low price.

Reliability-based demand response programs are designed to provide a method by which end-use customers are compensated for load reduction during an emergency event, e.g. when the system is in jeopardized or during the period of price spikes. The trigger for the emergency event is defined by network reliability and security standards, which are published in advance by the system operator. This program tends

to provide enhanced power system margins without the need for additional infrastructure.

This report discusses programs offered for power consumers with flexible load in a variety of different electricity markets, including PJM, California, New York and Texas he demand response. The demand response program are categorised to 6 different types of classification of control, which are: -

1. Time of use
2. Real time pricing
3. Demand bidding
4. Ancillary services
5. Direct load control
6. Interruptible

Table 2: Demand-side Participation Program in United State

Type	Program	Purpose	Pre-requisites	Targeted load	Duration	Activation time	Payment	Penalties
Time of Use Pricing	Time of Use Rate - Texas	Shift in power consumption away from high priced peak periods	Meter that registers cumulative usage during different time blocks is required.	Large commercial and industrial customers, also available for small customer	Varies with different time of day and different seasons of year	N/A	Cheaper rate during off-peak and more expensive during peak time	N/A
	Critical Peak Pricing – California, Texas	Reduce power consumption during summer-season peak demand hours – noon to 6 p.m. It assist in alleviating potential power shortages in their communities.	An approved communicating interval metering system capable of recording usage in 15-minute intervals and in operation for at least 10 non-holiday weekdays.	Customers with demand greater than 200 kW and with ability to reduce power during events hours	12:00 p.m. – 6.00 p.m. on weekdays during summer seasons	N/A	Discounted rate during the non-Critical Peak Pricing periods.	No penalty but customers pay higher than normal rates for on peak CPP usage, which could be three or five times higher than normal rate
	Scheduled Load Reduction Program - California	Reduce power consumption during summer season	A telephone-accessible interval meter installed and operational	Customers with demand at least greater than 100 kW.	4 hours	8 a.m. to noon, noon to p.m. or 4 p.m. to 8 p.m.	$0.10 per kwh for committed energy reduction below a baseline.	Terminated from the program if failing to comply for five times.
	Special TOU rate (TOU-D-1 and TOU-D-2) - California	Shifting power consumption to off-peak period	A TOU meter need to be installed	Residential customers	10-6pm or weekdays during summer season	10 am – 6pm on weekdays during summer seasons	Lower energy rate during off-peak period	No penalty but customers pay higher than normal rates for usage between 10 a.m. – 6 p.m.
Real Time Pricing	Schedule RTP-2 – California	For customers to shift energy use to take advantage of lower price hours	A meter is required. The utility installs and pays for the meter, but the customer pays a monthly use charge	Commercial/Industrial – three electric service demand of up to 2kV, 2kV-50kV; above 50kV	Varies	Varies	Based on the hour of the day, type of day and temperate via the national weather service during summer or winter season	None
Demand Bidding	Qualified Balancing Up Load -Texas	To assist power balance and zonal congestion management	Met the registration requirements	Loads that contract with a qualified scheduled entity	Minimum 15 minutes	Within 10 minutes for a full payment; within 70 minutes for a partial payment	QSE receives energy and capacity payment base on market clearing price, load customer receive value for interruptible load base on the type of product offered by REPs	Disqualification
	Day-ahead Demand Response Program – New York	Load reduction bids compete with generators' offers to meet the State's electricity demand	Metering is required	Retail electricity customers	Depends on the curtailment bid	The customer of the scheduled load curtailment is notified when a curtailment bid is accepted	Curtailment initial cost and hourly locational-based marginal prices times the scheduled load	Any shortfall will be charged the higher of either the day-ahead, or spot market price
	Demand Bidding Program - California	Lower customer operating costs and help alleviate power shortage in California.	Internet access and an approved communication interval metering system capable of recording usage in 15-minute record. The installed Interval meter must be operational for 10 days prior to program participation.	Small, medium and large business who have billed maximum demand greater than 200 kw for one or more of the past 12 billing months.	2 hours	Between noon till 8 p.m. unless designate a different time	Forecasted hourly market price plus $0.10 per kwh, credits capped at $0.35 per kwh, unless the price of power exceeds $0.35 after which participants will receive market price	No penalties however no credit will be received for that event

Type	Program	Purpose	Pre-requisites	Targeted load	Duration	Activation time	Payment	Penalties
Ancillary Services	Load Acting as a resource – Texas 1. Responsive reserve 2. Non-spin reserve 3. Regulation up and down service 4. Balancing energy up 5. Replacement Reserve Service	Being deployed during system emergencies or when no other market solution exists to solve certain system operating problems.	Depends on types of ancillary services. Under frequency relay need to be installed for responsive reserve. Real time telemetry needs to be installed for most of the type of the services.	N/A	Variable.	Variable. 10 minute notice for responsive reserve, 30 minutes for non spin reserve and 10 minutes for balancing energy up service	Energy and capacity payment.	Compliance violation
	Out-of-Merit Energy - Texas	Enable ERCOT acquires energy for the balancing energy market from resources when there is an urgent need for energy in the system and no market solution exists to resolve the situation	Telemetry	N/A	N/A	Varies	Compensation based on formulas for OOME	N/A
	Participating Load Program – California 1. Non-Spinning Reserve 2. Replacement Reserves 3. Supplemental Energy	Allows loads to participate as price-response demand in the ISO	Minimum 1 MW reduction, an approved internal meter (except for the provision of supplemental reserve)	Load aggregators	Dispatch similar to generation	Dispatch similar to generation	Paid in the same manner as dispatched generation and may be eligible for capacity payment	N/A
	California Demand Reserve Partnership - California	Power reduction when wholesale power market prices are high or during critical demand times	Metering and communication equipment at participant cost	Small, medium and large business	24 hours per calendar month	Up to 24 hours notification time	Capacity and performance payment	Penalties for non-performance
Direct Load Control	Direct Load Control - Texas	Curtailment of load during price spikes	N/A	Groups of small customers	N/A	N/A	Pay lower rates or obtain rebates	N/A
	Summer Discount Plan – California	Reduce energy consumption during summer period	Installed cycling devices on participant central air conditioner, minimum of one-year participation	Residential, small medium and large business	Depends on the cycling setting	When reserve drops below 5% and other emergency conditions	Depends amount of cycling, size of air conditioner and amount of electricity usage	Removal from the program
	Agricultural and pumping interruptible program - California	Load reduction in SCE's service territory upon notification to SCE from the CAISO	Metering equipment need to be installed for billing purposes. Load control device installed on the customer's pumping equipment.	Agricultural and pumping customers with a measured demand of 50 kW or greater, or with at least 50 horsepower of connected load	6 hours per event, 25 events per calendar year, 150 hours per calendar year.	At any time	Monthly credit - $0.00973 per kWh credit applied against the customer's bill	Excess energy charges may apply for any kWh consumed starting 30 minutes after the period of interruption has commeneced
Interruptible	Emergency Demand Response Program – New York	Reduce load during specific times when electric service in New York State could be jeopardized	Metering is required, minimum 100 kW per zone	N/A	Minimum 4 hours	Notified the day prior to an expected emergency program event. 2 hours notice prior to when an events starts	Measured on an hourly basis and payment is computed on higher of either $500/MWh, or the wholesale electricity price	No penalty
	Installed Capacity - Special Case Resource – New York	Curtail usage of electricity during times when the electric grid could be jeopardized.	Metering is required	Participants who could commit to reduce load of a minimum of 100 kW with 100 kW increments, mainly retail electricity customers	Depend on the contract period	21-hour advance notice and a confirmation notice is provided a minimum of two hours before the actual event begins	Payment rates vary according to a participant's location in the State and the contract period	Reduction of any future capacity claims and result in a proportional reduction fo any future long-term contractual payments

Type	Program	Purpose	Pre-requisites	Targeted load	Duration	Activation time	Payment	Penalties
Interruptible	Emergency Load Response Program – PJM	End-use customers be compensated by PJM for voluntarily reducing load during an emergency event	Metering equipment that provides integrated hourly kWh vaules	Customers who capable of reducing at least 100 kW of load and receiving PJM notification to participate during emergency condition,	Minimum 2 hours	Request initiated following the declaration of Maximum Emergency Generation	Based on the actual kWh relief provided plus the adjustment for losses, i.e. measured reduction adjusted for losses times the higher of the appropriate zonal locational marginal price or $500 /MWh	No penalty
	Economic Load Response program - PJM	Provide an incentive to customers to reduce consumption when PJM LMP prices are high.	Installed with metering equipment that provides integrated hourly kWh values	PJM member companies that are curtailment service provider	N/A	N/A	Full LMP above trigger price ($75/MWh), LMP minus G&T charges below	End use customers that have load reduction committed in the day-ahead market that cannot demonstrate hourly performance in real time will be charged the higher day-ahead or real time LMP for the shortfall amount plus any associated day-ahead operating reserve credit
	Time-of-use Based Interruptible Program - California	Reduce 15% of participant maximum demand during interruption events	Installed with one dedicated telephone and telephone line for the purpose of receiving interruption notifications	Small , Medium and Large Business	No more than 4 hours per day or 120 hours per year	Within 30 minutes of interruption notice at any time	Monthly bill credit	Failure to respond to two valid notices of interruption within a 12-month period will result in termination of interruptible service
	I-6 Large power interruptible program – California	Reduce load when there are transmission line and other constraints	Installed with remote terminal unit (RTU) and dedicated telephone line. The RTU is SCE-owned equipment.	Large business	1 event per day, 4 events per week and 25 events per year. No more than 6 hours per event, and the total periods of interruption will noe be more than 40 hours per month or 150 hours per calendar year.	Within 30 minutes of receiving notification	Lower rates for all electrical usage above their firm service level, whether or not an interruption occurs.	Excess energy charges may be applied when customers fail to reduce their electrical usage to their FSL during an interruption event
	Optional binding mandatory curtailment (OBMC) program - California	Exempt from outages in exchange for partial power reduction over a longer period	Installed with communication and metering equipment at participants' cost.	Large business	Longer duration than rotating outage	During every rotation outage	Exempts from rotating outages	Penalty of $6/kWh of excess energy. If the participant fail to reduce the required amount of power during two events in any one-year, the customer will be terminated from the program, and will not be permitted to rejoin the OBMV program for five years.

3.1. Time of Use

Time-of-use rates are designed to more closely reflect the utility cost structure where rates are higher during peak periods and lower during off-peak periods. Rates are not based on real-time prices in the marketplaces.

Time of Use Rate (Texas)

Time of use is a rate with different electricity prices for different periods of time, usually defined for a 24-hour period. It reflects the average cost of power production during those periods of time. It often varies with different time during a day and different seasons during a year. In general, this type of program is widespread use for large-scale power consumers or aggregations of medium-scale ones. Smaller customers, however, can still benefit from reduced power prices by purchasing power in a time-varying price plan. Meters that could register cumulative usage during different pricing periods are required.

Critical Peak Pricing (California, Texas)

The Critical Peak Pricing (CPP) benefits the participants on weekdays in the summer season by reducing or shifting their energy usage away from the noon to 6p.m. peak period during 12 or fewer CPP events. In exchange for this, the participants will receive a discount on all part and on-peak usage on all other days of the summer period that starts May 1 and ends October 31. CPP events will generally be triggered by temperature and extreme system conditions, such as high forecasted spot market power prices. CPP participants will be notified by 3 p.m. the business day before a CPP event is to be called. Any kwh usage that occurs weekdays between noon and 6 p.m. on a designated CPP day there are higher "critical peak" on-peak energy charges which will be charged three to five times their normal rate. The participants must have billed maximum demand greater than 200 kw during any one of the past 12 billing months and metering equipment is required to be installed. The utility does not assure the receipt of CPP notices, participants are responsible for all the costs associated with a CPP notice that is not received. CPP rates are not yet common, but have been tested in pilots for large and small customers in California.

Scheduled Load Reduction Program (California)

The participants of the Scheduled Load Reduction Program (SLRP) will be offered a bill credit to reduce their electric load during a pre-determined time period that specified in advance. The participant picks a specific four-hour time period, one, two or three times each week and a minimum load reduction and then meet that reduction level during that period each week throughout the summer season, June 1 through September 30. To participate, the participant must commit to curtail at least 15% of average monthly load or a minimum of 100 kw, which is greater. The participant will be paid $0.10 per kwh for committed energy reduction below a baseline. The baseline is the average of previous 10-day electricity usage excluding days when participant was paid to reduce load. To be qualified for SLRP, the participant must have a telephone-accessible interval meter installed and operational for 10 days prior to program participation. There are no penalties assessed for not reducing power usage. However, participants who are failing to comply with five SLRP events can be terminated from the program.

Special Time of Use Rate (California)
There are two types of Special Time of Use Rate (TOU), which are TOU-D-1 and TOU-D-2 pricing. These options are available to most residential customer. They benefit participants who can avoid using most of their electricity weekdays between 10 a.m. and 6 p.m. and who use between 400 and 600 kwh for TOU-D-1 pricing and more than 600 kwh for TOU-D-2 pricing per month. Customers who use most of their electricity during "off peak" hours could benefit from these programs. A daily TOU meter need to be installed at participant cost.

3.2. REAL TIME PRICING

In this program, prices vary on an hourly and/or day-ahead basis. Load changes in response to changes in prices or forecasts of day ahead prices are optional on the part of customer.

Real Time Pricing (Texas)
Involving set prices during predetermined hours of the day, that reward shifts in consumption away from high priced peak periods.

Commercial/Industrial Schedule RTP-2 (California)
In this program, three electric service demand levels are used: up to 2kV; 2kV-50kV; above 50 kV. Rates are calculated based on the hour of the day, type of day and the temperature via the national weather service during the summer or winter season. The benefit is for customers to shift energy use to take the advantage of lower price hours. A meter is required. The utility installas and pays for the meter, but the customers pays a monthly use charge.

3.3. DEMAND BIDDING

Demand bidding programs are available when the customer is willing to forego using electricity at a certain predetermined price. Typically these are voluntary programs since the customer has a choice about whether and how much to participate on any particular day in response to utility request.

Qualified Balancing Up Load (Texas)
Loads that are contracted with qualified scheduled entity (QSE) to formally submit offers to Electric Reliability Council of Texas (ERCOT) to provide balancing energy by reducing their electricity use are referred to as balancing up loads (BULs). BULs are paid only if they are actually deployed in response to selection by ERCOT, but if deployed they receive two separate forms of compensation:

- They receive an energy payment for the actually load reduction delivered, based on the prevailing market clearing price for energy in the balancing energy market
- They may also receive a capacity payment based on the market clearing for capacity in the non-spinning reserves market. This payment is an additional reward for BULs submitting bids into the balancing energy market, even though they are not actually providing non-spinning reserves
- These payments are made to a load's QSE who may pass the value on its retail electricity provider (REP) who may in turn pass the value along to the customer.

Day Ahead Demand Response Program (New York)
This program offers retail electricity customers a chance to bid load reduction capability in New York State's wholesale electricity market. To participate, companies bid their load reduction capability, on a day-ahead basis, into the wholesale electricity market, where these load reduction bids compete with generators' offers to meet the State's electricity demands. If the load reduction bid is a less expensive alternative than a generator's offer, it is accepted and the bidder is scheduled to reduce load during the hours specified the following day. The bid amount, term, frequency of submitted bids and use of generation may be subject to some restrictions, based on each program provider's rules and regulations.

Demand Bidding Program (California)
When the forecasted system reserve margins for the next day result in the California Independent System Operator (CAISO) issuing an Alert Notice or when the CAISO day-ahead forecasted peak demand is 43000 MW or greater, the participant will request load reduction bids from customers for the following non-holiday weekday. Participant seeking to participate in the DBP can submit bids for a proposed level of curtailment. Participating customers will have until 4 p.m on the day before a proposed curtailment event to submit bids via internet. Upon evaluation, customers will be notified of bid acceptance after 5 p.m. of the same day. Participants must bid a minimum of two consecutive hours throughout the day and must meet the minimum energy reduction threshold of 50 kw. For accepted bids, DBP participants will receive a credit that is equal to the product of the qualified energy reduction an dthe sum of the forecasted hourly market price, plus a participation bonus if applicable. Energy reduction will be determined as the difference between the Customer Specific Energy Baseline (CSEB) and the customer's actual energy usage. CSEB is determined on an hourly basis using the average energy for the three highest total energy usage days out of the 10 similar days prior to DBP event excluding the days the participant was paid to reduce load. The participation bonus will equal to $0.10/kw for each hour and will adjust so that the maximum DBP incentive will not exceed $0.35/kw. When the forecasted day-ahead market price equal or exceeds $0.35/kw, the participant bonus will be zero.

3.4. ANCILLARY SERVICES

This program includes providing different kind of ancillary services like non-spinning reserve, replacement reserves, responsive reserve, regulation up & down, supplemental energy and balancing energy up services.

Load Acting as a Resource (Texas)
Interruptible loads that meet set performance requirements may participate in the ancillary service market under the load acting as a resource (LaaR) program. The load reduction for an LaaR is treated in the same manner as an increase in generation in this market. Participants receive a payment for deployment in addition to a capacity payment. There are a variety of classification for LaaRs by ERCOT based on load characteristics and technology. These include responsive reserve, non-spin reserve, balancing energy and replacement reserve service. Real time telemetry needs to be installed for most type of the services.

Out-of-merit Capacity Service (Texas)
Out-of-merit Capacity (OOMC) not selected by bid price, but selected because of a relatively urgent need for additional capacity or capacity at a specific location. This is a service whereby ERCOT procures capacity from resources, or LaaRs, that would otherwise not be selected to operate because of their place in the Merit Order of Resources' bid for Ancillary Services. OOMC is used by ERCOT to provide for the availability of sufficient capacity so that Balancing Energy ids are available to solve capacity insufficiency, congestion, or other reliability needs, when a market solution does not exist.

Out-of-Merit Energy Service (Texas)
Energy from resources (generators and/or LaaRs) may also be purchased by its bid price because of a relatively urgent need for system energy or energy at a specific location. Technically, this is a service whereby ERCOT procures energy from Resources that may or may not have provided bids. It is used by Ercot to provide Balancing Energy Service when no market solution exists for resolving congestion, or if required in declared emergencies as described in the ERCOT Protocols.

Participating Load Program (California)
In this program, the load is required to provide non-spinning reserves and replacement reserves in the day-ahead and hour-ahead markets and the provision of supplemental energy service are limited to the real-time market only. The participants receive the capacity payment for being available and energy payments in the event that they provide a real-time service of non-spinning reserve and replacement reserves. The participant in supplemental energy only receives energy payments. However, the participating loads in this market are treated in the same manner as generator with respect to scheduling and dispatching. The load must be equipped with telemetry hardware at participant cost and they must show the ability to reduce its load by at least 1MW. In general, the non-spinning reserve service is much more restrictive than the other replacement and supplemental energy services.

California Demand Reserves Partnership (California)
Certain aggregators (also called demand reserve providers) promote the program to both bundled service and direct access customers. Participants determine the maximum amount of kw reduction they can provide during weekdays between 11:00 a.m. and 7.00 p.m. Then, the participants submit a capacity bid at the beginning of the month and receive a monthly "reservation fee" to have capacity available. In addition, when the state needs additional energy via reduced usage, participants receive notification up to 24 hours in advance and receive a "performance payment" tied to the actual amount of demand reduced. The participants can be called up to 24 hours per calendar month. Once participants have met their monthly obligation of 24 hours, they are not obligated to reduce demand for any remaining hours in that month. Besides signing up and providing payments to customers, the aggregators under contract for this program will help participants develop a strategy for reducing demand when requested, inform customers when the state needs demand reduction and ensure participants have the proper metering and communication equipment so the demand reduction can be properly determined. Penalties may apply to participant for non-performance.

3.5. DIRECT LOAD CONTROL

Direct load control programs target customers with equipment that can be turned off or cycled for relatively short period of time.

Direct Load Control (Texas)
This program allows small customers or groups of small customers who are making themselves available for direct load curtailment to receive compensation. This compensation can be reduced rates, rebates, or some other benefit.

Summer Discount Plan (California)
The participant can save money on their summer season electricity bills and help conserve energy. The utility provides and installs a cycling device on the participant air conditioners. In exchange, a credit on participant summer season electric bills is received for permitting the air conditioner is periodically turned off or cycle. The amount credited to participant determined by the amount of cycling they choose. The maximum credit amount can vary depending on the size of the central air conditioner units and the amount of electrical usage.

Agriculture and Pumping Interruptible Program (California)
This program provides lower energy and/or time-related demand charges to customers who are willing to interrupt power usage at SCE's request. It is offered on a contract basis to eligible agricultural and pumping customers who register 50 kW or greater of maximum demand or have 50 horsepower or greater for connected load. The customer load is automatically interrupted through SCE's radio controlled device. Interruption events are limited to one event per day, four events per calendar week (defined as Sunday through Saturday), or 25 events per year and will not exceed 6 hours per day, 40 hours per month, or 150 hours per year.

3.6. Interruptible

Interruptible programs are available to customers willing to have their operation interrupted by a utility for a few hours or a shift.

Emergency Demand Response Program (New York)
Emergency demand response program (EDRP) pays retail electricity customers to reduce load during specific times when electric service in New York State could be jeopardized. During these "declared events", participants are expected, though not obligated, to either reduce electricity consumption and/or transfer load to an on-site generator for a minimum of four hours. During these emergency program events, performance is based on how much metered load is reduced.
Installed Capacity Special Case Resources Program (New York)
This program pays retail electricity customers to provide their load reduction capability for a specified contract period. Program participants receive payments for an agreement to curtail usage during times when the electric grid could be jeopardized. Based upon system condition forecasts, participants are notified to curtail this subscribed "capacity", either through the use of on-site generation and/or reducing electricity consumption to a firm power level. Any under-performance results in an assessment of a penalty. To register for the program, participants commit to a load reduction of a minimum of 100 kW with 100 kW increments, subject to a one-hour verification either through an actual event or test to be called by NYISO.

Emergency Load Response Program (PJM)
This program is designed to provide method by which end-use customers may be compensated by PJM for voluntarily reducing load during an emergency event. The on-site of synchronized or non-synchronized generator who exports to the grid by local generators will be eligible for compensation under this program

Economic Load Response Program (PJM)
This program is designed to provide an incentive to customers or curtailment service providers to enhance the ability and opportunity for customers to reduce consumption when PJM locational marginal prices (LMP) are high. Program participants have the choice of two option: a day a-head option or real time option. The day-ahead option will provide a mechanism by which any qualified market participant may offer customers the opportunity to reduce the load they draw from the PJM system in advance of real time operations and receive payments based on day ahead time LMP for the reductions. The real-time option will provide a mechanism by which any qualified market participant may offer customers the opportunity to commit to a reduction of the load they draw from the PJM system during times of high prices and receive payments based on real time LMP for the reduction.

Time-of-Use Base Interruptible Program (California)
Interruptible programs are available to customers willing to have their operation being interrupted by a utility for a few hours or a shift.
The TOU-BIP is an interruptible rate designed for customers who have monthly demand greater than 200kW in any three months during the preceding 12 months. Customers must commit to reducing at least 15% of their maximum demand, which cannot be less than 100kW. Customers must select a firm service level. The customer is required to reduce its electrical usage to this specified firm service level within 30 minutes of being notified of an interruption event. In exchange customers receive a monthly credit based on the difference between their average peak period demand for each month and their selected firm service level. Interruptions are limited to one event per day, four hours per event, 10 events per calendar month, and 120 events per calendar year.

I-6 Large Power Interruptible Program (California)
Provides lower energy and time-related demand charges for the portion of power usage a customer is willing to interrupt when requested by SCE. This rate is now available only to eligible customers with a minimum of 500 kW who are adding new load, or are new to SCE service territory. Interruption events are limited to one event per day, four events per calendar week (defined as Sunday through Saturday) and 25 events per year. An event will not exceed 6 hours, and the total period of interruption will not be more than 40 hours per month or 150 hours per year.

Optional Binding Mandatory Curtailment Program (California)
The optional binding mandatory curtailment (OMBC) exempts participant customers from rotating outages in exchange for partial power reduction from the facilities entire circuit over a longer period. Specifically, the participant must reduce power on their entire circuit by up to 15% during the entire duration of every rotating outage cycle.

4. References

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