Rulemaking 12-03-014 (LTPP Local Reliability Track I)

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Witnesses Andrew Hoffman

Commissioner Michel P. Florio

ALJ David R. Gamson

ENERNOC, INC.

LOCAL RELIABILTY TRACK I
PREPARED TESTIMONY

Rulemaking (R.) 12-03-014
Long Term Procurement Plans (LTPP)
Track 1 (Local Reliability)

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ENERNOC, INC.
PREPARED TESTIMONY OF
ANDREW HOFFMAN
RULEMAKING (R) 12-03-014:
LONG TERM PROCUREMENT PLANS (LTPP) TRACK 1 (LOCAL RELIABILITY)

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I.
INTRODUCTION

EnerNOC, Inc. provides demand response and energy efficiency services in many organized markets in the United States, Canada, the United Kingdom, Australia, and New Zealand. As Manager of Program Operations for EnerNOC's Western Demand Response (DR) Markets, I oversee over 400 MW of emergency, peak-shaving, and fast-response demand-side resources across the United States and Canada. During my tenure at EnerNOC, our Western DR programs have expanded considerably both in geographic reach and speed of response. Prior to joining EnerNOC, I worked as an economic consultant preparing expert testimony for a diverse group of North American energy industry clients. Further details of my work and educational history are included in my Statement of Qualifications, Attachment A. My testimony will discuss the various products and services within domestic and international markets wherein DR resources can provide fast response services for system reliability purposes.

In the Scoping Memo and Ruling of the Assigned Commissioner and the Administrative Law Judge (Scoping Memo) issued on May 17, 2012, an issue within the scope of this docket for the local reliability phase was "How resources aside from conventional generation, such as uncommitted energy efficiency, demand response, energy storage and distributed generation resources should be considered for future

reliability needs".[1] The purpose of my testimony is to demonstrate that demand response (DR) resources can (and currently do) provide reliability services beyond those contemplated in the California Independent System Operator's (CAISO's) testimony. While today, in California, DR is primarily used as an emergency resource or a peaking resource, it is expected that DR will soon also be able to participate in CAISO's markets to provide economic DR and ancillary services, once certain existing hurdles are overcome. In markets outside of California, DR is providing fast-response services in the form of spinning reserves, under-frequency support, and pilots that examine the use of DR for wind integration purposes. It is EnerNOC's expectation that, over a 10-year planning horizon, the potential for demand response resources will increase beyond the levels and services currently provided. A number of factors will contribute to this growth, including California's wholesale market integration, greater need for balancing resources due to the increased penetration of intermittent renewable sources of supply, increasing automation of customer load response (for both load curtailments and load increases), and enhanced metering and communications technologies.

[1] Scoping Memo at p. 5.

II.

DEMAND RESPONSE IN VARIOUS MARKETS SUPPORTS GRID RELIABILITY

Demand response has the ability to respond very quickly to dispatch instructions and notifications. This value has been recognized in several markets throughout the world. My testimony highlights examples of wholesale markets that have integrated fast-response DR resources. This information is intended to demonstrate the ability of DR resources to provide fast-response services while the Commission considers future resource needs for renewable integration purposes and system reliability generally.

CAISO has submitted testimony[2] indicating a need for new local resources during the planning period (2012-2022). The need for new resources arises from a projected reduction in existing resources due to once-through-cooling (OTC) regulations and increases in renewable resource penetration. CAISO has proposed[3] certain products that it will need to manage renewable integration needs in the resource adequacy docket (R.11-10-023) that include ramping, load following, and regulation services. Load following and regulation require quick responses of 10 minutes or less.

Various markets, as described in more detail below, have implemented fast response demand-side resources with dispatch requirements of 10 minutes or less. Different markets have different names for the products that they offer. Spinning reserves are reserves that are synchronized with the system, also known as synchronized or reactive reserves. Spinning reserves can be dispatched with short notice, generally within 10 minutes. Non-spinning reserves represent generation that is

[2] CAISO Witnesses Rothleder and Sparks, May 25, 2012.
[3] CAISO Supplemental Proposal, May 2, 2012.

neither running nor synchronized with the grid, but could be within 10 minutes notification. Regulation reserves are units that can respond to intra-minute dispatches and are directly dispatched by the system operator. Under-frequency response services are extremely fast response resources that respond (oftentimes within a second) when the frequency drops below a prescribed level.

In California, and in other areas in the western United States that are subject to the rules of the Western Electricity Coordinating Council (WECC), DR resources can provide only non-spinning reserves at present. EnerNOC provides, under contract, fast-response DR services to utilities in other western states, notably Public Service of New Mexico (PNM) and Salt River Project (SRP). The 10-minute response times would qualify these programs for non-spinning reserves, even though they are not part of an organized market. In fact, some of the resources already qualify as 10-minute response Operating Reserves as part of the Southwest Reserve Sharing Group. CAISO has proposed a product called Proxy Demand Resource (PDR) that will allow for DR participation as a non-spinning reserve resource. CAISO is awaiting approval of PDR by the Federal Energy Regulatory Commission (FERC)). While PDR has the potential to increase the number of quick-start DR reserves available in California, in general the WECC limitations on DR acting only as a non-spinning reserve restricts DR's ability to provide other high-value, necessary services that are currently permitted in other markets.

In my testimony below, I will discuss demand-side resources' role in providing support for system reliability purposes in several markets in North America, the United Kingdom, and New Zealand. Again, this information is offered to illustrate that DR

resources are currently providing fast-response, reliability-based services today and could play a significant role in addressing California's challenges over the coming years.

A. Demand Response in Alberta, Canada

In Alberta (AB), electric demand has been growing quickly over recent years in response to increased production of oil and gas in the province. Alberta is an energy-only market. One way of mitigating upward pressure on the price of electricity within the province is the ability to import capacity from other provinces (principally British Columbia, or BC) over an intertie. The intertie between BC and AB is rated at 1,200 MW but in operation the Alberta Electric System Operator (AESO) has had to restrict imports to 400-600 MW due to reliability concerns. In order to increase imports across the AB-BC line while maintaining system reliability, the AESO issued a request for offers for DR resources that can provide near-instantaneous under-frequency (UF) response. The service, which went live in early 2012, is called Load Shed Service for Imports (LSSi).

The AESO selected bids to provide LSSi in the second half of 2011, and as of mid-2012 over 130 MW are regularly available in the market to help the AESO increase the scheduling capability on the AB-BC intertie. Participating customers and aggregators in LSSi install UF relays that monitor grid frequency in real-time and disconnect, or "trip", loads within 200 milliseconds if the system frequency drops to or below 59.5 Hz. The rapid response stabilizes system frequency while longer-start resources come online, allowing the AESO to more fully utilize existing resources like the AB-BC intertie.

B. Demand Response in PJM[4]

DR resources have been an integral part of PJM's markets for several years. 14,000 MW of DR capacity cleared in the most recent Reliability Pricing Model auction, and over 19,900 MW were offered. PJM has a Synchronized Reserves Market, wherein DR resources can participate. PJM's Synchronized Reserves Market averages about 80,000 MWh per month of DR participation, which means that on average DR supplies 8-10% of the total Synchronized Reserves Market. In certain hours, as much as 22% is supplied by DR resources. Resources are dispatched with ten (10) minutes advanced notification and require one (1) minute interval data readings. The program is available year round on a 24-hour, 7-days-per-week basis (24/7/365). DR events can last up to 30 minutes, but generally last around 12 minutes. Customers can determine the number of times they can be dispatched.

PJM initially requested, and received, a 25% cap on the amount of synchronized reserves that could be provided by DR resources. In certain hours, the amount of DR resources participating in the Synchronized Reserves Market has approached the cap.[5] PJM has been very pro-active in seeking to expand the cap so as not to limit DR resource participation in this market by initiating a stakeholder process when DR penetration in the Synchronized Reserves Market hit 22.3%. In fact, PJM officials have

[4] PJM (Pennsylvania-New Jersey-Maryland) Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of a 13-state area of the mid-Atlantic area plus the District of Columbia. PJM dispatches about 180,400 megawatts (MW) of generating capacity over 61,200 miles of transmission lines.

[5] http://www.pjm.com/markets-and-operations/demand-response/~/media/markets-ops/dsr/2012-dsr-activity-report-20120612.ashx

publicly stated that the future direction in which the industry is heading will likely have alternative resources, including DR, providing the bulk of ancillary services.

Another highly publicized use of DR resources for providing regulation reserves is a water heater pilot program that PJM has initiated.[6] Domestic water heaters are equipped with a communication device that is capable of receiving and responding to signals from PJM in real time. PJM is also exploring other innovative ways of providing regulation to the system including energy storage, flywheels, PHEVs, and more.

C. Demand Response in the Electric Reliability Council of Texas (ERCOT)

Texas is unique, in the United States, for having an energy-only market structure. Texas has not incorporated DR as a supply-side resource, as the FERC-jurisdictional markets are required to do. These differences were among those acknowledged in a recent electricity market study as potentially limiting DR participation in Texas.[7] However, the study authors find that ERCOT may be ahead of the curve in utilizing DR resources to provide responsive reserves.[8]

There are several different ERCOT products that provide quick-start resources. Emergency Response Service (ERS), formerly known as Emergency Interruptible Load Service (EILS), is dispatched within a 10-minute notification as an emergency resource.

[6] https://www.pjm.com/~/media/about-pjm/exploring-tomorrows-grid/advance_tech-4pg_2.ashx

[7] "ERCOT Investment Incentives and Resource Adequacy", June 1, 2012, The Brattle Group, at pp. 88-100.

[8] Id. at p. 95.

ERS resources receive a capacity payment, as do ancillary services, but with somewhat onerous performance requirements.[9]

There are also two products in the ancillary services market in ERCOT in which DR resources can participate. They are Controllable Load Resources (CLR) and Load Resources (LR). CLR is dispatched directly by ERCOT and is capable of providing regulation and responsive reserves (spinning reserves). Regulation CLR resources can both curtail and increase load in response to ERCOT dispatches. LR can provide responsive reserves. CLR and LR can be dispatched within 10-minutes notice by ERCOT and also respond automatically to under-frequency events. Participation by LR in the responsive reserves market is capped at 1400 MW, which is 50% of the total responsive reserves market. The cap was increased this year from the previous cap, 1,150 MW, which was fully subscribed.

D. Demand Response in the United Kingdom

National Grid, in the United Kingdom, operates Short-Term Operating Reserves, or STOR. Through STOR, demand response provides non-synchronized (non-spinning) reserves when demand levels exceed supply forecasts or when supply outages occur. Demand resources and generation can provide this product upon a 20-minute advance notification. Events can last from 15 minutes up to 4 hours, and the event frequency is at the discretion of the aggregator.[10]

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[9] Id.

[10] http://www.nationalgrid.com/NR/rdonlyres/1CCCF147-8FD6-46ED-B086-51891581633F/50778/TR16_GeneralDescription_Final.pdf

In addition, National Grid offers an under-frequency response service called Frequency Control by Demand Management (FCDM). Response by demand resources is automated and must occur within two (2) seconds of under-frequency events, which can last for up to 30 minutes and are called, on average, about ten times per year.[11]

E. Demand Response in New Zealand

DR has the opportunity to participate as an under-frequency resource in New Zealand's Electricity Market. New Zealand has an Interruptible Load (IL) program, which is part of the Instantaneous Reserves market. There are two Instantaneous Reserves products available currently in which DR resources participate: Fast Instantaneous Reserve (FIR) and Sustained Instantaneous Reserve (SIR).

FIR requires a response in less than 1 second and resources remain disconnected from the grid for 60 seconds. SIR resources respond within 60 seconds, and resources remain disconnected until restored by the System Operator (typically 15-30 minutes). Currently, EnerNOC is providing both ancillary services with a combined capacity of between 120 and 140 MW in a total market of 400 to 800 MW. Interruptible Load events occur about 6 times per year on the North Island and about once per year on the South Island. Similar to LSSi in Alberta, fast-response aggregated IL arrests frequency drops in response to grid-destabilizing events like the sudden failure of a large generating unit. The diversity of the aggregated portfolio across the system also provides the advantage of staggered restoration, which improves system reliability.

[11] http://www.nationalgrid.com/uk/Electricity/Balancing/services/frequencyresponse/fcdm/

F. Wind Integration Pilots in Bonneville Power Authority's Service Territory

The Bonneville Power Administration (BPA) is a federal agency in the Northwest with multiple responsibilities, including marketing and selling wholesale power from federal hydro projects in the Columbia River Basin, operating and maintaining a significant portion of the transmission in the Northwest, and serving as the balancing authority for an area covering rural portions of Oregon and Washington, as well as small segments in neighboring states.

BPA's balancing area represents approximately 11,000 GW[12] of peak demand, to which 4,000 MW of wind is interconnected today[13]. The result is one of the highest concentrations of intermittent wind generation in North America. While the majority of this wind power serves load outside of BPA's balancing area, BPA is responsible for ensuring a constant balance between load and generation within its system. BPA's hydroelectric resources currently provide approximately 1,000 MW of balancing reserves[14], but they are reaching their limit. And thousands of additional MW of wind generation are expected to come online in the coming years.

As new intermittent generation is connected, BPA will require additional balancing reserves. They have implemented several pilot projects to assess the abilities of demand-side resources to provide these load following resources. The pilots explore whether residential water heaters and commercial and industrial (C&I) businesses can provide INCs (load curtailments) and DECs (load increases) to respond to real-time deviations from forecasted system supply and demand. Response times

[12] http://www.bpa.gov/corporate/pubs/fact_sheets/10fs/BPA_Wind_Power_Efforts_March_2010.pdf
[13] http://www.bpa.gov/corporate/BPANews/ArticleTemplate.cfm?ArticleId=article-20120322-01
[14] Berwager, Sydney, "BPA Report on Wind Integration: Progress and Challenges", NWPPA Power Supply Workshop, October 5, 2011

are ten minutes or less, and pilot resources are available 24/7/365. Additionally, load responses are automated. In other words, they require no manual intervention. It is worth noting that several of the demand-side customer categories that are being tested at BPA (residential water heaters, cold storage facilities, industrial processes) also represent significant sources of load in California.

III.

Conclusion:

As detailed in my testimony above, demand-side resources are significantly enhancing system reliability across a number of markets in North America and beyond. DR is able to provide services well beyond the emergency and peak-shaving products currently employed in California. In other states and countries, demand response commonly supplies both 10-minute response non-spinning reserves, spinning reserves and under-frequency response. There is also limited penetration of load following and regulation services. Over the next ten years, demand-side resources' abilities will only increase with the advent of both California's wholesale market and continued technological evolution.

EnerNOC encourages the CPUC and CAISO to incorporate demand-side resources as they review options for future integration of intermittent renewable and replacement of OTC-affected generation. As detailed in the testimony of Mona Tierney-Lloyd, DR is a preferred resource to meet various policy objectives articulated by the Commission and other agencies. It is also likely to increase in size and capability as smart grid implementation and other technological advancements occur over the planning period of the LTPP.

ENERNOC, INC.

APPENDIX A

STATEMENT OF QUALIFICATIONS

ENERNOC, INC.

STATEMENT OF QUALIFICATIONS OF ANDREW HOFFMAN

Q1 Please state your name and business address.

A1 My name is Andrew Hoffman, and my business address is 275 Sacramento St Suite 300, San Francisco, CA 94111.

Q2 Briefly describe your present employment.

A2 I am employed as a Manager of Program Operations by EnerNOC, Inc. As Manager of Program Operations for EnerNOC's Western Demand Response (DR) Markets, I oversee over 400 MW of emergency, peak-shaving, and fast-response demand-side resources across the United States and Canada. I manage client relationships and contracts with utility and ISO clients. Part of my current role includes planning for ancillary service and "next generation" product development. I have also analyzed portfolio composition to ensure reliable delivery and optimal customer participation. I have been employed by EnerNOC in various roles since 2007.

Q3 Please summarize your professional background.

A3 Prior to joining EnerNOC, I was employed by Lexecon Consulting, as a Consultant, in 2005 and 2006. I provided economic litigation support to clients in various energy-related and other fields including electric utility deregulation, oil and gas exploration and production, the automotive industry, etc. I also drafted and edited legal and economic reports and expert testimony for litigation. I graduated with an undergraduate degree from Dartmouth College in Environmental Studies and English, Cum Laude with Honors. I am currently enrolled in the MBA program of Haas Business School, UC Berkeley.

Q4 Have you previously testified at a hearing before the California Public Utilities Commission?

A4 No.

Q5 What is the purpose of your testimony?

A5 The purpose of my testimony is to present examples from North American and International markets where demand-side resources participate in fast response services to support system reliability in the Local ReliabilityTrack I Phase of R.12-03-014 (LTPP).

Q6 Does this conclude your statement of qualifications?

A6 Yes, it does.