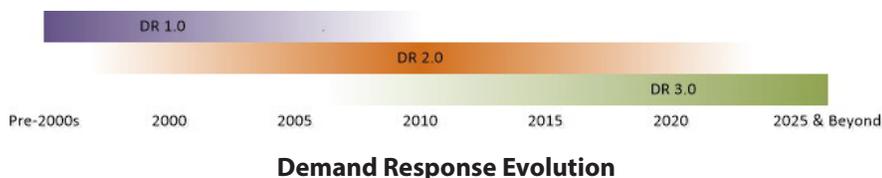




# Evolution of Demand Response in the United States Electricity Industry

May 25, 2017

As PLMA refined and coordinated materials for the Demand Response Training Series, Michael Brown, NV Energy and Chair of the PLMA Education Committee, together with the Education Committee and PLMA Training Partners realized there was not a singular, agreed upon definition of Demand Response and the stages of its evolution (DR 1.0, 2.0, and 3.0) to help new and transitioning professionals, regulators, and lawmakers understand the growth and trends of the industry, so they set out to develop a harmonized, consistent definition, followed by a public comment period. This definition is used across the three demand response training courses produced by PLMA. This topic was presented in a Demand Response Dialogue that included Michael Brown, NV Energy; Scott Coe; Ross Malme, Skipping Stone; and Stuart Schare, Navigant, on Thursday, September 1, 2016; 12:30-1:00 p.m. Eastern. **Listen to the recording of the DR Dialogue presented Sept. 1 [www.peakload.org/event/DREvolve](http://www.peakload.org/event/DREvolve).** The discussion continued at the 34<sup>th</sup> PLMA Conference in Delray Beach, Florida, on November 9, 2016, with a panel presentation **Defining the Evolution of Demand Response: From 1.0 to 3.0 and Beyond**, Moderated by Michael Brown, Berkshire Hathaway, NV Energy; with Ross Malme, Skipping Stone; Robin Maslowski, Navigant; Ray Pustinger, Alternative Energy Systems Consulting; Dennis Quinn, Joule Assets.



## DR 1.0 – The Past

The beginning of demand response can be traced to the first interruptible tariffs for large commercial and industrial customers where utility staff called or paged a primary customer contact to manually change power consumption on-site with no immediate feedback in the utility control room, or the first one-way communication load-control devices installed on residential water heaters and air conditioners, or when wholesale markets were introduced to the US electricity industry. Then, demand response was primarily used to provide Energy (MWh) and/or Capacity (MW) when wholesale prices were unusually high, when there was a shortfall of generation or transmission capacity or during unexpected emergency grid operating situations. Notifications were typically manual day ahead or hour(s) ahead and the “system of record” for measurement and verification was usually the utility meter which was read on its regular cycle, often manually. There was little or no immediate customer feedback on performance during a demand response event.

## DR 2.0 – The Present

Demand response has become an integral part of most wholesale electricity markets and grid operation systems in the United States. Not only can demand

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response-driven initiatives provide more precise energy and capacity to support wholesale marketplace activities, but demand response can now also provide more sophisticated and near-instantaneous Ancillary Services such as non-spinning and spinning reserves and frequency and voltage support. Measurement and verification has become much more sophisticated and near real time measurements (either utility or non-utility) are often used as “system of record” for confirmation of customer performance during demand response events and for customer feedback.

### DR 3.0 – The Current Path to the Future

Demand response is evolving to be a component of broader distributed energy resources including distributed photovoltaic, electric vehicle charging, and various forms of energy/thermal storage both on a grid operating system scale as well as behind (i.e., on the customer side) of the meter. As a component of distributed energy resources, demand response can now provide a wide variety of service benefits both to the grid operator and to the customer (who may be a Prosumer who provides as well as consumes grid power) including volt/var control, renewable energy integration, and localized distribution system congestion management. Where there are wholesale markets, demand response may have as its major underlying economic principle a price signal, which moves the industry away from traditional “command-and-control” mechanisms that will maintain a role for efficient grid operation. In other words, DR 3.0 is not triggered directly by the utility or the system operator, but rather automatically by devices that react to pre-programmed price thresholds; however, a price signal will not be a requirement. Utilities may continue to rely on a grid signal such as voltage, rather than a price signal, for emergencies and system peaks or it may be valued related to costs (e.g., avoiding a CT start).

### Bonus Resource:

Download the free: **PLMA Demand Response Training Series Abbreviations and Glossary** at [www.peakload.org/resource/resmgr/PLMA\\_Demand\\_Response\\_Abbrevi.pdf](http://www.peakload.org/resource/resmgr/PLMA_Demand_Response_Abbrevi.pdf).

### About the PLMA DR Dialogue Series:

PLMA produces this thought leadership series as a webcast with a follow-on white paper. The primary audience are utility and regulatory staff as well as other energy industry trade allies and organizations seeking thought leadership and insight on innovative demand response methods to meet peak energy load needs, mitigate price, and manage variable generation.

The content is available for free for 90 days after the event, then is archived for limited access by PLMA members. To learn more, visit [www.peakload.org](http://www.peakload.org).



## Demand Response Evolution

