



Lowering Technical Barriers for Small Demand Resources

April 21, 2008

H. Walter Johnson, Ph.D., California ISO

Motivation

- FERC Order 693
- EPA Act 2005
 - Unnecessary barriers to DR participation in Energy, Capacity, and Ancillary Service markets shall be eliminated
 - Time-based pricing and other Demand Response shall be encouraged
 - The deployment of technologies that enable customers to participate in Demand Response systems shall be facilitated

IRC Goals

- Reduce existing barriers for small demand response resource participation in wholesale markets
- Enhance the ISO/RTO control room's ability to rely on small demand response resources to respond to operational requests

What Are the Problems?

- Historically, small resources have not been linked with ISO/RTO control room systems, as the cost of doing so has been high relative to the amount of available energy
- Without real-time communications to the control room, how can a reliability organization know:
 - How much demand response-based reserve capacity is available?
 - If a resource has responded to a demand request?

IRC Objective

- Develop recommended technical standards for real-time two-way communication between ISO/RTO control rooms and small resources that are simpler and less costly to implement, relative to the current requirements that originally designed for larger resources
- Focus on real-time operations, not forward markets or post-real-time functions (such as settlements)

What is a Small Demand Resource?

Typical Sizing Criteria

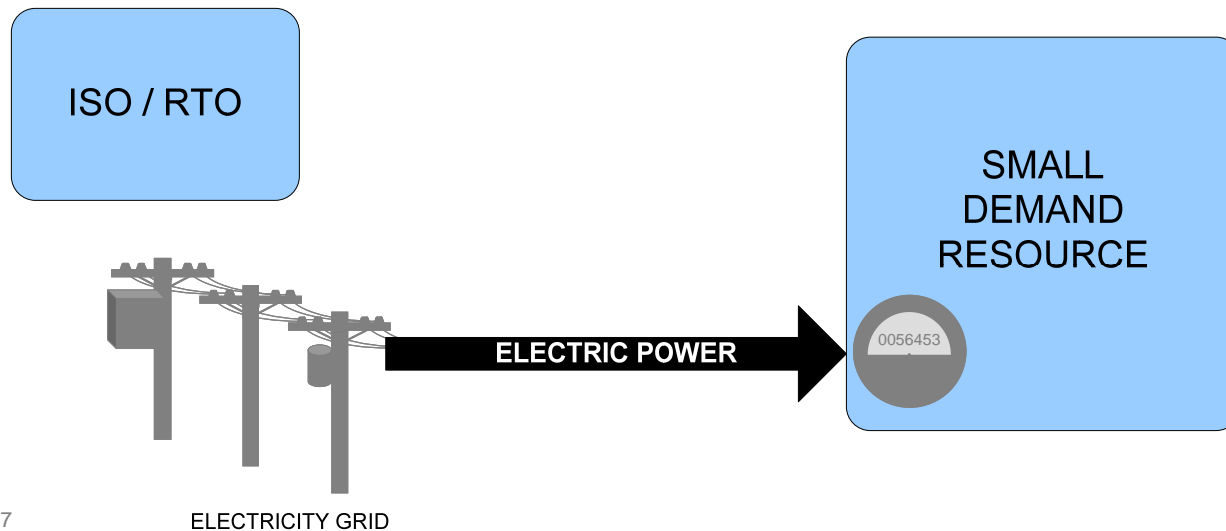
- < 5 MW
- Aggregated to a minimum, e.g. 100 kW

ISO/RTO Relationship

- Usually not dispatched
- Often no real-time telemetry

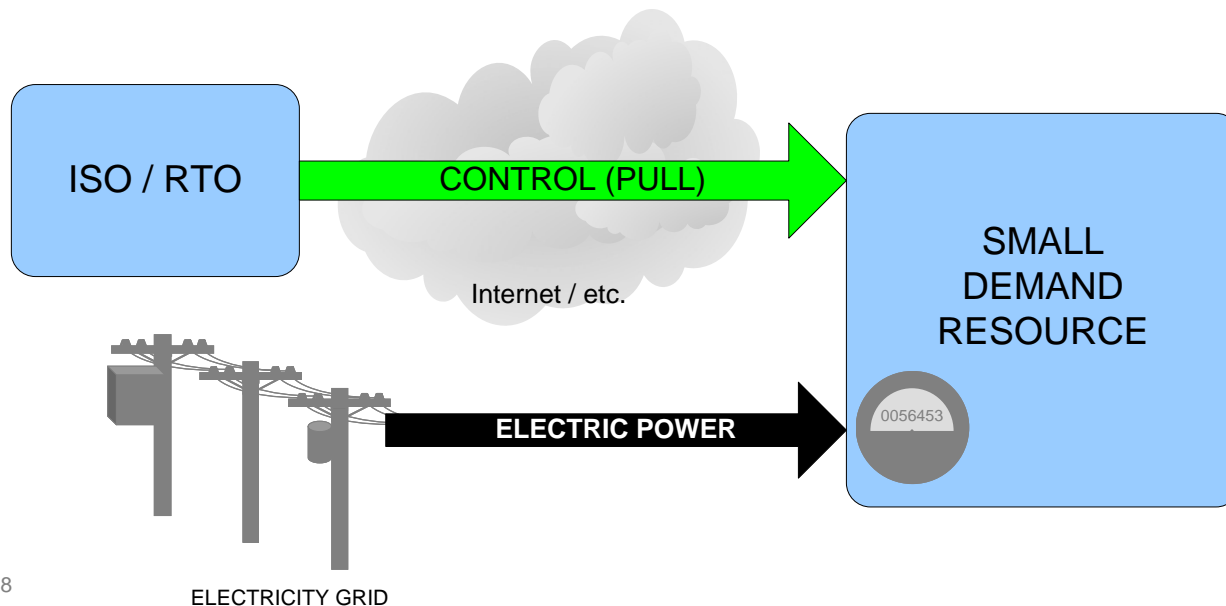
Autonomous DR

- Resource senses the need for DR and acts independently
- Built-in sensors detect high or low line frequency or voltage and the resource automatically adjusts its demand for a period of time
- No communication with the system operator is required, but no control is possible
- Provides very rapid response to local system conditions, but large amounts might jeopardize the system's stability



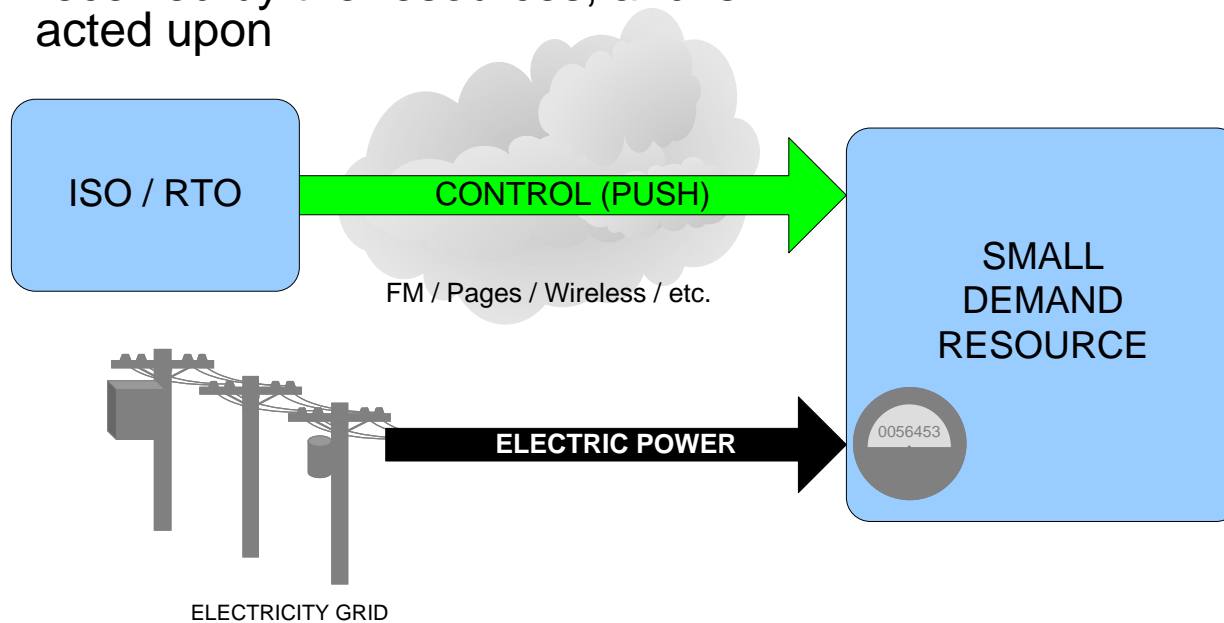
Resource-Initiated DR

- Resource inquires about the need for DR and adjusts itself accordingly
- Resource polls an information source (such as a Web site) and retrieves system prices or condition information for immediate or future use
- Only one-way (inquiry) communication is required, but response may not be immediate or highly predictable
- Operator lacks information on the magnitude of the response, either before or after posting the triggering information



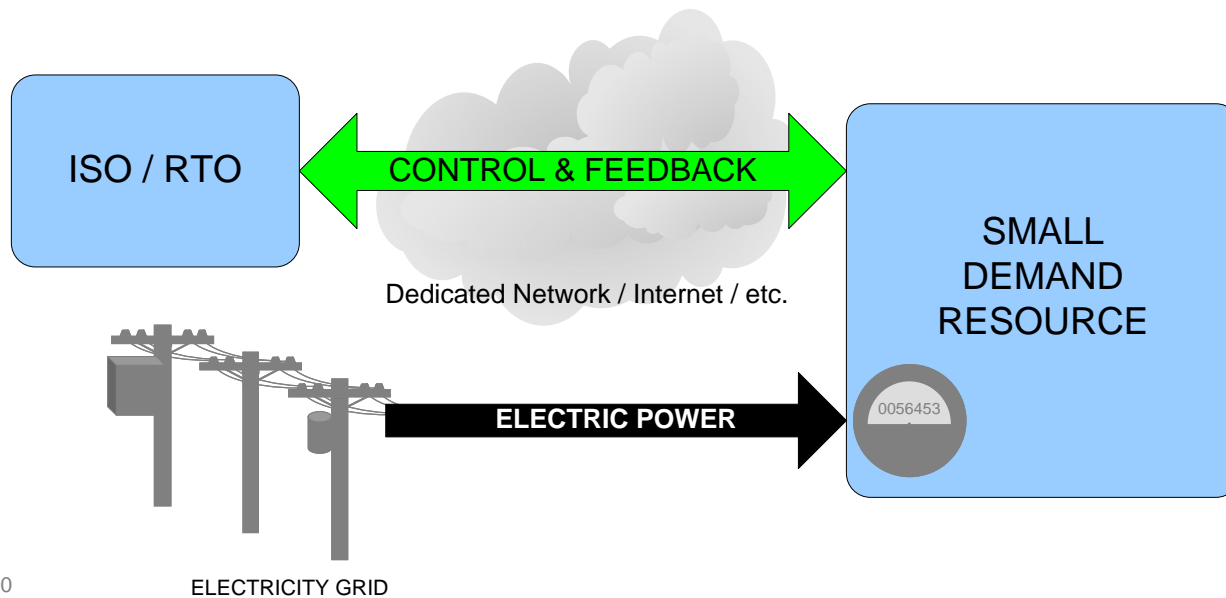
Bulk-Dispatched DR

- Operator dispatches a group of resources, each of which may or may not be able to (or choose to) respond
- Based on system prices or conditions, a dispatch instruction (load interruption, thermostat set point change, etc.) is broadcast (e.g., via radio, broadband, AMI, etc.), is received by the resources, and is acted upon
- Only one-way (broadcast) communication is required, but the magnitude of the response is unpredictable
- Operator lacks assurance of the magnitude of response, either before or after issuing the dispatch instruction



Precision-Dispatched DR

- Operator dispatches a group of resources based on real-time knowledge of available response
- Two-way communications with the operator are required
- Provides rapid response and on-going visibility of DR
- Based on system prices or conditions and real-time knowledge of the state of the resources, a dispatch instruction (load interruption, thermostat set point change, etc.) is broadcast (e.g., via radio, broadband, AMI, etc.), is received by the resources, and is acted upon

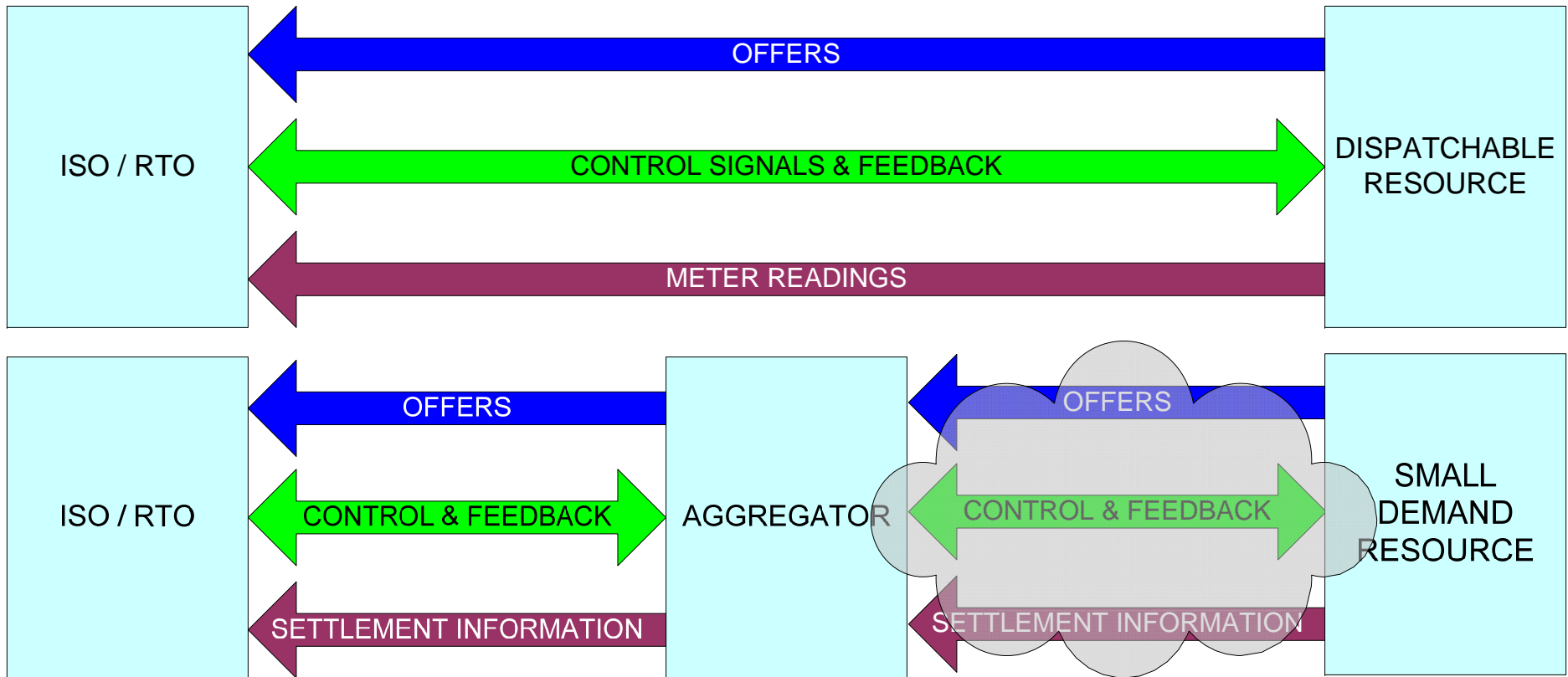


Types of DR Functionality

	<i>Response Initiation</i>	<i>Control Signal</i>	<i>Response Signal</i>	<i>Location Known</i>
Autonomous	Resource			
Resource-Initiated	Resource	✓		
Bulk-Dispatched	ISO/RTO	✓		
Precision-Dispatched	ISO/RTO	✓	✓	✓

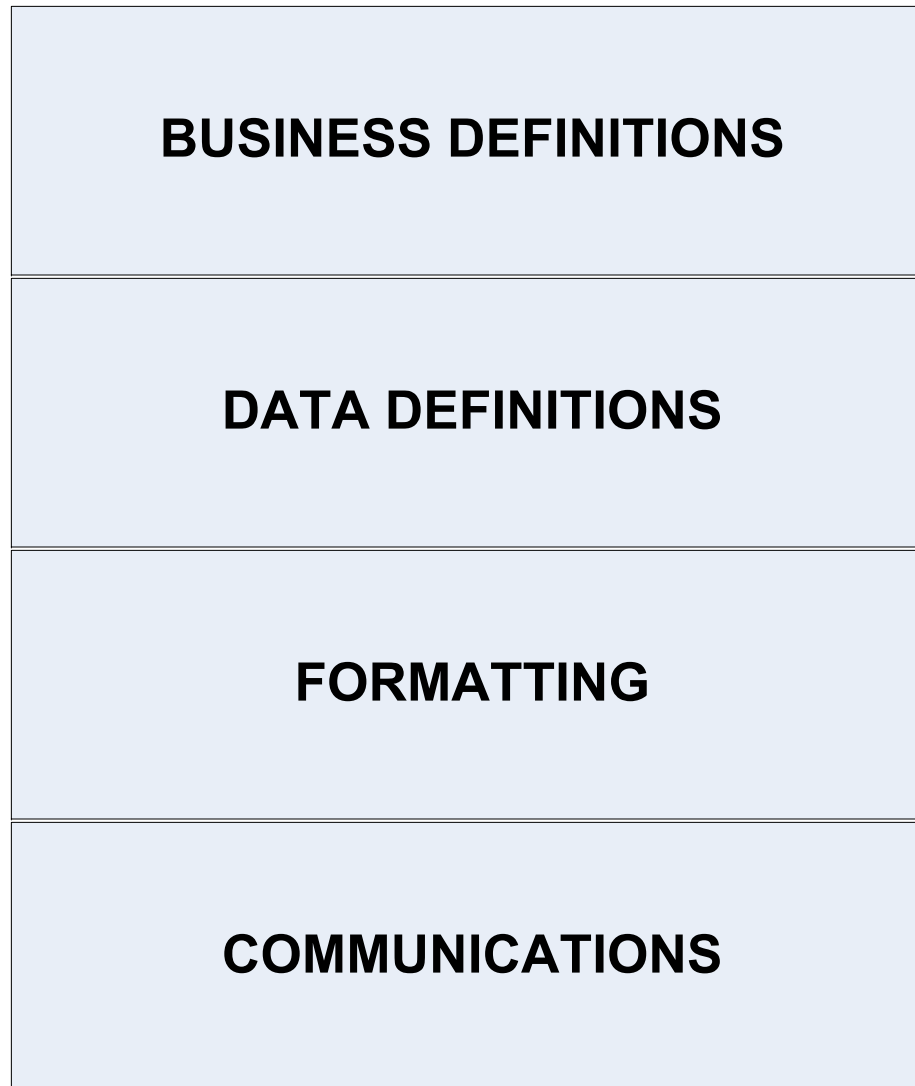
Note: Individual devices may possess more than one type of DR functionality

Communication Basics



- PRE-DISPATCH
- REAL-TIME
- POST-DISPATCH

Standardization Opportunities



Next Steps

- Determine correct scope of standardization
 - ISO/RTO-to-Aggregator
 - Aggregator-to-Demand Resource
- Determine level standardization
 - Business Definitions?
 - Data Definitions?
 - Formatting?
 - Communications?
- Evaluate enabling technologies
- Explore standardization routes

Contact Information

IRC Program Manager			
Scott Coe	Consultant	203.947.5269	scoe@iso-ne.com
ISO/RTO DR Regional Contacts			
Robert Burke	ISO-NE	413.535.4356	rburke@iso-ne.com
John Conboy	PJM	610.666.4630	conboj@pjm.com
Walt Johnson	CAISO	916.608.5919	wjohnson@caiso.com
Steve Krein	ERCOT	512.248.6830	skrein@ercot.com
Maria, Gamal	IESO	905.855.6367	gamal.maria@ieso.ca
Robert Pike	NYISO	518.356.6156	rpike@nyiso.com
Michael Robinson	MISO	317.249.5741	mrobinson@midwestiso.org
Gerrud Wallaert	SPP	501.614.3358	gwallaert@spp.org
Paul Wattles	ERCOT	512.248.6578	pwattles@ercot.com