

Demand Response Opportunities in Building Codes & Standards

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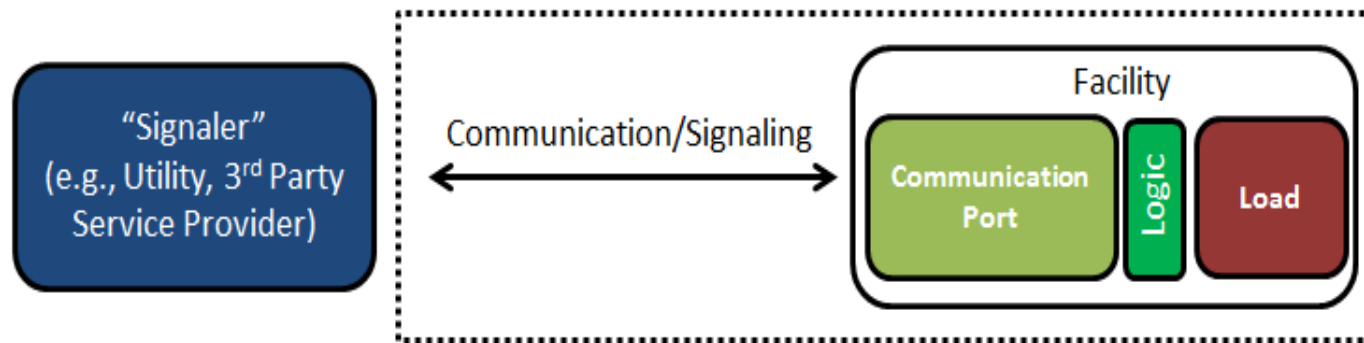
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ENERGY SOLUTIONS

Agenda

- Focus: Downstream Building C&S Opportunities



- Why C&S?
- What foundation can support successful C&S?
- Overview of Communication Protocol Pathways for DR
- Overview of Building Code Pathways for DR

The Smart Grid is subject to the Chicken & Egg Fallacy

More developed infrastructure needed to drive greater participation



Greater participation needed to drive more developed infrastructure

What can code do?

Code can enable participation in DR

Code can standardize practices, improving interoperability of smart grid components while reducing technology deployment costs

Code can lead to a system that is more reliable and secure, making DR transactions easier for all market actors

It primes the market for broader participation

It does not need to mandate participation

Foundation for C&S



Regulatory Triggers

- Regulatory framework must value peak demand savings
- Ex: Time-Dependent-Valuation (TDV) Methodology & Time-Of-Use (TOU) Pricing Tariffs



Technology Triggers

- Proven, reliable technologies
- Consistent Communication Protocol
- Advanced Metering Infrastructure (AMI)



Market Triggers

- Code should maintain consumer choice
- Incentive programs can help with:
 - Program enrollment
 - Compliance
 - Market acceptance

COMMUNICATION STANDARDS ADOPTED WITHIN BUILDING CODES

Communication standards adopted into mandatory building codes afford many benefits



Facilitate seamless integration of technologies with smart grid



Ensure greater interoperability (mitigation of stranded asset)

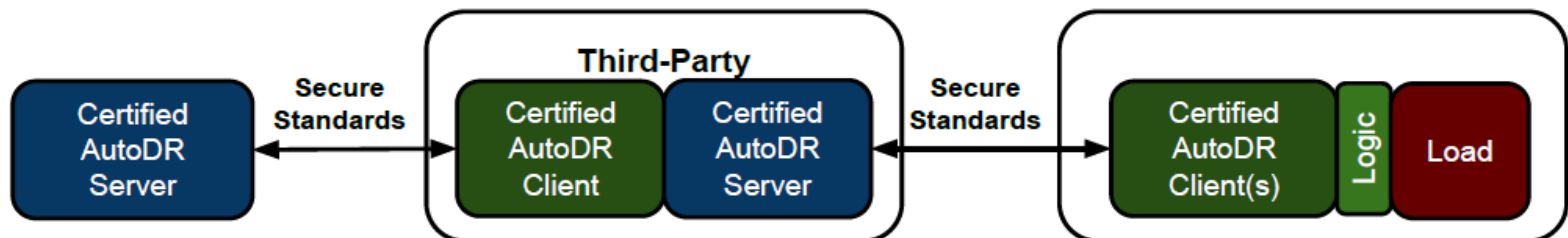
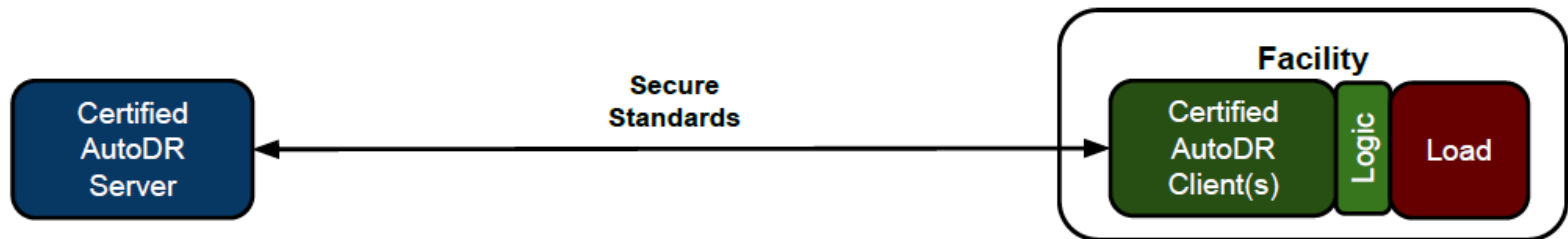
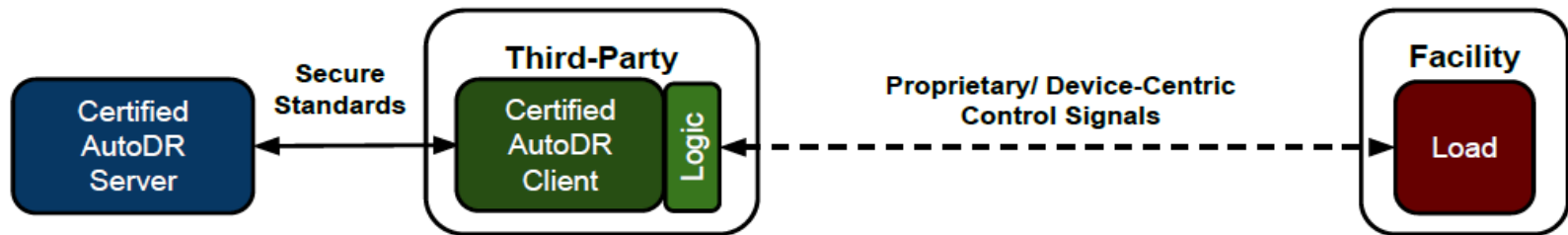


Potentially lowers technology cost



Ensure secure transactions

Communication Architectures – Proprietary vs. Universal



BUILDING CODE OPPORTUNITIES FOR DEMAND RESPONSE

Building Codes 101

Base Codes

(ASHRAE 90.1 & CA Title 24)

- Legally binding minimum EE requirements

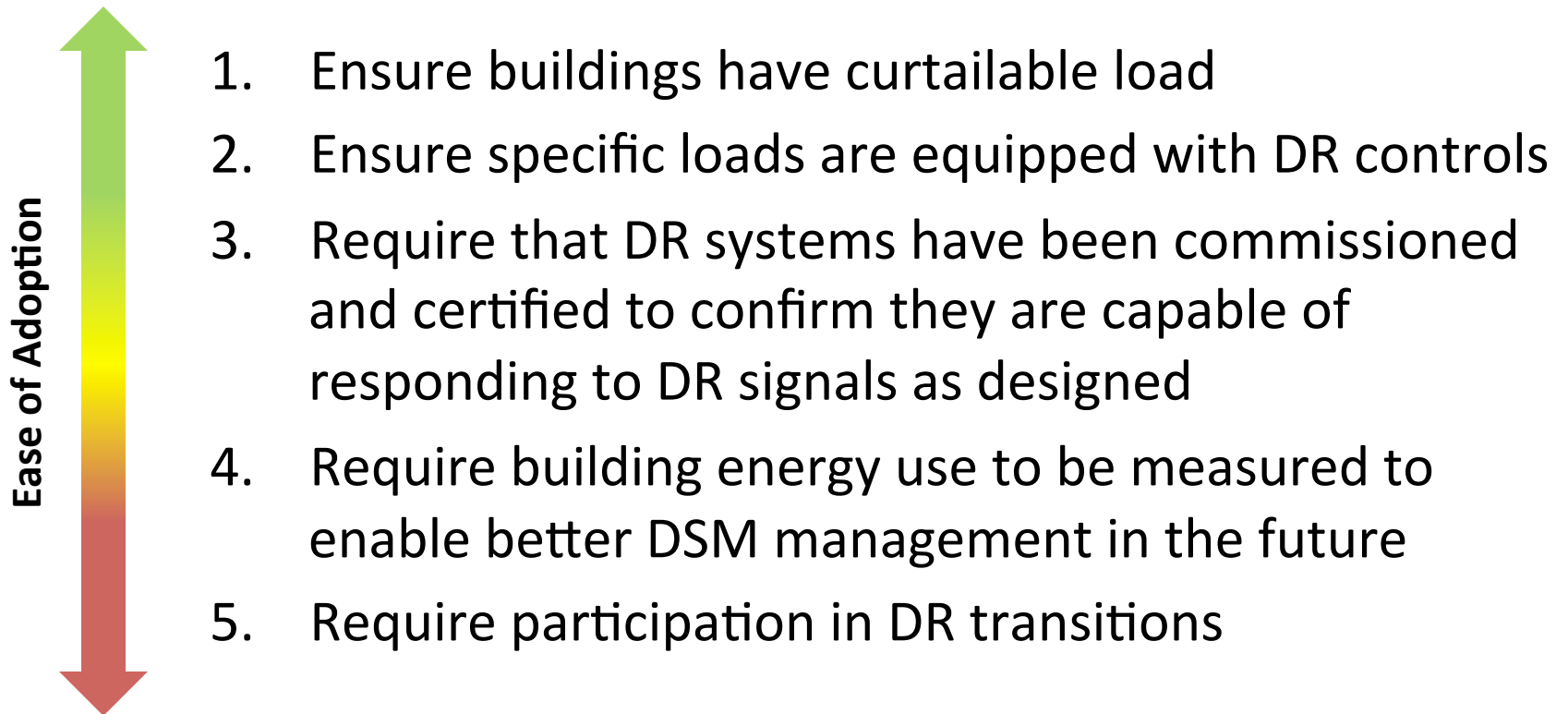
Reach Codes

(CALGreen 2019, 189.1, LEED)

- Higher energy efficiency goals and load reductions
- More stringent requirements, or individual buildings

Both can and should incorporate DR strategies of different flavors

Building Codes can deploy several strategies to facilitate participation in DR transaction



Ensure buildings have curtailable load

Type	Description	Pros/Cons
Performance provisions	Require buildings to have the capability to adjust a given load by kW or % of peak load	<ul style="list-style-type: none">- Allows designers to innovate- Harder to verify compliance
Prescriptive requirements	Require building to deploy specific DR strategies	<ul style="list-style-type: none">- Reduces ambiguity- Can more easily target different loads
Mandatory	Require specific building systems or controls	<ul style="list-style-type: none">- Provides better level of control within the building- May be path for plug-load level DR

Ensure buildings are equipped with DR Controls

Type	Description	Pros/Cons
Performance	A control is code compliant if it capable of adjusting load to the specified level	<ul style="list-style-type: none">- Gives building operators greater flexibility- Could result in stranded asset issue
Prescriptive	E.g., HVAC controls must be capable of responding to DR signals and be programmed with temperature reset functionality	<ul style="list-style-type: none">- Could incorporate communication standards that ensure interoperability, security, and potentially ease of use

Ensure DR Systems have been certified as capable of responding to DR signals

Type	Description	Pros/Cons
Acceptance Testing	<p>A certified field technician must complete an acceptance test to validate:</p> <ul style="list-style-type: none">• DR control functionality• Capability of receiving/responding to signals• Capability of reducing load by specified code amount	<ul style="list-style-type: none">- Has the most teeth in terms of compliance with code- Dependent on resources to conduct acceptance testing- Testing could be difficult to conduct if internet connection is not yet available

Mandate monitoring and reporting to inform future code changes

- Monitoring devices that are capable of measuring electricity use from the following systems at least on a 15-minute basis:
 - total electricity use
 - HVAC systems
 - interior lighting
 - exterior lighting
 - receptacle circuits
- Enable better demand-side management

Require building occupants to participate in DR transactions

- *Requiring* participation in DR transactions is usually outside the scope of building codes”
 - Difficult to enforce
 - Typically perceived to be up to the customer’s discretion
 - Best suited for voluntary, reach codes for now
- LEED is currently piloting a credit that requires building occupants to enroll in a 1-year DR participation agreement with a qualified DR program provider

Base Code Strategy Adoption

BASE Building Codes	Strategy for Encouraging Participation in DR Transactions				
	Curtailable Load	DR Controls	Certification of DR System	Participation in DR Transactions	Monitoring Reporting
2013 Title 24	Yes	Yes	Yes	No	Yes
ASHRAE 90.1-2013	Yes	No	No	No	Yes
2012 IECC	Yes	No	No	No	No
2012 IRC	Yes	No	No	No	No

Reach Code Strategy Adoption

Reach Building Codes	Strategy for Encouraging Participation in DR Transactions				
	Curtailable Load	DR Controls	Certification of DR System	Participation in DR Transactions	Monitoring Reporting
2013 CALGreen	Yes	Yes	Yes	No	Yes
ASHRAE 189.1-2011	Yes	Yes	No	No	No
IGCC	Yes	Yes	No	No	No
LEED (pilot credit 8)	Yes	Yes	Yes	Yes	No
National Home Energy Rating System (HERS)	No	No	No	No	No
California HERS	No	No	No	No	No

DISCUSSION