



TVA Smart Communities

Summary of Benchmarking Study

May 2014

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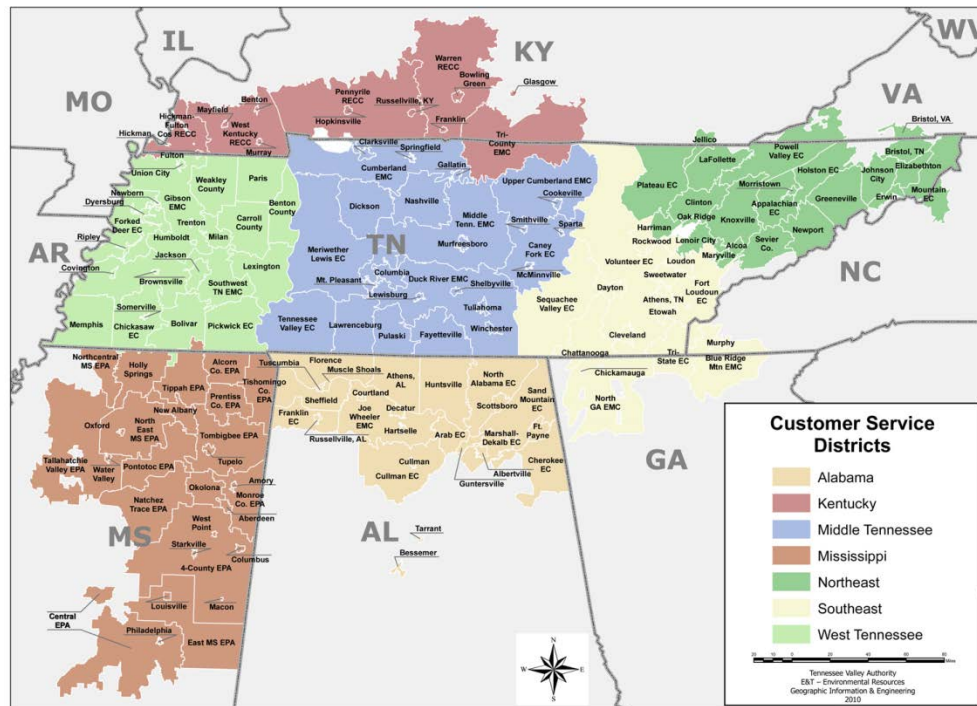
Smart Energy Technologies

- Market Overview
- Business Models
- Key Findings

Next Steps

TVA is the nation's largest public power company

- TVA operates fossil-fuel, nuclear, and hydropower plants, and also produces energy from renewable sources.
- TVA manages the nation's seventh-largest river system (41,000-square-mile watershed)
- TVA's power-service area covers 80,000 square miles in the southeastern United States, including almost all of Tennessee and parts of Mississippi, Kentucky, Alabama, Georgia, North Carolina, and Virginia.



- TVA provides wholesale power to 155 municipal and cooperative local power companies (http://www.energyright.com/power_company_listing.html), and directly serves 57 large industries and government installations
- TVA supplies the electricity needs of about nine million people at prices below the national average

Objectives

Each part of the project has distinct objectives

Extreme Energy Makeovers (EEM)

TVA defines an “Extreme Energy Makeovers” project as one that



Achieves a **25% reduction** in each home’s electric energy use with an estimated total project savings of **1,000 MWh/year** at approximately **\$10/square foot**



Focuses on homes that are **at least twenty years old** in **lower income** communities



Educates participants on the operation and care of their home needed to achieve its designed energy efficiency

Smart Energy Technologies (SET)

TVA defines a “Smart Energy Technologies” project as one that



Showcases **newer, energy efficiency technologies** while integrating them with the primary enabling elements of a **smart grid**



Explores the opportunities and tests the **human interaction** of smart grid devices and ultra efficient homes



Uses **energy efficiency** in conjunction with **demand response** to make the house function as a machine

TVA has identified key design elements for EEM projects



Extreme Energy Makeovers



Benefit to Participants

Creates positive impact on Consumers, Utilities/Local Power Companies (LPCs), and other Participants



Community Engagement

Involves community leaders and organizations in the design, launch, and management of the program



Consumer Education

Educates consumers on the benefits of energy upgrades and impact of their behavior



Cost Effectiveness

Completes retrofits at an average cost of \$10/square foot



Ease of Implementation

Allows Utility/LPC to more quickly and easily create or replicate an extreme energy makeovers project



Savings

Lowers emissions by reducing a home's energy use by 25%



Scalability

Creates a business model that allows the size of the project to scale across a Utility/LPC service territory



Sustainability

Creates a business model that could enable the project to continue

TVA has identified key design elements for SET projects



**Smart Energy
Technologies**



Behavior Change

Improves consumer attitudes toward energy efficiency and/or utility control of home devices



Benefit to Participants

Creates positive impact on Consumers, Utilities/Local Power Companies (LPCs), and other Participants



Ease of Implementation

Allows Utility/LPC to more quickly and easily implement smart community project



Innovation

Advances the market by achieving a new element of or approach to a smart community



Peak Load Reduction

Reduces peak load through demand response or load shifting



Replicability

Creates infrastructure or partnerships that facilitate replication of projects at other Utilities/LPCs



Savings

Saves energy and reduces emissions of greenhouse gases and air pollutants



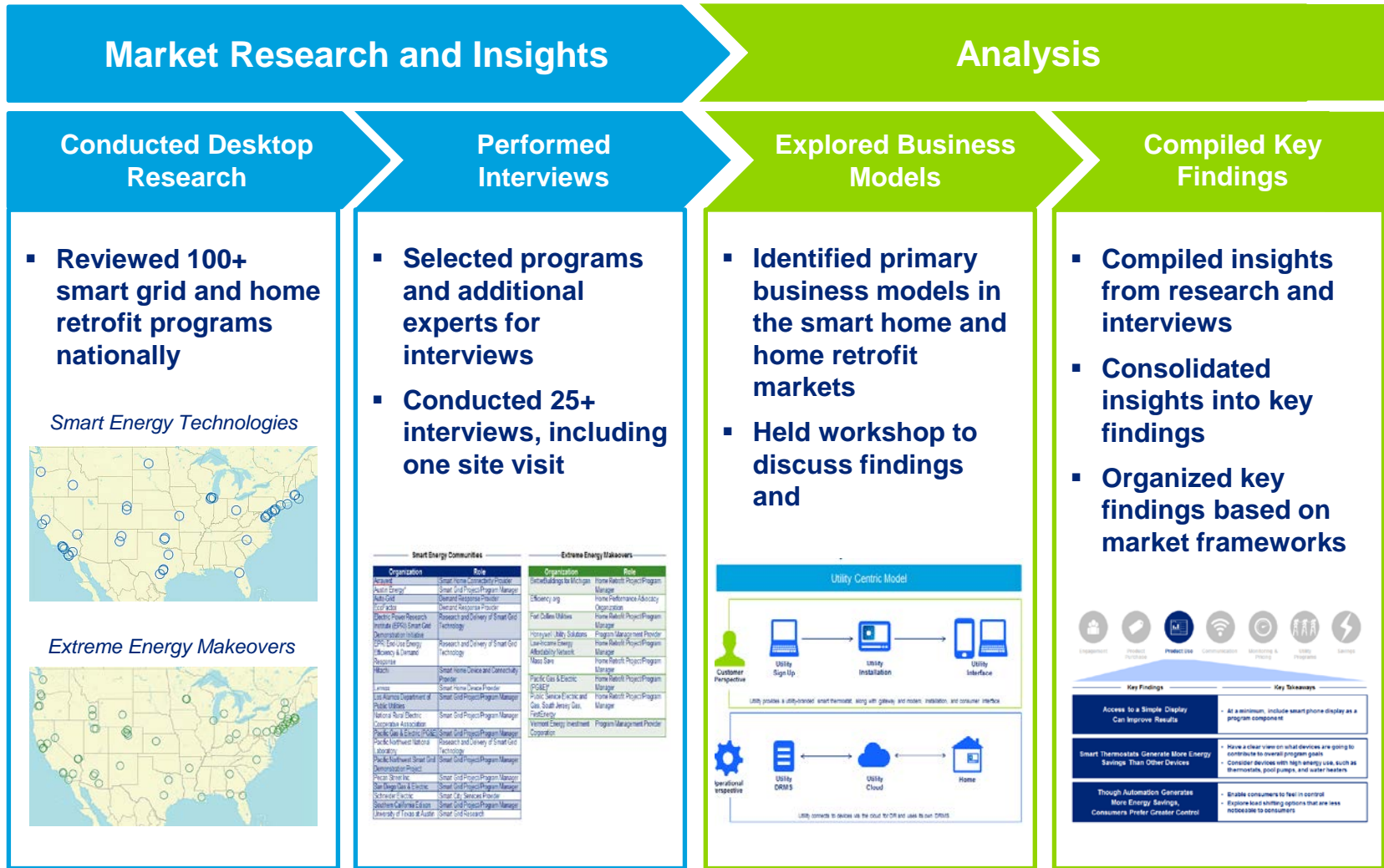
Sustainability

Creates a business model that could enable the project to continue

Questions?

Study Approach

The Study was created through four phases of work



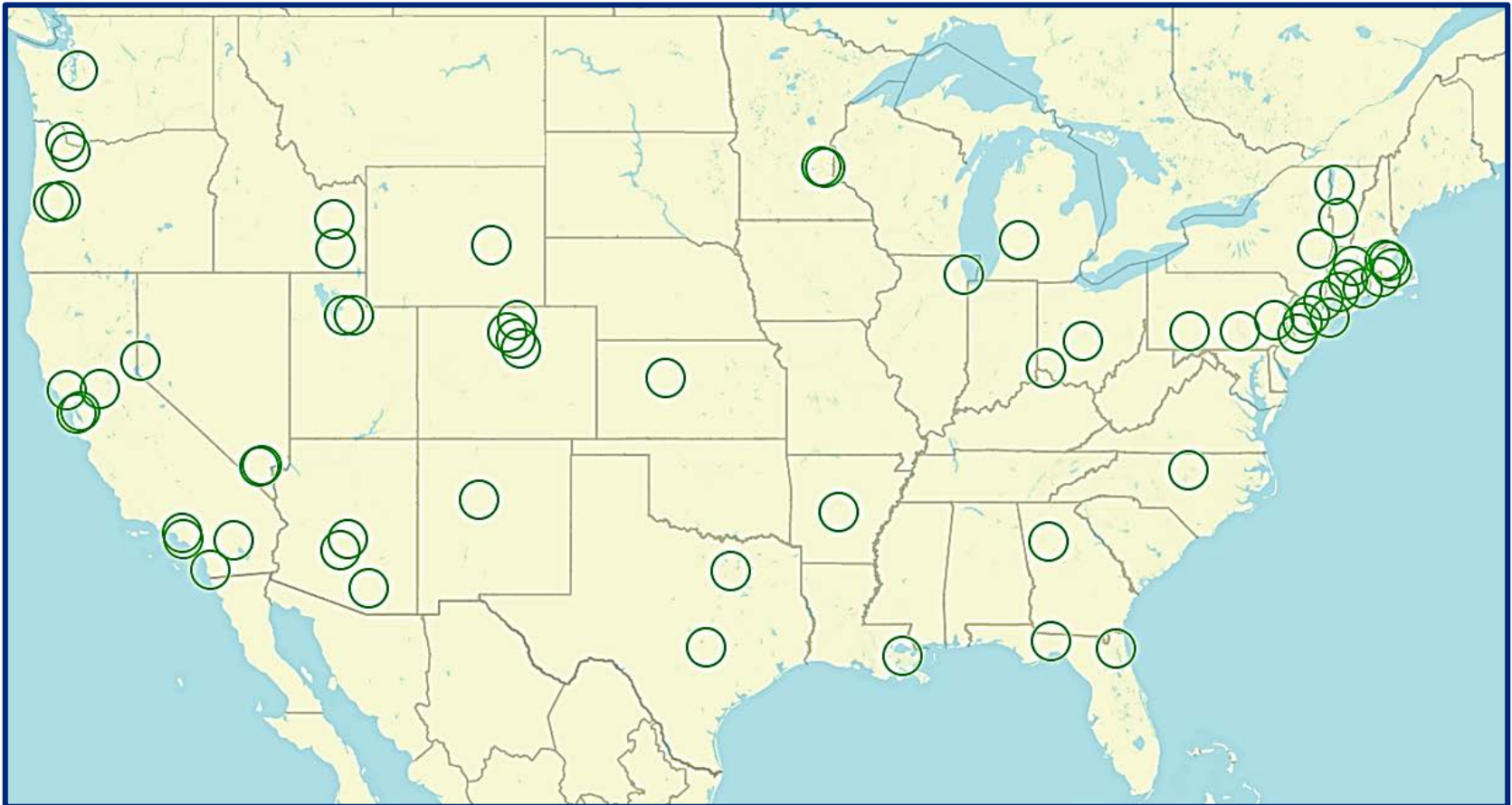
Extreme Energy Makeovers





We began with a national review of programs

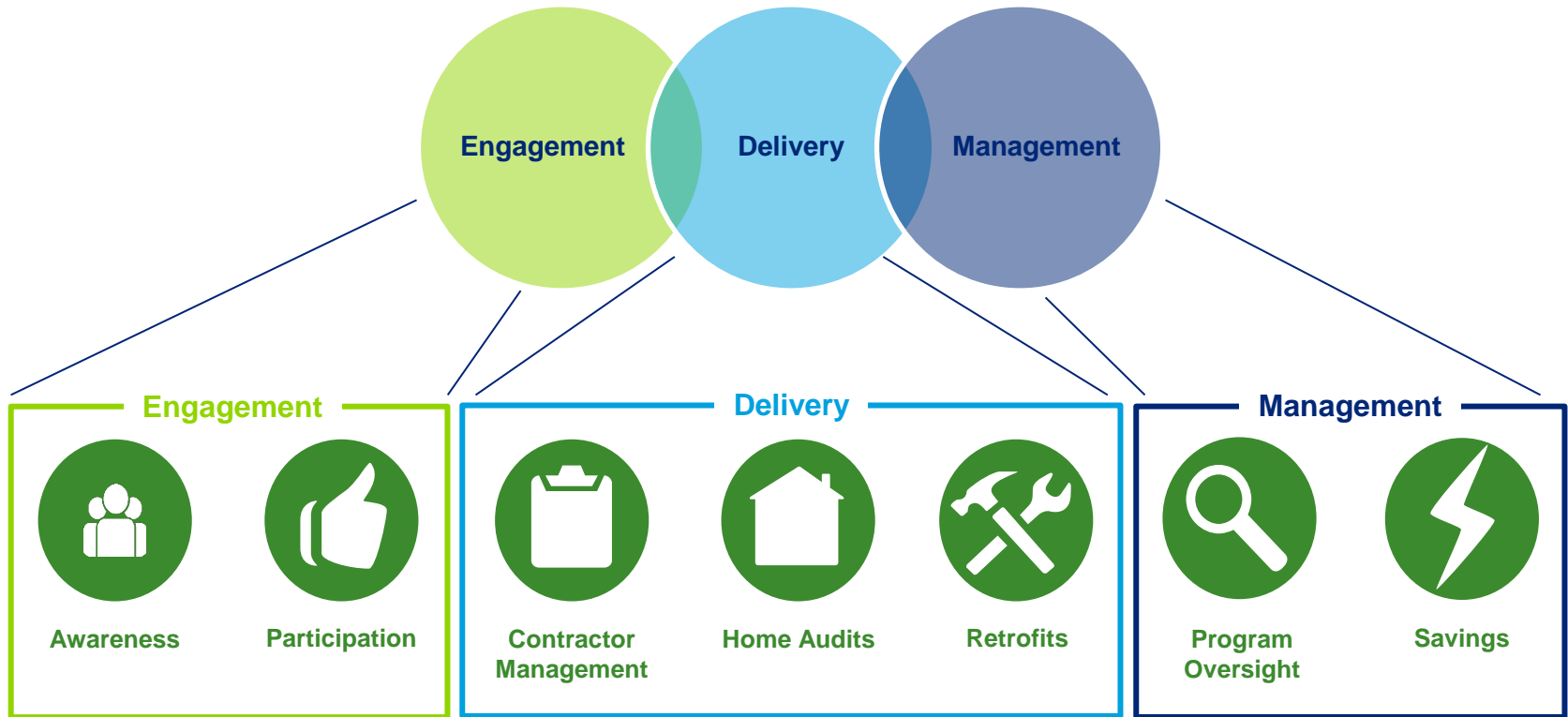
For Extreme Energy Makeovers, we reviewed more than 60 programs related to home energy retrofits.





We broke down the market into its key elements

At its core, a home retrofit project must include three elements: engagement, delivery, and management.



Each key element is broken down into sub-components



Engagement

Awareness

Approach to increasing consumer awareness of the program and interest in participating. Includes messaging, consumer education, marketing channels, and marketing spend.



Participation

Eligibility required for participation (e.g., income, age of home, etc.), process of eligibility verification, and incentives offered to drive participation.



Delivery

Contractor Management

Recruitment, screening, and management of contractors who perform retrofit work; can include rewarding higher performing contractors and mentoring/training lower performing contractors.



Home Audits

Process of performing the home audit and integrating the audit with the rest of the home retrofit process; includes who conducts audit and what level of audit is performed.



Retrofits

Scope of measures to be performed in each home, including guidelines for contractors on which measures to perform and at what cost.



Management

Program Oversight

Management of the program by the lead implementer, whether a utility, community organization, or third party; may include ongoing stakeholder engagement and revisions to the program.



Savings

Measurement of the energy and emissions savings associated with home retrofits.

Business Models





There are a few dominant models in the retrofit market

The Study includes a description of three business models to provide a sense of the primary delivery models used in the home retrofit market.

Utility/LPC Led

- Utility/LPC-branded program
- Utility/LPC partners with local community organizations
- Utility/LPC leverages TVA Quality Contractor Network (QCN)
- Utility/LPC employs localized, manual processes

Third Party Implementer

- Utility/LPC-branded program
- Implementer partners with local community organizations
- Utility/LPC leverages TVA QCN or third-party network
- Implementer could employ centralized, automated processes

Retailer Partnership

- Utility/LPC and retailer co-branded program
- Retailer leverages its contractor network
- Retailer could employ centralized, automated processes

Key Findings





Key Findings: Awareness



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

Key Takeaways

Consumers Respond Best to Messaging Centered on Their Pain Points

- Focus on consumer needs, such as comfort, for program messaging
- Tailor messaging to suit the customer base

Enlisting Local Spokespeople Can Help Programs Gain Trust

- Market through trusted local community members
- Use early adopters as spokespeople

Leveraging Existing Community Infrastructure Can Increase Participation

- Partner with local community organizations, particularly those focused on low income communities

Marketing Is Essential Even When Programs Have Rich Incentives

- Emphasize marketing to optimize results



Key Findings: Participation



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

Key Takeaways

Low Income Threshold Should Be Defined to Streamline Verification Process

- Minimize administrative burden by aligning eligibility with existing low-income programs

Targeting Homes with Higher Usage Can Increase Energy Savings

- Prioritize homes with greater electricity usage to maximize percent savings per home and reach 25% electric energy savings goal



Key Findings: Contractor Management



Awareness



Participation



**Contractor
Management**



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

Key Takeaways

**Program Design Should Take into Account
Industry Capacity and Capabilities**

- Design program based on local industry circumstances, such as availability of accredited contractors and contractors able to perform multiple retrofit measures

**Contractor Requirements Should be
Standardized Across Programs**

- Leverage contractor networks built for existing programs
- To the extent possible, align requirements across programs and geographic areas

**Actively Managing Contractors
Yields Better Results, but
Can Be Time and Resource Intensive**

- Place an early emphasis on rigorous QA and contractor management, which can be ramped down over time to lessen administrative burden



Key Findings: Home Audits



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

**A Flexible Audit Implementation Process
Can Help Prevent Program Bottlenecks**

Key Takeaways

- Allow for multiple pathways in which different type of companies (including contractors) can perform audits
- Create standard audit guidelines and perform third party oversight to ensure consistency

**Participant Engagement is Key to Keeping
Audit Process on Track**

- Encourage low-income homeowner engagement to minimize process delays caused by rescheduling



Key Findings: Retrofits



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

Leading Programs Have a Method to Address Safety Issues Encountered During Retrofits

- Create a clear policy and procedure for dealing with health and safety issues
- Consider partnering with local organizations focused on health/safety in low income homes

A Whole-Home, Custom Approach Generates Higher Savings per Home, but Can Take Longer to Implement

- Base retrofits on conditions encountered in each home
- Establish guidelines for contractors on what cost-effective measures to prioritize

The Market May Move Toward a Performance-Based Approach

- Create standardized energy savings calculations to enable future development of performance-based approaches



Key Findings: Program Oversight



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

Involving Key Stakeholders Can Improve Program Design and Oversight

More Flexible Programs Achieve Better Results

Key Takeaways

- Create a stakeholder committee that includes local government, contractors, community organizations, etc. to aid in program design and management
- Incorporate flexibility into program design
- Create a best practices committee that reviews performance and adjusts the program at set intervals



Key Findings: Savings



Awareness



Participation



Contractor
Management



Home Audits



Retrofits



Program
Oversight



Savings

Key Findings

**Measuring Actual Savings
Is More Challenging and Costly
Than Other Measurement Options**

**Low Income Weatherization
Must Be Paired with Education
to Produce Energy Savings**

Key Takeaways

- Consider long-term program goals when determining energy savings methodology
- Consider using a program to improve the availability of data for statistical analysis

- Design program to address take-back
- Prioritize consumer education
- Consider ongoing monitoring to confirm savings and effectiveness of education

Questions?

Smart Energy Technologies





We began with a national review of programs

For Smart Energy Technologies, we reviewed more than 40 programs related to the smart grid and the smart home.



Telecommunications Providers



Home Theatre



Security



Automation & Control



Climate Control



Lighting



Cloud

Security Companies



Security



Automation & Control



Climate Control



Lighting



Cloud

Appliance Manufacturers



Home Theatre



Security



Automation & Control



Climate Control



Lighting



Audio, Mobile



Cloud

Energy / EV Vendors



Climate Control



EV



Solar



Cloud

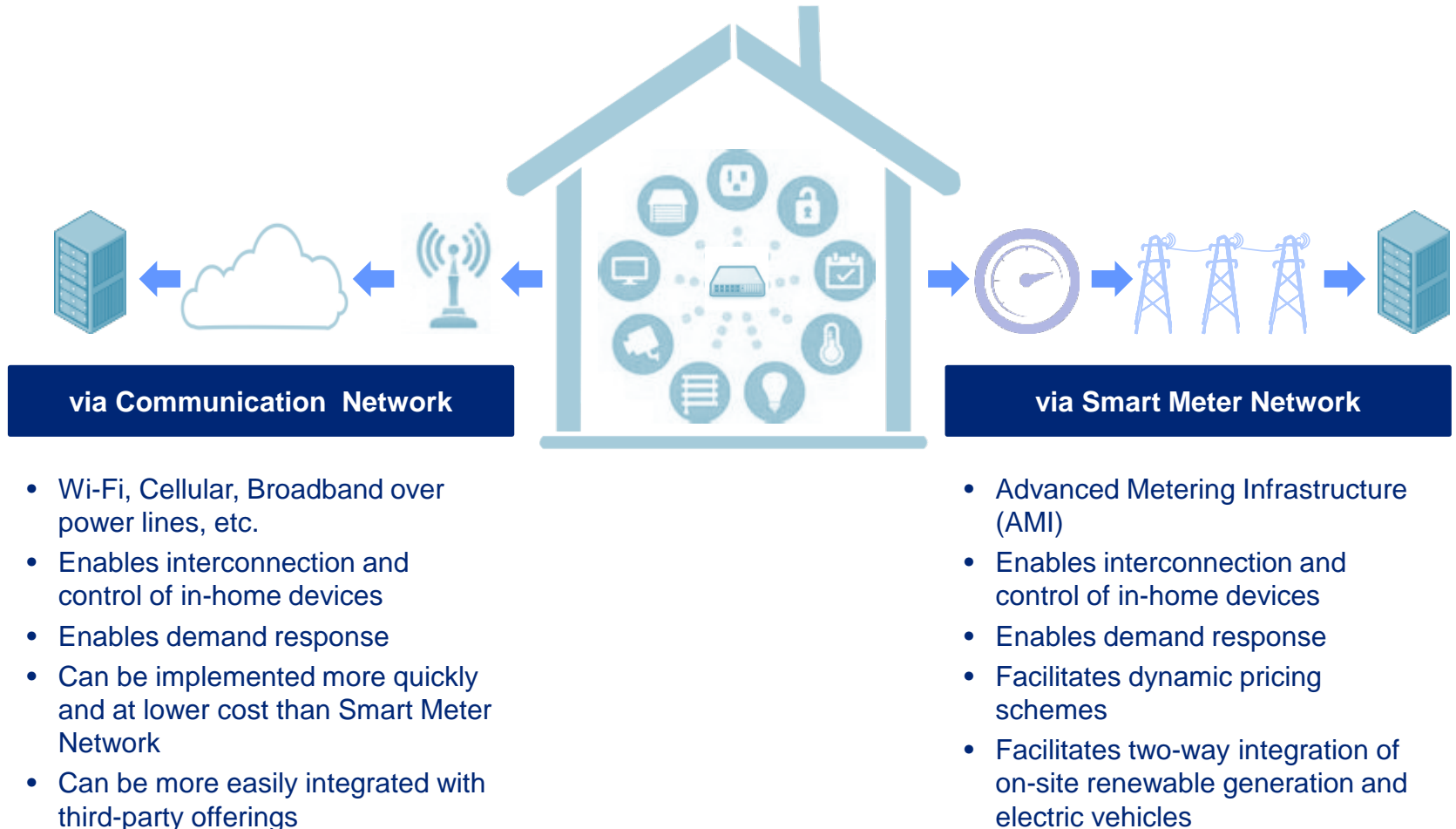


Standalone / silos



We researched the different methods of connecting the smart home to the smart grid

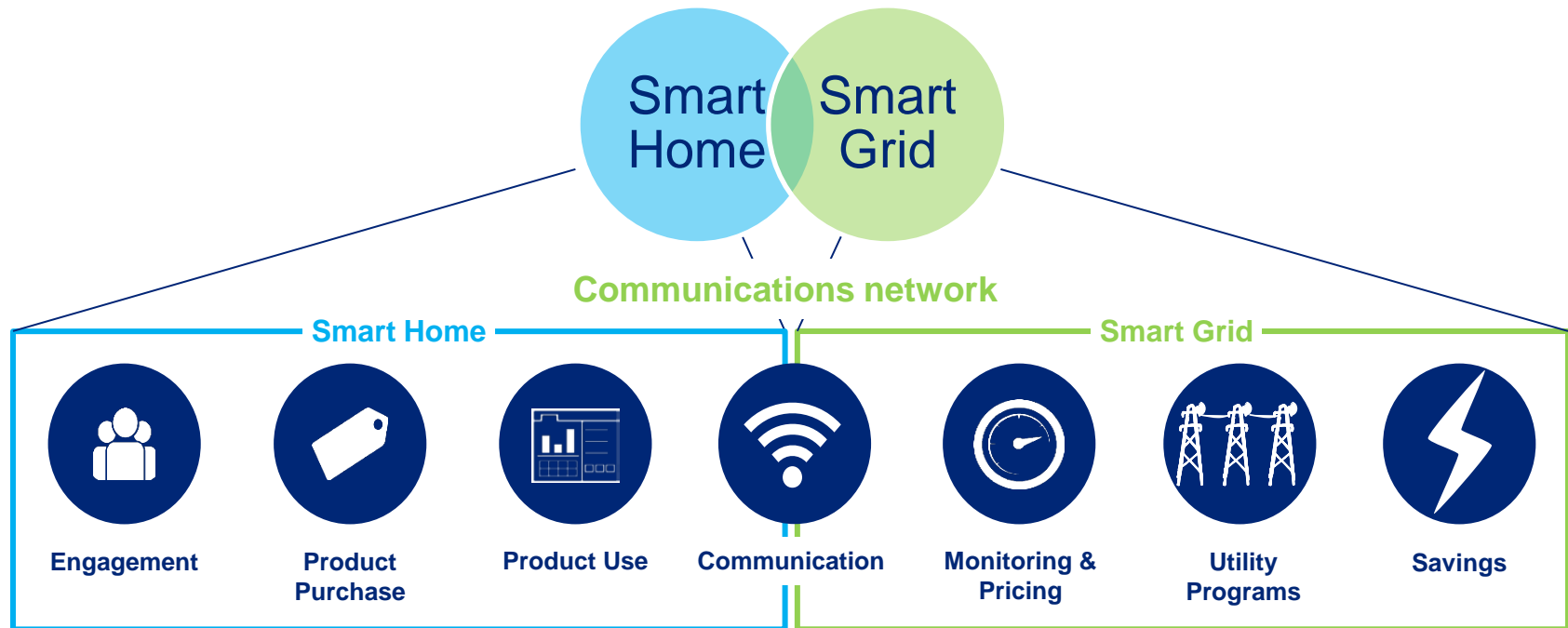
Paths of Smart Home Connectivity





We broke down the market into its key elements

At its core, a SET community must include three elements: a smart home, a smart grid, and a communications network that connects the home to the grid.





Each key element is broken down into sub-components

Smart Home



Engagement

Approaches to increasing consumer awareness of the products and services available in the marketplace, including how to target consumers.



Product Purchase

Process of getting smart devices into customer homes, whether provided by utility, offered through retail channels, or incentivized via rebate or discount programs.



Product Use

Consumer's use of the product according to its function, including how well the product meets consumer preferences, changes behavior, and reduces energy use.



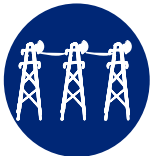
Communication

Networks, technology and protocols to transmit and exchange information; the connection between the smart home and the smart grid.



Monitoring & Pricing

Ability of service providers to inform smart devices in the home when energy demand is high, track how much electricity is used and when it is used, and price accordingly.



Utility Programs

Programs offered by a utility to manage energy consumption, and the back-end systems necessary to run those programs.



Savings

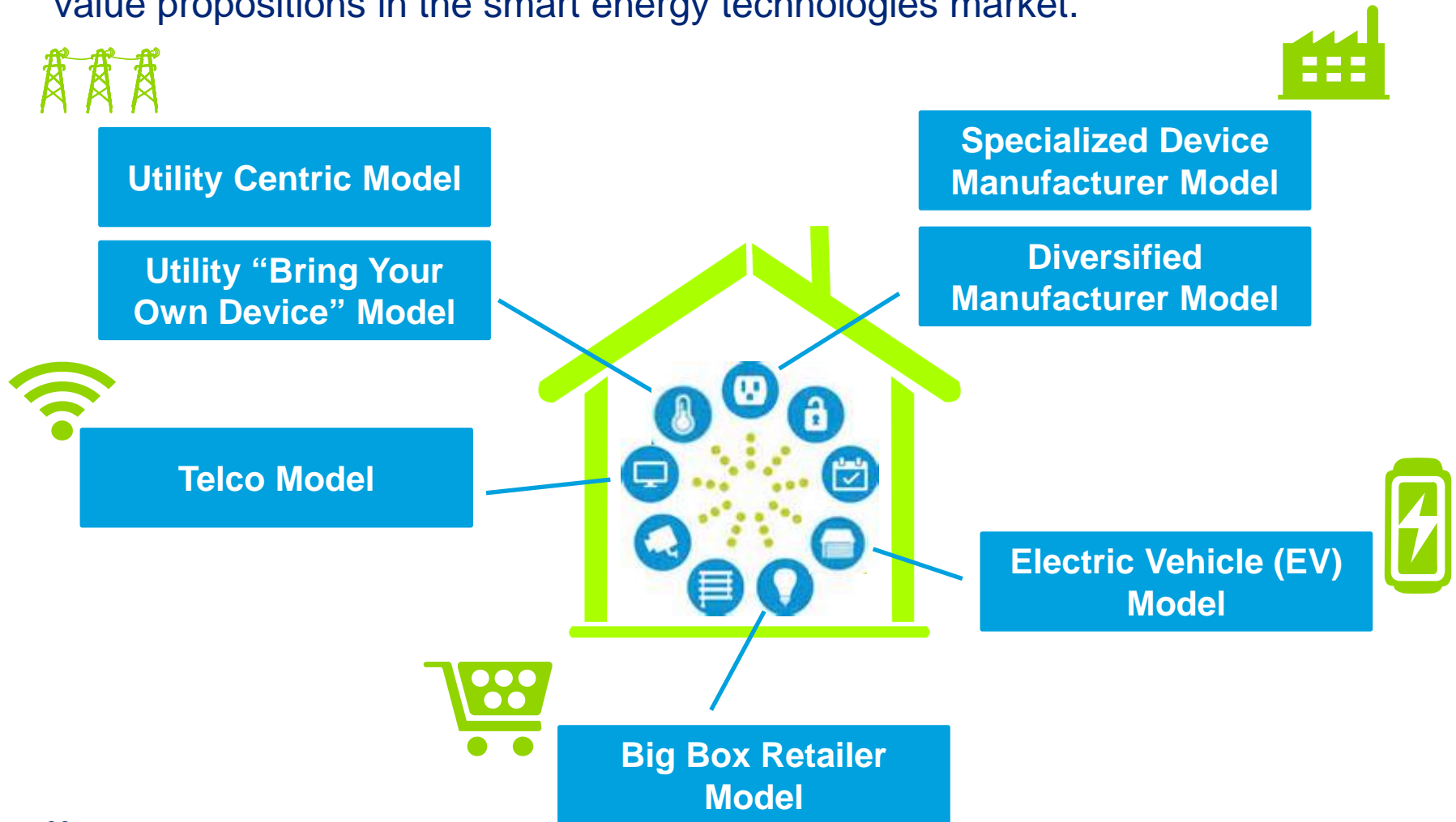
Efficiency gained in the amount of energy consumed and/or reductions in air pollution or greenhouse gas emissions associated with the deployment and use of smart technologies.

Business Models



Business models and market players are diverse

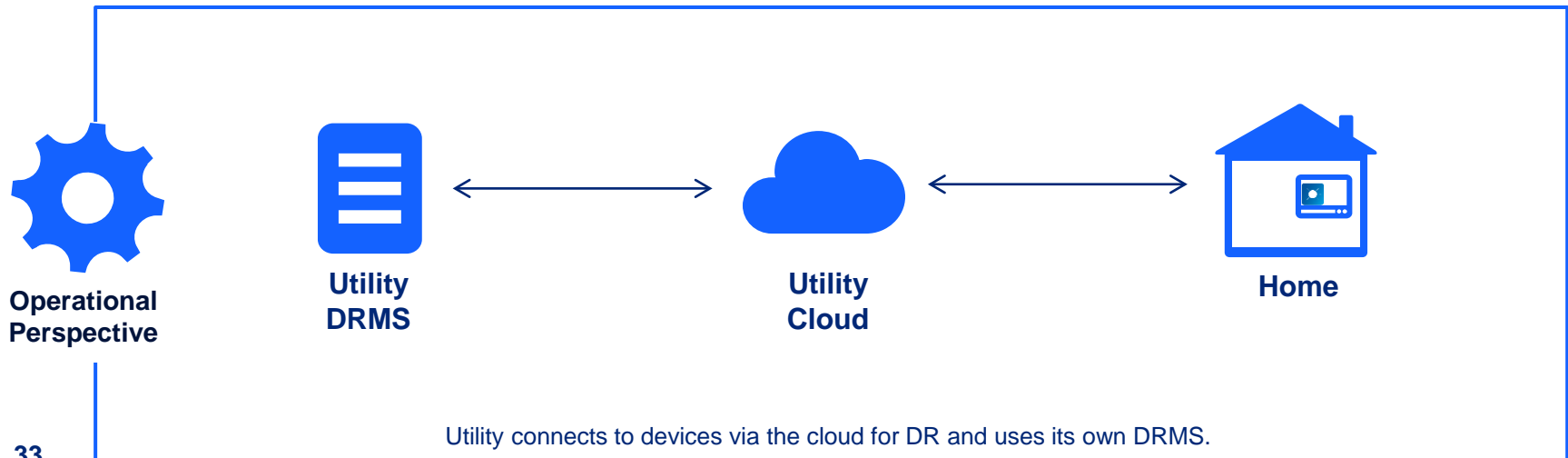
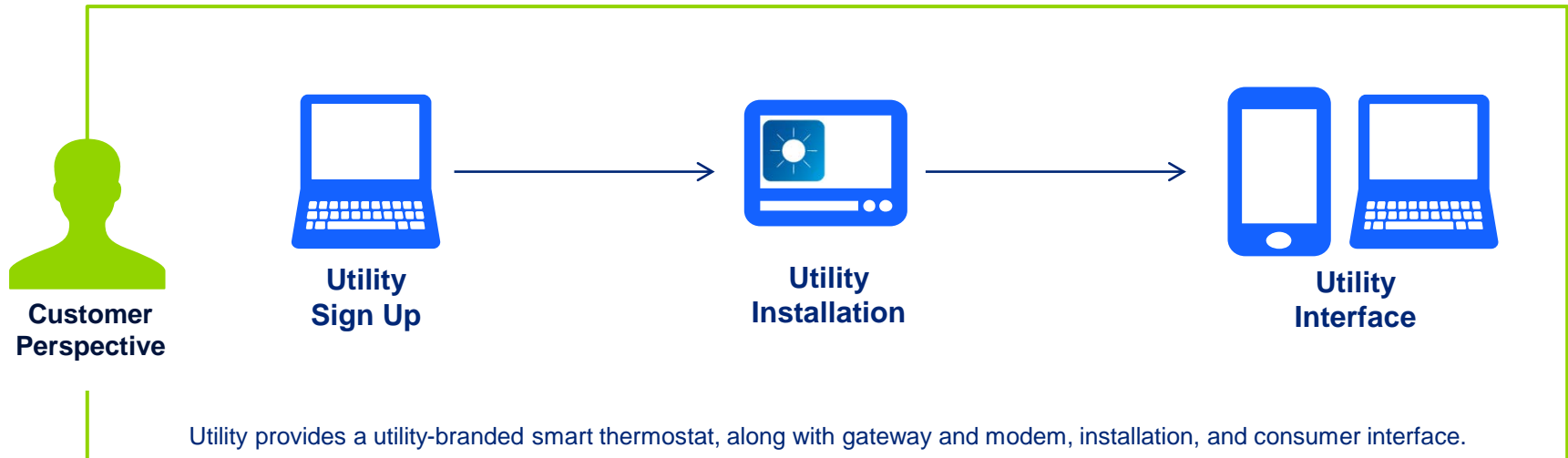
The study includes a description of seven business models. This list is not inclusive of all models being used, but it shows the diversity of players and value propositions in the smart energy technologies market.





Utility-Centric Model

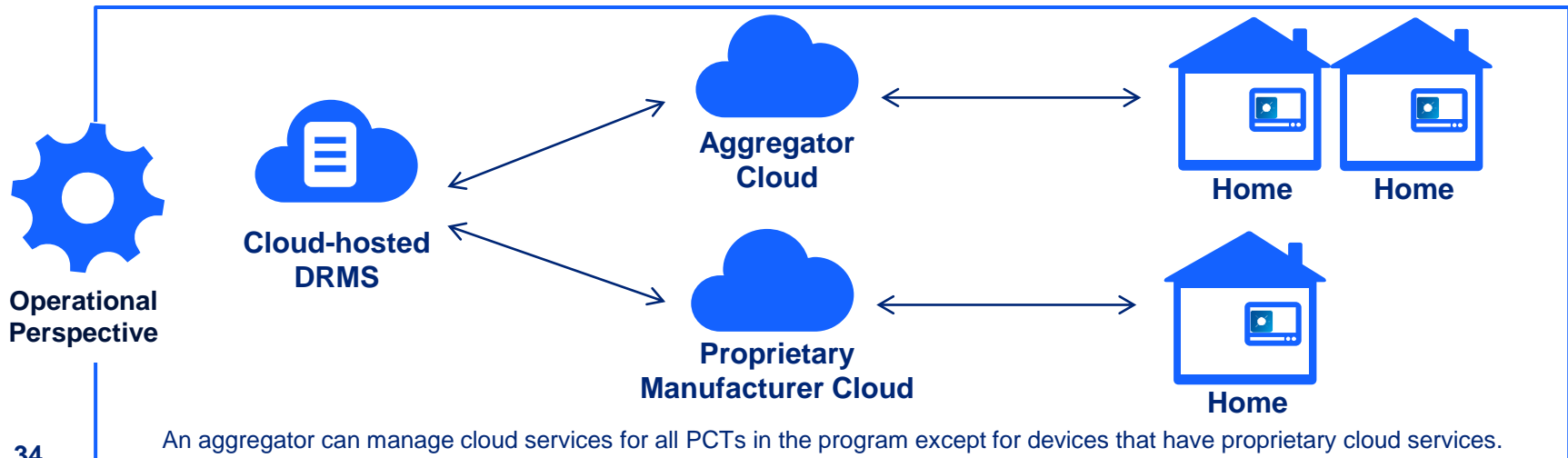
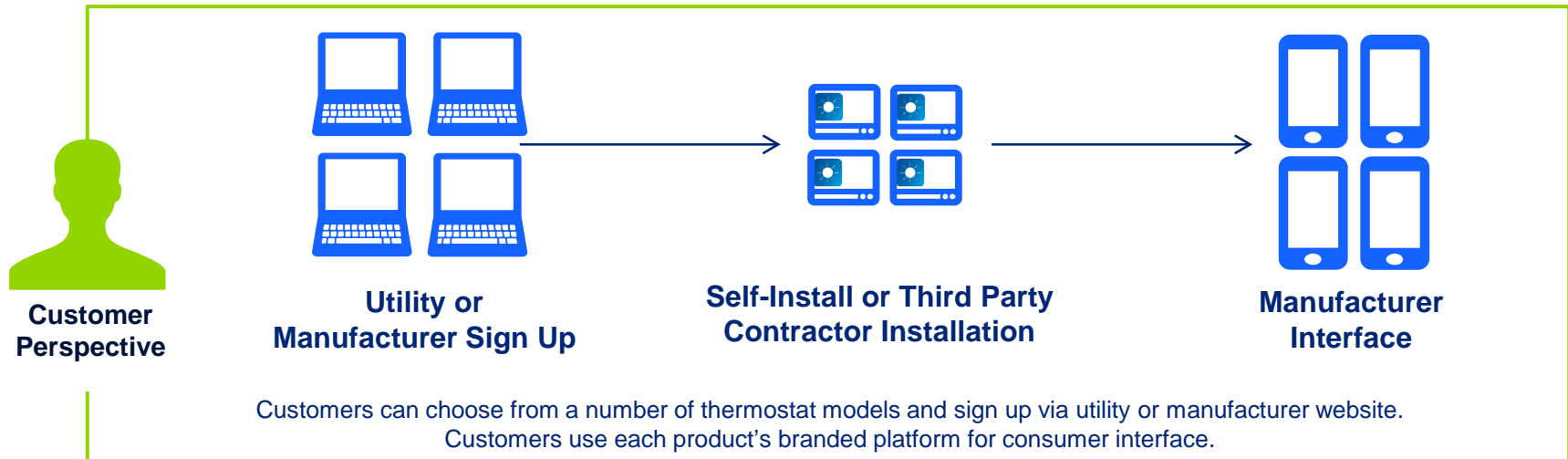
Utility sets up and controls a branded service





Bring Your Own Device Model

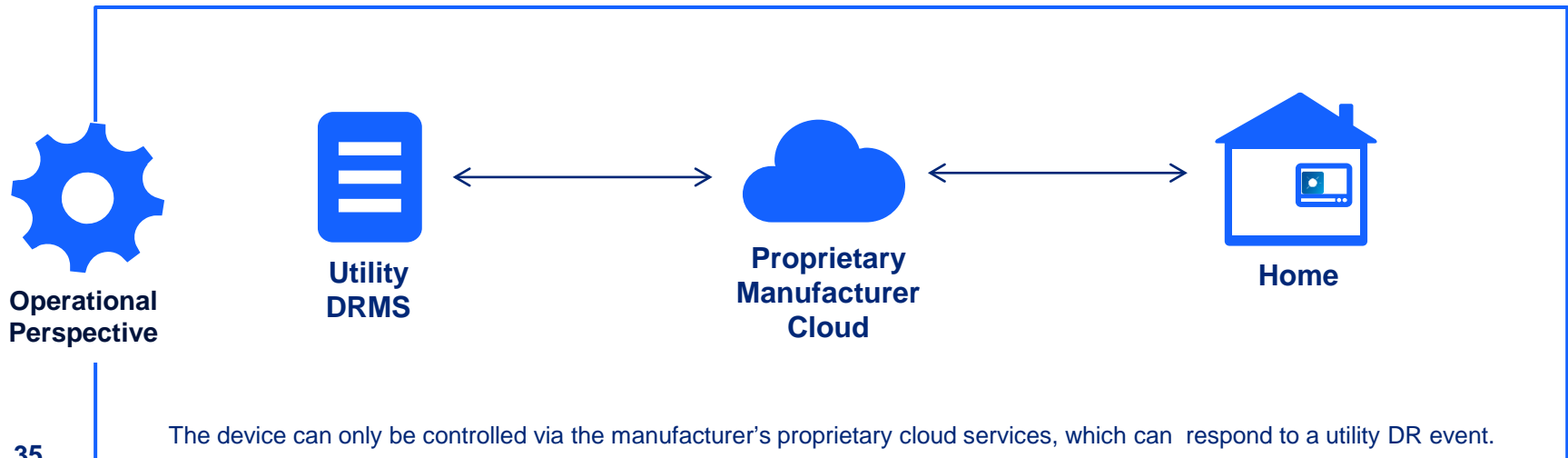
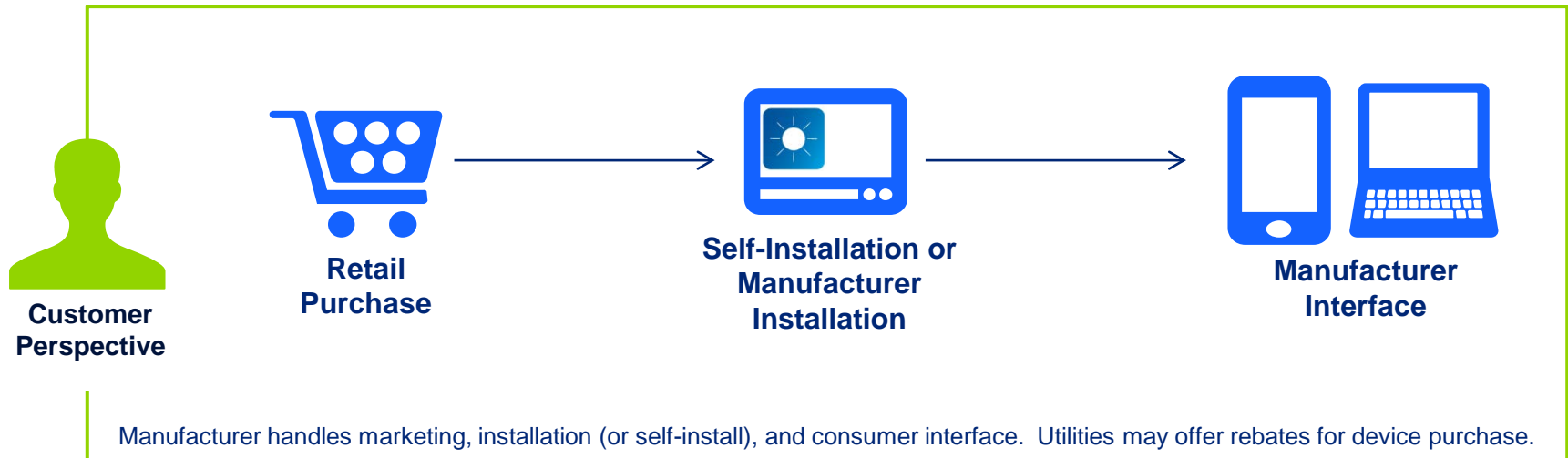
Utility facilitates connectivity of consumer devices





Specialized Manufacturer Model

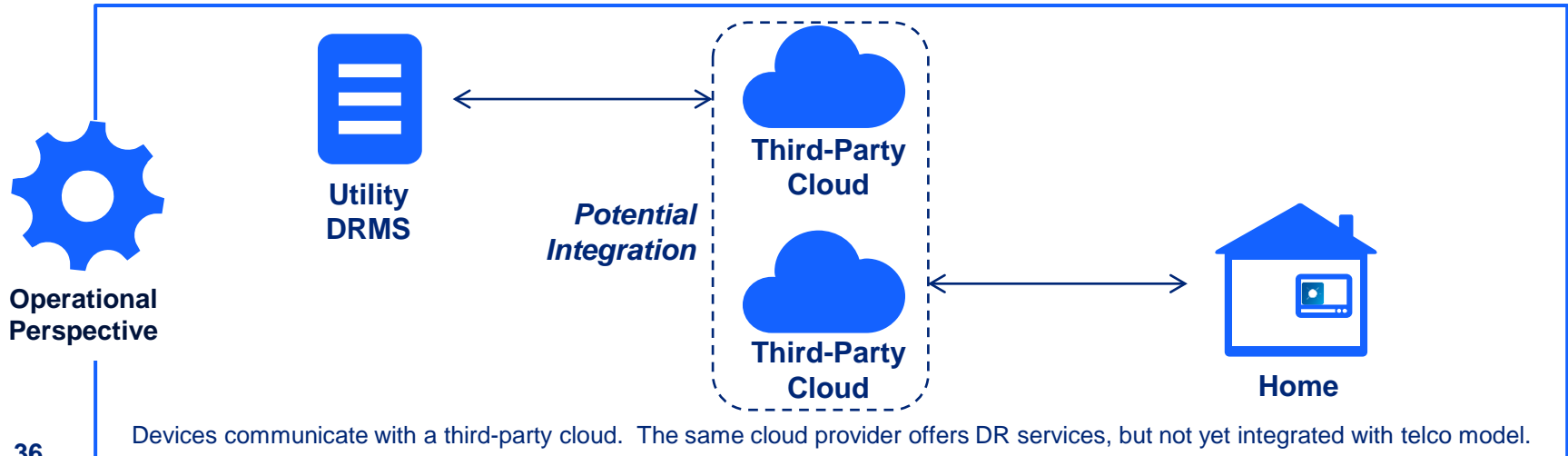
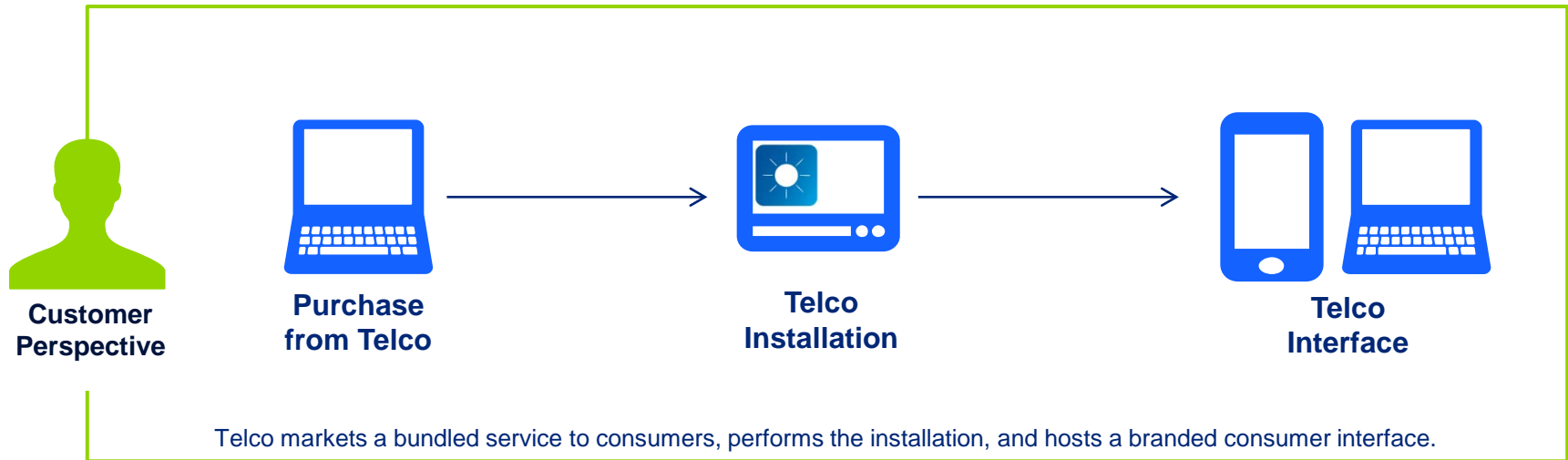
Specialized manufacturer sells directly to consumers





Telco Model

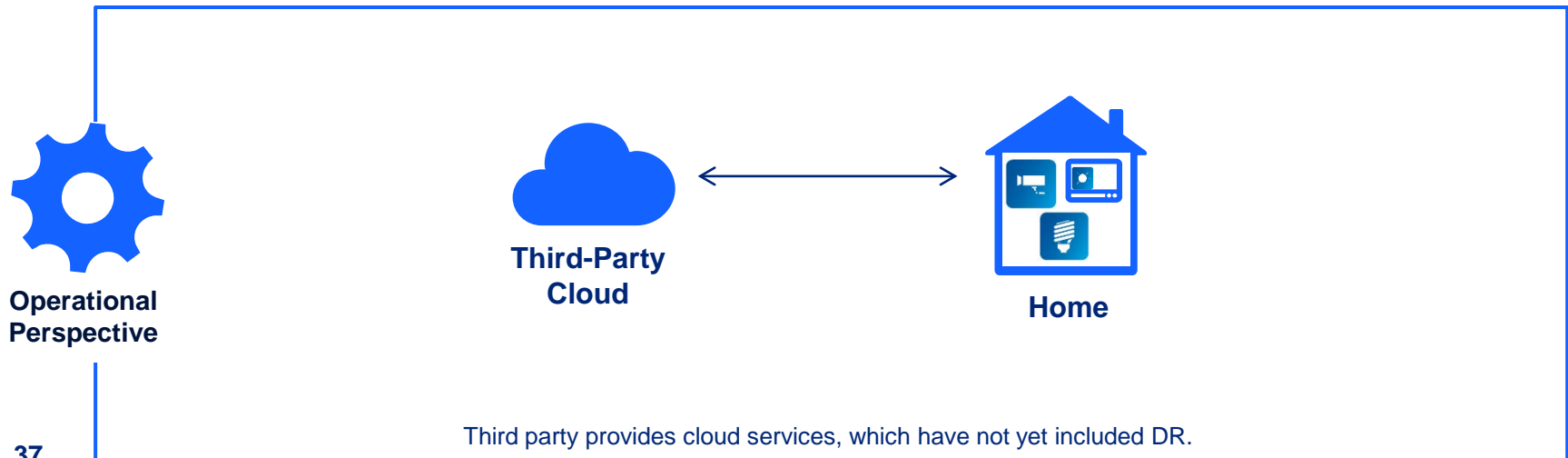
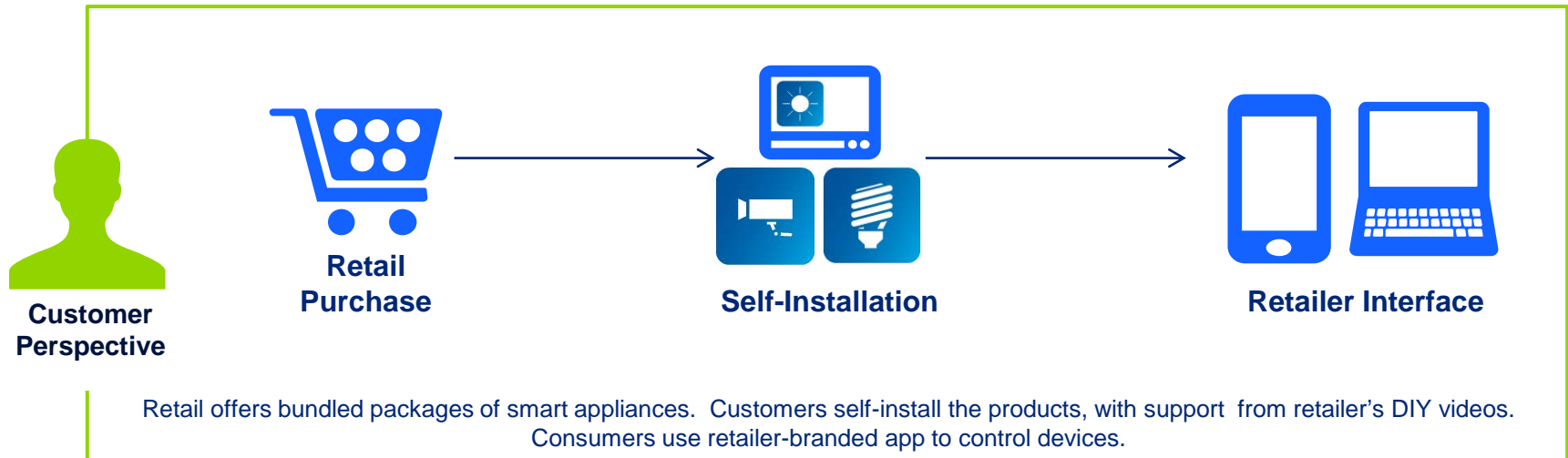
Telco adds home automation to other services





Big Box Retailer Model

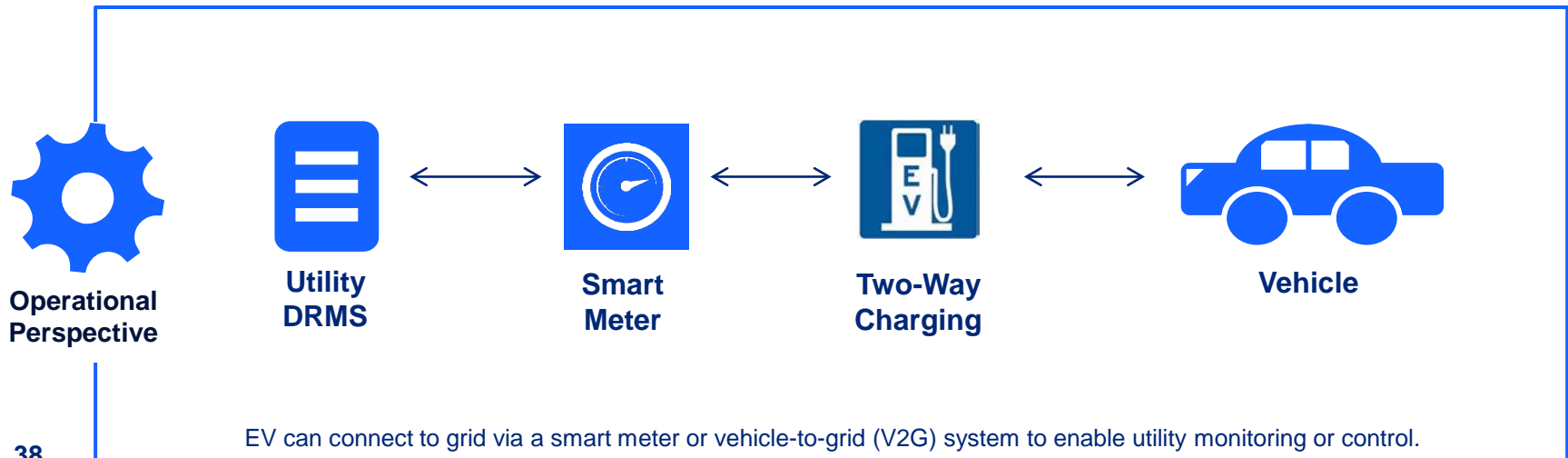
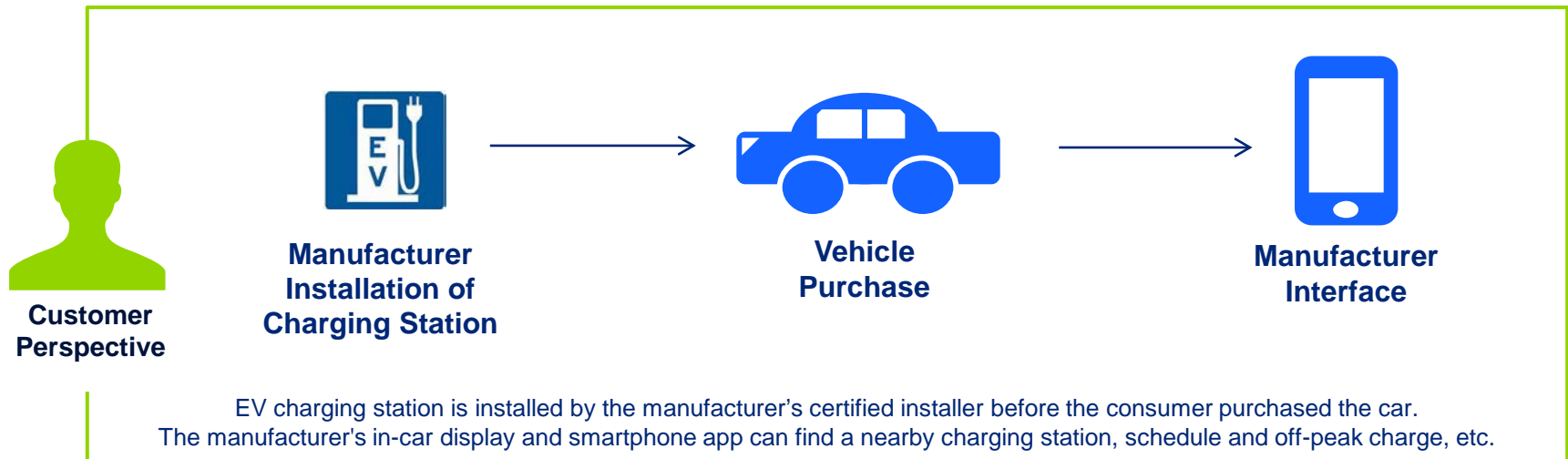
Retailer bundles devices controlled by its branded app





Electric Vehicle (EV) Model

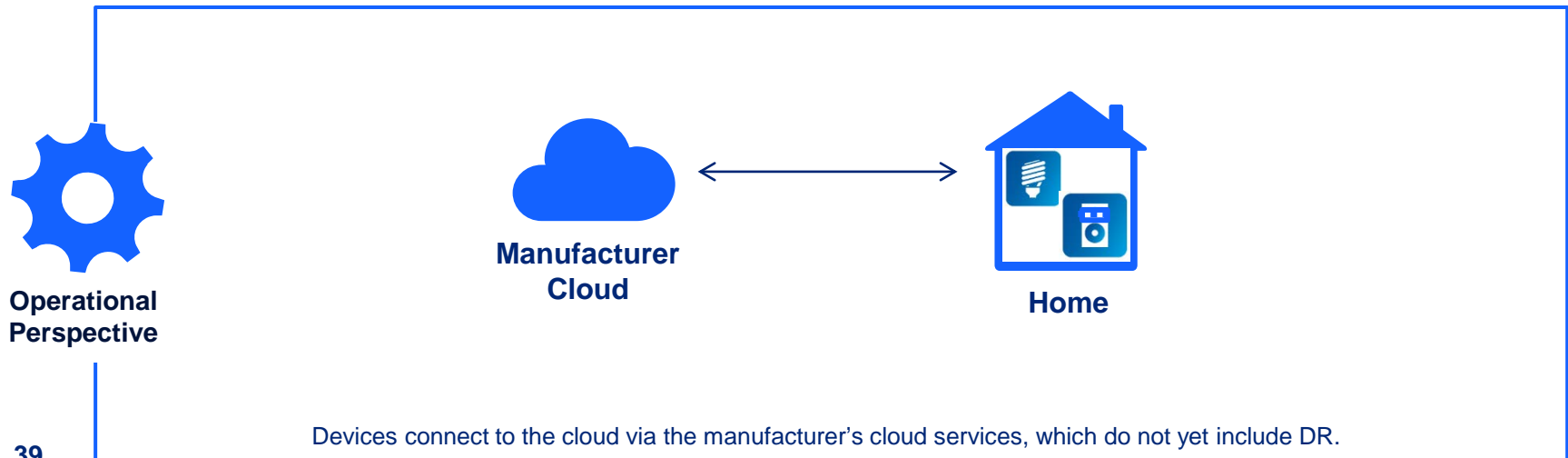
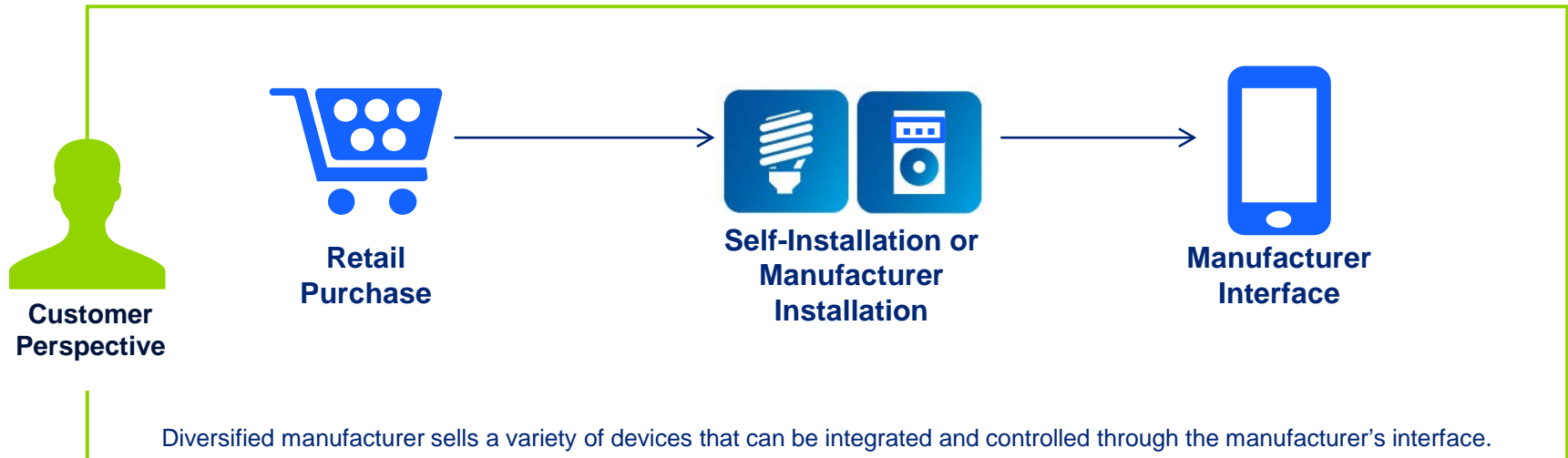
EV manufacturer's interface schedules charging times



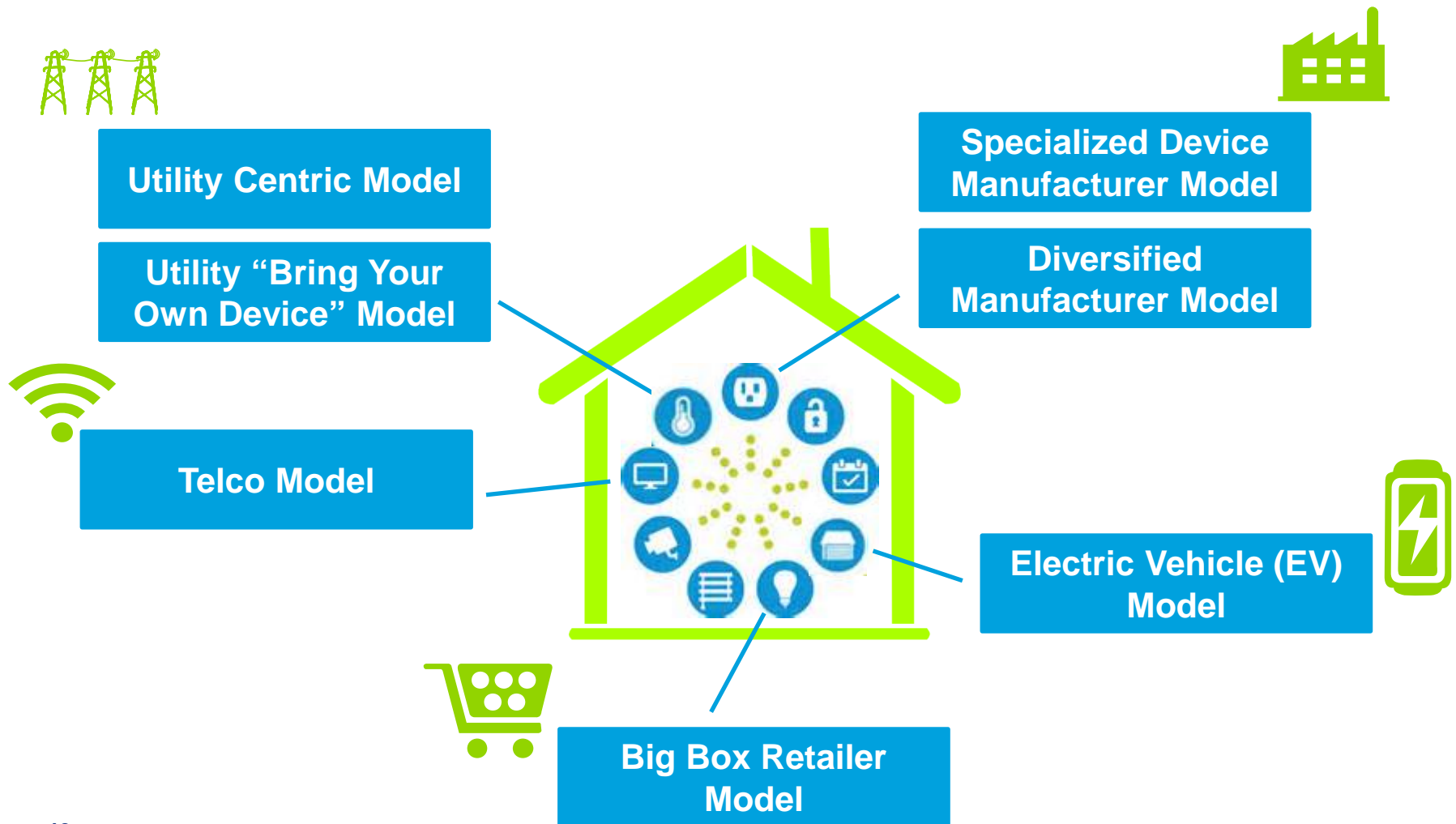


Diversified Manufacturer Model

Diversified manufacturer integrates control of devices



LPCs can use these examples to think of new business models that fit their area



Questions?

Key Findings

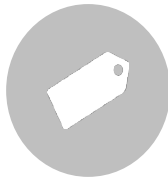




Key Findings: Engagement



Engagement



Product
Purchase



Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

Key Takeaways

Messaging Benefits is Most Effective When It Combines Saving Money with Other Simple, Customer-Focused Benefits

- Undertake customer segmentation analysis
- Focus messaging on consumer benefits for each customer segment
- Design program to address privacy concerns

Programs Can Build on Existing Relationships to Drive Participation

- Build on an existing relationship with a customer segment
- Partner with organizations who have relationships with the targeted community



Key Findings: Product Purchase



Engagement



**Product
Purchase**



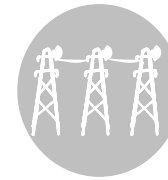
Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

**Consumers Prefer to
Choose Their Own Devices,
but Are Not Ready to Pay for Them**

**Technologies are Immature and
Vendors Can Be Inexperienced**

Key Takeaways

- Allow consumers to choose between a short list of interoperable, accredited devices
- Offer discounted (e.g., through rebates) or free devices to attract consumers

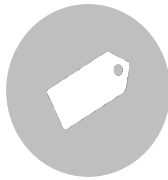
- Create a technology due diligence process
- Set realistic expectations with participants



Key Findings: Product Use



Engagement



Product
Purchase



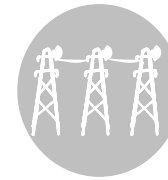
Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

Key Takeaways

**Access to a Simple Display
Can Improve Results**

- Include smart phone/tablet display as a program component

**Smart Thermostats Can Generate More
Energy Savings Than Other Devices**

- Have a clear view on what devices are going to contribute to overall program goals
- Consider devices with high energy use, such as thermostats, pool pumps, and water heaters

**Though Automation Generates
More Energy Savings,
Consumers Prefer Greater Control**

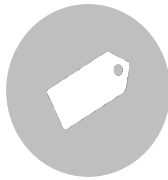
- Enable consumers to feel in control
- Explore load shifting options that are less noticeable to consumers



Key Findings: Communication



Engagement



Product
Purchase



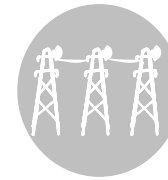
Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

**Open Communications Standards
Are Best for Programs,
but Often Resisted by Vendors**

**Interoperability Is Difficult to Achieve,
Even with a Common Protocol**

**Cloud-Based Communications Can Achieve
Smart Grid Benefits; Smart Meters Can
Enhance Those Benefits**

Key Takeaways

- Encourage use of open standards
- Consider technologies, such as standard ports, that allow communications to evolve without replacing appliances

- Address technical requirements early on and prepare to play a large role in connectivity
- Create backup for interruptions in connectivity, such as data caching

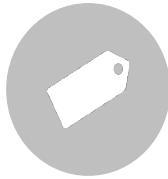
- Define smart grid as broader than smart meters to include cloud-based communications solutions
- Explore both AMI and non-AMI deployment models



Key Findings: Monitoring & Pricing



Engagement



Product
Purchase



Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

**Consumers Prefer Smarter,
but Simpler Pricing Schemes**

Key Takeaways

- If smarter pricing schemes are pursued, make them simple and straightforward for consumers
- Prepare to educate consumers on dynamic pricing schemes

**Remote Monitoring Can
Increase Value Proposition**

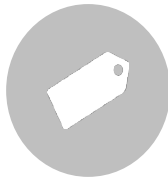
- Consider remote monitoring as a component of the EM&V cycle and a way to enable additional products and services



Key Findings: Utility Programs



Engagement



Product
Purchase



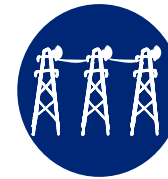
Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

**Back Office Infrastructure
May Need to Be Upgraded
to Realize Smart Grid Benefits**

Key Takeaways

- Include necessary back office capabilities (e.g., meter data management, billing, demand response management system, etc.) in program design

**Opt-In Programs Achieve
Lower Participation Rates, but
Higher Energy Savings per Participant**

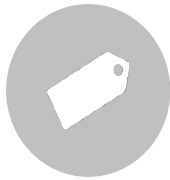
- If the goal is to achieve higher savings per participant, design programs to be opt-in
- If the goal is to collect a large data set, design programs to be opt-out



Key Findings: Savings



Engagement



Product
Purchase



Product Use



Communication



Monitoring &
Pricing



Utility
Programs



Savings

Key Findings

Energy Savings Has Not Been a Focus of Many “Smart” Projects

Key Takeaways

- Create energy savings calculation methodology
- Balance energy/emissions savings with other program objectives

Questions?

Next Steps

The Benchmarking Study will be used during the RFP process

Now that we have it, what do we do with it?

- How TVA Smart Communities Team will use the study
- How you can use the study
- How Project Teams will use the study



**Extreme
Energy
Makeovers**



**Smart Energy
Technologies**

The TVA Smart Communities Team will use the Study to write the RFP and evaluate responses

Benchmarking Study	TVA Smart Communities Team Actions
Describes findings to address major components of successful programs	Use concepts to write request for proposals that solicit the best project concepts to achieve objectives outlined in the plan approved by EPA
Includes both national leading practices and key design elements	Utilize these two elements to aid in the evaluation of proposals
Presents existing and emerging business models	Use examples to understand concepts that have been proven in the market

Ideally, we are looking for projects that can be replicated, but the most important criteria is that the proposed projects meet the needs of TVA, the LPC, and the Community.

The Project Teams will use the Study to guide their project concepts

Benchmarking Study	Project Team Actions
Describes findings to address major components of successful programs	Create new project concepts that represent the best combination and balance of these leading practices and business models
Includes both national leading practices and key design elements	Combine these two elements to produce the best project proposal
Presents existing and emerging business models	Use examples to inform project proposal not define it

Project proposals should be based on the characteristics of the community to be served and be rooted in an understanding of the local area.

Make sure Local Power Companies know about your organization!

If you have not already, send your contact information, a 200 word description of your company's capabilities, and your organization's potential role on a project team to smartcommunities@tva.gov. All responses will be compiled for Local Power Companies.

Key dates and communications guidelines

Key RFP Dates



Extreme Energy Makeovers (EEM)

- Pre-RFP webinar – June 4, 2014 2:00 pm – 3:00 pm CT
- EEM RFP release – June 6, 2014*



Smart Energy Technologies (SET)

- Pre-RFP webinar – July 31, 2014 2:00 pm – 3:00 pm CT
- SET RFP release – week of July 28, 2014*

*Dates are tentative and subject to change

RFP Communications

- Reminder: Per Procurement, TVA employees are not allowed to discuss RFPs with outside parties after the release of the RFP
- Once RFPs are released, all questions should be directed to smartcommunities@tva.gov
- During response period answers to questions will be posted online at http://www.tva.gov/environment/epa_mitigation/smart_energy_communities.htm

Questions?

Climate Zones of the Continental United States

U.S. EPA Indoor airPLUS Construction Specifications
Version 1 (REV. 01) EPA 401/K-13-001
February 2013

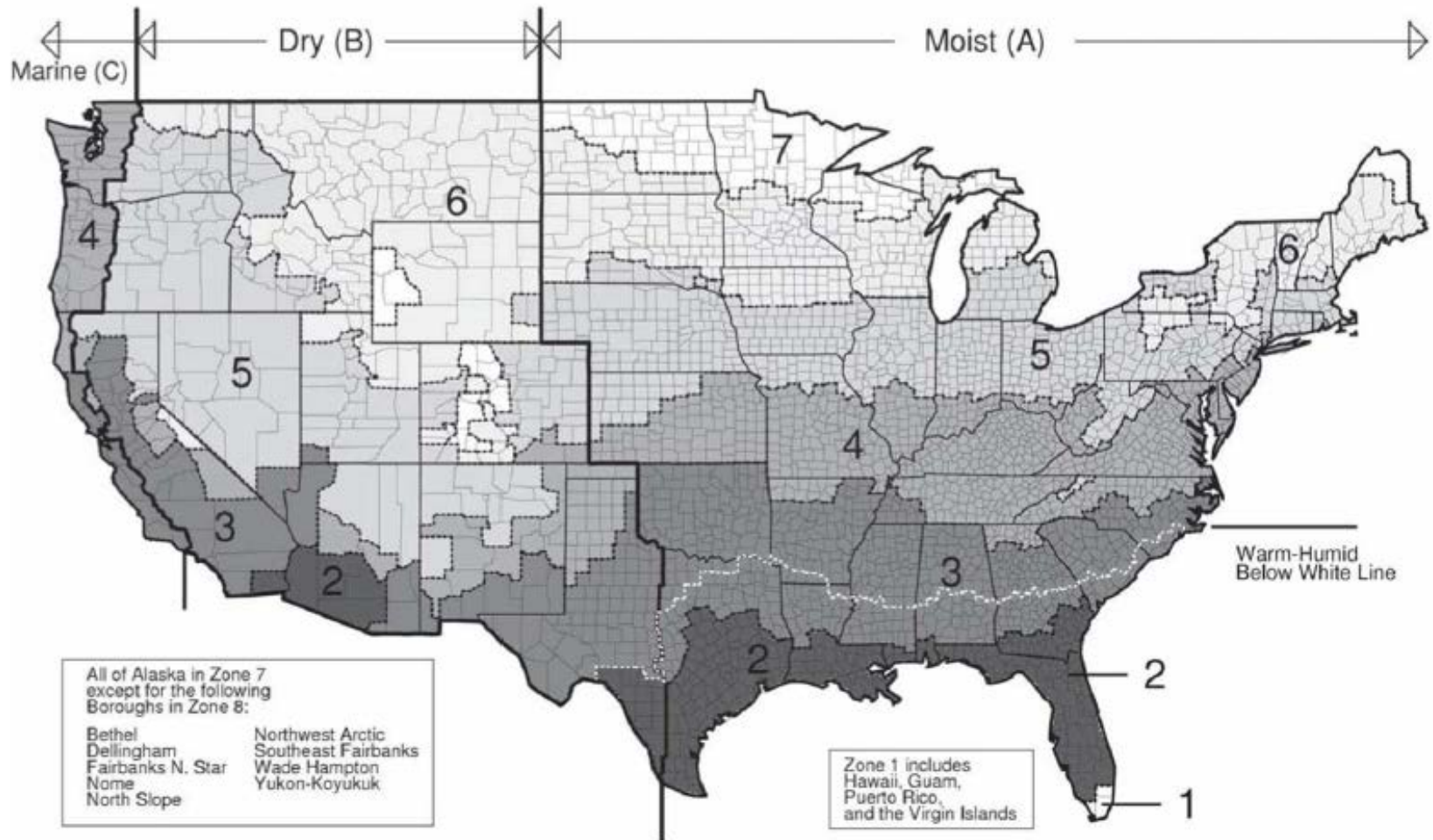


Figure 301.1, 2006 International Energy Conservation Code®

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