

SCE Utility for 2020 and Beyond

A Smarter, Cleaner, Reliable Energy Future

ADVANCED
TECHNOLOGY
Transmission & Distribution Business Unit



Michael R. Montoya
March 30, 2011

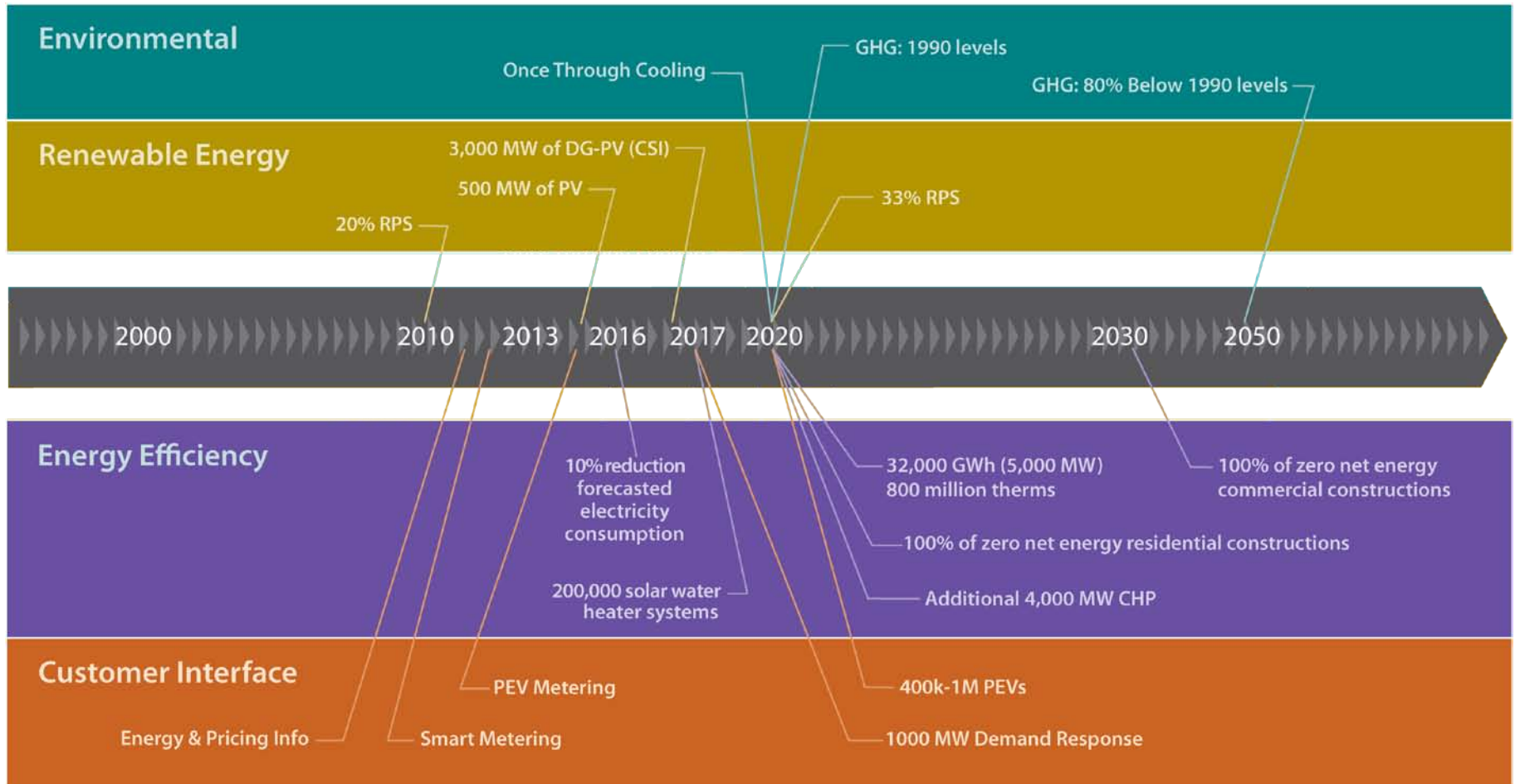
Pioneering the Future with SCE's Smart Grid Vision

- SCE's vision of a smart grid is to develop and deploy a more reliable, secure, economic, efficient, safe and environmentally-friendly electric system covering all facets of electricity from production through transmission, distribution, and its smart use in homes, businesses and vehicles.



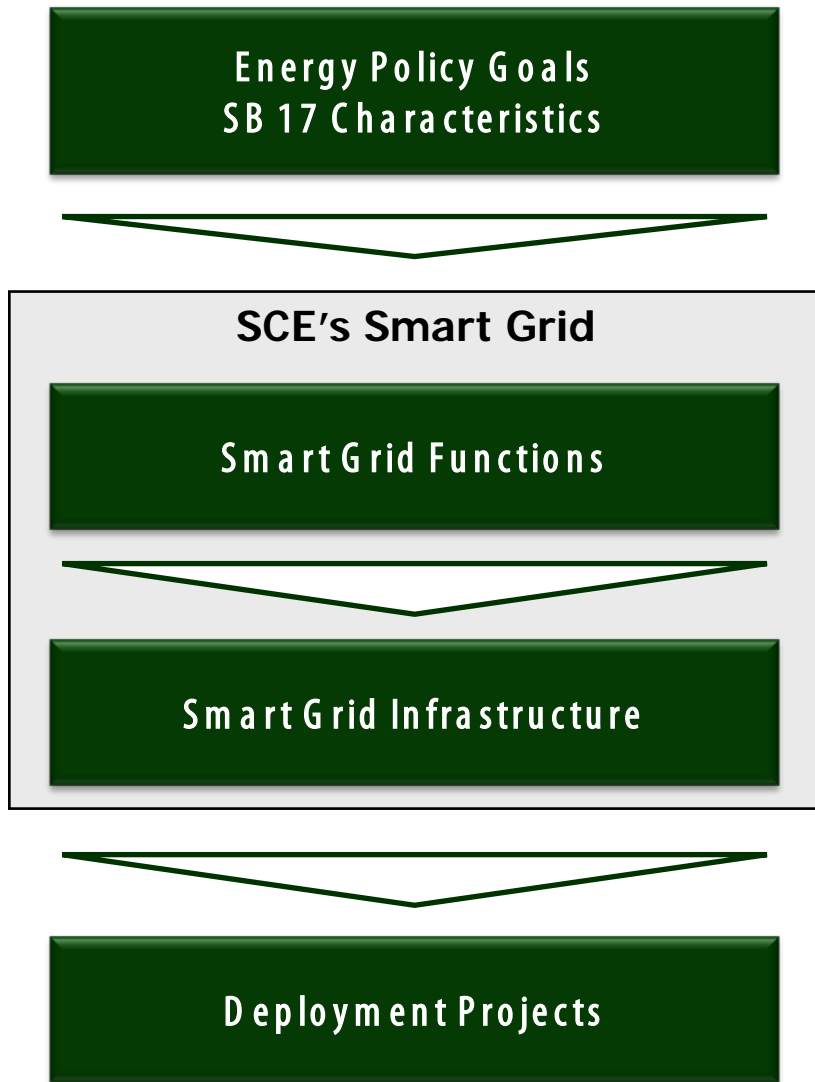
CA Policies Affecting Smart Grid Development

Most aggressive policies in the United States



*This list is not comprehensive. Other energy policies or other drivers, e.g. R.A.M.F.I.T. or DG proposals, will also impact utility planning and operations

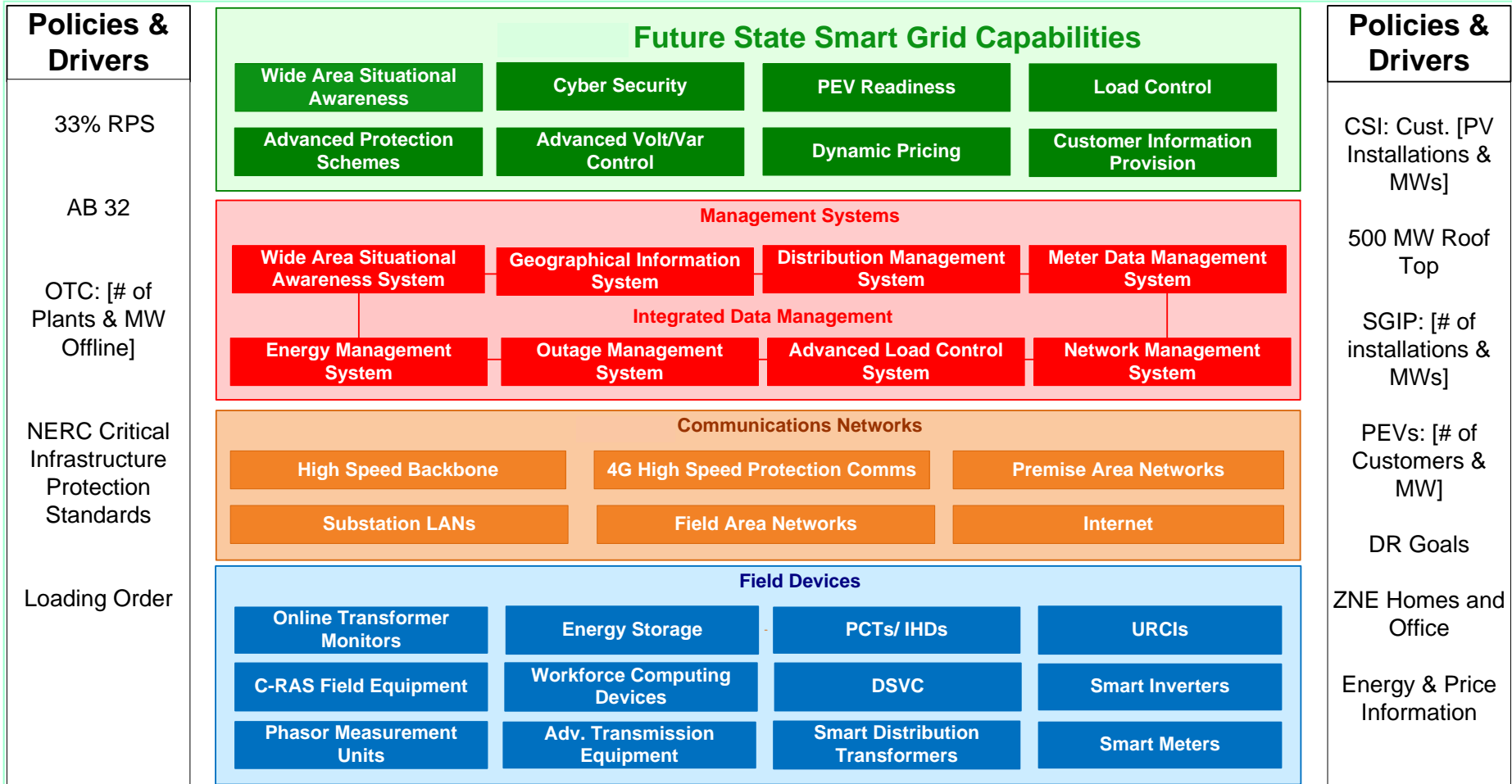
Smart Grid Deployment Plan (SGDP) Framework



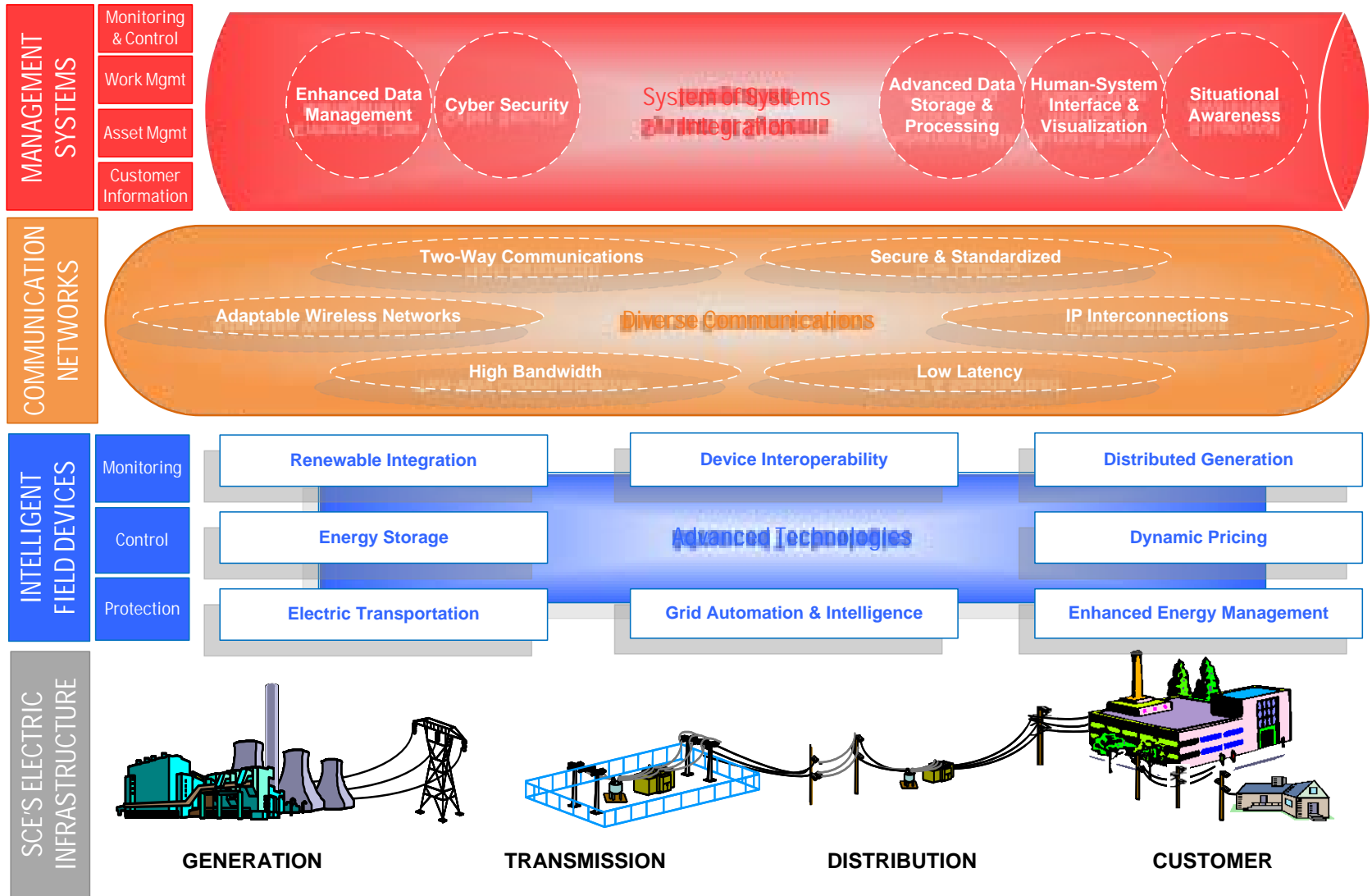
SGDP Outline

Vision	Describe SG functions that reflect policy goals and SB17
Strategy	Define SG infrastructure required to support needed functions, and guidelines for deploying infrastructure
Baseline	Describe SCE's ability to deliver functions and progress of infrastructure deployment as of 12/31/10
Roadmap	Present timeline for deployment of infrastructure in deployment projects through 2020
Costs	Estimate costs of deployment projects through 2020
Benefits	Discuss benefits delivered by SG functions
Cyber Security	Present cyber security strategy consistent with D 1006047
Metrics	Report values as of 12/31/10

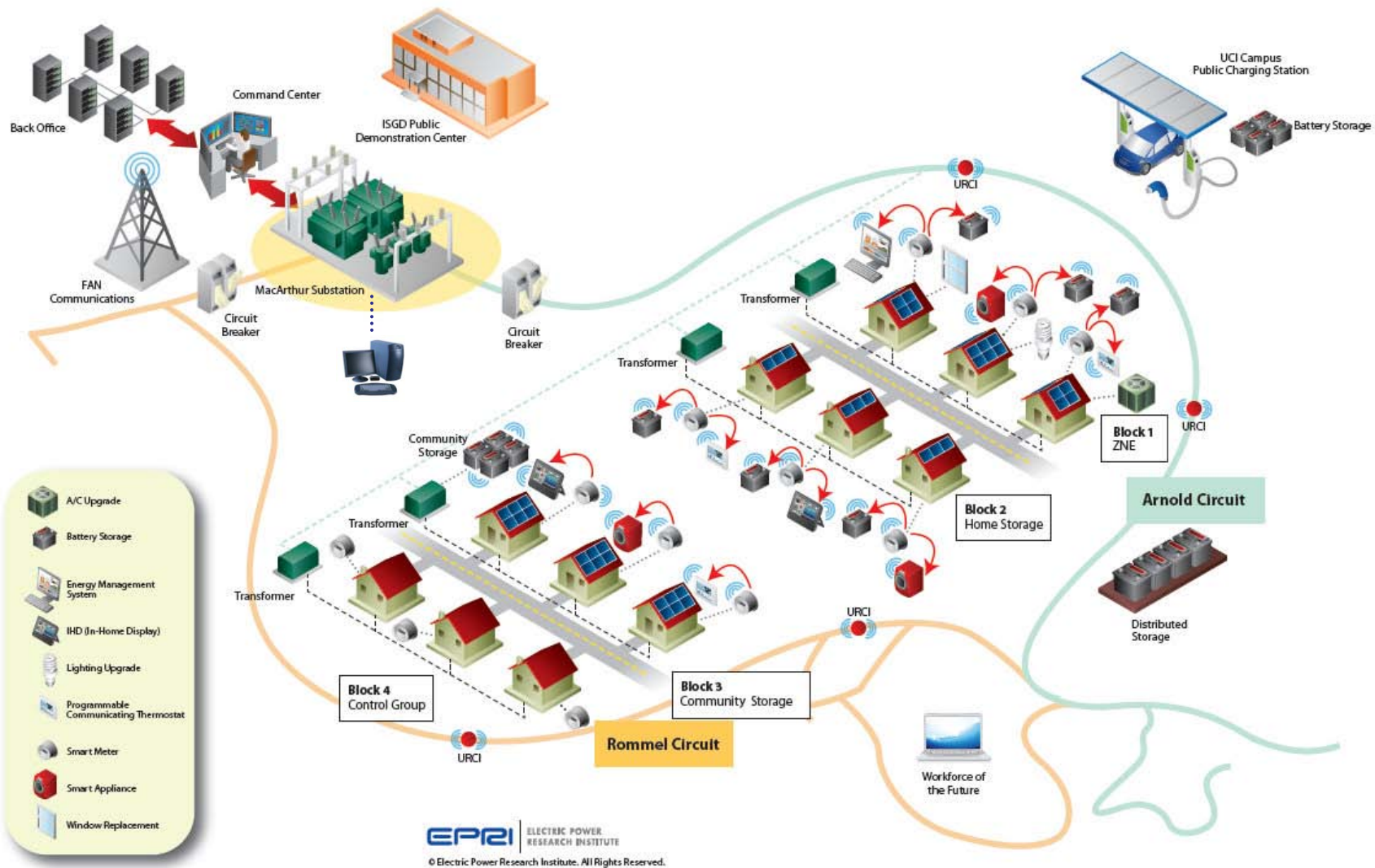
Requires Full Suite of Capabilities & Infrastructure



System of Systems

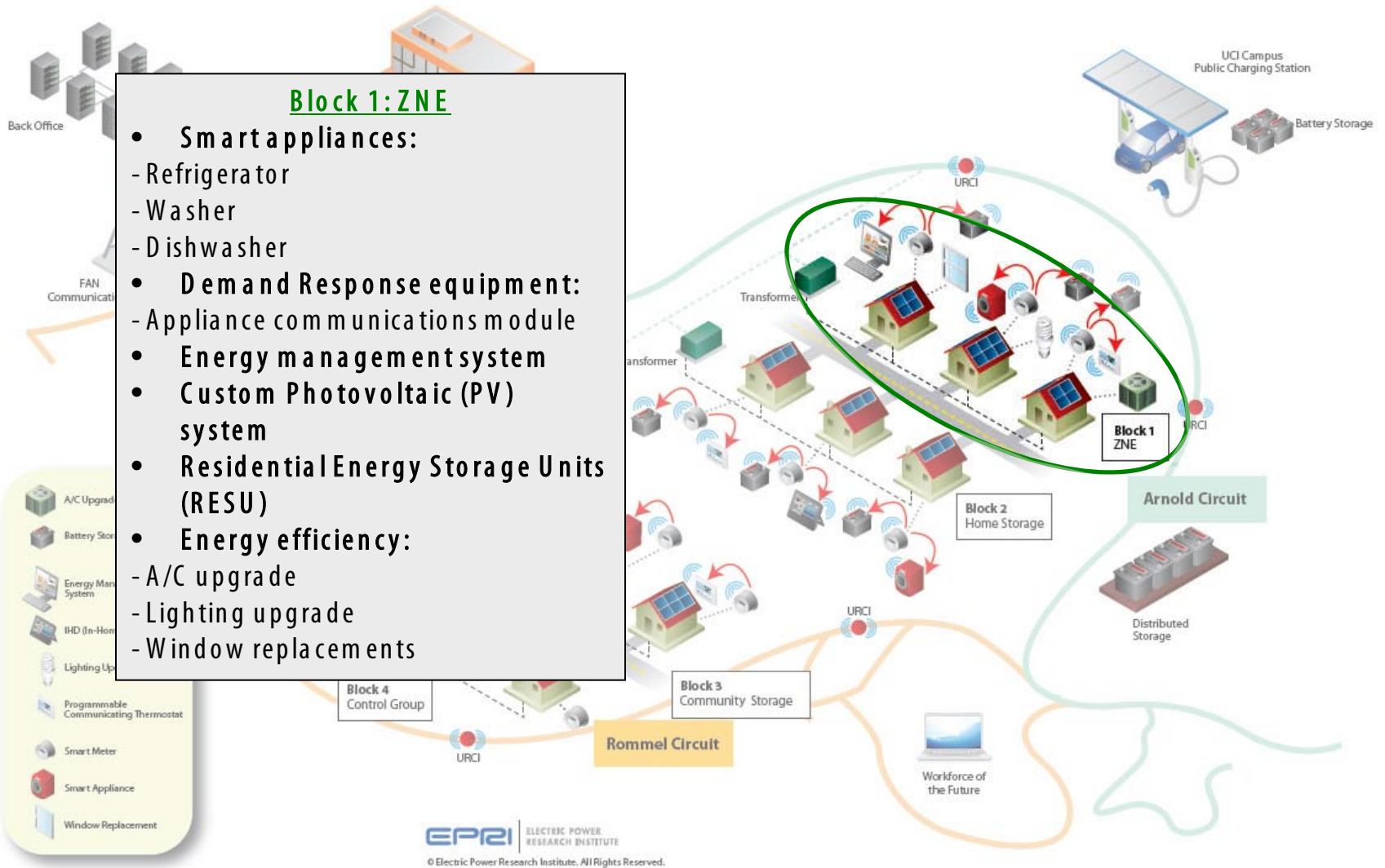


Demonstration Projects

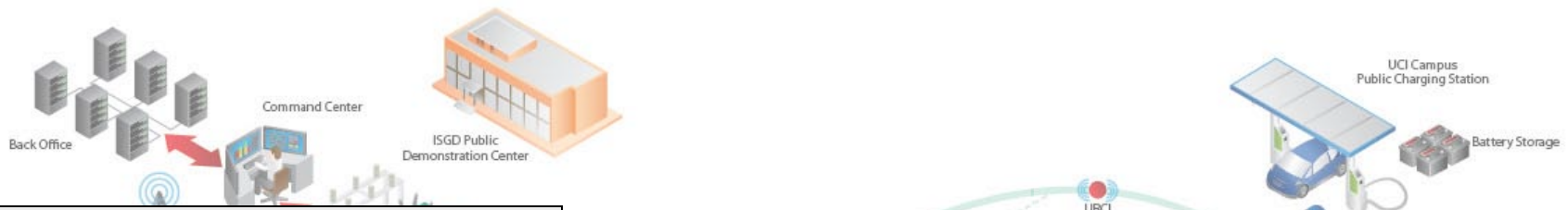


ISGD Scope

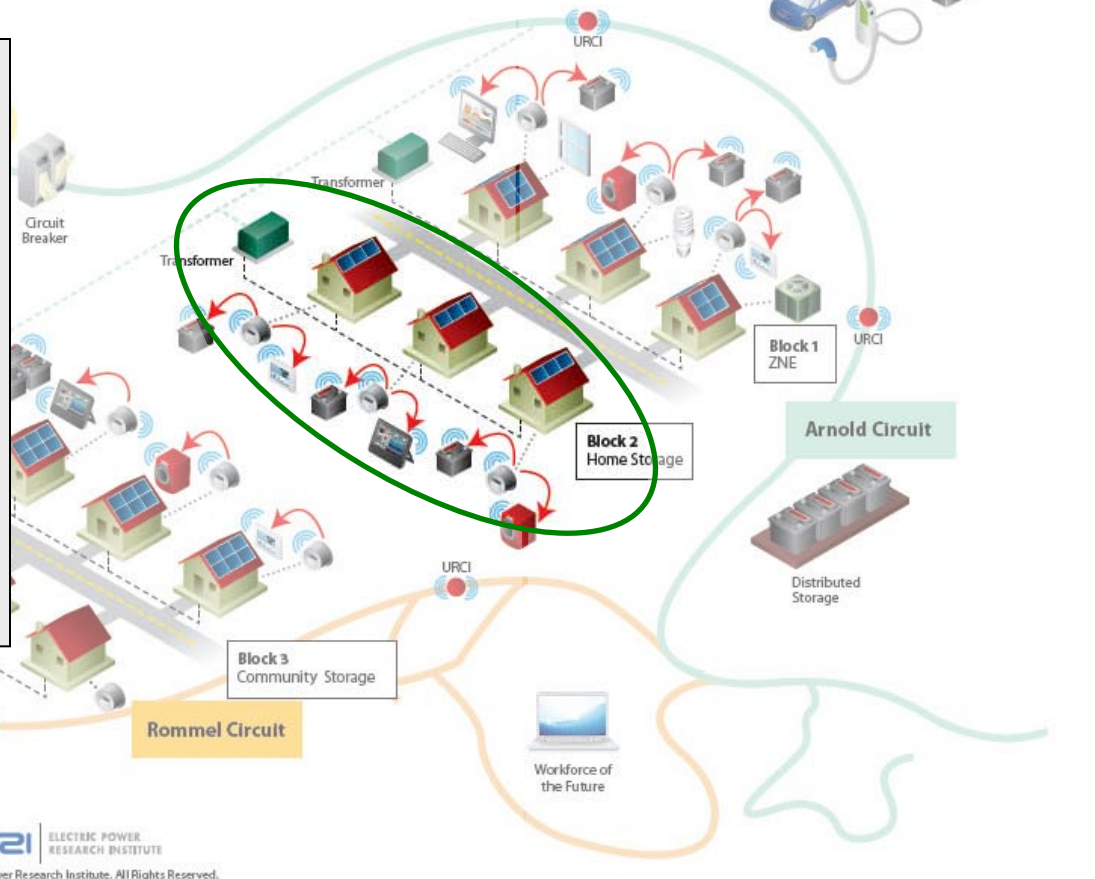
Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid



ISGD Scope



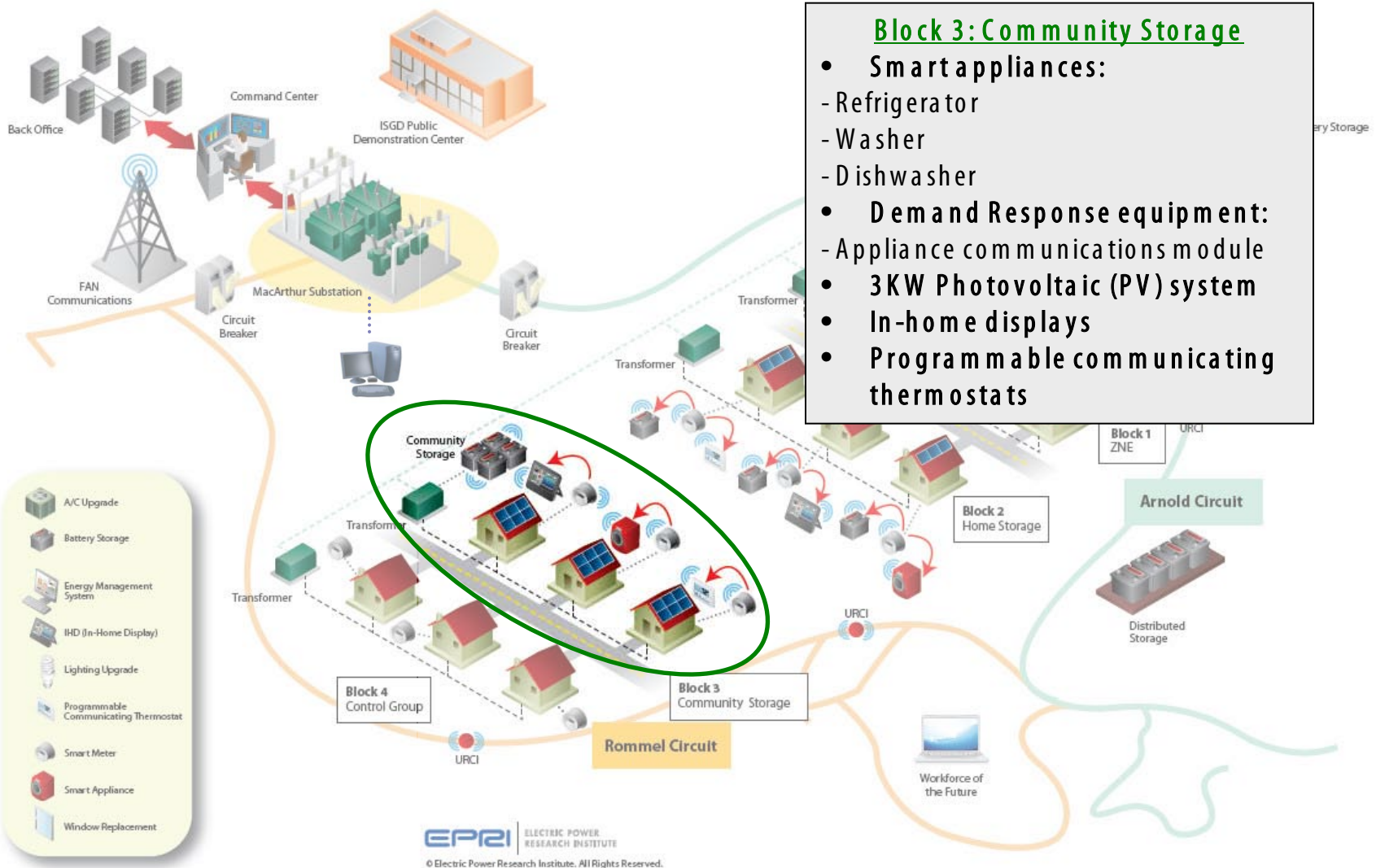
- ### Block 2: Home Storage
- **Smart appliances:**
 - Refrigerator
 - Washer
 - Dishwasher
 - **Demand Response equipment:**
 - Appliance communications module
 - 3KW Photovoltaic (PV) system
 - Residential Energy Storage Units (RESU)
 - In-home displays
 - Programmable communicating thermostats



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ISGD Scope

Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid



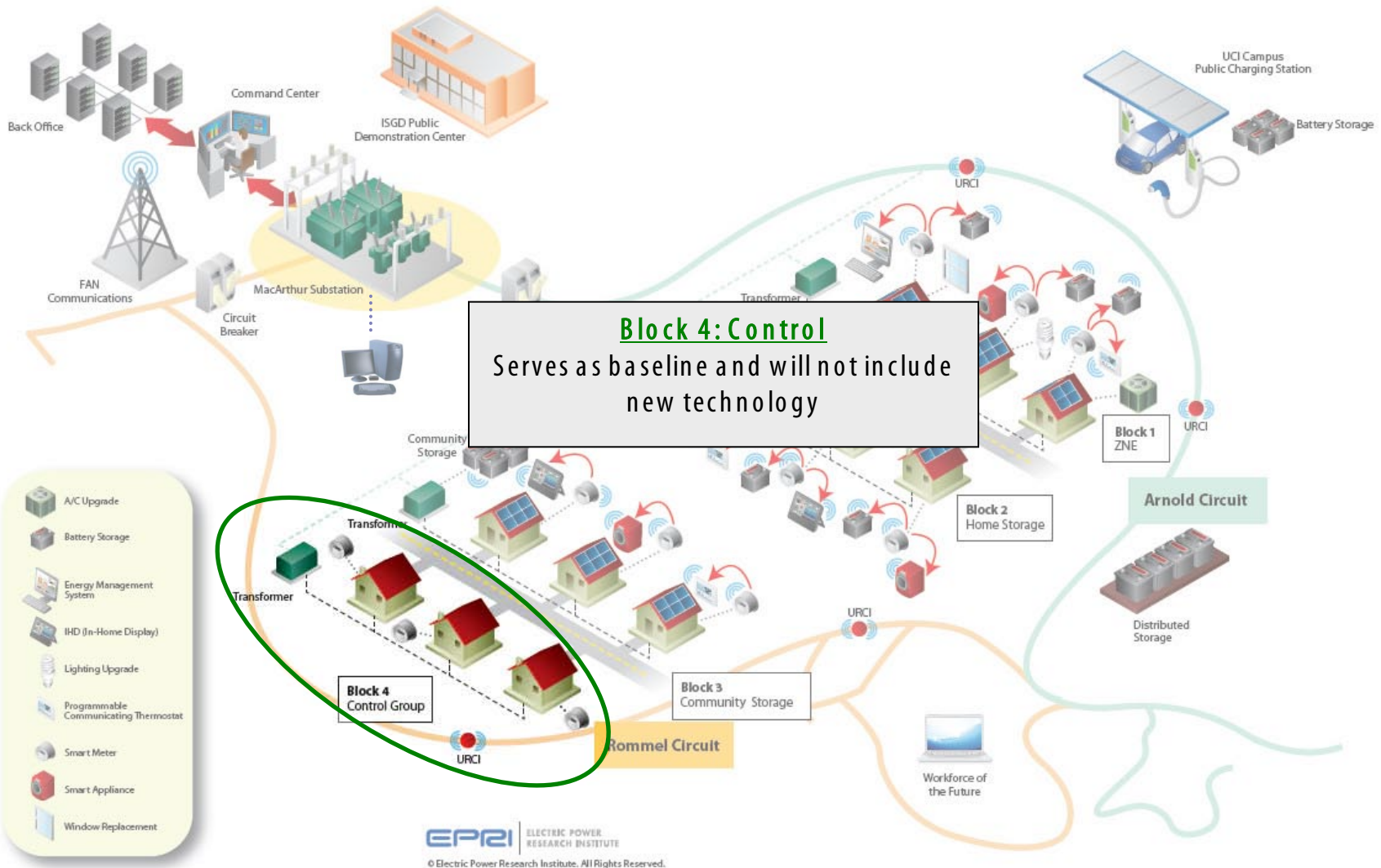
- Block 3: Community Storage**
- Smart appliances:
 - Refrigerator
 - Washer
 - Dishwasher
 - Demand Response equipment:
 - Appliance communications module
 - 3KW Photovoltaic (PV) system
 - In-home displays
 - Programmable communicating thermostats

- A/C Upgrade
- Battery Storage
- Energy Management System
- IHD (In-Home Display)
- Lighting Upgrade
- Programmable Communicating Thermostat
- Smart Meter
- Smart Appliance
- Window Replacement

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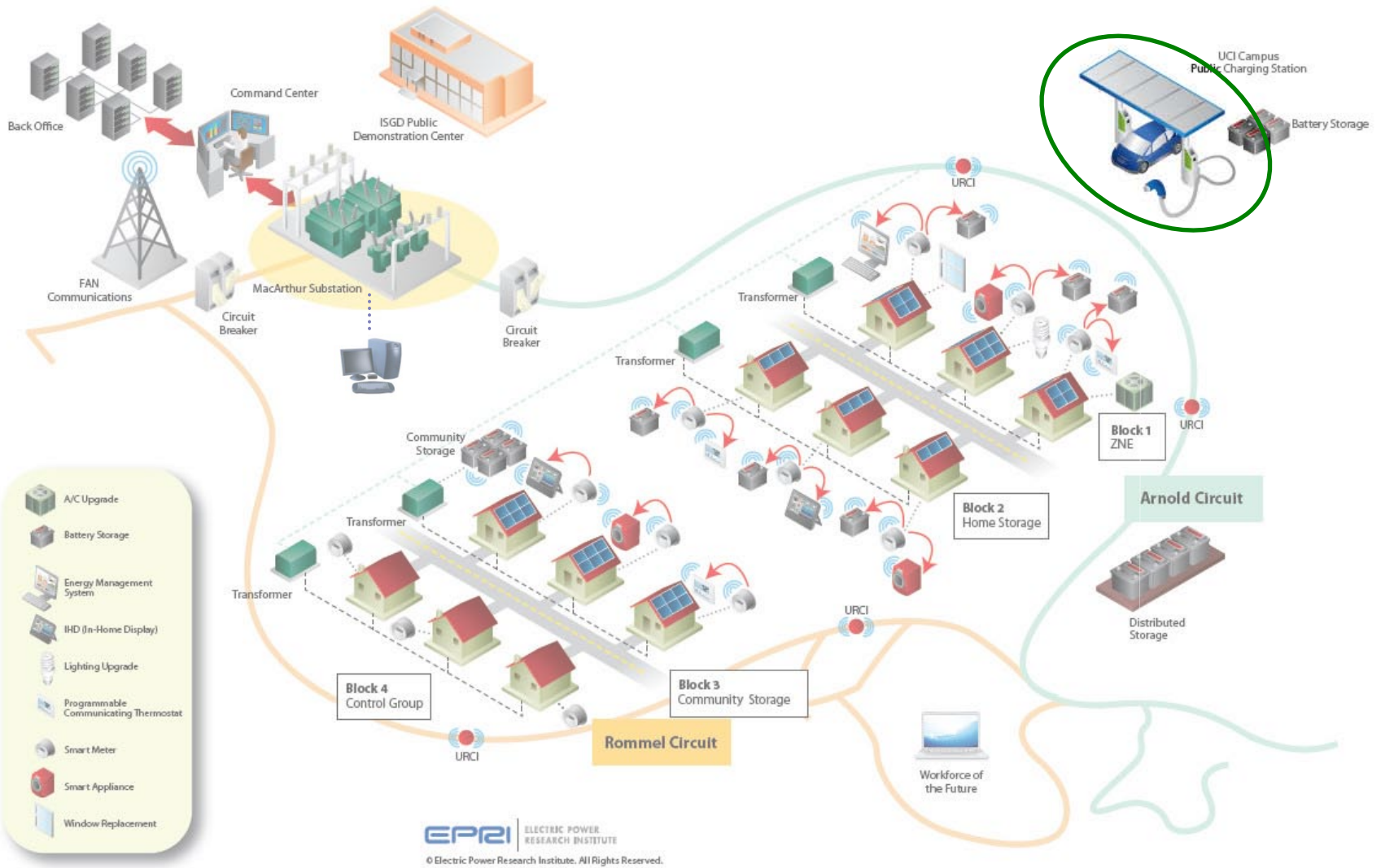
Subproject I – Evaluating Zero Net Energy (ZNE) Home on the Grid



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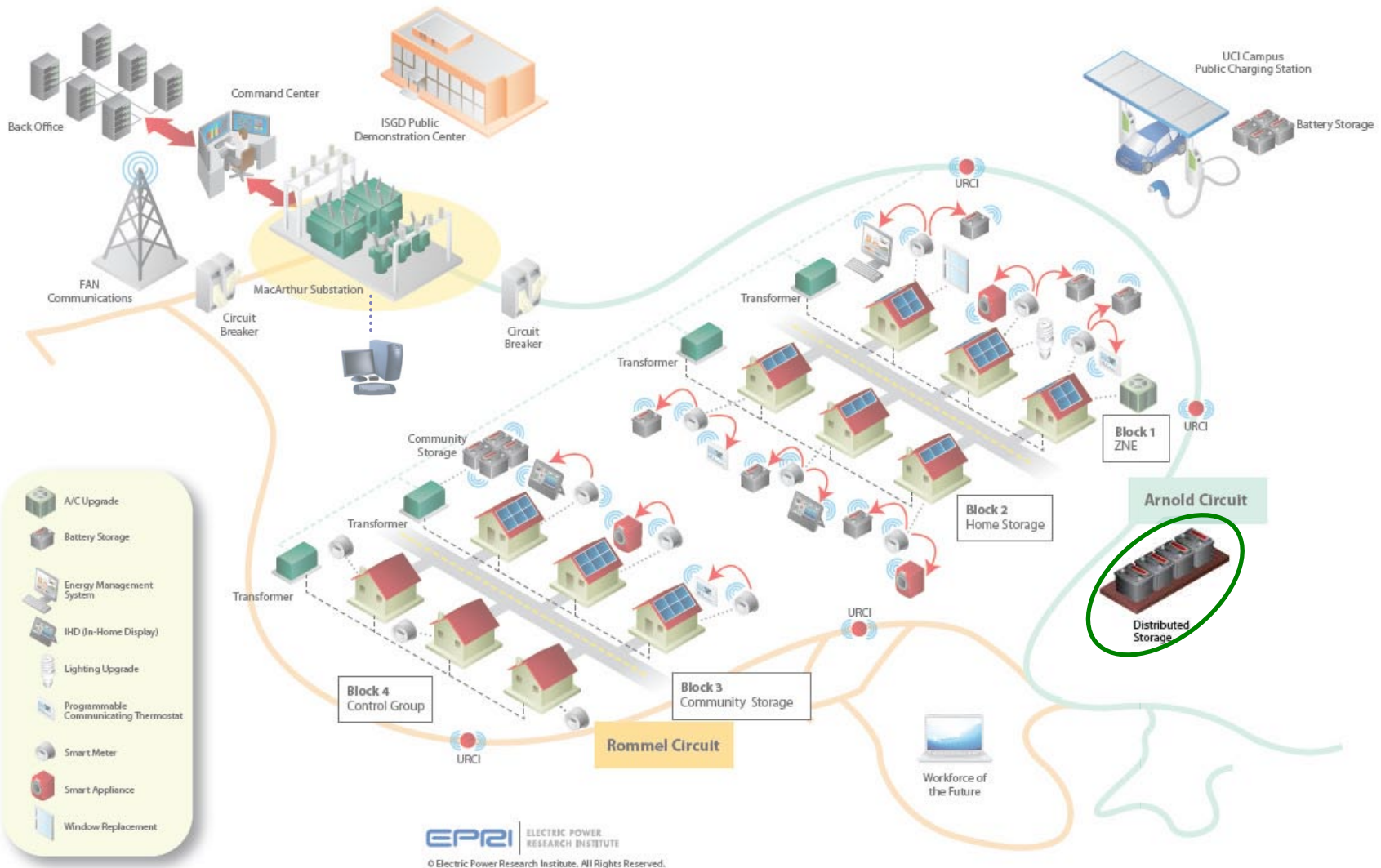
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Subproject II – Plug-In Electric Vehicle (PEV) Charging at Home and Work



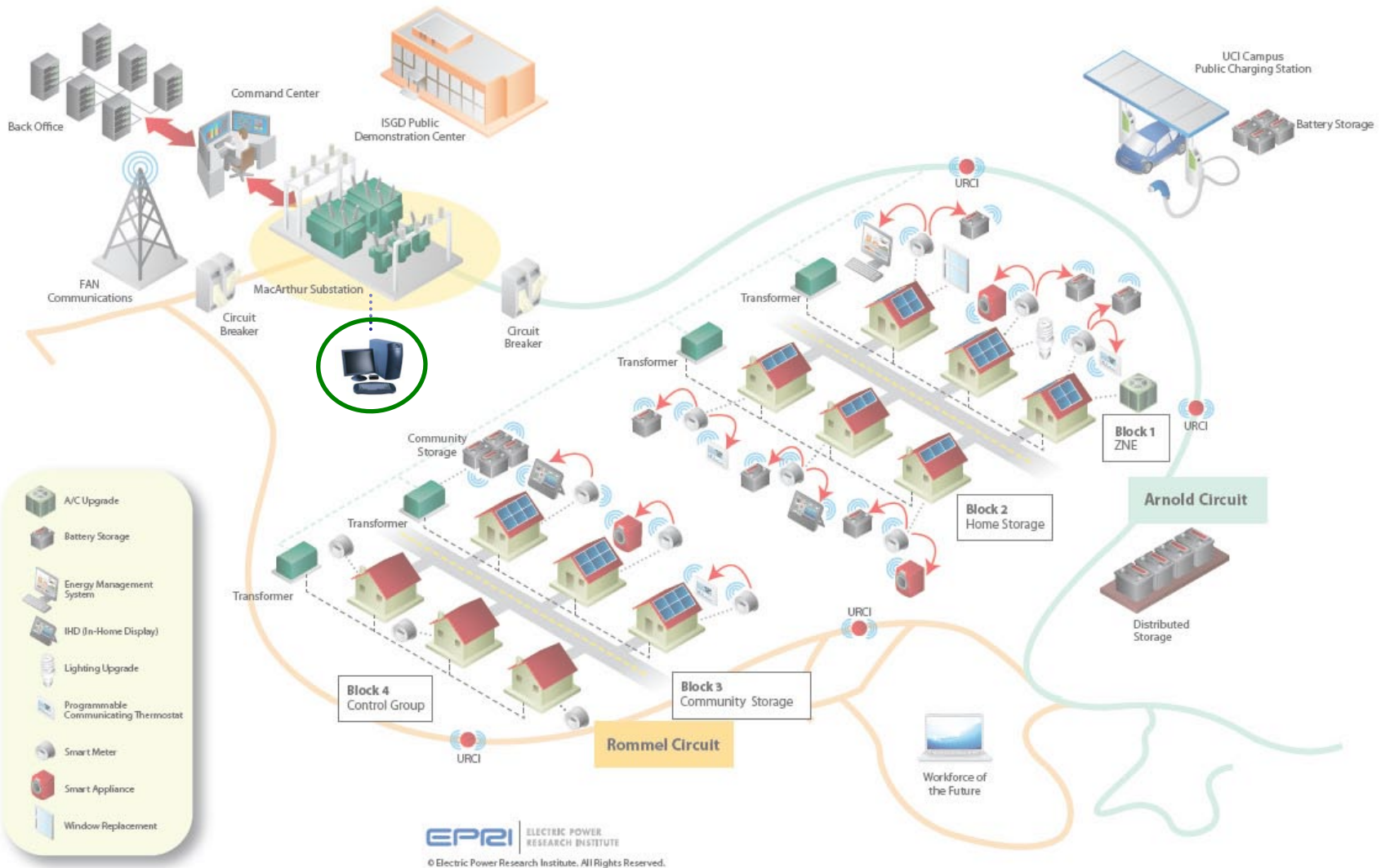
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Subproject III – Distribution Circuit Constraint Management Using Energy Storage

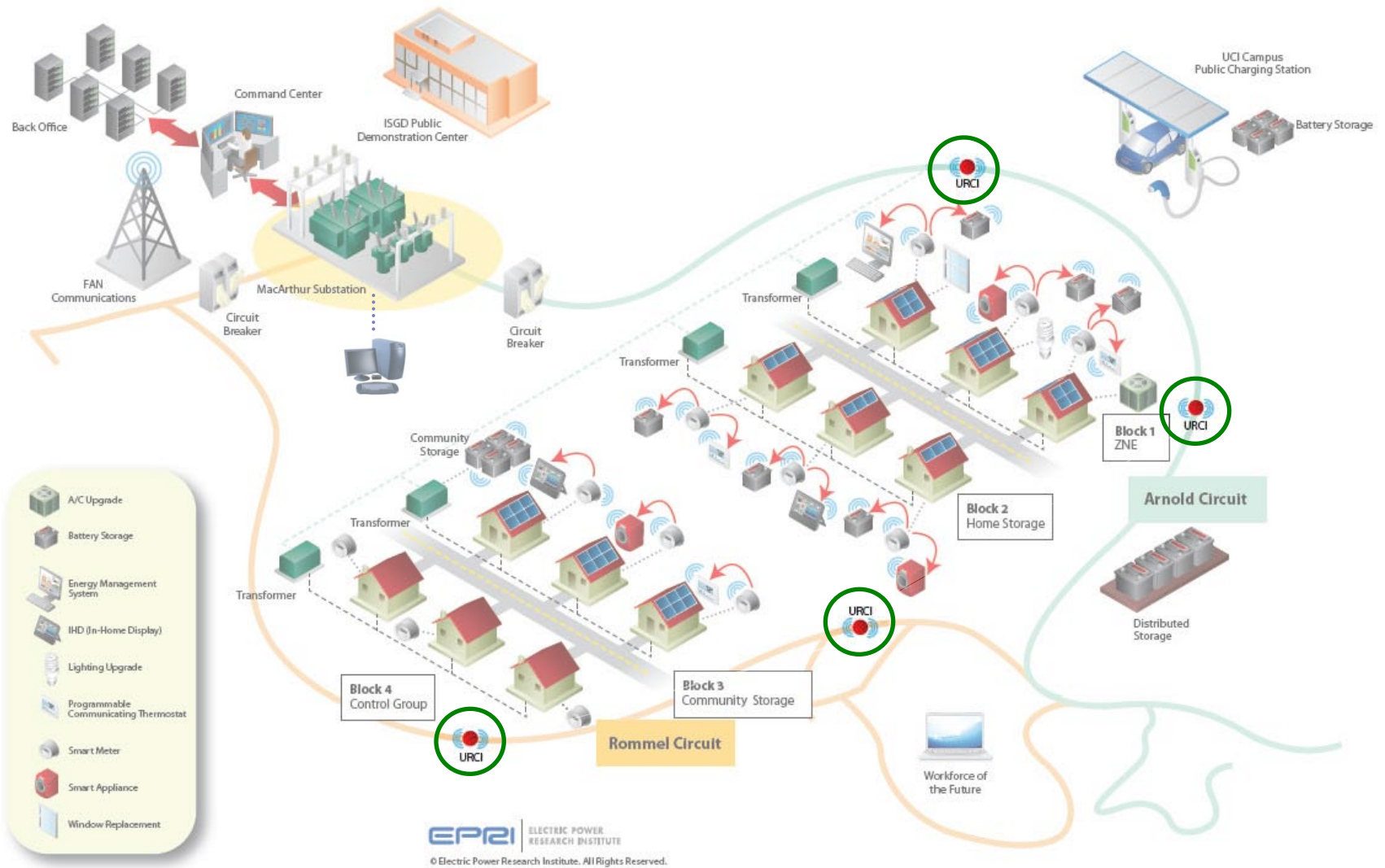


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Subproject IV – Enhanced Circuit Efficiency and Power Quality through Volt/VAR and Frequency Control

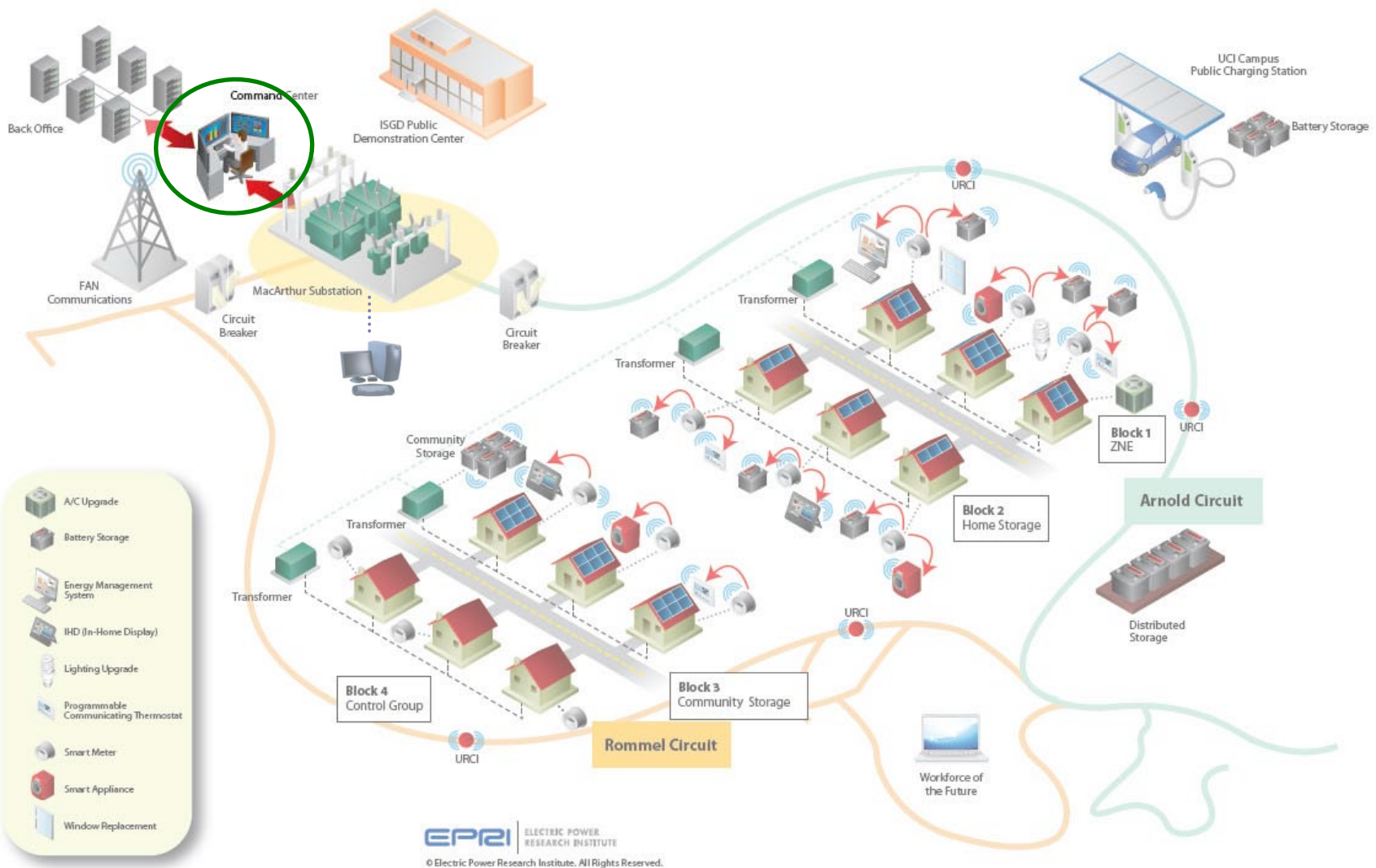


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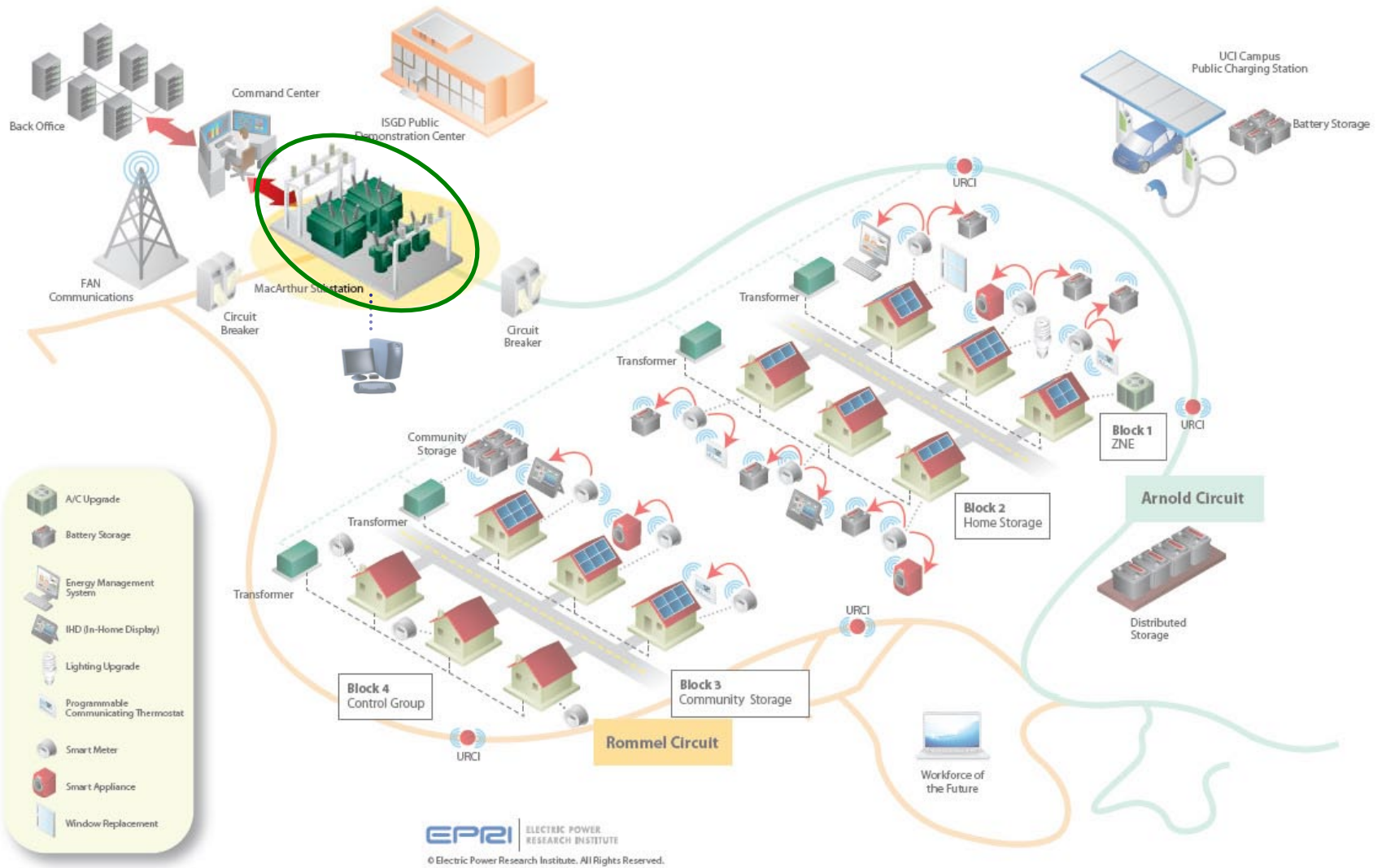


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Subproject VI – Deep Grid Situational Awareness for Transmission Operators Using Phasor Technology

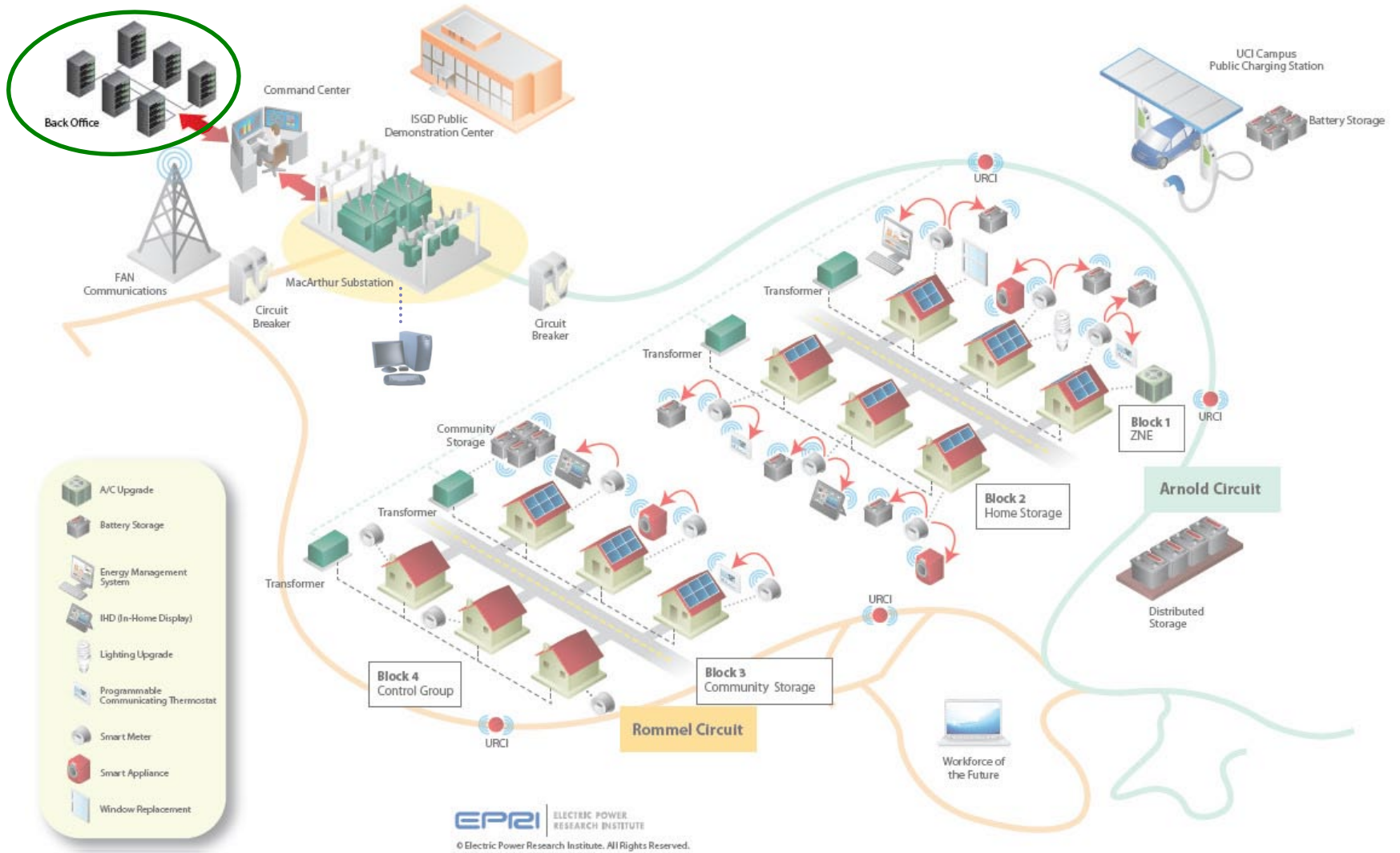


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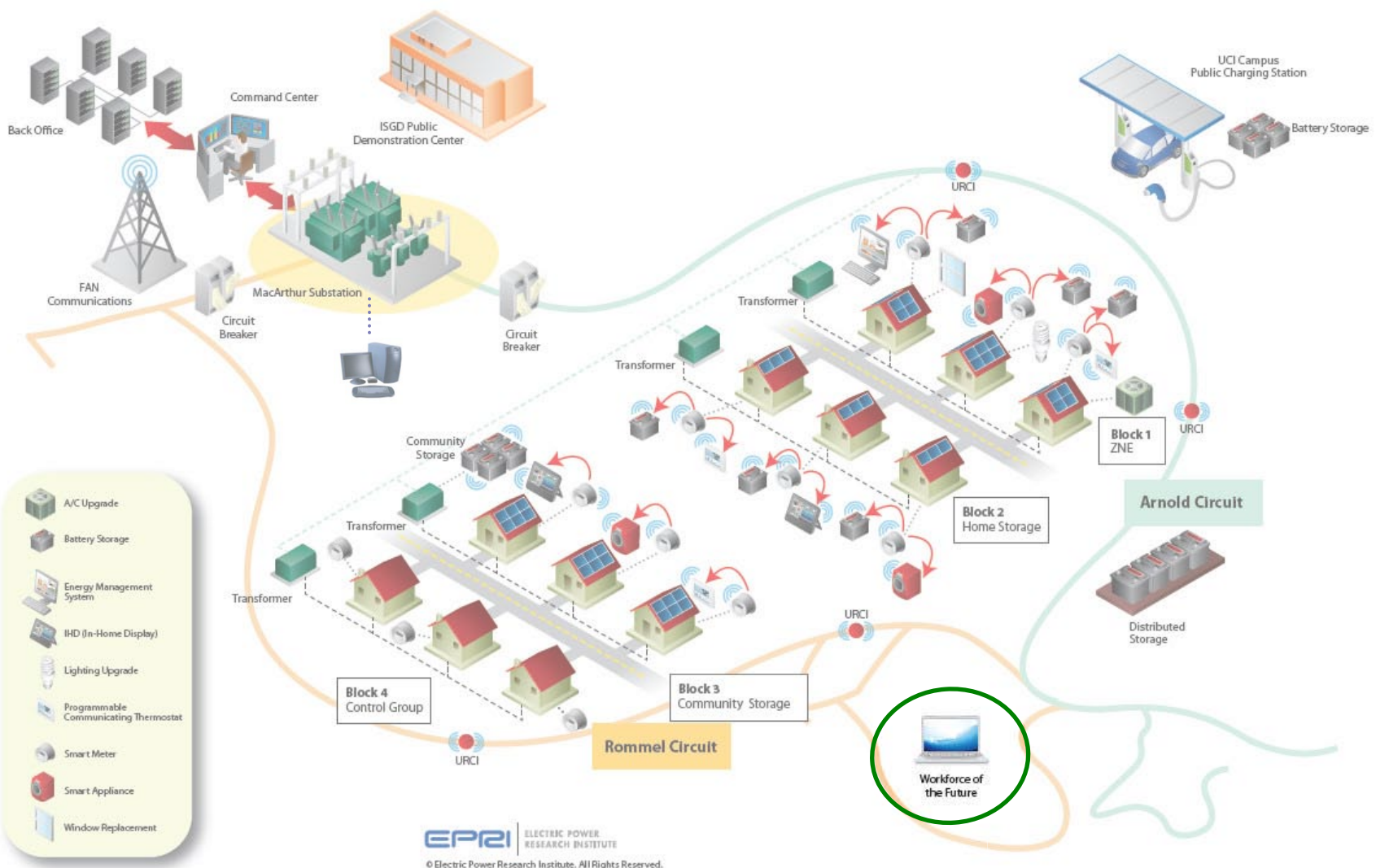
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Subproject VII – Demonstrating End-to-End Cyber Security and Interoperability of Three Primary Networks Inter-Utality, Intra-Utality and Field Area



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Subproject VIII – Identify the Organizational Impacts and Educational Curriculum Development to Produce the Next Generation Utility Worker



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Tehachapi Wind Energy Storage Project Scope

- The TSP will involve the largest ever grid-applied lithium-ion Energy Storage System (8MW-4hr or 32-MWhr) coupled with a Smart Inverter.
- The project intends to test & demonstrate 13 Research Objectives, both individually and “stacked”.



Key Objectives

TSP will test the largest ever grid-applied Lithium-ion Energy Storage System (8MW-4hr or 32MWhr) coupled with a Smart Inverter.

TSP will enable SCE to:

- Demonstrate the performance of a Lithium-ion Storage System for 13 specific operational uses, both individually and stacked
- Share data and results with CAISO, DOE, and other interested parties
- Test and demonstrate Smart Inverter with LISS
- Assess range and life-cycle of LISS
- Potentially resolve key issues with wind-integration and/or with remote generating sources
- Expand expertise in Energy Storage Technologies and Operations

Measurement & Verification Plan:

- Define and test 13 operational uses
 - Develop test plan for each operational use and for combining uses
 - Execute test plan
- Collect and analyze system performance data
 - Analyze performance vs. baseline
 - Quantify benefits/organize by DOE category

13 Use Cases

Transmission Uses:

1. Support with voltage/grid stabilization
2. Decrease transmission losses
3. Diminish congestion
4. Increase system reliability by load shed deferral
5. Defer transmission investment
6. Optimize size and cost of renewable energy-related transmission

System Uses:

7. Provide system capacity/resource adequacy
8. Integrate renewable energy (smoothing)
9. Shift wind generation output

Market Uses:

10. Frequency regulation
11. Spin/non-spin replacement reserves
12. Capacity for ramping, reductions in ramping needs
13. Energy price arbitrage

Facility With Battery & Inverter System

Racks of batteries will be installed inside a new climate controlled facility at Monolith



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For more information on SCE's Smart Grid strategy, news,
and updates, go to: www.sce.com/smartgrid