

Smart Grid Projects at SCE

**ADVANCED
TECHNOLOGY**
Transmission & Distribution Business Unit



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Southern California Edison (SCE) Overview



- Serves a population of about 14 million people in a 50,000-square-mile service area within central, coastal and Southern California
- 5 million electric meters
- 5,000 MW of generating capacity from interests in nuclear, hydroelectric, and fossil-fueled power plants
- Award-winning energy efficiency & DR customer programs
- Industry leader in renewable energy, electric transportation, smart grid and smart metering

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.



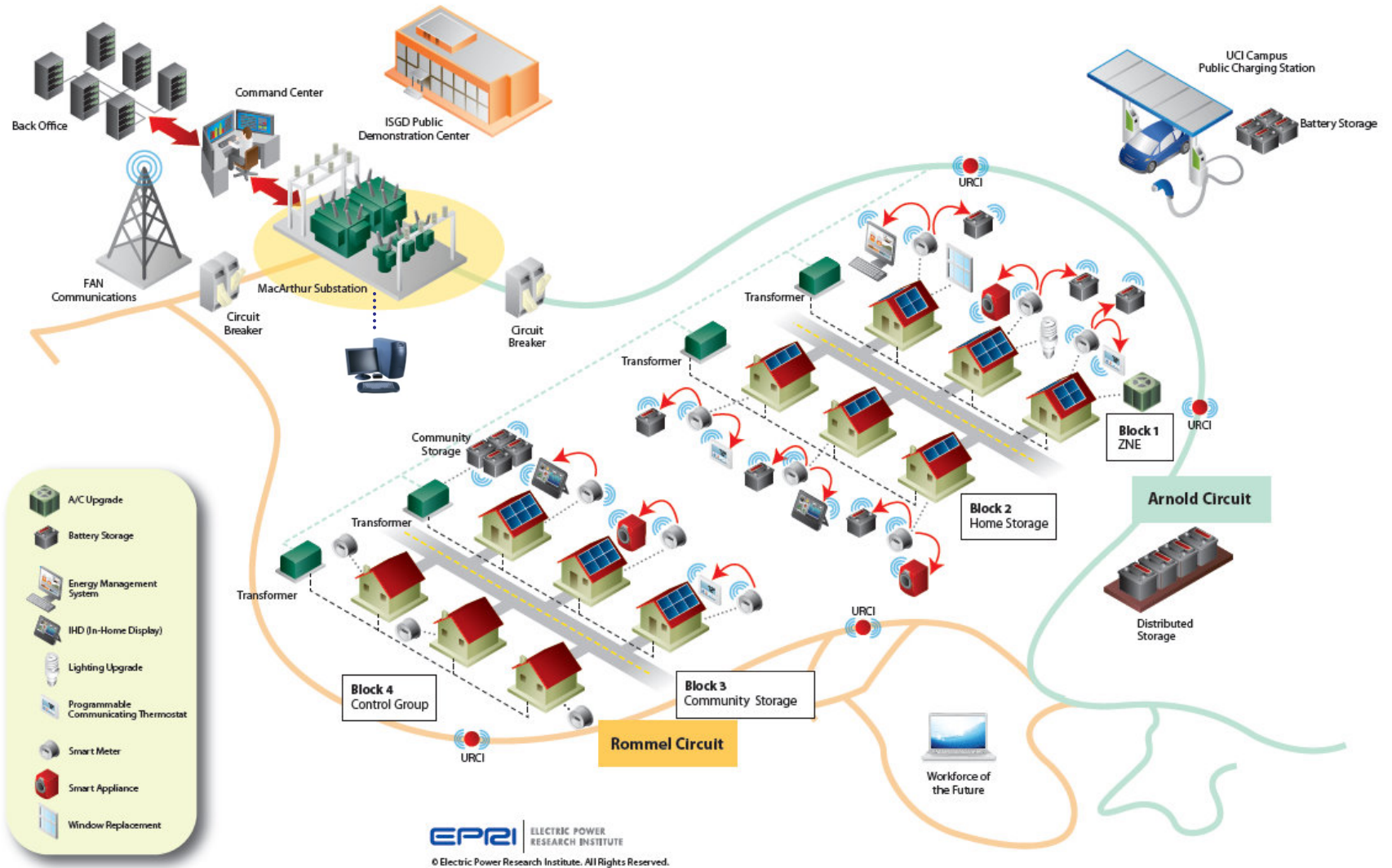
Irvine Smart Grid Demonstration (ISGD)

ISGD Objective

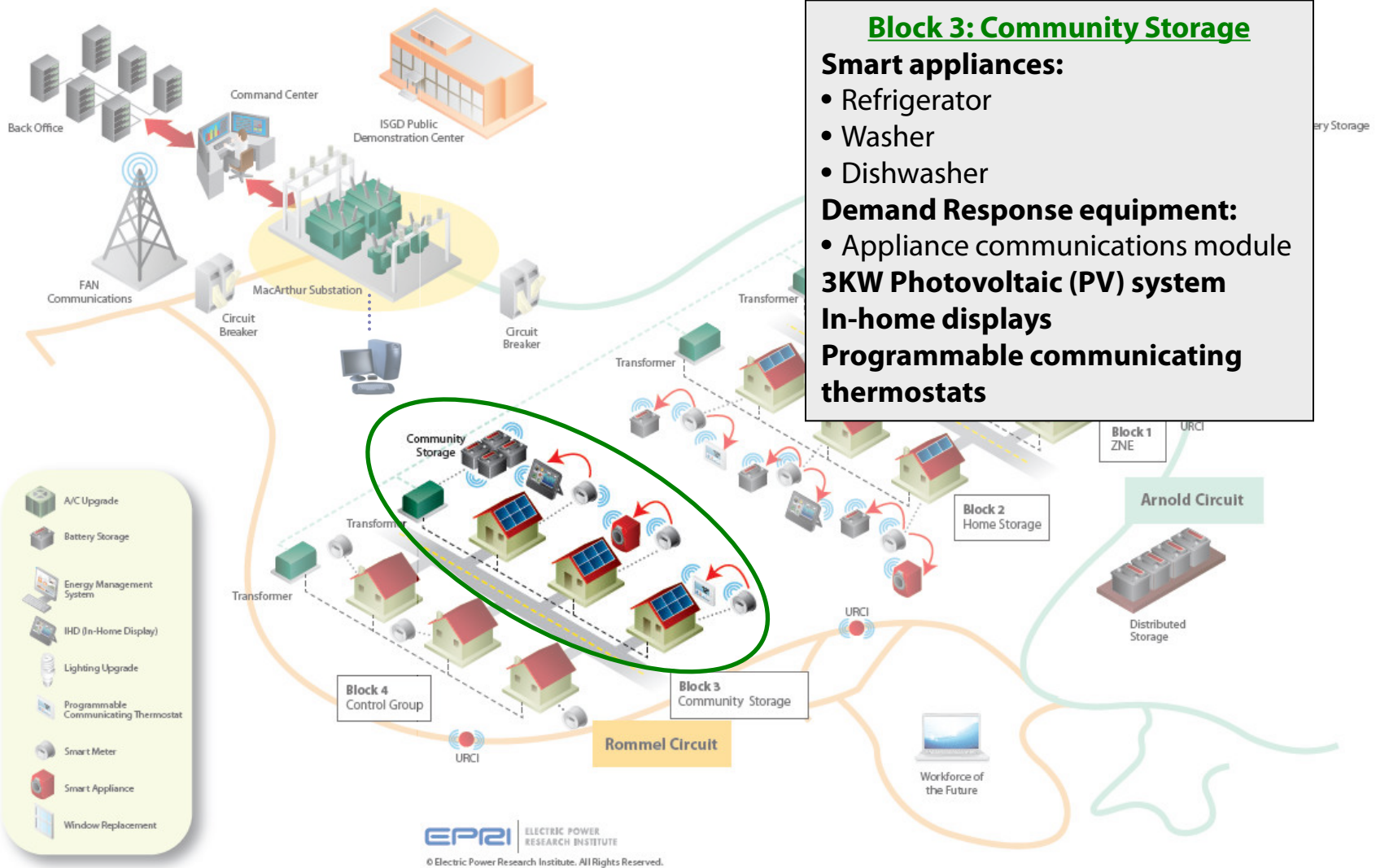
- The ISGD project demonstrates
 - Existing and new Smart Grid technologies in the same location with the following demonstration goals:
 - Interconnectivity and interoperability of those technologies
 - Reduction of energy cost to consumer using tariffs by shifting consumption load to off-peak hours
 - Cost savings and reduced emissions by optimizing circuit voltage and using renewable energy storage
- Identify organizational structure and recommended job training for nationwide implementation of Smart Grid technologies
- SCE expects that most, if not all, of these technologies will be part of the future Smart Grid and essential in meeting or exceeding the goals of various state- and nationwide initiatives regarding Smart Grid deployment and reducing carbon emissions
- The ISGD will yield use cases from successful demonstrations that will be applicable for utilities nationwide

1. Energy Smart Customer Devices

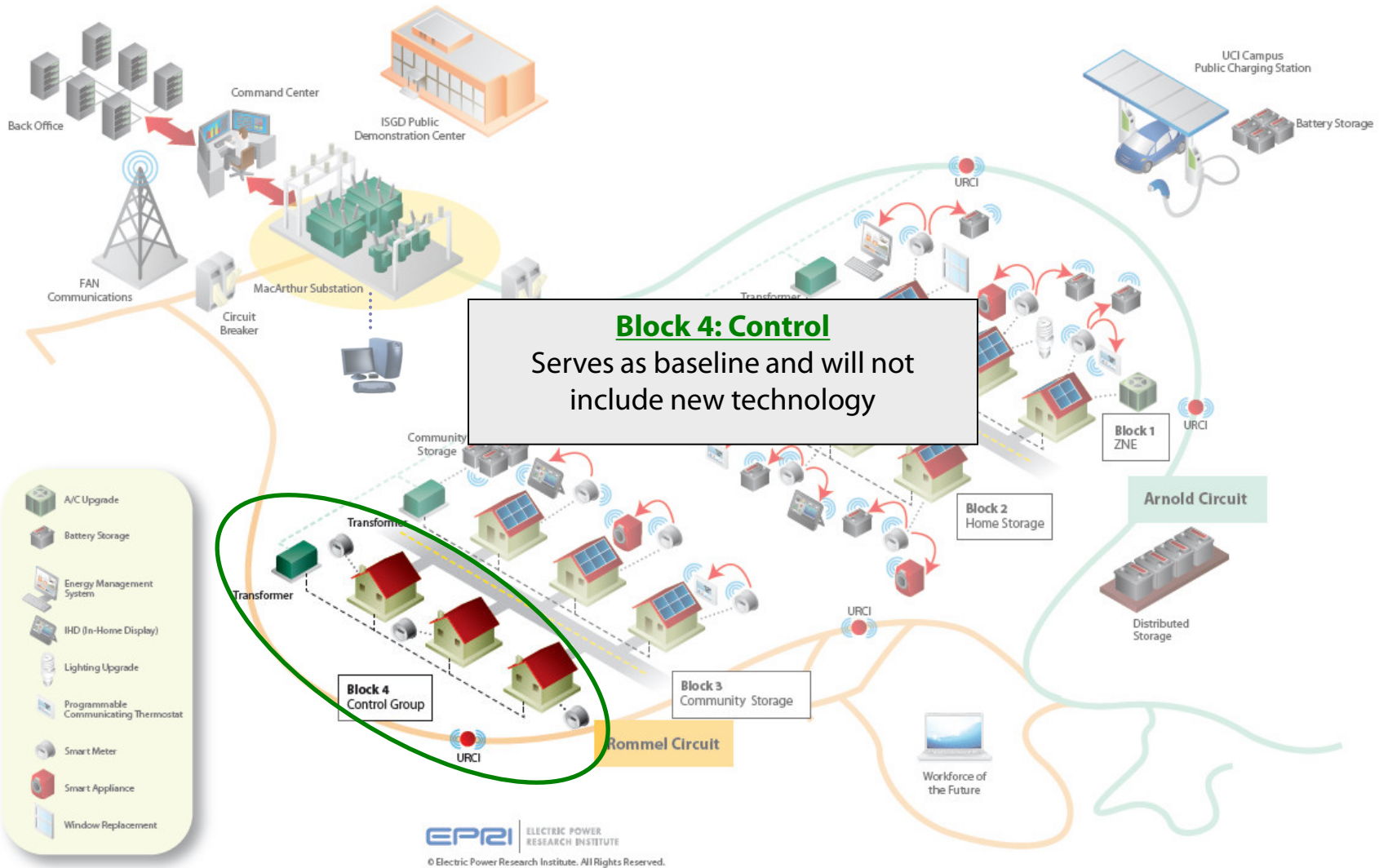
ISGD Scope



ISGD Scope

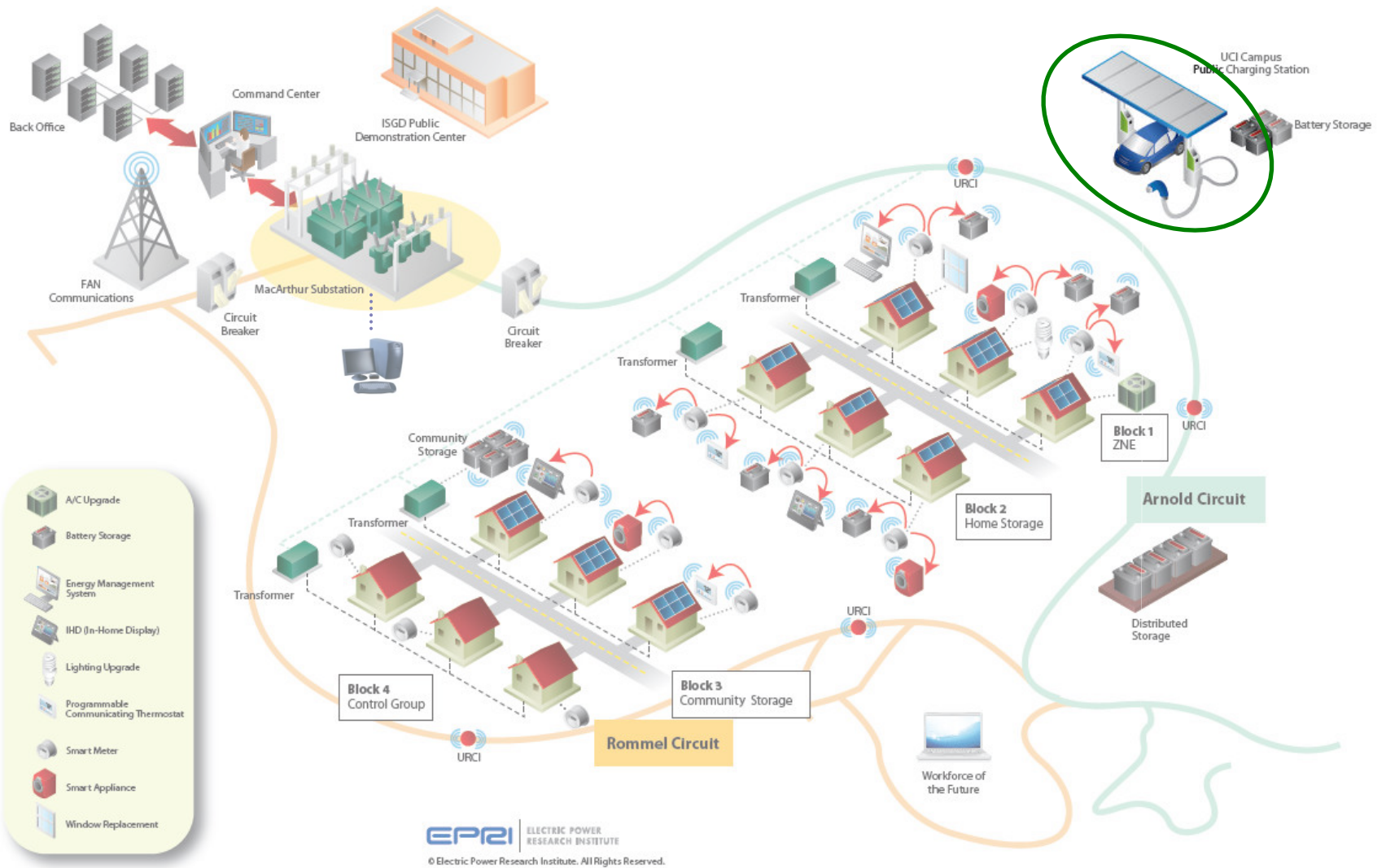


ISGD Scope

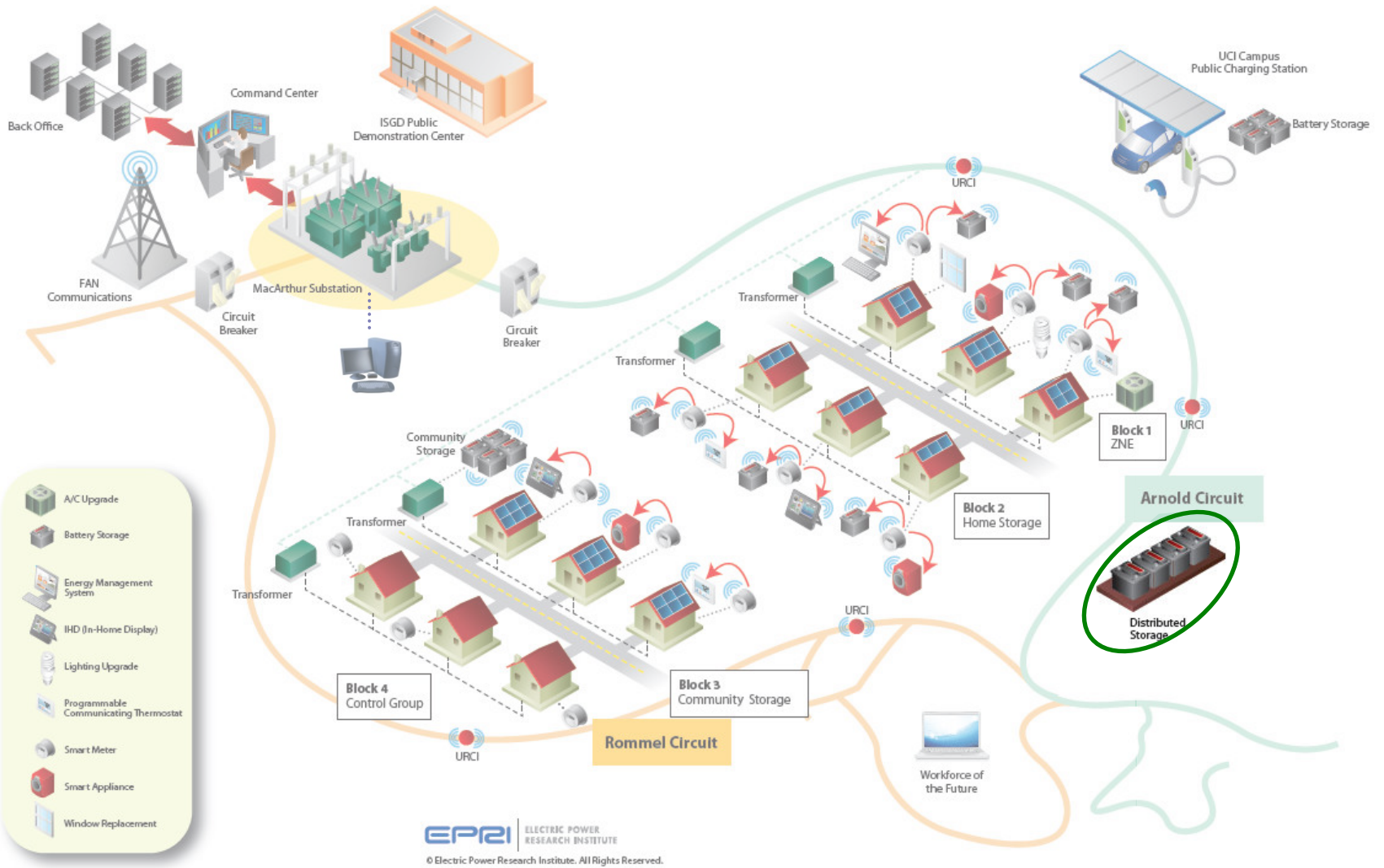


ISGD Scope

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



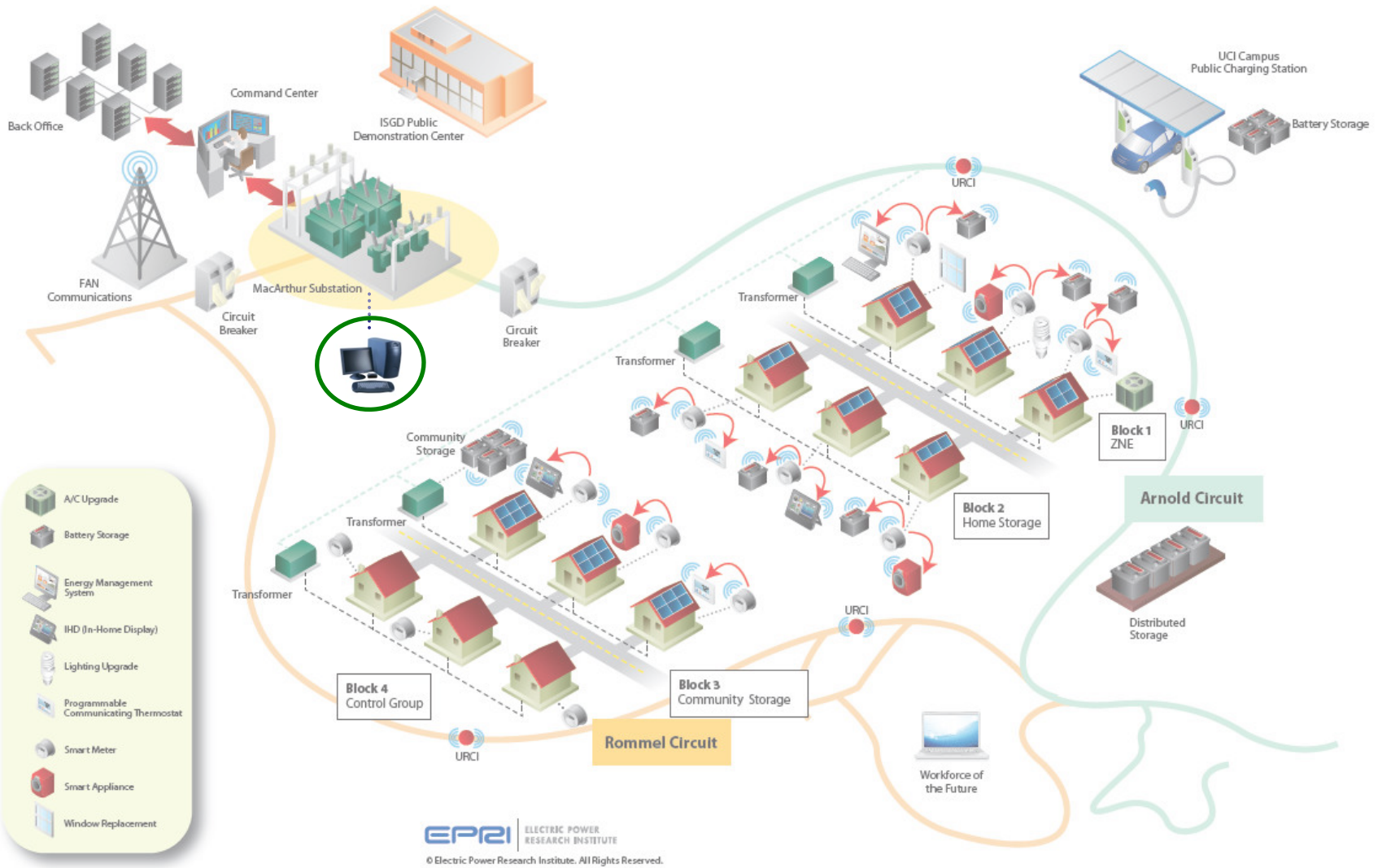
ISGD Scope



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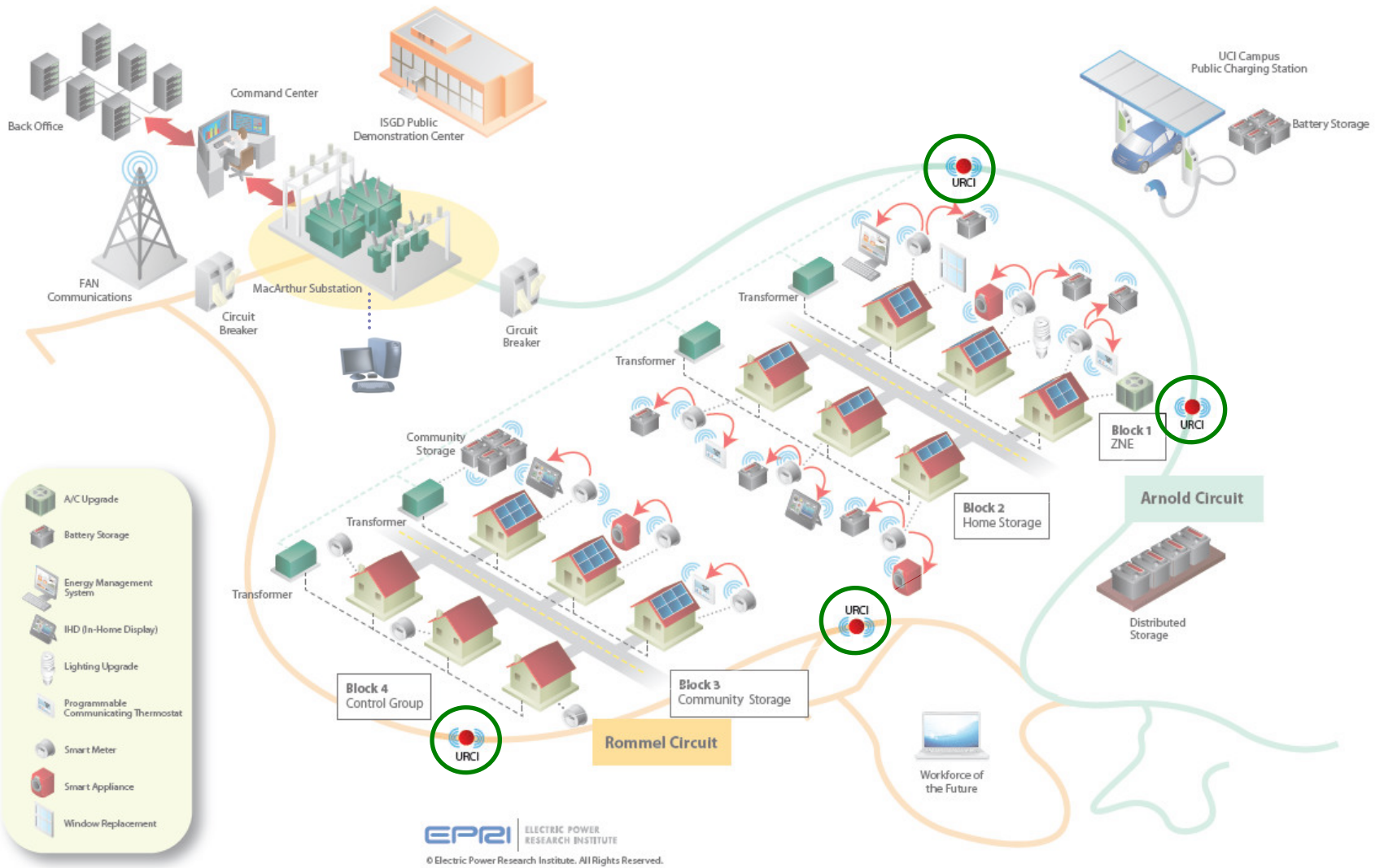
ISGD Scope

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



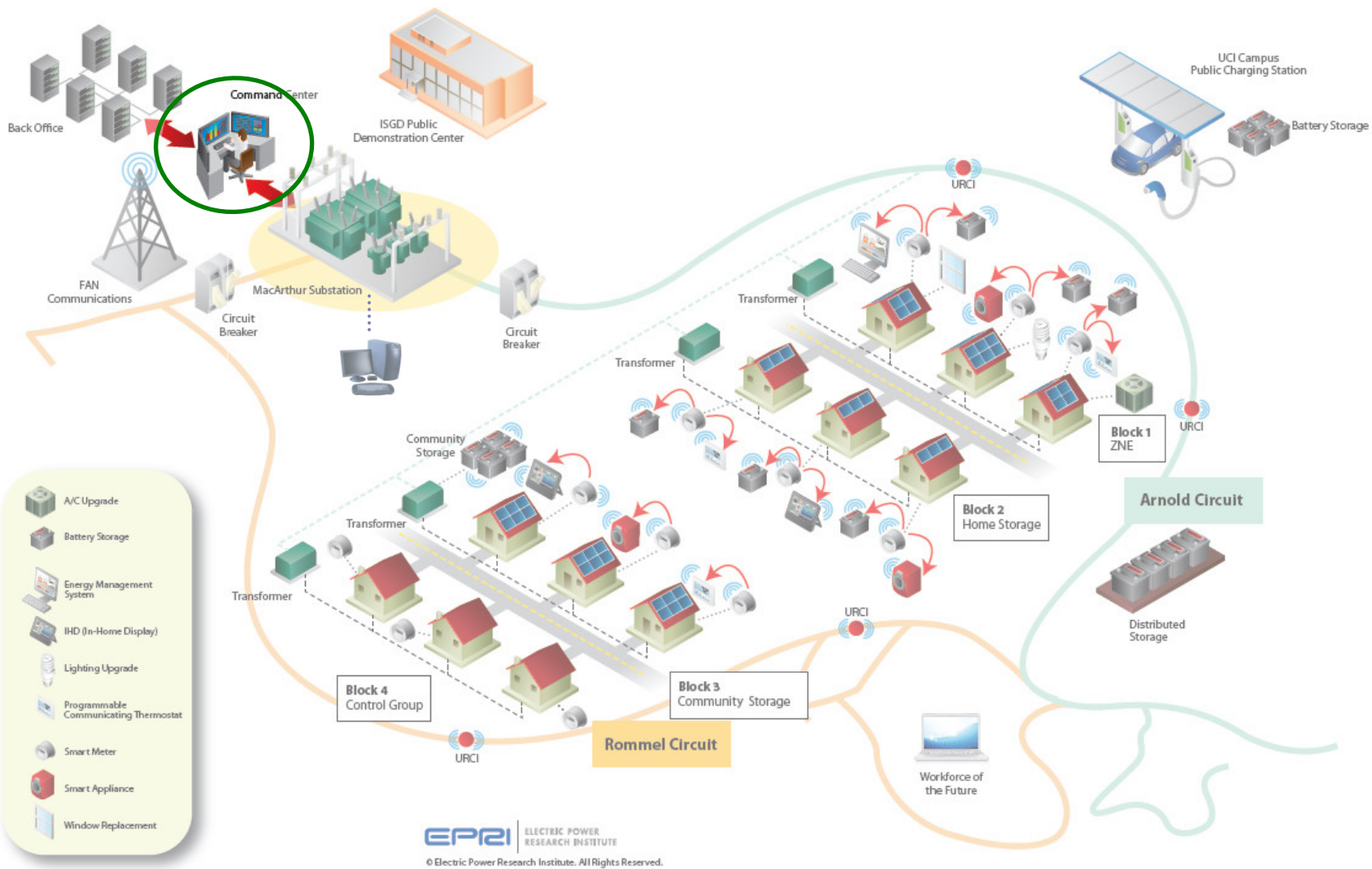
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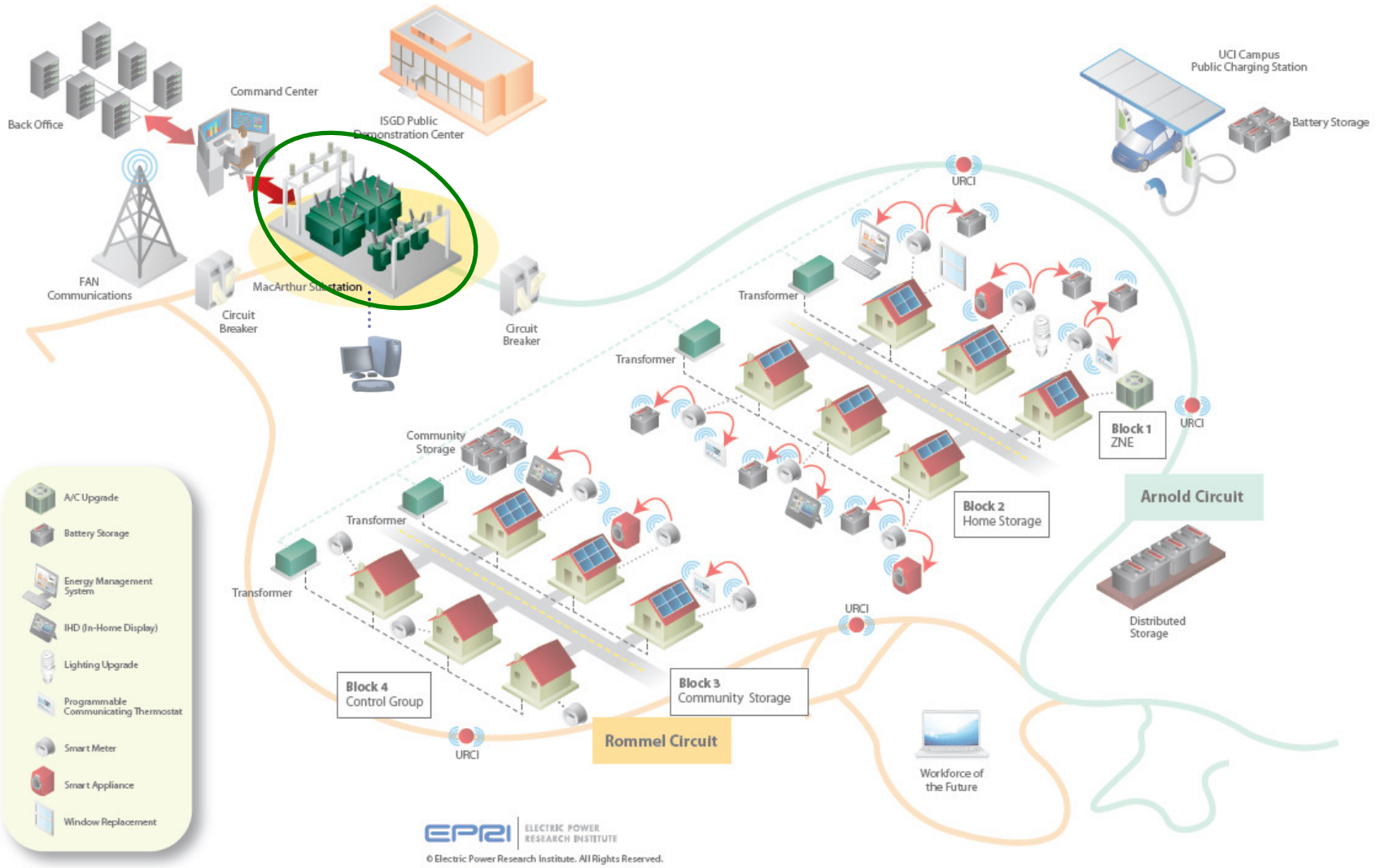


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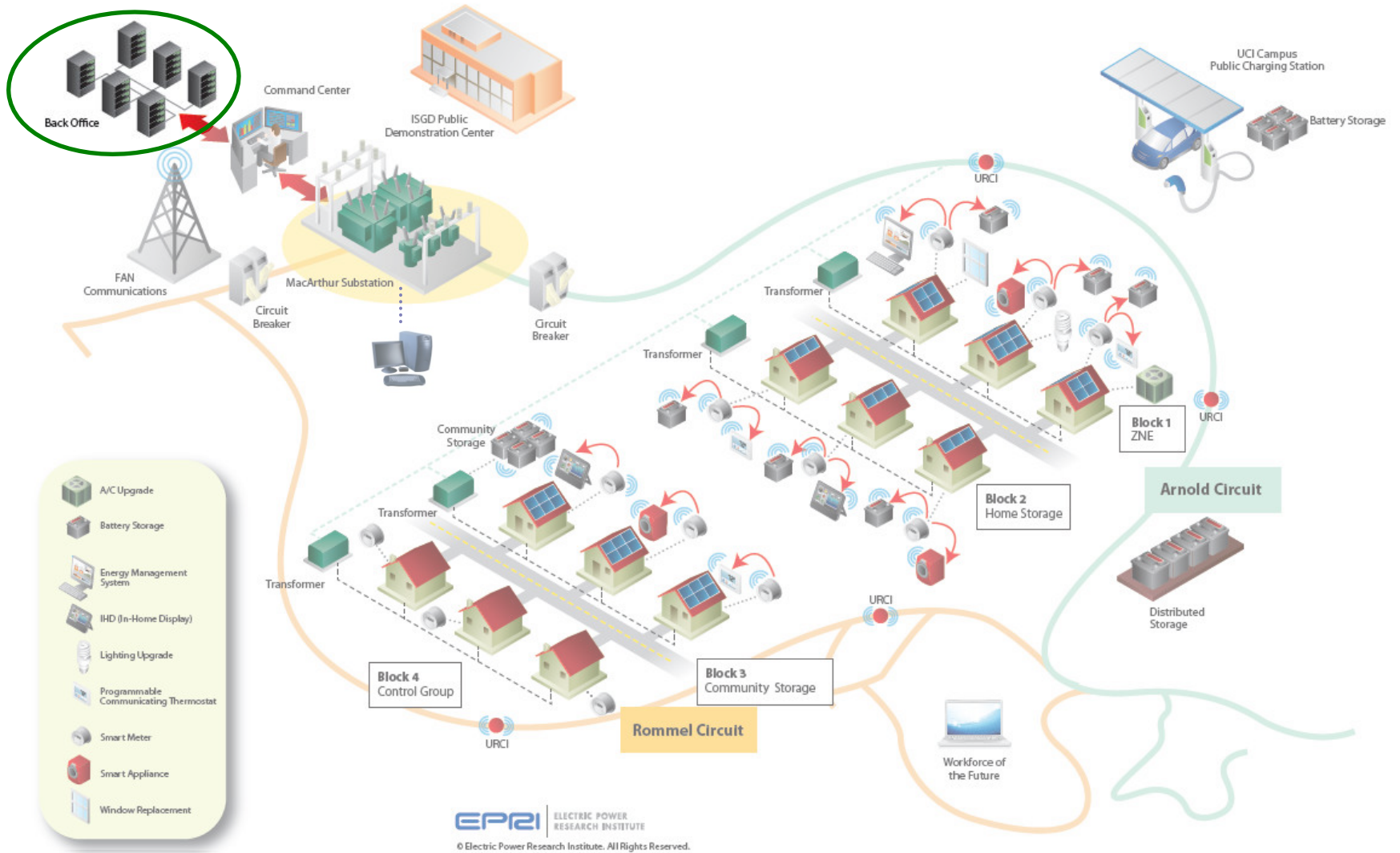
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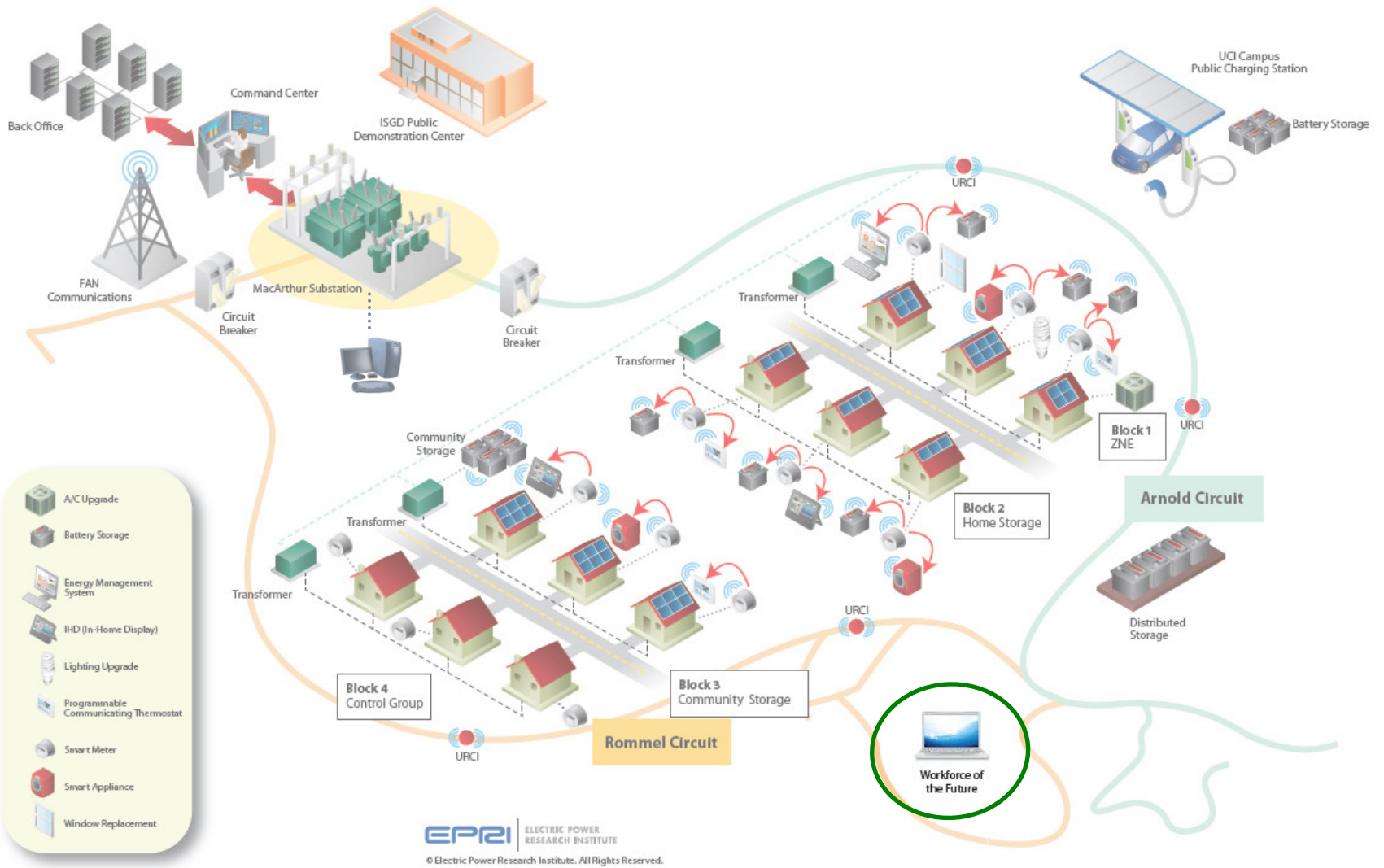
ISGD Scope

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



ISGD Scope

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 (TSP)

TSP 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

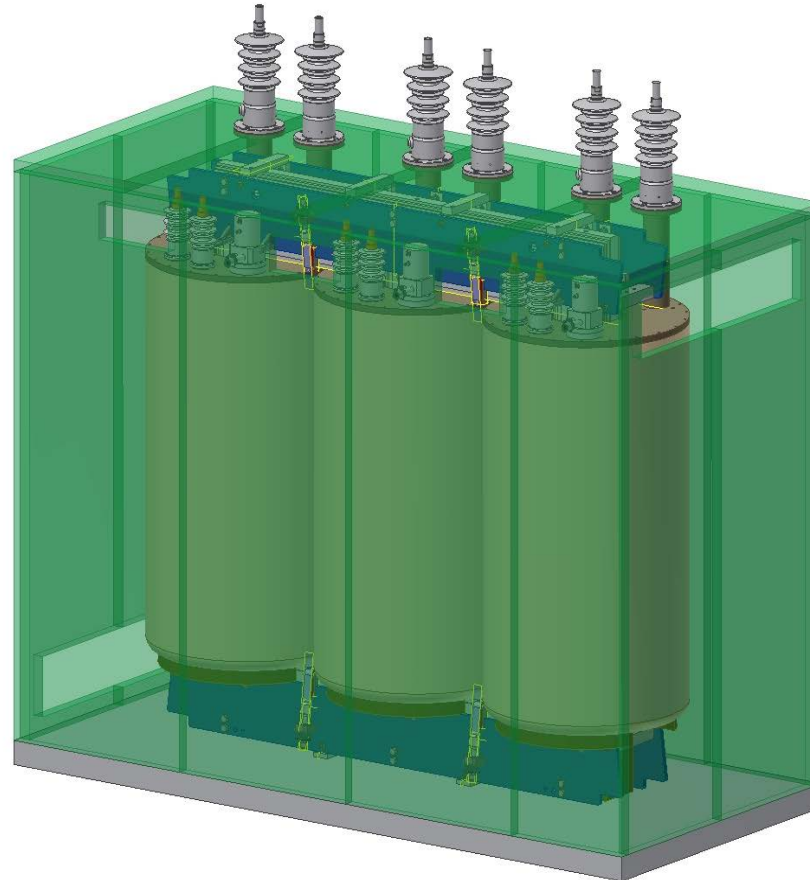
Facility With Battery & Inverter System

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



Waukesha Superconducting Transformer Project

Waukesha Superconducting Transformer



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

For information on careers with Advanced Technology, please email Lee Cordner at Lee.Cordner@sce.com