

SCE's Irvine Smart Grid Demonstration

**ADVANCED
TECHNOLOGY**
Transmission & Distribution Business Unit



**IEEE PES General Meeting
Detroit, MI
July 25, 2011**

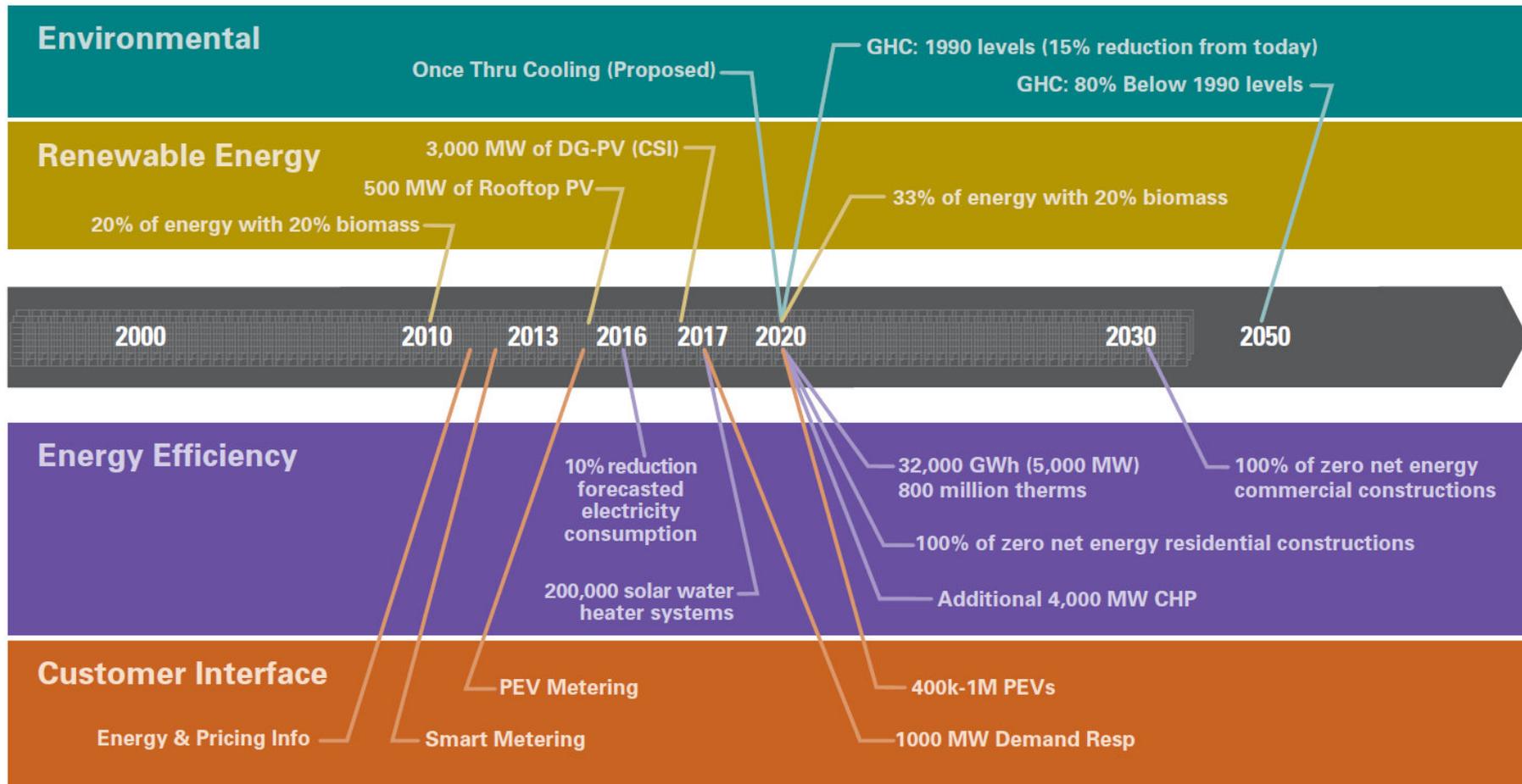
Southern California Edison Overview



- SCE provides power to:
 - Nearly 14 million people
 - 180 cities in 50,000 miles
 - 11 counties in central, coastal and Southern California
 - Commercial industrial and nonprofit customers, including:
 - 5,000 large businesses
 - 280,000 small businesses
- To deliver that power it takes:
 - 16 utility interconnections
 - 4,990 transmission and distribution circuits
 - 425 transmission and distribution crews
 - The days and nights of more than 17,000 employees
 - More than a century of experience

California Climate & Energy Policies

Most Aggressive Policies in the United States



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)

Objective

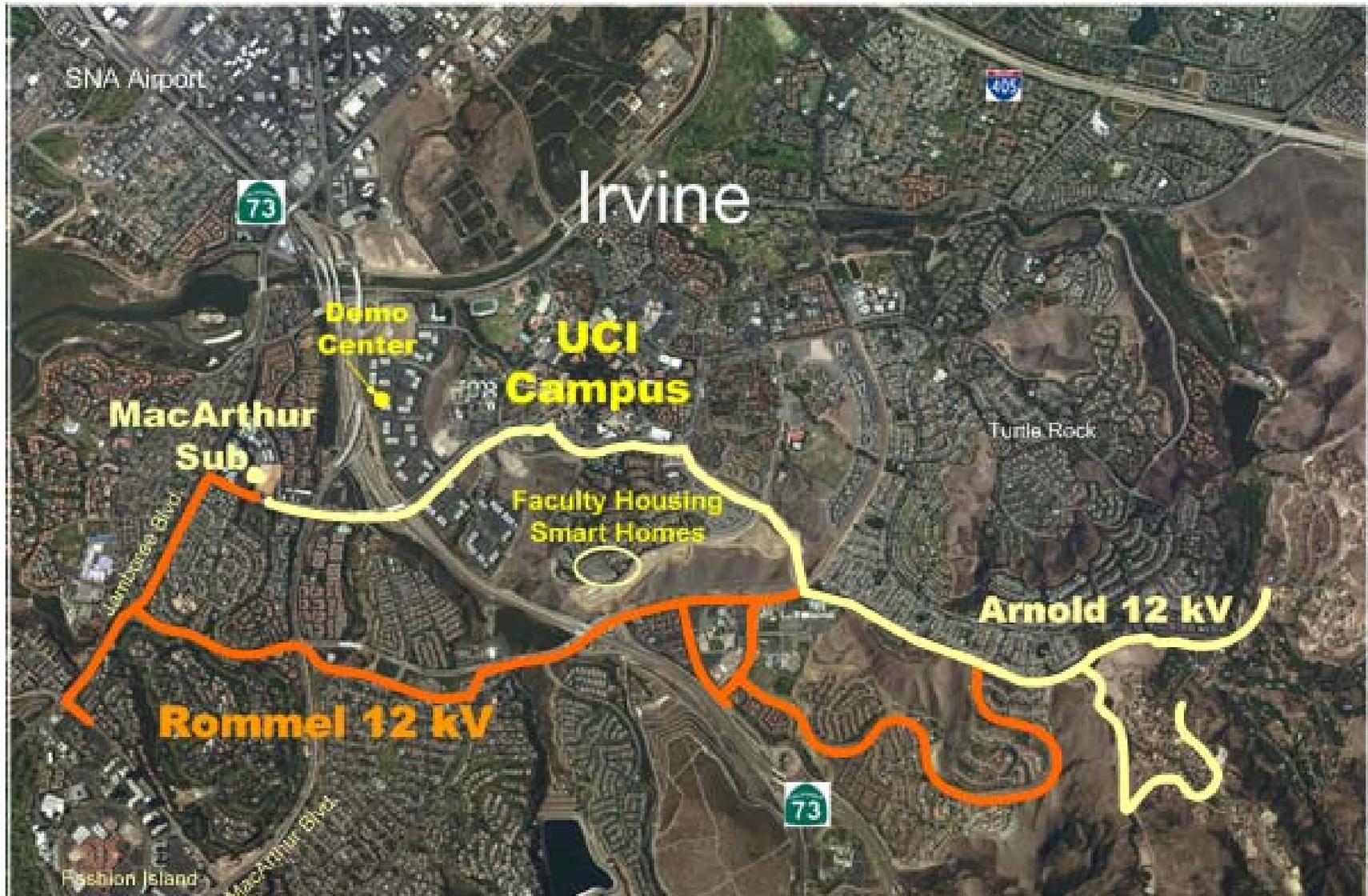
- The ISGD demonstrates a variety of existing and new Smart Grid technologies in the same location with the following demonstration goals:
 - Interconnectivity and interoperability of those technologies
 - Demonstrate the technical and communication capability of smart technologies to shift consumption 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

ISGD Scope

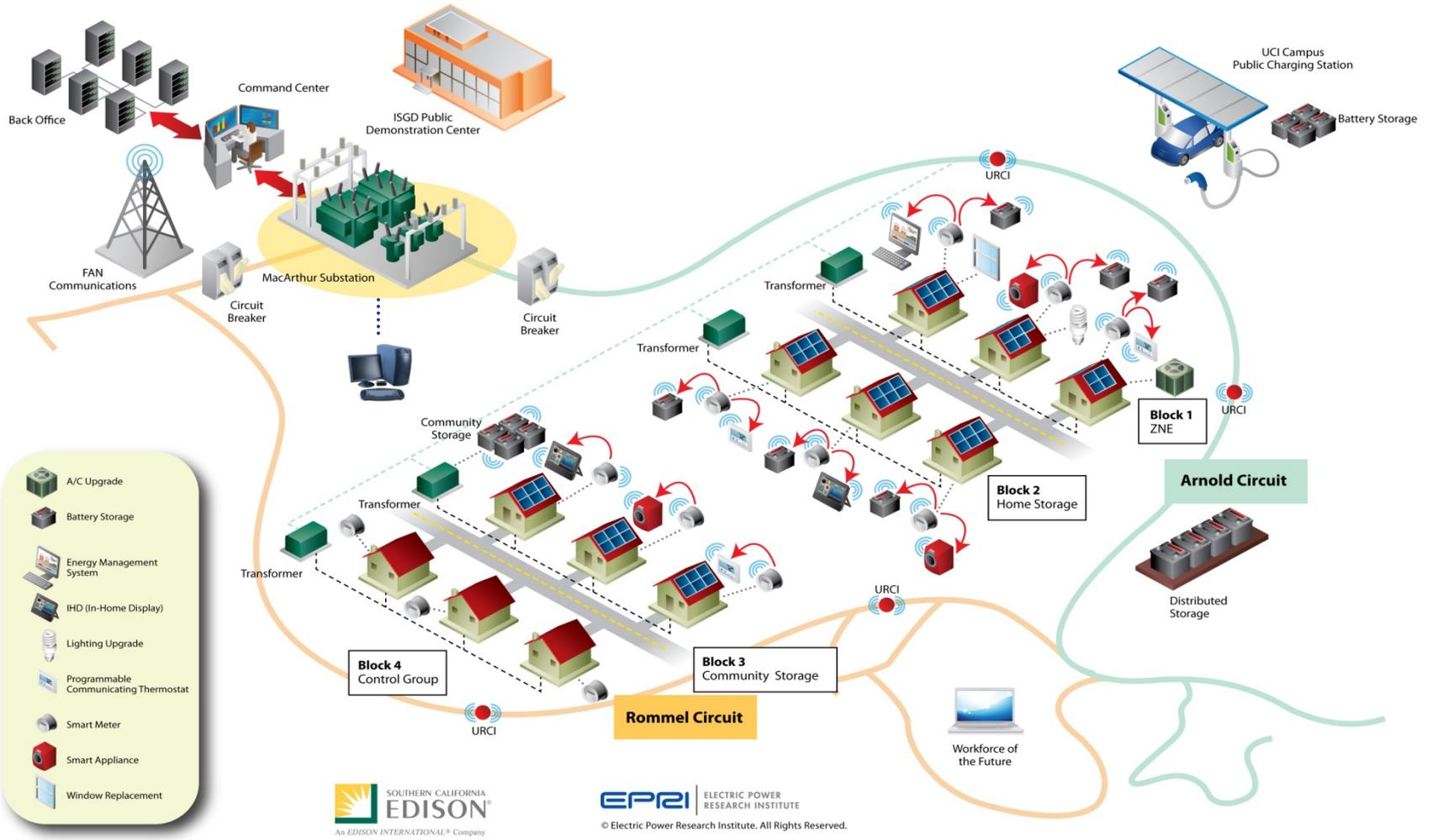
- **Subproject I** – Evaluating Zero Net Energy (ZNE) Home
- **Subproject II** – Plug-In Electric Vehicle (PEV) Charging
- **Subproject III** – Distribution Circuit Constraint Management Using Energy Storage
- **Subproject IV** – Advanced Volt/VAR Control (AVVC)
- **Subproject V** – Self-Healing Distribution Circuits
- **Superconducting Transformer (Waukesha)***
- **Subproject VI** – Deep Grid Situational Awareness
- **Subproject VII** – Interoperability and Cyber Security (SENet)
- **Subproject VIII** – Workforce of the Future

*included in Waukesha award

ISGD Location



ISGD Scope



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



ISGD Scope

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

Block 1: ZNE

Smart appliances:

- Refrigerator
- Washer
- Dishwasher

Demand Response equipment:

- Appliance communications module

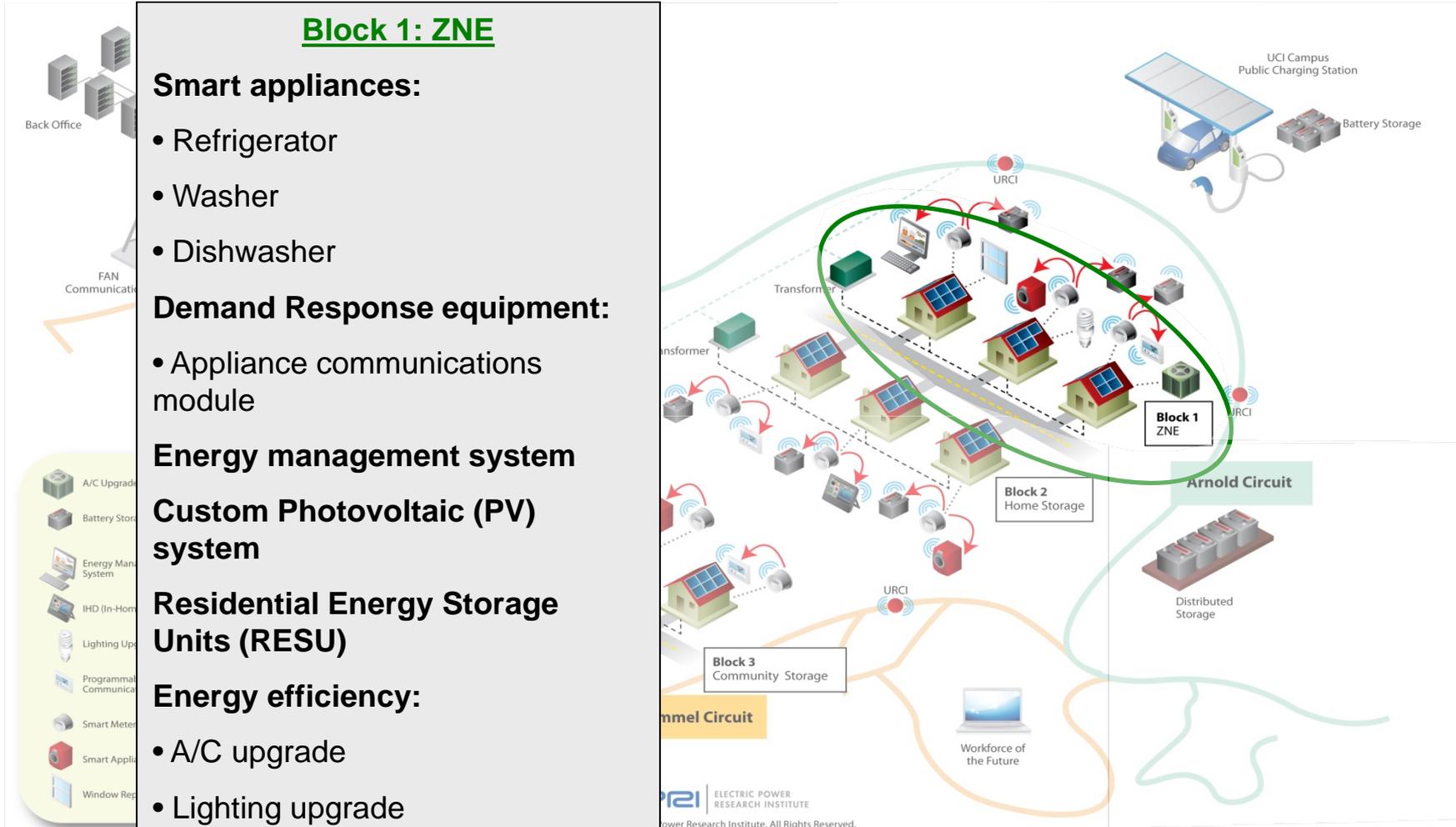
Energy management system

Custom Photovoltaic (PV) system

Residential Energy Storage Units (RESU)

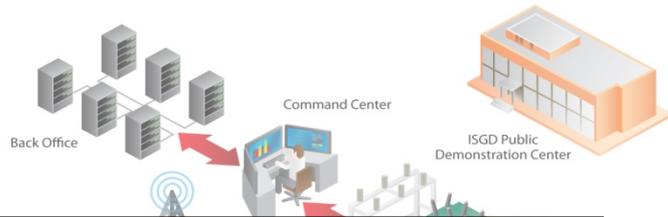
Energy efficiency:

- A/C upgrade
- Lighting upgrade
- Window replacements



ISGD Scope

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



Block 2: Home Storage

Smart appliances:

- Refrigerator
- Washer
- Dishwasher

Demand Response equipment:

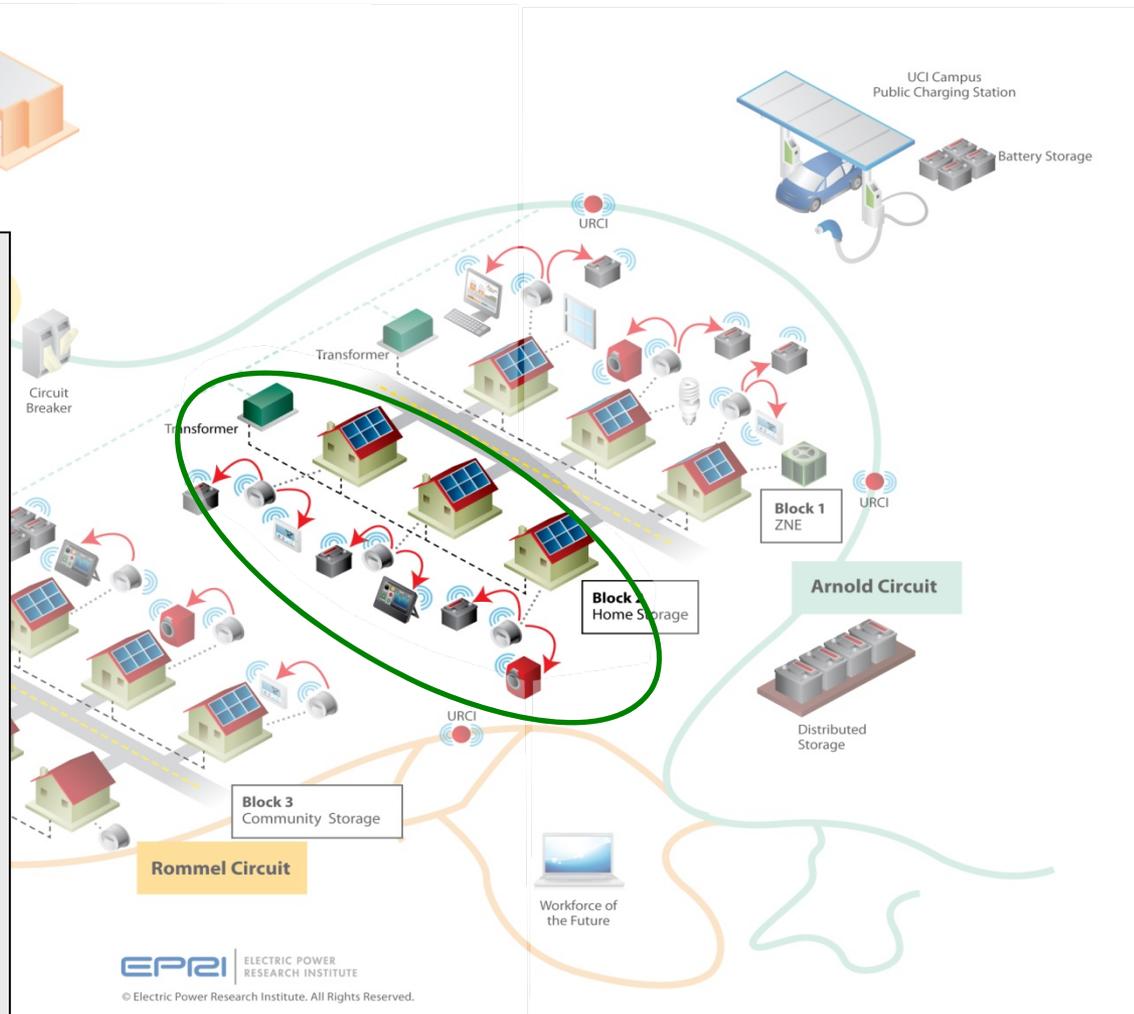
- Appliance communications module

3 kW Photovoltaic (PV) system

Residential Energy Storage Units (RESU)

In-home displays

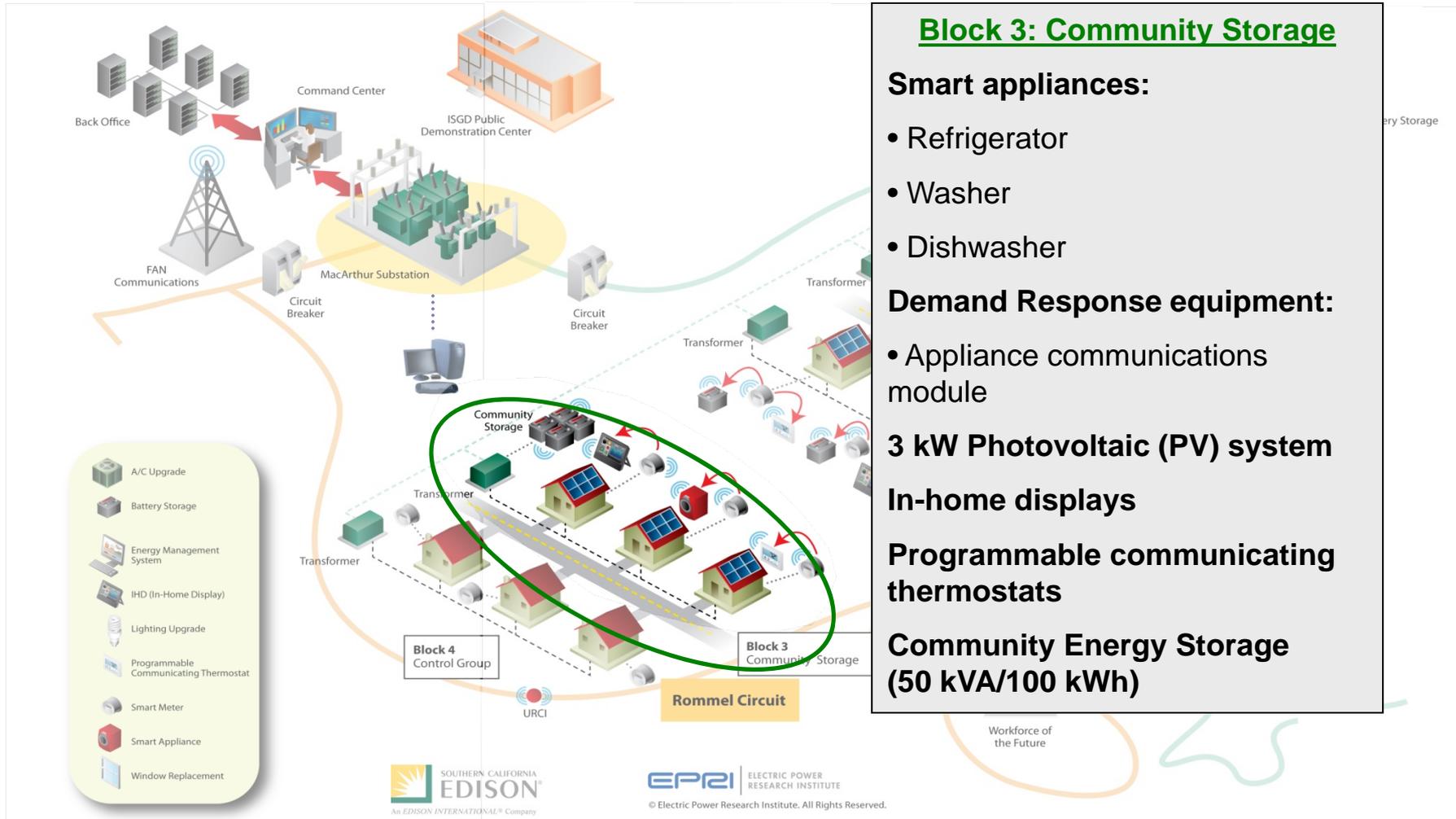
Programmable communicating thermostats



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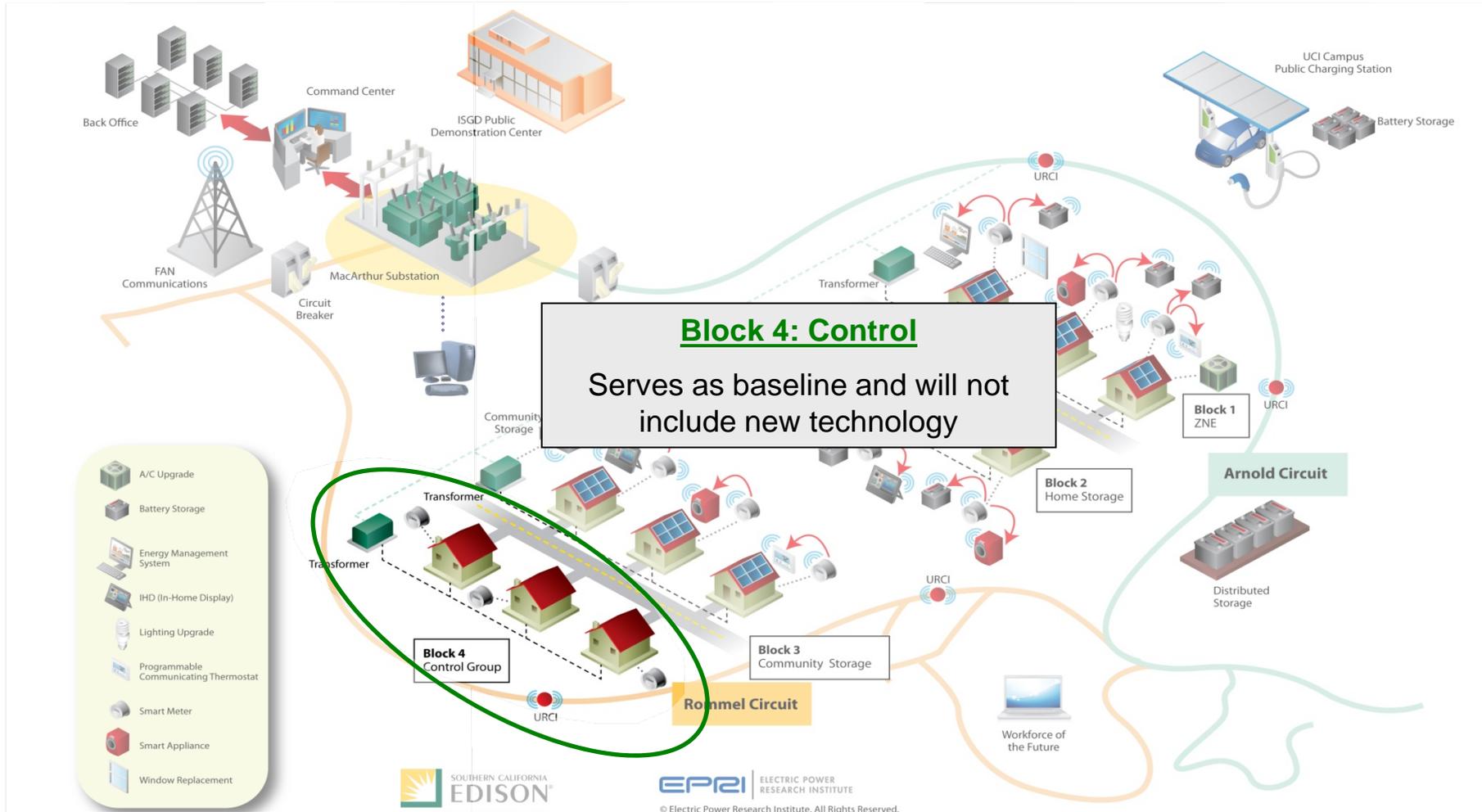
ISGD Scope

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



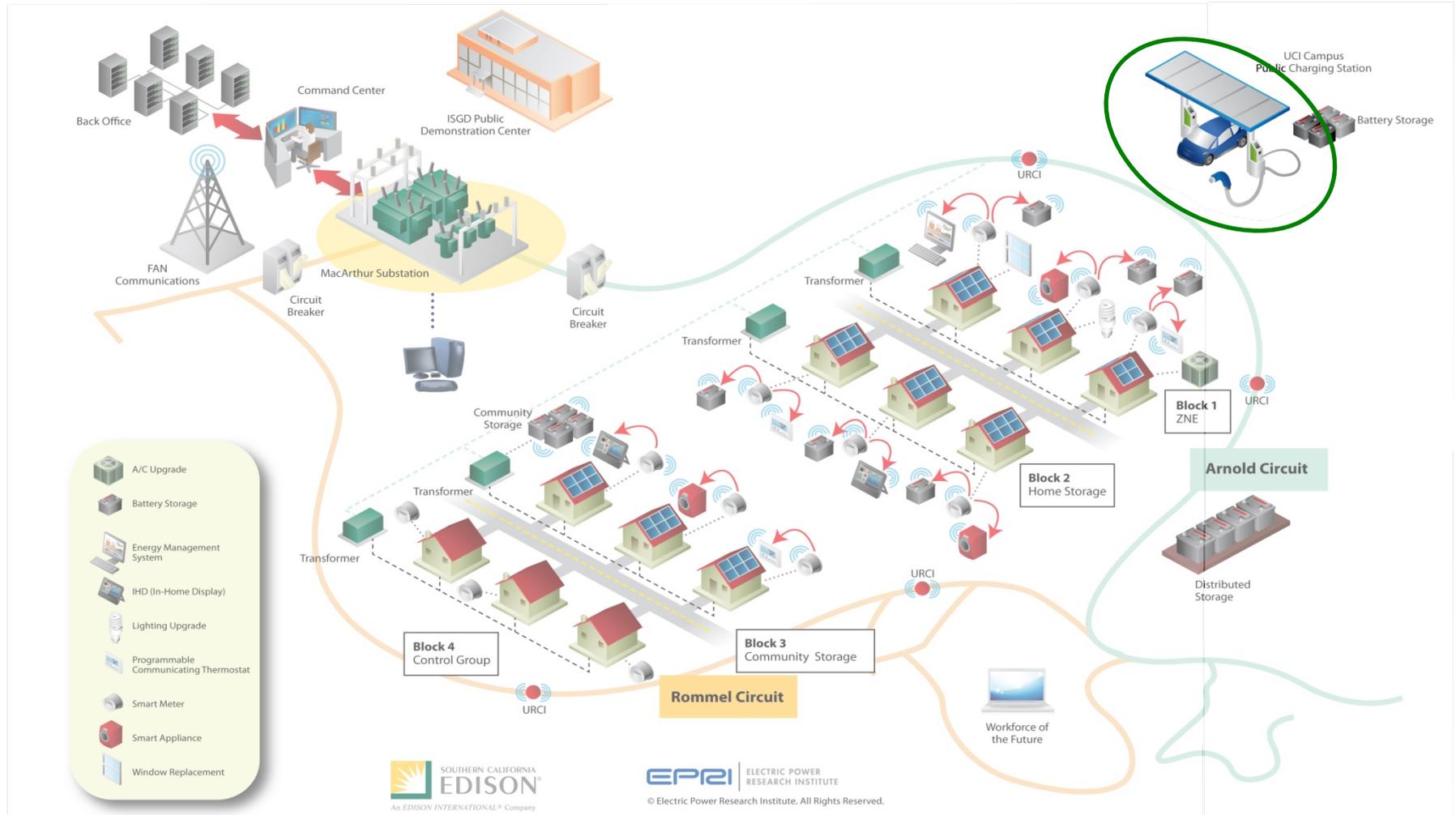
ISGD Scope

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



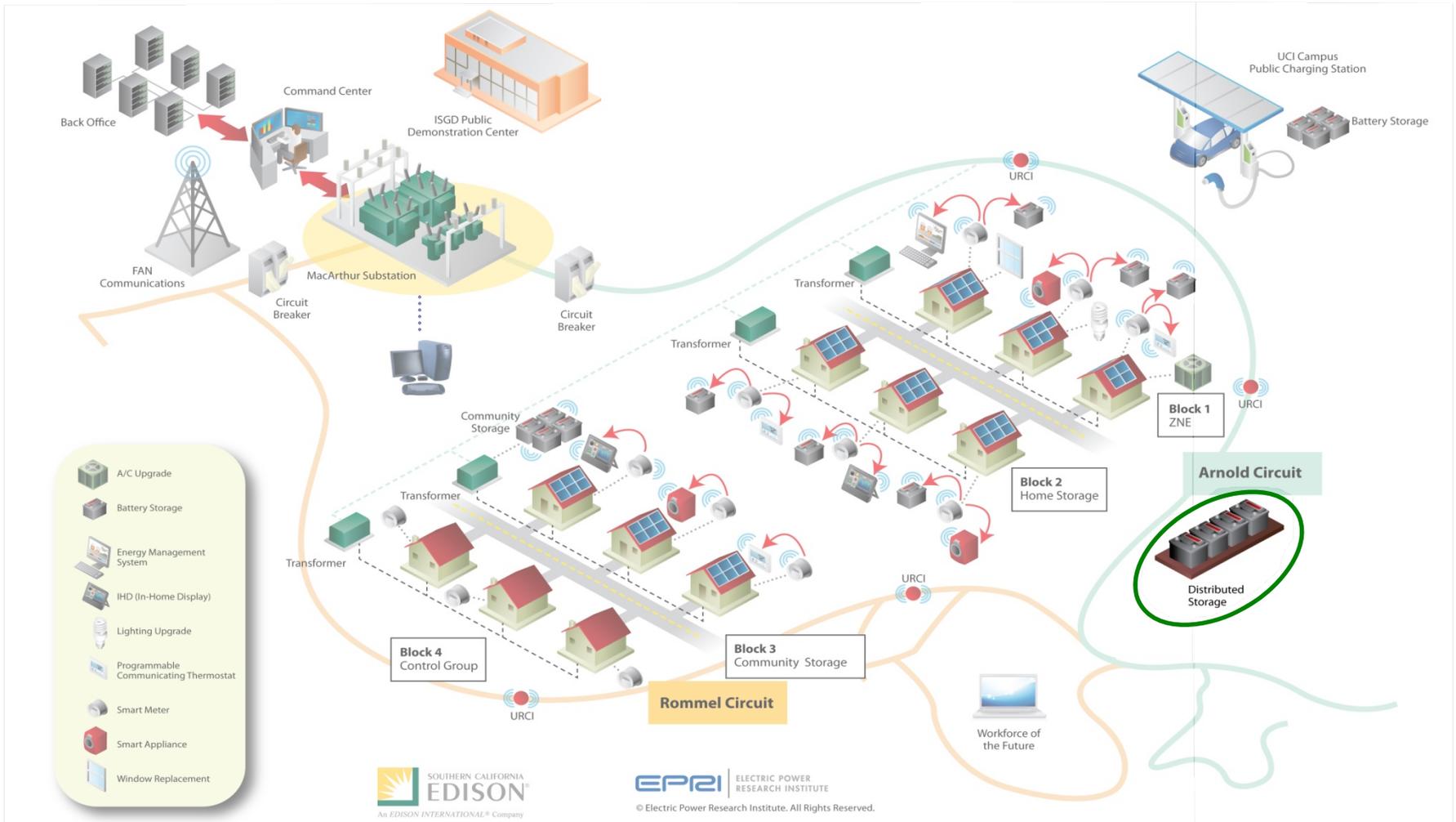
ISGD Scope

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



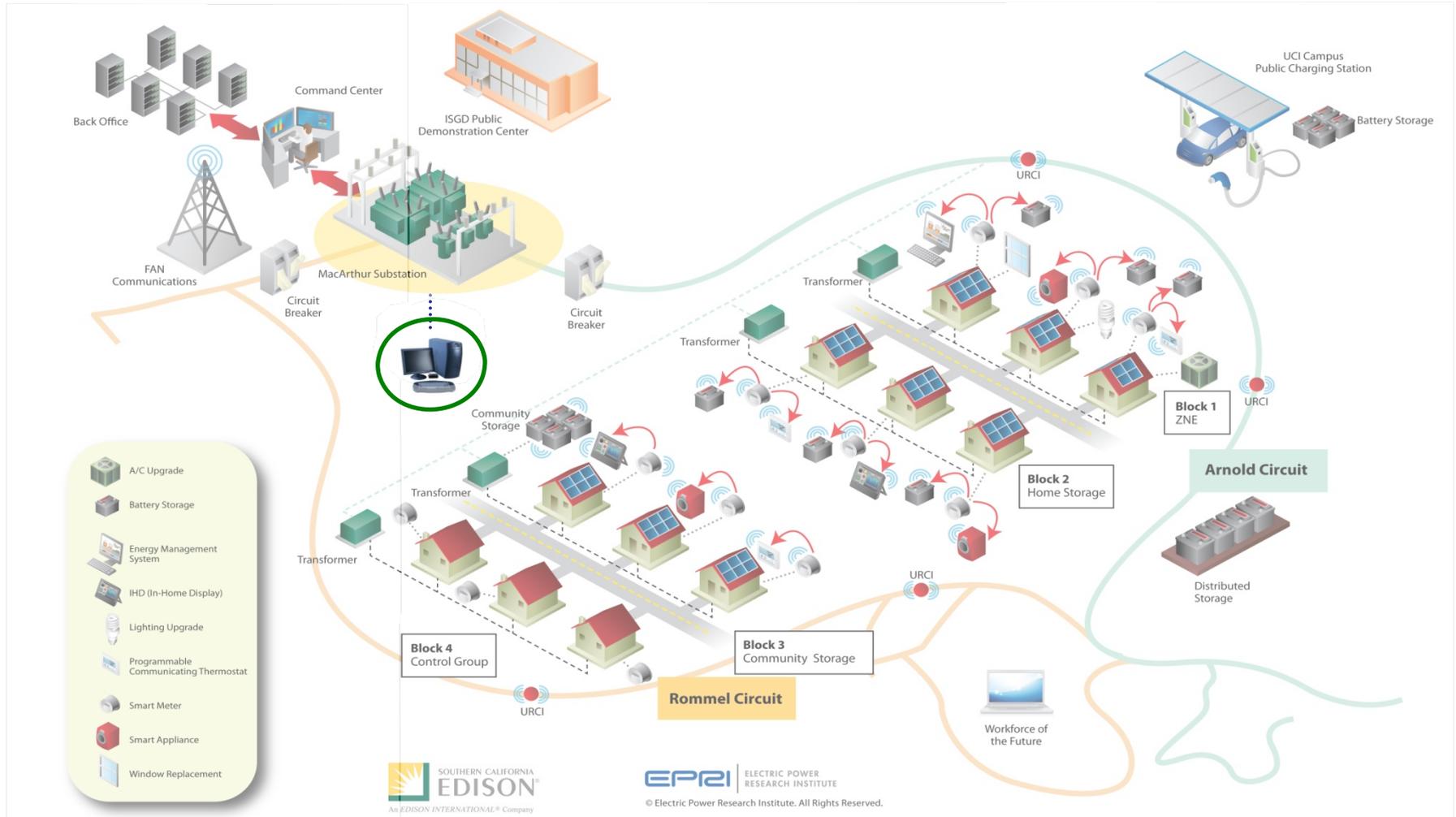
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Subproject III – Distribution Circuit Constraint Management Using Energy Storage



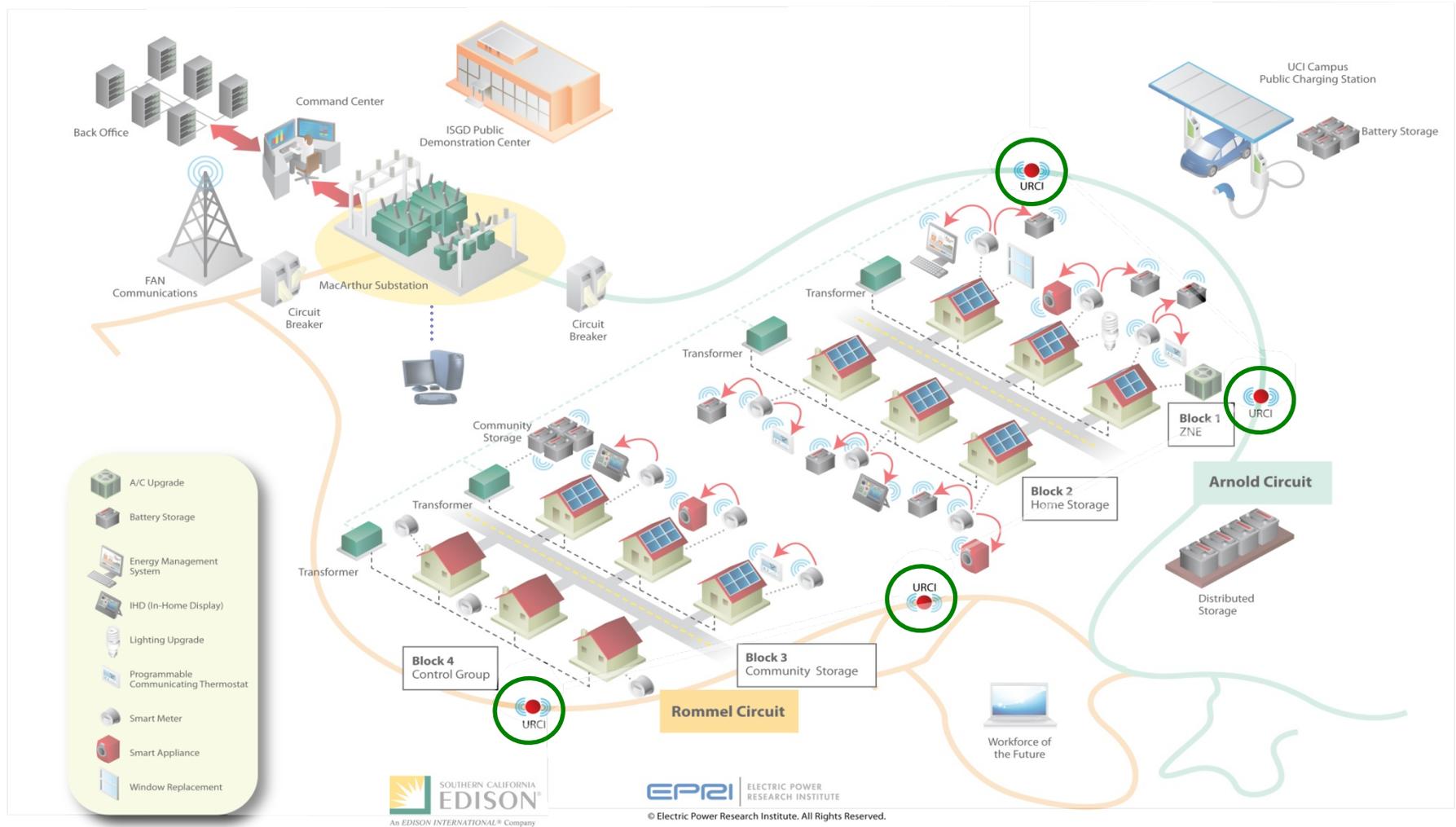
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Subproject IV – Enhanced Circuit Efficiency and Power Quality through Volt/VAR and Frequency Control



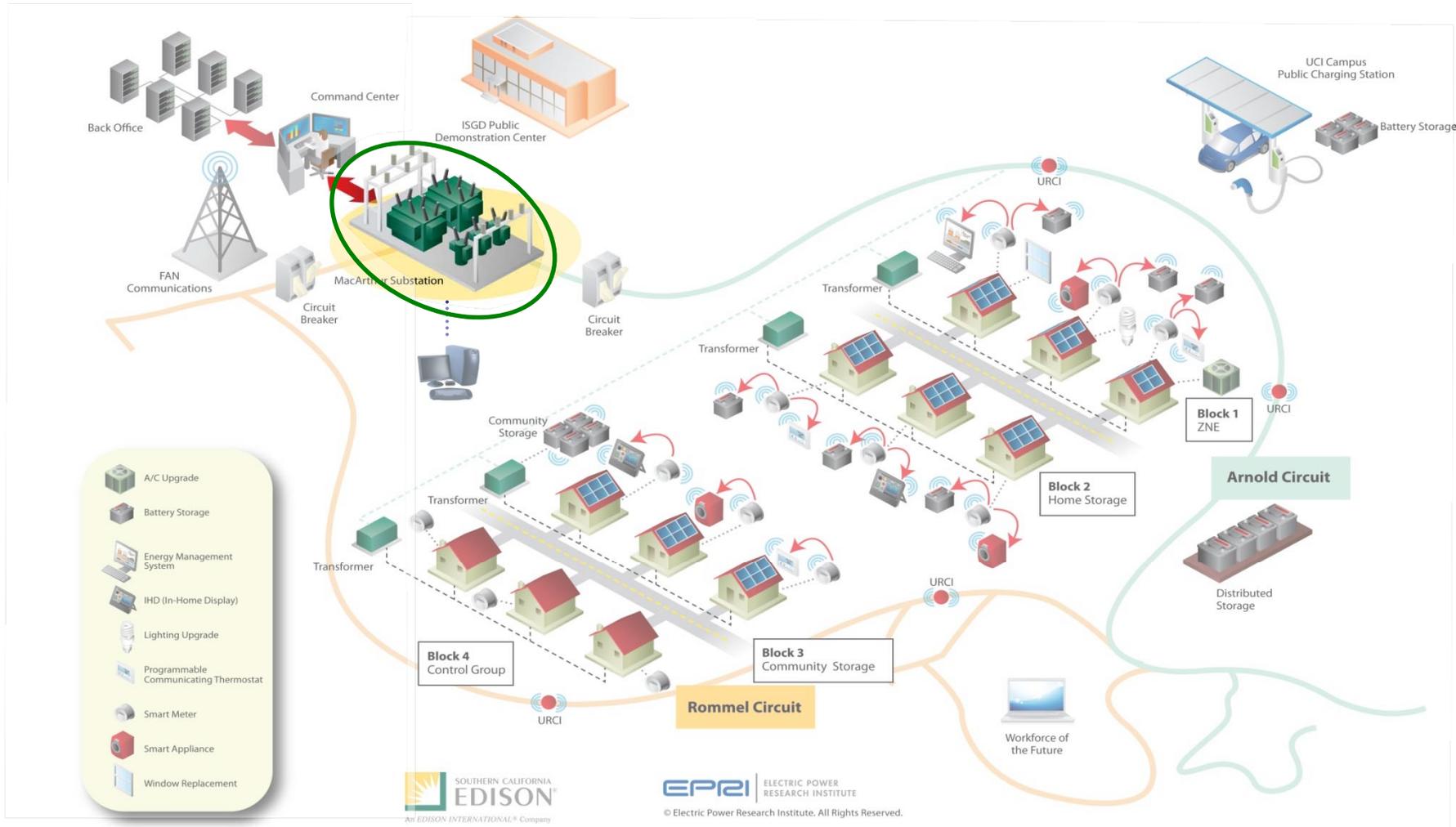
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Subproject V – Self-Healing Distribution Circuit



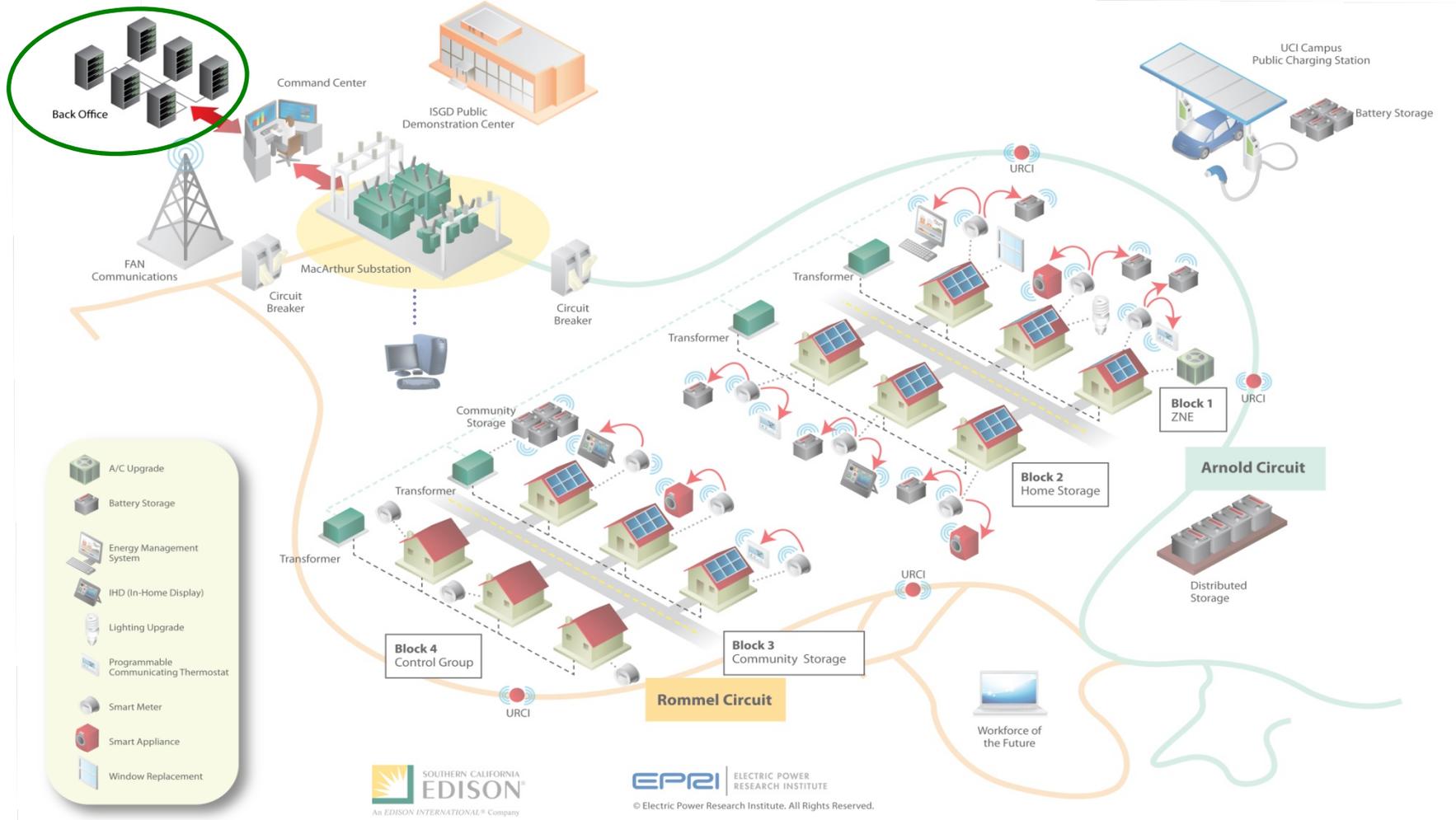
ISGD Scope

Superconducting Transformer (Waukesha)

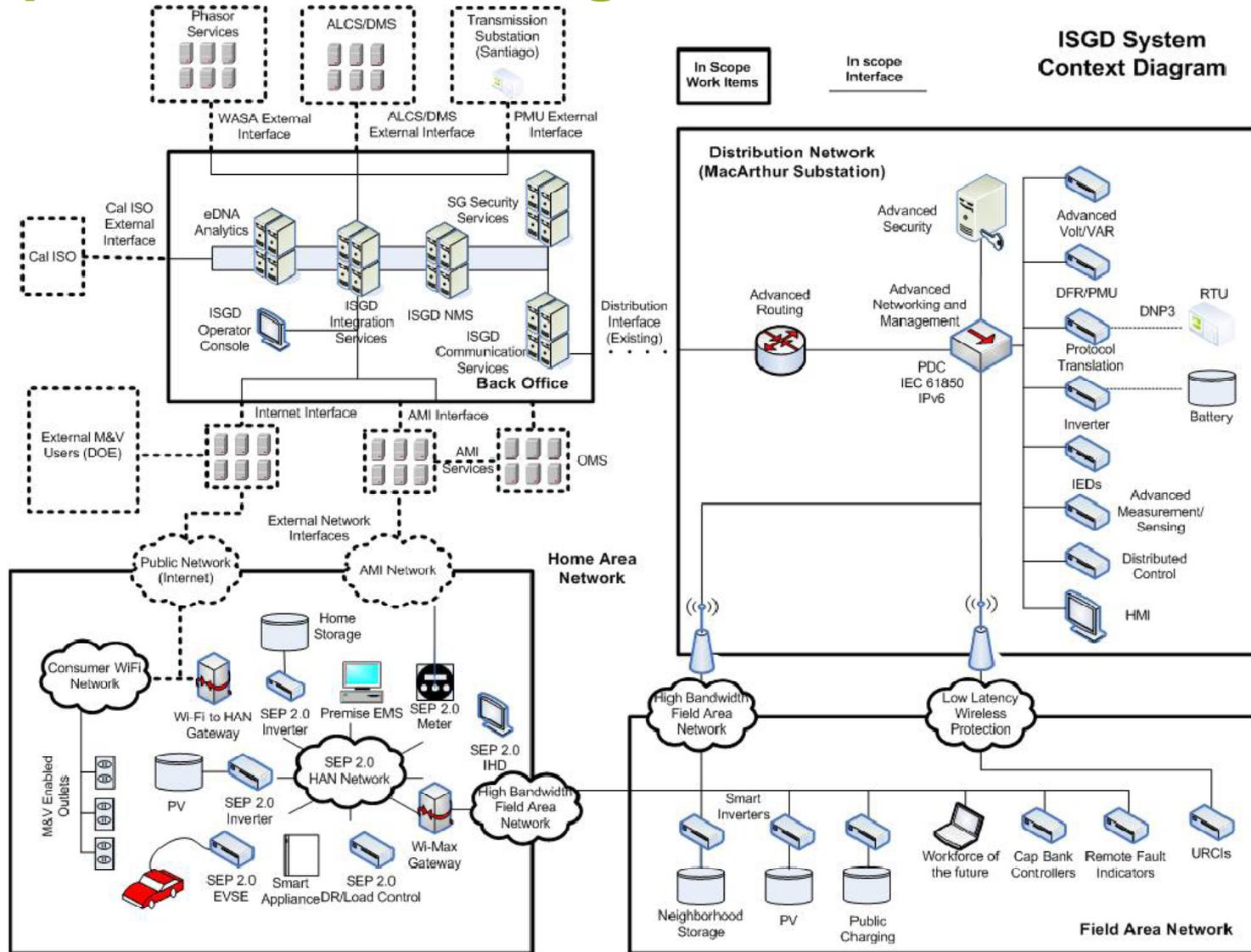


ISGD Scope

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

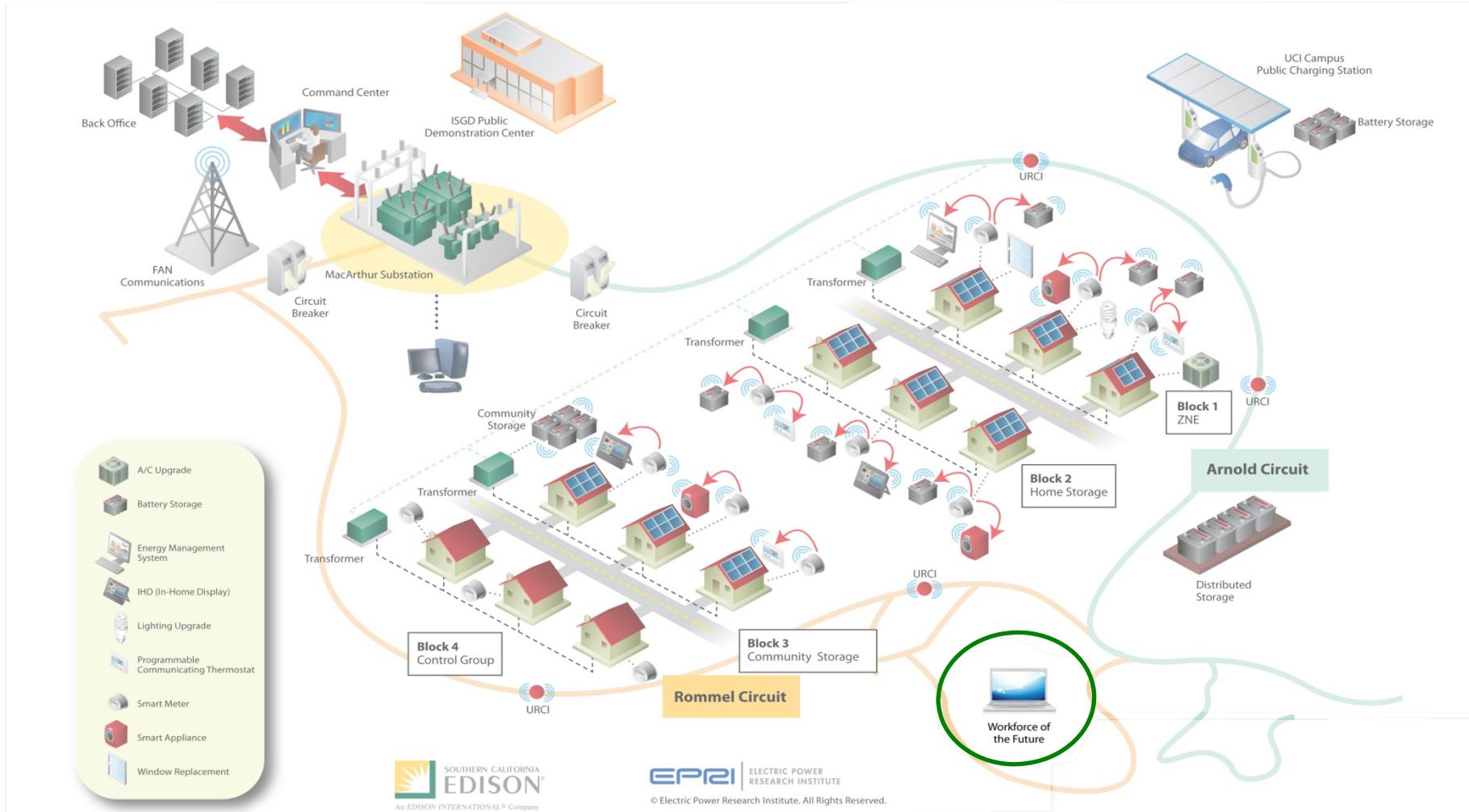


Proposed Context Diagram



ISGD Scope

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



ISGD Scope

ISGD Demonstration Center



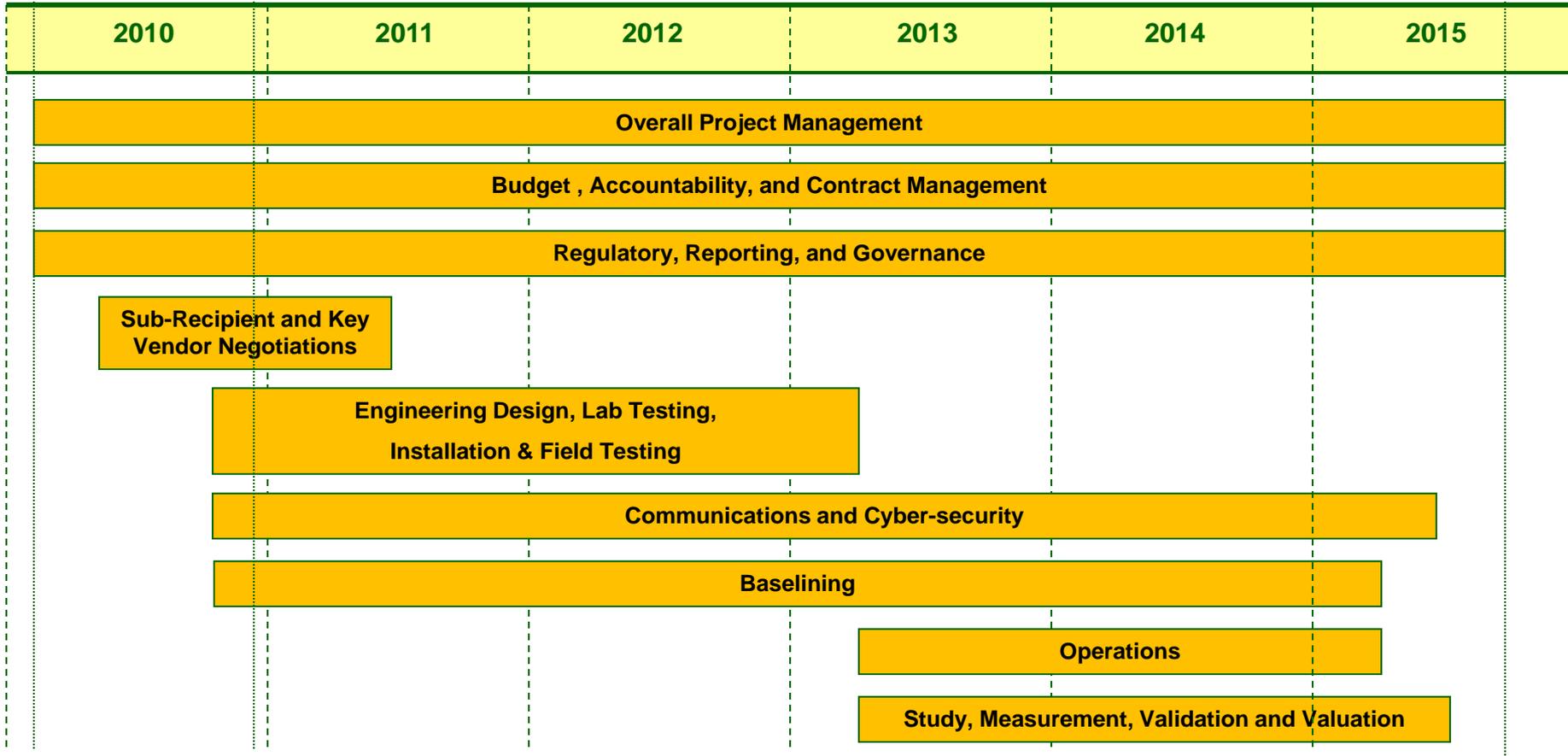
ISGD Timeline

Overall Project Timing

Project Start
Date 2/9/10

Definitization
Date 12/23/10

Project End
Date 9/30/15



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