



Emerging Technologies Summit

MAKING THE CONNECTION:
From Energy Efficiency Innovation to Delivery

April 19 – 21, 2017

The Path to Success: Scaling Integrated Solutions

JERINE AHMED, COLIN CLARK, CINDY REGNIER, STAN LEW



SMARTScale

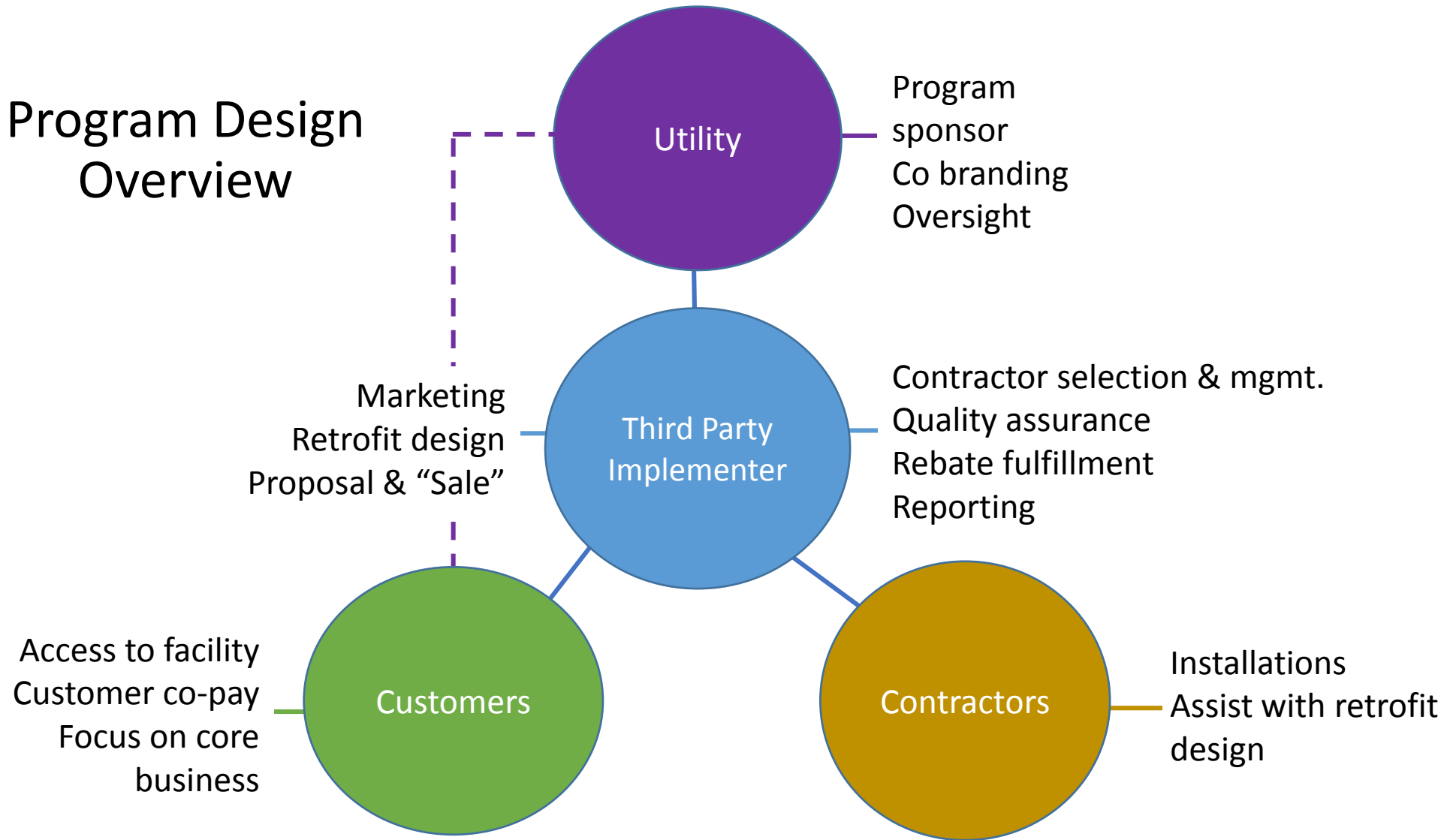
Accelerating the Energy Efficiency Market

Deep Savings for Small Commercial Direct Install Retrofit Program

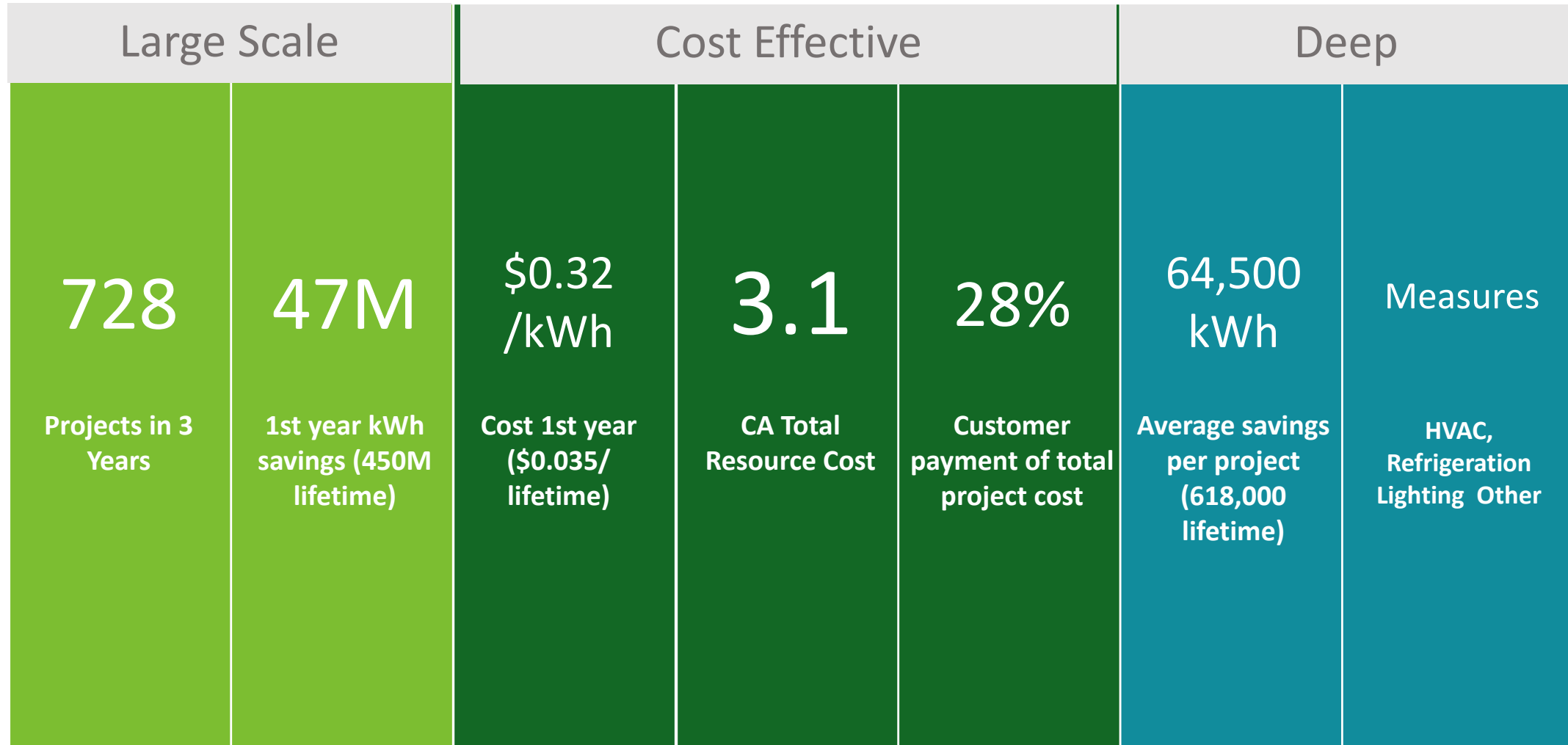
A Replicable Model for High Volume, Cost Effective
Energy Savings



Program Design Overview



Program Results



5 Ideal Utility Program Conditions*

1. Willingness for a **3rd party** Program Implementer (PI)
2. Structure for PI includes **pay for performance** + customer/contractor liaison
3. **Calculated** savings
4. Orient and Train in “**Sales**”
5. Customer **Co-Pay**

These factors create depth, diversity and cost-effectiveness.

Greater savings per transaction = lower cost per transaction/kWh

Challenges to Going Deeper

- Measure saturation
- Finding contractors that can support multiple measures
- Getting utility and regulator approval of streamlined measurement and savings values
- Utility tracking, verifying and reporting systems



Challenges to Scaling

- **Diversity in Stakeholders.** 3000+ utilities in the U.S. and diversity of stakeholders
- **Change takes time.** Typical project method ‘Pilot to Product to Proliferation’ limits the timeframe for outreach and change
- **Unclear Authority.** Fractured authority for adopting or changing SMB retrofit approaches
- **Regulatory Variations.** Regulatory environments and interpretations vary and influence opportunities
- **Utility Culture.** Business as Usual is the norm and culturally resistant to change

But there are growing market drivers – existing buildings are upgrading



SAN FRANCISCO
2030
DISTRICT



2030 DISTRICT™

2030 DISTRICTS

Unique private/public partnerships

- ◎ Property owners and managers
- ◎ Local governments
- ◎ Business and community stakeholders

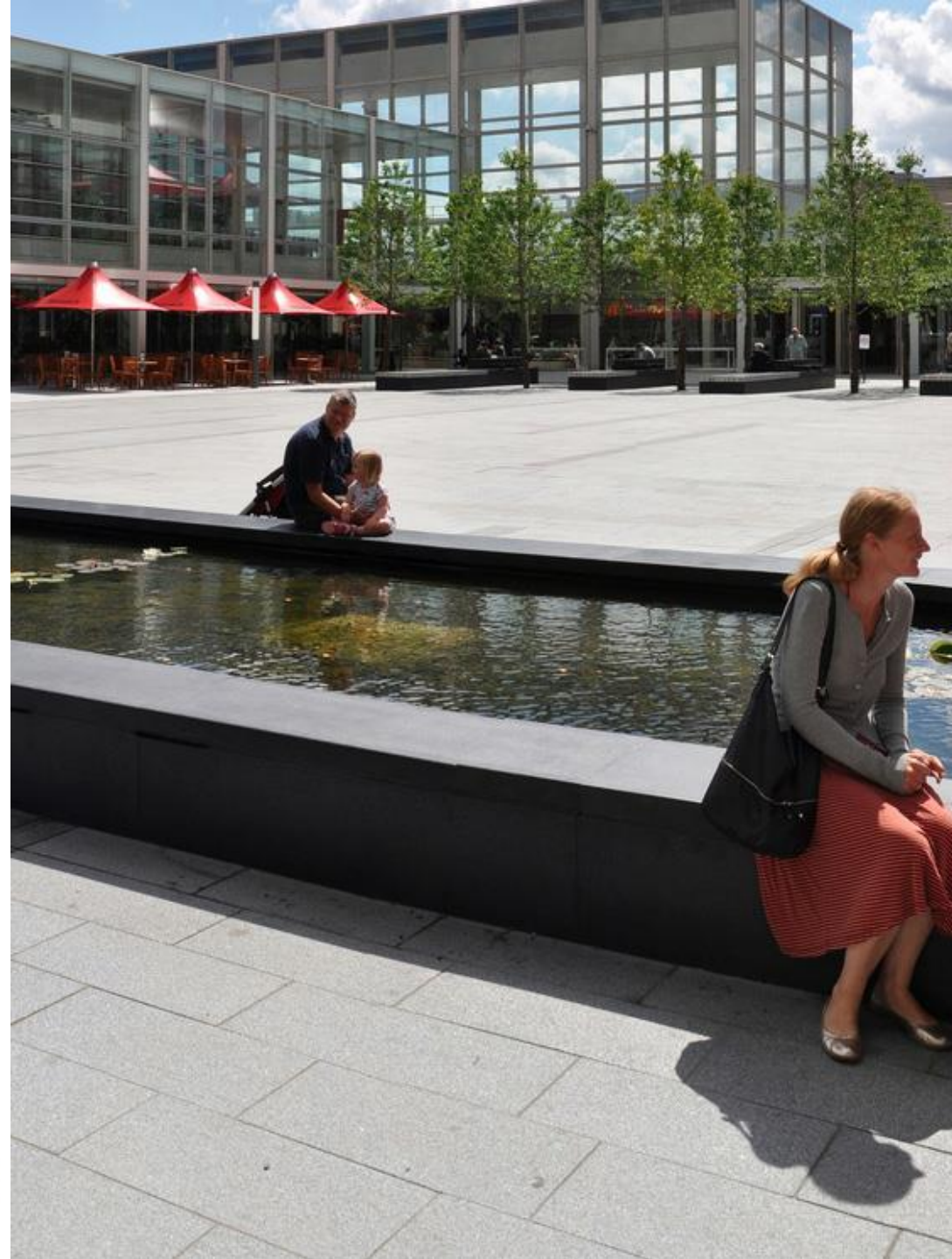
2030 Districts are business models for urban sustainability through collaboration, leveraged financing, and shared resources.



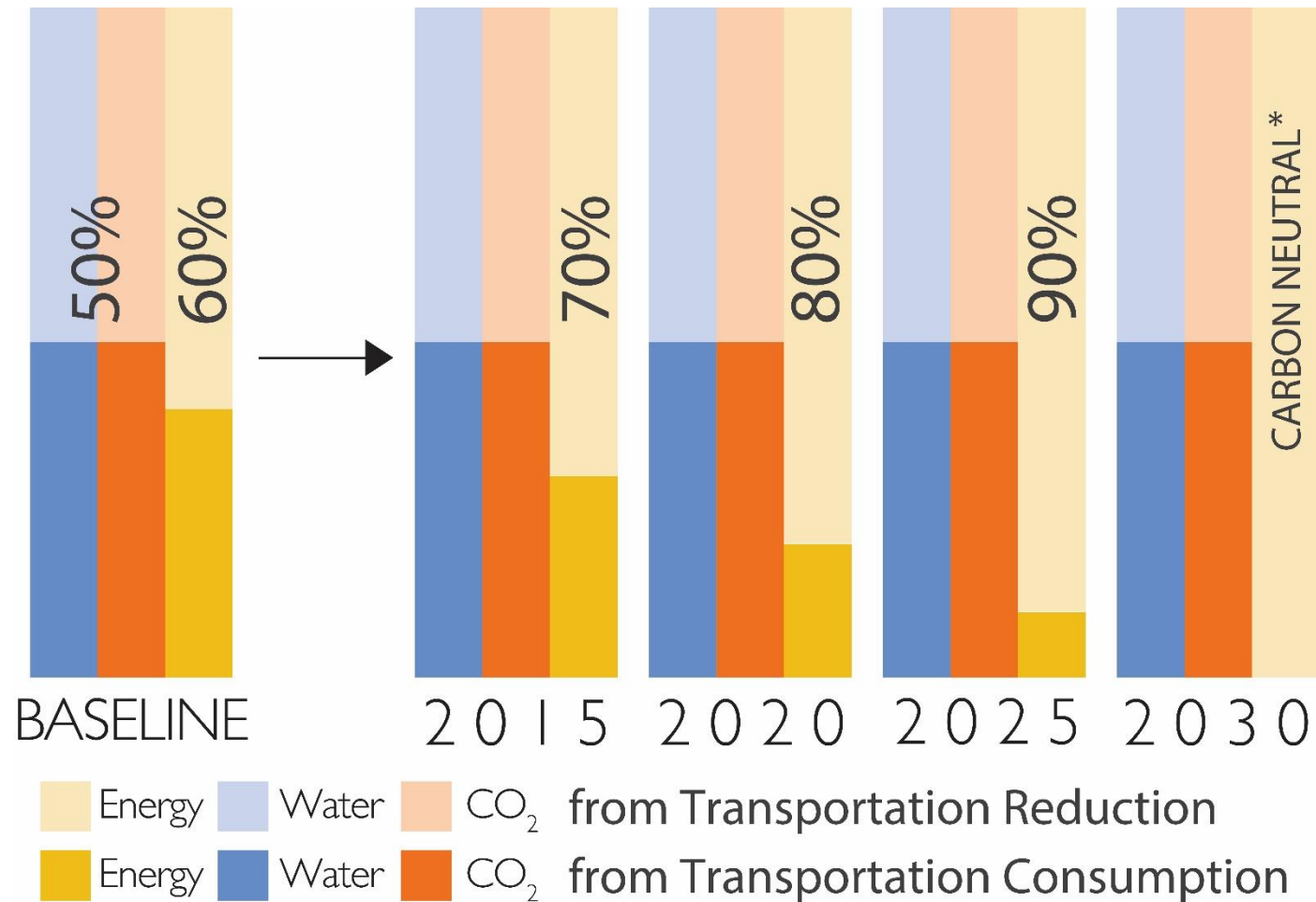
Private/Public Partnerships



- ⦿ Private Sector Led
- ⦿ Public Sector Supported
- ⦿ Voluntary
- ⦿ Common Mission and Goals
- ⦿ Connected to Market Realities



New Construction Goals

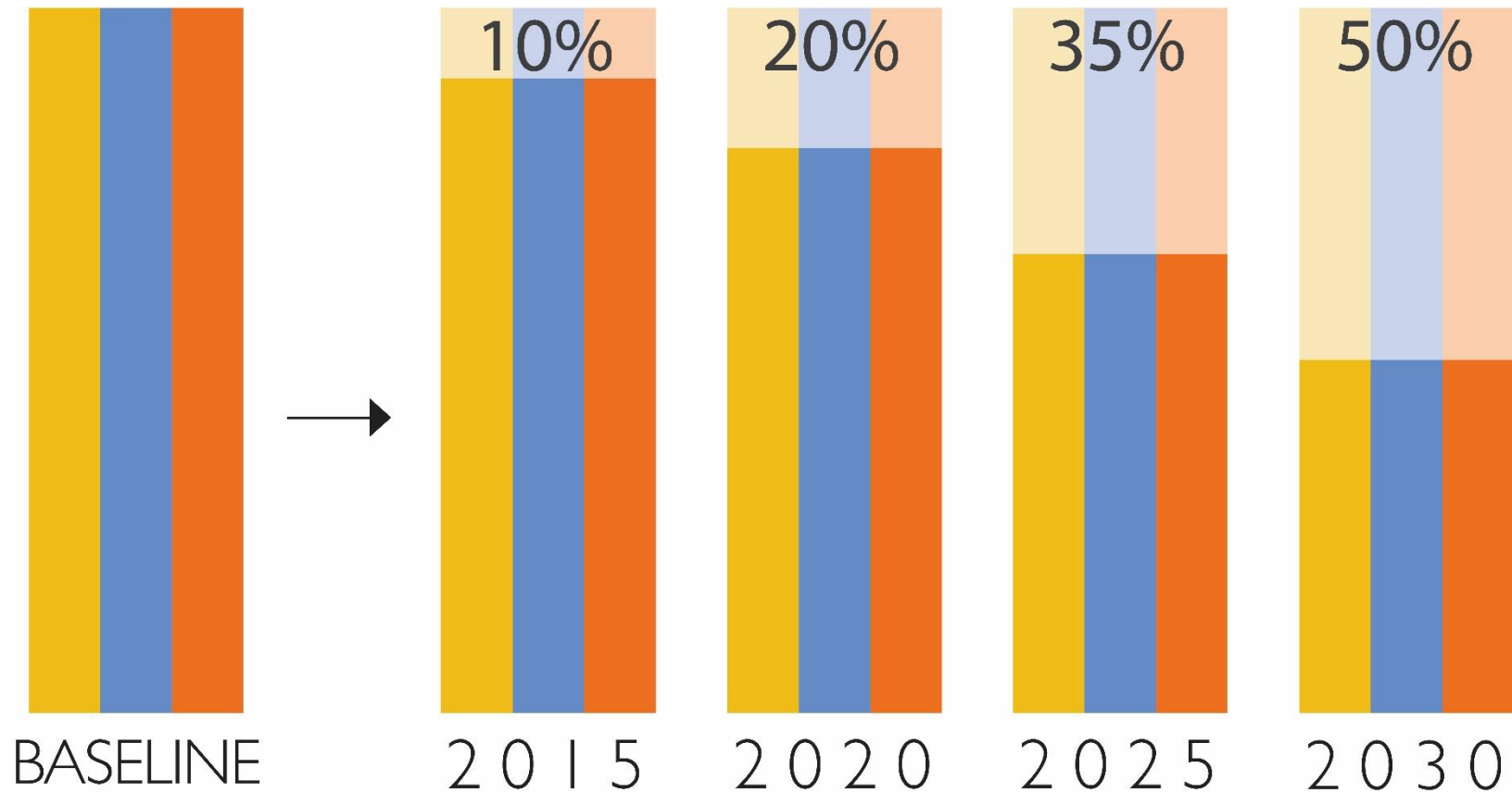


The 2030 Challenge for Planning:
New Buildings & Major Renovations

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*Using no fossil fuel GHG-emitting energy to operate.

Existing Building District-Wide Goals



- Energy, Water, and CO2 from Transportation Reduction
- Energy, Water, and CO2 from Transportation Consumption

The 2030 Challenge for Planning: Existing Buildings

Source: © 2011 | 2030, Inc. / Architecture 2030. All Rights Reserved.

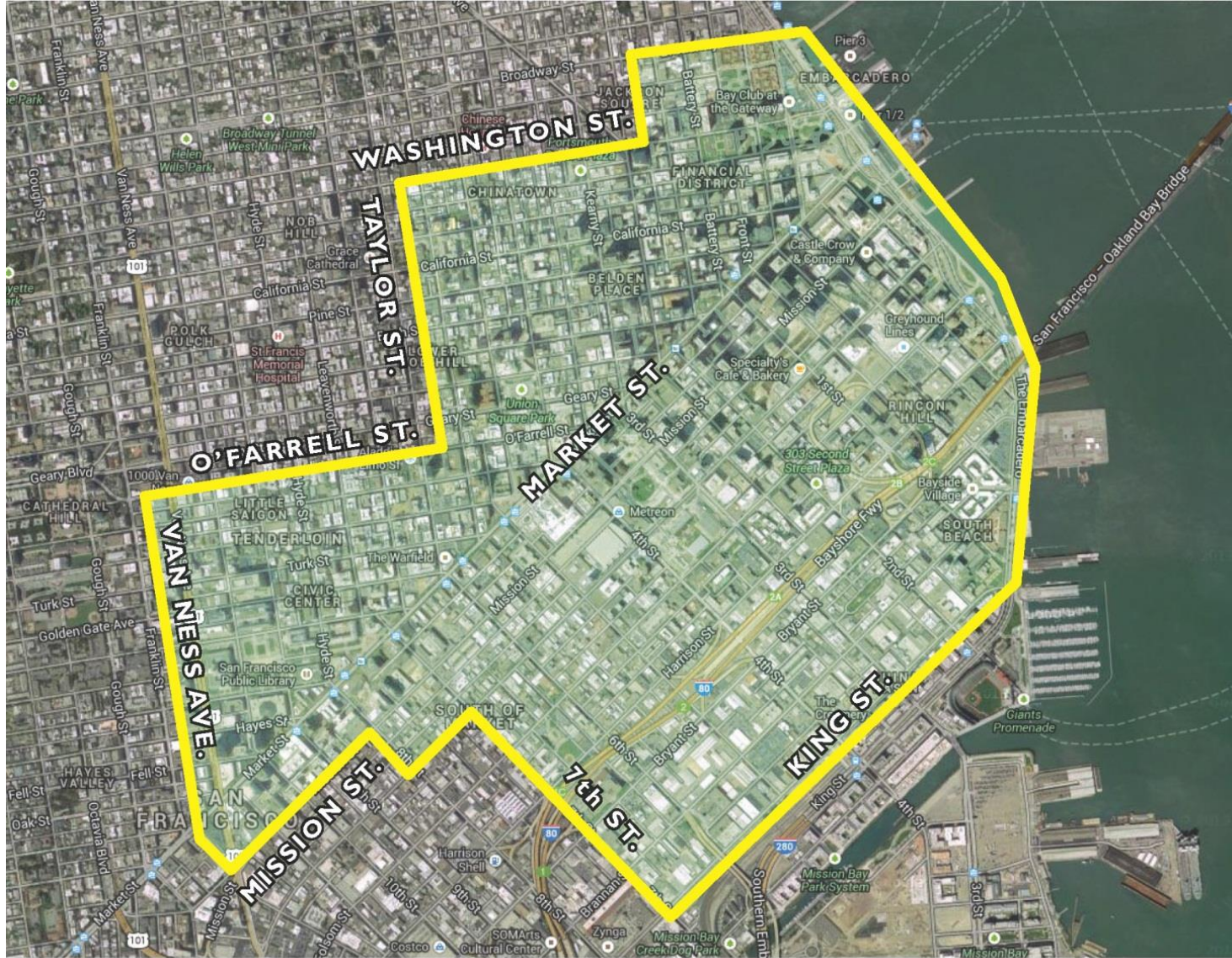
SAN FRANCISCO

2030

DISTRICT

- ⦿ **Developed around Central Business District**
- ⦿ **Area of approximately 2 square miles**
- ⦿ **Initial focus on Commercial Buildings**
- ⦿ **Over 2,800 Buildings**
- ⦿ **Contains over 150 Million Square Feet**





— 2030 District Boundary



San Francisco 2030 District Supporters



2030 DISTRICTS NETWORK



241M
Square Feet
Committed

- **936** Buildings
- **268** Property Members
- **160** Professional Stakeholders
- **100** Community Stakeholders

Emerging Districts

- Ann Arbor
- Detroit
- Portland, ME
- New York City
- Austin



Marketplace

- © 2030 Districts Marketplace
- © Leverage Purchasing Power across Network
- © Negotiated Pricing for Products & Services



Tools

- ◎ **Small Commercial Toolkit**
- ◎ **Access to Pilot Project Opportunities**
- ◎ **Technology Discovery Process**



Knowledge Transfer







Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

Getting Beyond Widgets: Developing Utility Programs for Building Integrated Systems

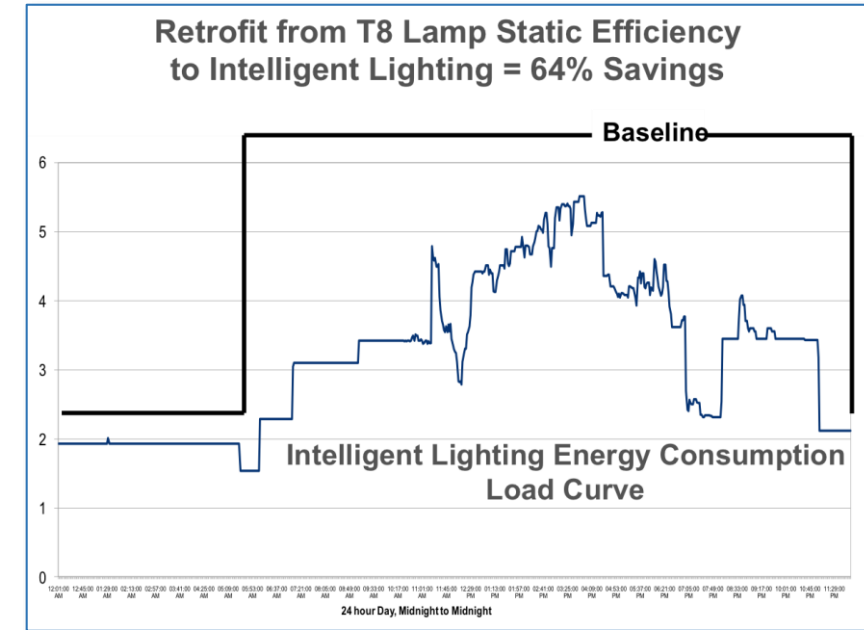
U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy

Building Technologies Program



Integrated Systems – Utility Incentive Program Challenges

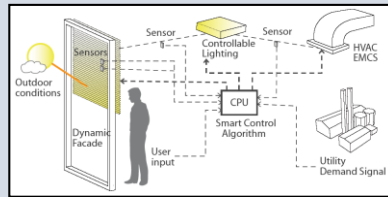
- DSM Portfolios are currently ‘widget-oriented’
 - Technical Reference Manual doesn’t cover systems
 - Deemed savings approaches are suited towards ‘widget’ technologies
- Custom DSM programs require higher levels of technical assistance & incur higher delivery costs – not viable for small commercial
- Subset of cost-effective, energy-saving component technologies are becoming smaller with increasingly more stringent code req’ts
- ET feeds the DSM program pipeline, but ET systems technologies assessments are difficult under current pilot demonstration approach
 - Field demonstrations model makes it very difficult to provide true ‘apples-to-apples’ systems comparisons with robust data to enable extension to other customer site conditions



DOE-LBNL 'Beyond Widgets' Project

Goal: Develop validated Building Systems Packages for streamlined deployment through utility energy efficiency incentive programs

Building Systems Program Package



System specifications



Savings & performance metrics

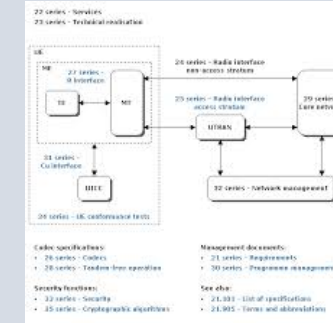


M&V specifications



FLEXLAB-validated Savings

Controlled testing and validation of systems



Savings persistence guidance

Part 5. GENERAL

1.01 Description: Provide all labor, materials, and equipment to perform the following the Contract, including incidental related to that work and completion and support of work specified elsewhere in the Contract Documents:

- Site Mobilization & Preparation
- Protection of Existing Features and Work in Progress
- Removal of the existing site conditions including soil, groundwater, utilities and existing building
- Excavation and Foundation Sub Preparation
- Supply, Placement, and Completion of health services by Engineering Specifications
- Supply, Placement and Completion of free draining material mat (Define with all specifics)
- Supply and Placement of top 18 inches of Debris S11 bags
- Supply and Placement of geogrid S11 geogrid
- Supply and Placement of the vegetation removal
- Supply and Placement of the vegetation removal

1.02 Related Sections: Coordinate related work specified in other parts of the contract documents, including but not limited to the following:

- Section 0100 - Site Preparation
- Section 2200 - Site and Plant Production
- Section 2300 - Site Production
- Section 2400 - Tree and Plant Removal
- Section 2500 - Earth Retention for Land Areas
- Section 2600 - Landscaping Plantings
- Section 2700 - Site Restoration

1.03 References:

- Manual Concrete Masonry Installation, Chapter Manual for Structural Forming Walls, 2nd, 11
- American Concrete Masonry Association (ACMA)
- ASTM C495 - Compressive Strength Concrete Specimens and Segments
- Concrete with Fibrous Concrete Blocks
- ASTM C1107 - Compressive Strength of Concrete - 1000 PSI
- ASTM C1108 - Unconfined Tensile-Creep Behavior of Concrete
- ASTM C1109 - Equilibrium Moisture Content of Concrete
- ASTM C1110 - Fresh-Site Analysis
- ASTM C1111 - Laboratory Compressive Strength of Self-Consolidating Concrete
- ASTM C1112 - Laboratory Compressive Strength of Concrete
- ASTM C1113 - Laboratory Compressive Strength of Concrete
- ASTM C1114 - Laboratory Compressive Strength of Concrete
- ASTM C1115 - Laboratory Compressive Strength of Concrete
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- ASTM C1195 - Laboratory Compressive Strength of Concrete
- ASTM C1196 - Laboratory Compressive Strength of Concrete
- ASTM C1197 - Laboratory Compressive Strength of Concrete
- ASTM C1198 - Laboratory Compressive Strength of Concrete
- ASTM C1199 - Laboratory Compressive Strength of Concrete
- ASTM C1200 - Laboratory Compressive Strength of Concrete

1.04 Current Requirements:

Streamlined assessment method & system implementation guidelines



FLEXLAB – Facility for Low Energy eXperiments in Buildings

FLEXLAB, DOE's unique facility dedicated to:

- Developing & validating solutions for highly-efficient, **integrated building systems under realistic operating conditions**
- Research focus includes:
 - ◆ Systems integration at end use, whole building & grid interaction levels
 - ◆ End use integration & component interactions (e.g., HVAC, lighting, windows, envelope, plug loads control systems)
 - ◆ Controls hardware & sensors
 - ◆ Simulation & tools for design through operations

Commercial buildings focus, with applications relevant to office, retail, educational, multi-family

- New construction & retrofit

Energy efficiency studies, including thermal & visual comfort & occupant engagement



Utilities and Systems

System

Market

Whole Building
Potential Savings



Automated shading
integrated with daylighting
controls

Med-large office
K-12 Educational

9-23%



Workstation specific lighting
with daylight dimming

Med-large office

17-33%



Integrated task/ambient
lighting with plug load
occupancy-based controls

Small-large office

17-27%



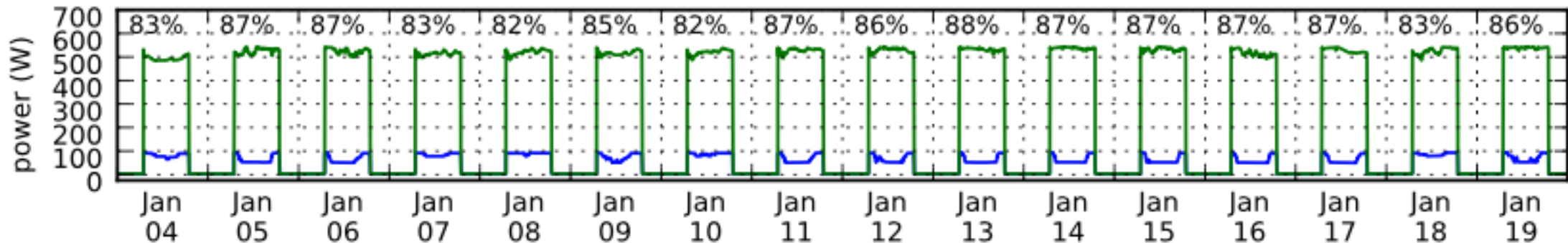
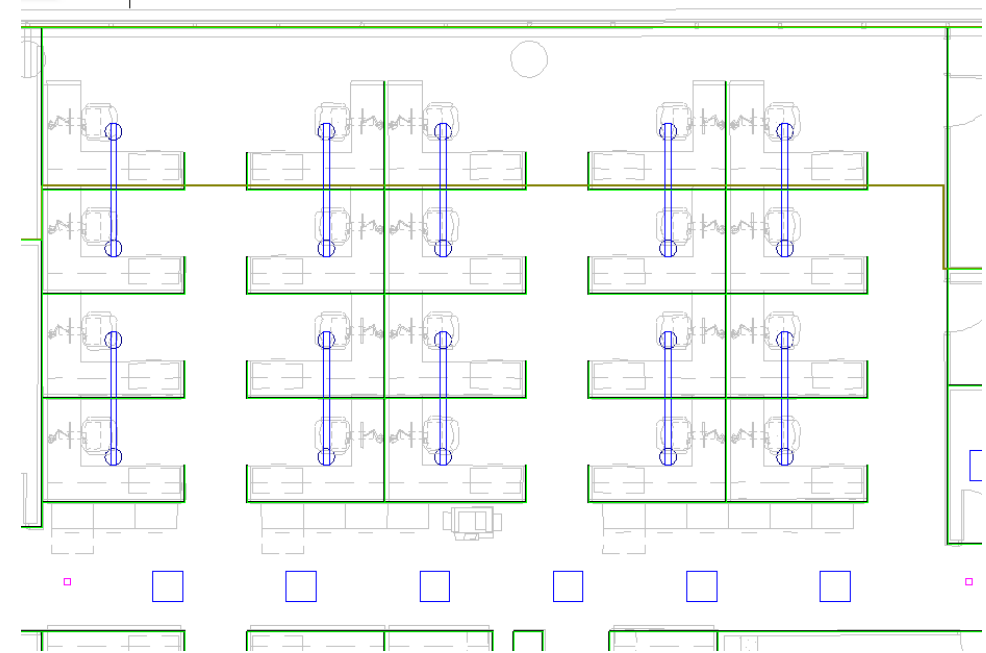
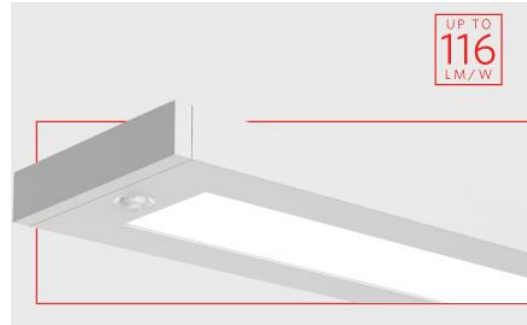
Integrated Workstation-Specific Lighting

Suspended I/D LED luminaires with individual networked control

- Maximum energy savings
- Glare free illuminance
- Occupant comfort tailored to each individual's needs

Fixture-integrated sensors:

- Sensor technology includes photosensors AND occupancy with PIR, ultrasonic, microphonics



Workstation specific lighting provides **83-93% lighting energy savings, representing an additional 13-20% lighting energy savings over traditional general zonal lighting approaches**



ComEd FLEXLAB Test Setup



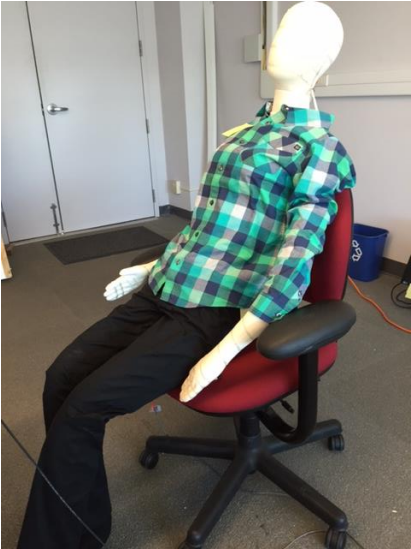
Licor sensor grid and HDR cameras



Partitioning for 15' zone



Paneling for lower window-to-wall ratio



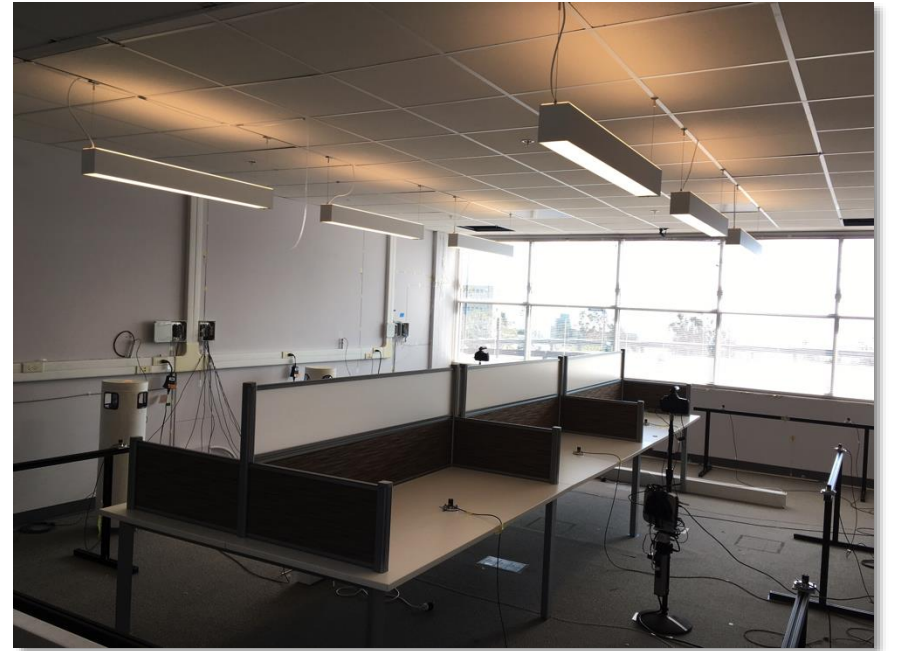
Occupant heat generators



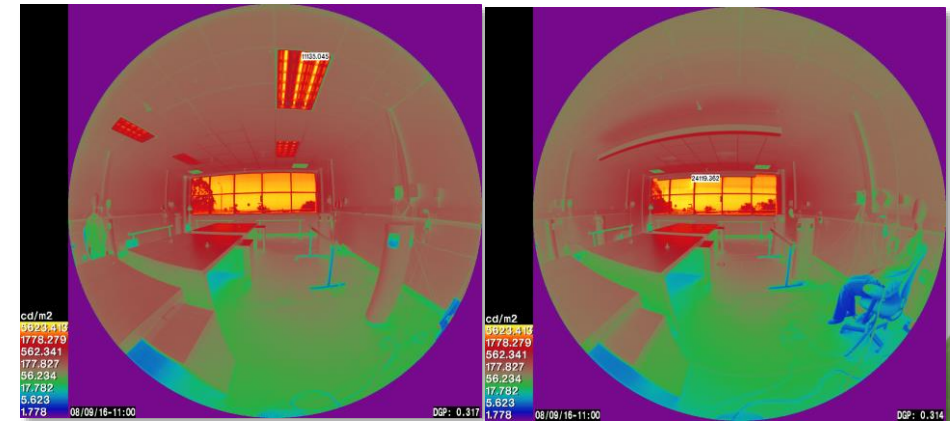
Overall Status and Next Steps

- FLEXLAB testing completed, test results data analysis underway
- M&V approaches analyzed
- Develop assessment method and implementation guidance
- Training and tech support for program implementation (through Fall 2017)
- Release updated program manual (July 2017)

cbs.lbl.gov/beyond-widgets-for-utilities



Workstation-specific luminaires



Noon (Aug 9) HDR DGP Candela maps near-window in each cell.

