Emerging Technologies Summit

MAKING THE CONNECTION:

From Energy Efficiency Innovation to Delivery

April 19 – 21, 2017

The Path to Success: Scaling Integrated Solutions

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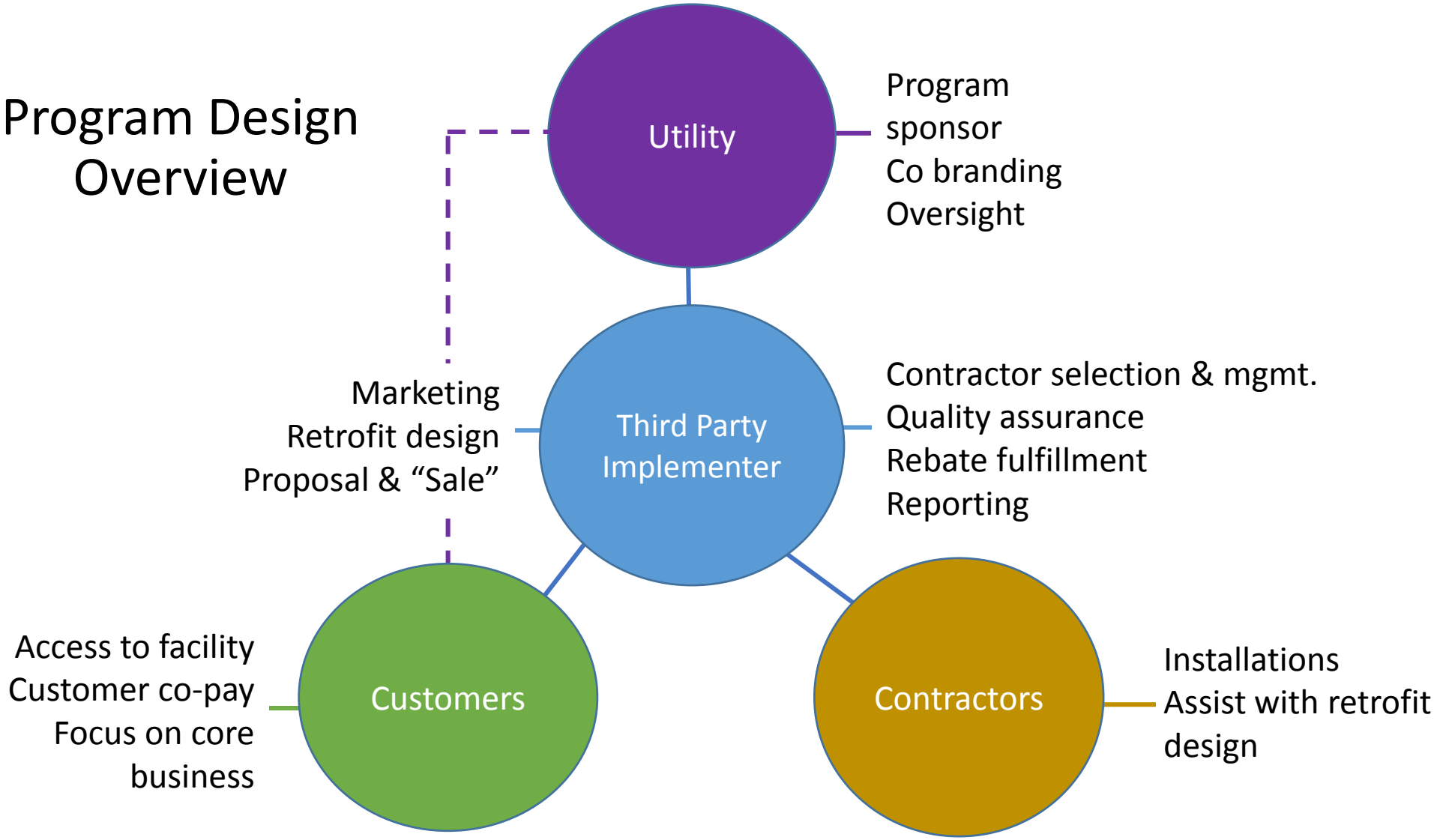
SMARTScale
Accelerating the Energy Efficiency Market

Deep Savings for Small Commercial Direct Install Retrofit Program

A Replicable Model for High Volume, Cost Effective Energy Savings

Ecology Action | Helping people act now.

Program Design Overview



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Program Results

Large Scale		Cost Effective			Deep	
728	47M	$0.32 /kWh	3.1	28%	64,500 kWh	Measures
Projects in 3 Years	**1st year kWh savings (450M lifetime)**	**Cost 1st year ($0.035/ lifetime)**	**CA Total Resource Cost**	**Customer payment of total project cost**	**Average savings per project (618,000 lifetime)**	**HVAC, Refrigeration Lighting Other**

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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

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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

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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

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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.

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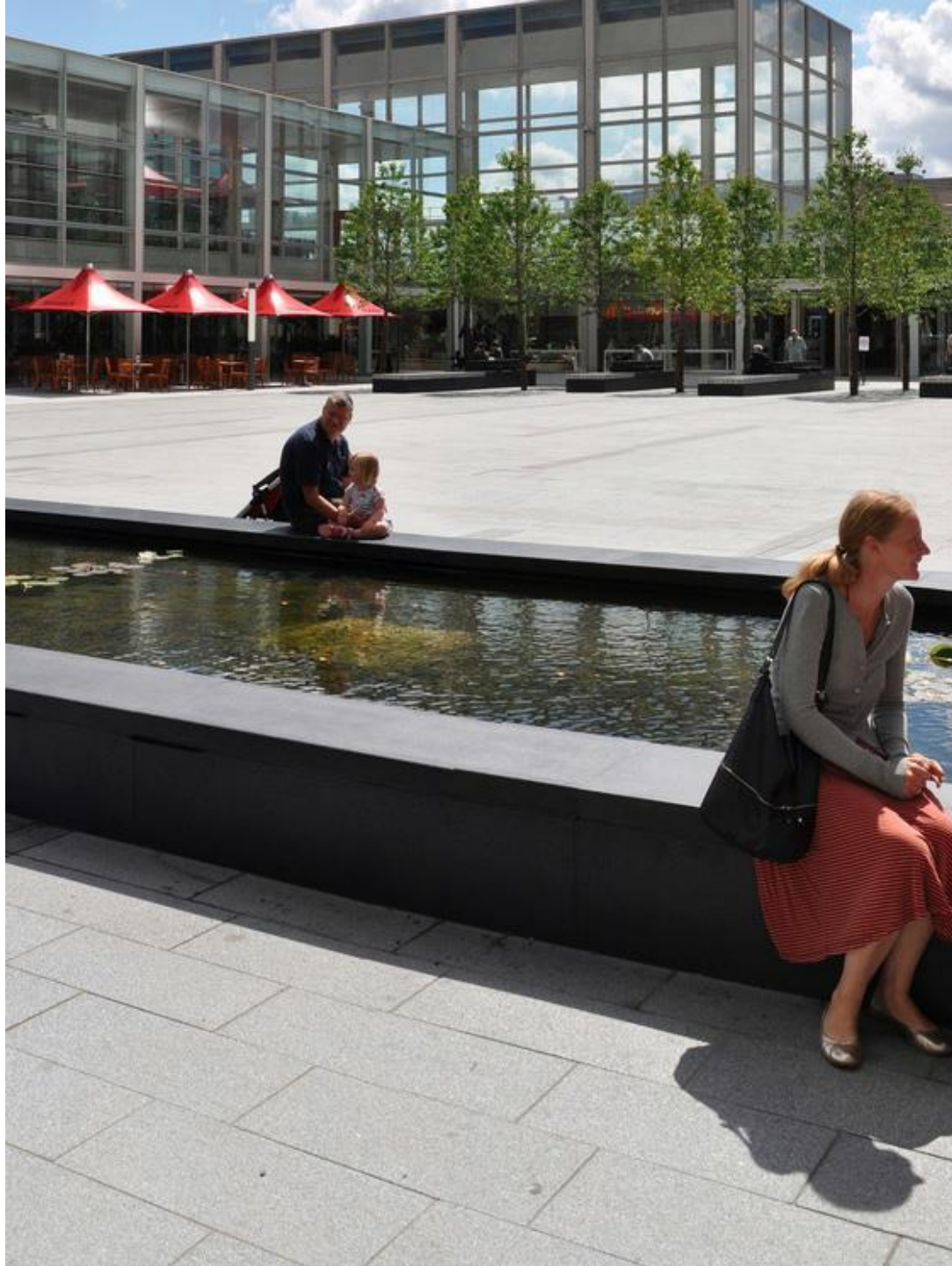
Private/Public Partnerships

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



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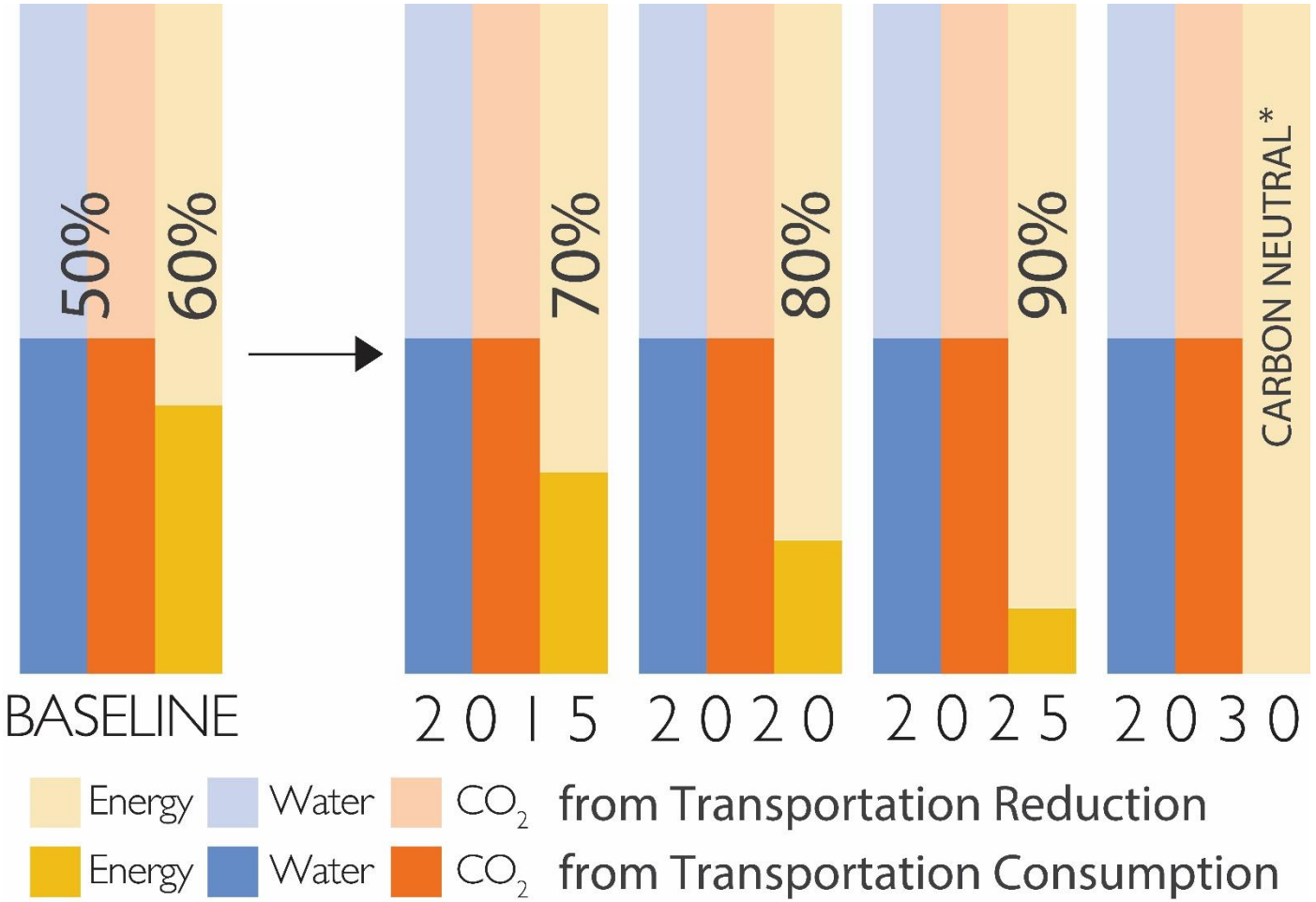
New Construction Goals



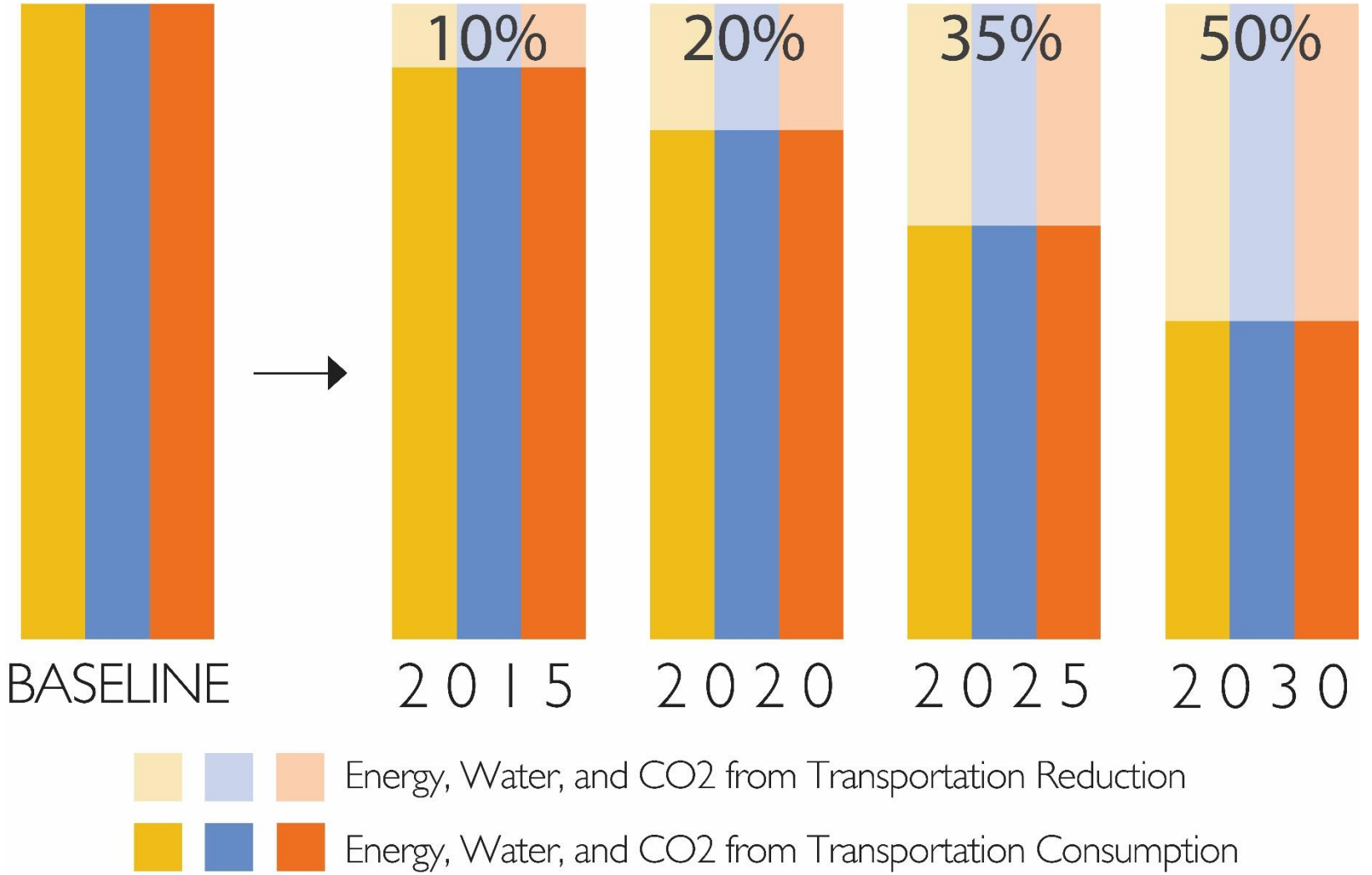
The 2030 Challenge for Planning:
New Buildings & Major Renovations

Using no fossil fuel GHG-emitting energy to operate.

SAN FRANCISCO 2030 DISTRICT

architecture 2030

Existing Building District-Wide Goals



The 2030 Challenge for Planning: Existing Buildings

SAN FRANCISCO 2030 DISTRICT

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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

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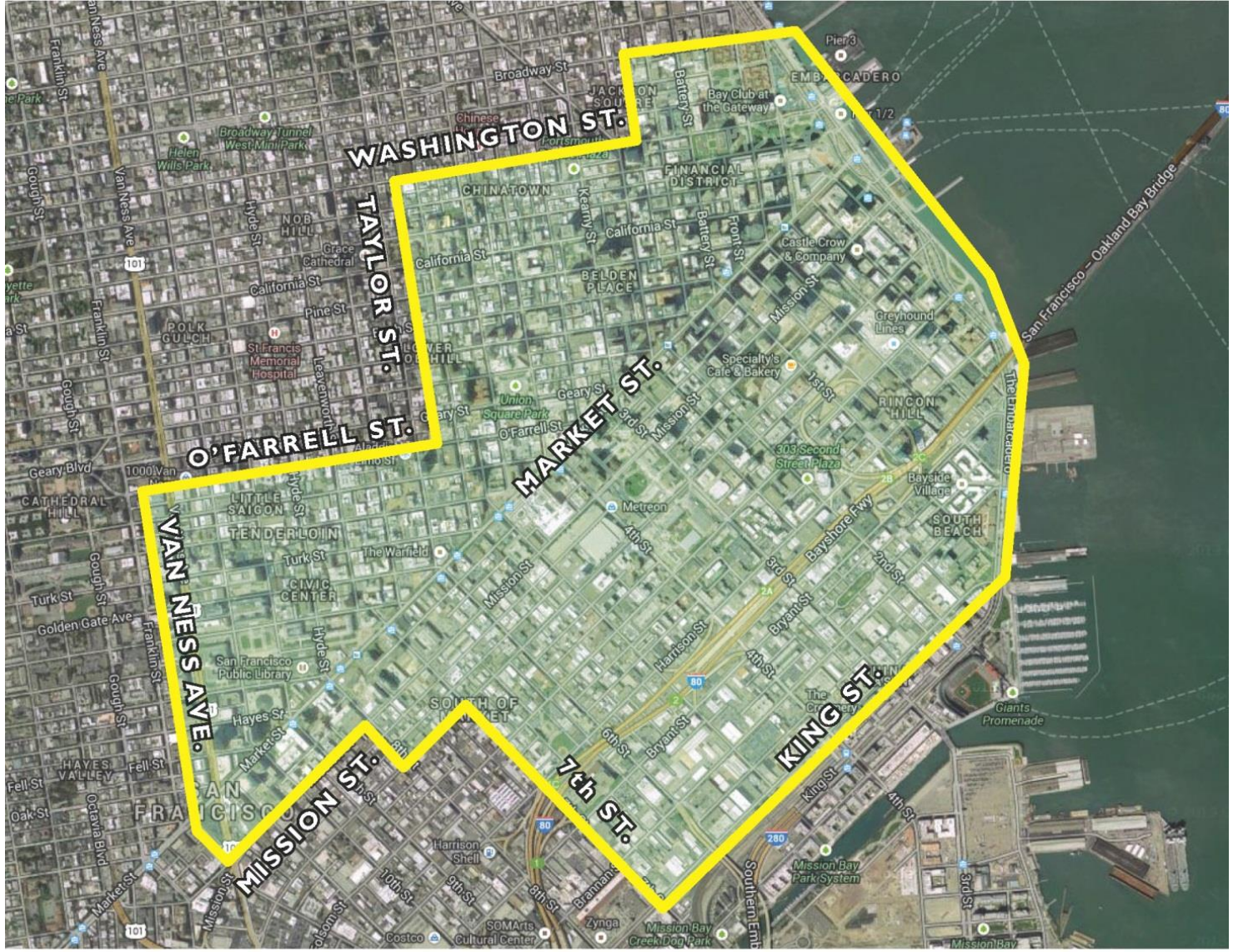

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San Francisco

2030 District Supporters

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2030 DISTRICTS NETWORK

241 M
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

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Marketplace

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

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Tools

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

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Knowledge Transfer

BERKELEY LAB
Lawrence Berkeley National Laboratory

SF Environment

INTEGRAL GROUP

Chinatown Community Development Center

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

vision
function
space
culture
ideas
experience
RMW think
architecture & interiors
listen
build
speak
learn

PROSPECT
Silicon Valley

SAN FRANCISCO 2030 DISTRICT

SEAL OF THE CITY AND COUNTY OF SAN FRANCISCO
ORO EN PAZ · FIERRO EN GUERRA

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BERKELEY LAB
Lawrence Berkeley National Laboratory

Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

Getting Beyond Widgets:

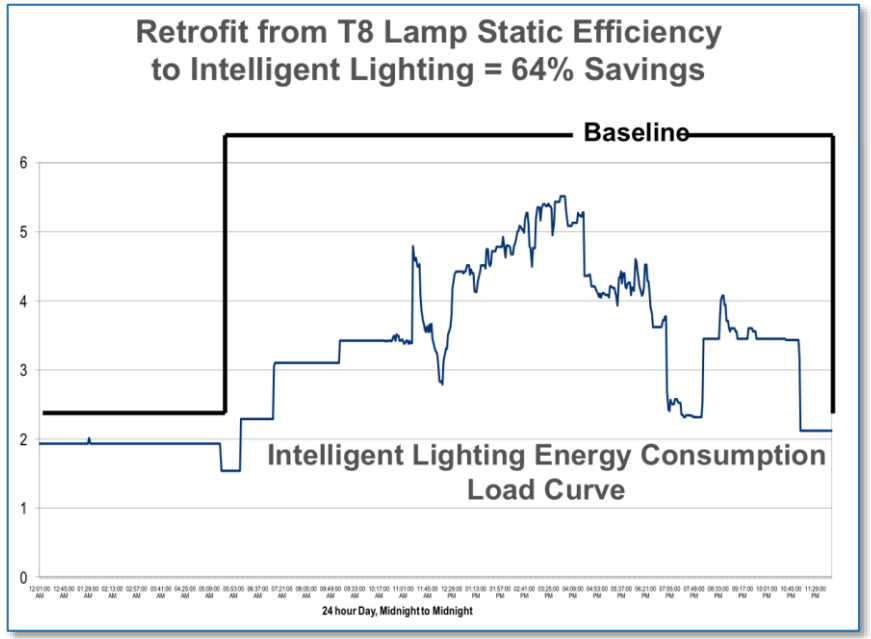
Developing Utility Programs for Building Integrated Systems

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

Building Technologies Program

Integrated Systems – Utility Incentive Program Challenges

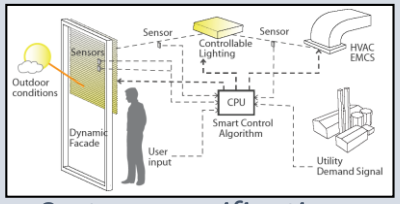
- DSM Portfolios are currently 'widget-oriented'
  - Technical Reference Manual doesn't cover systems
  - Deemed savings approaches are suited towards 'widget' technologies
- Custom DSM programs require higher levels of technical assistance & incur higher delivery costs – not viable for small commercial
- 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



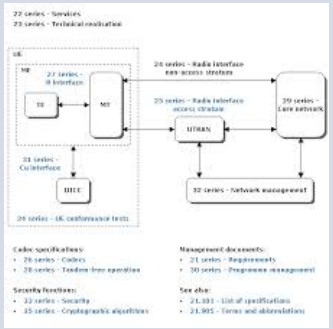
System specifications

Savings & performance metrics

M&V specifications

FLEXLAB-validated Savings

Controlled testing and validation of systems



Savings persistence guidance

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
ComEd An Exelon Company	Automated shading integrated with daylighting controls	Med-large office K-12 Educational	9-23%
Xcel Energy℠	Workstation specific lighting with daylight dimming	Med-large office	17-33%
A PUBLIC AGENCY NCPA NORTHERN CALIFORNIA POWER AGENCY SCPPA	Integrated task/ambient lighting with plug load occupancy-based controls	Small-large office	17-27%

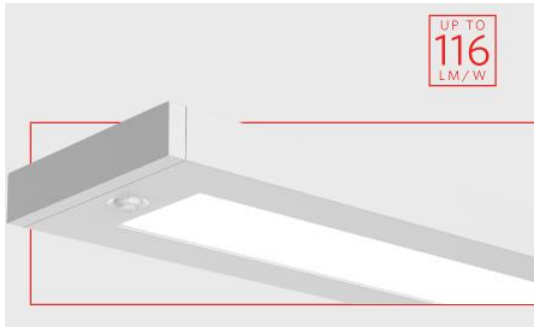
Integrated Workstation-Specific Lighting

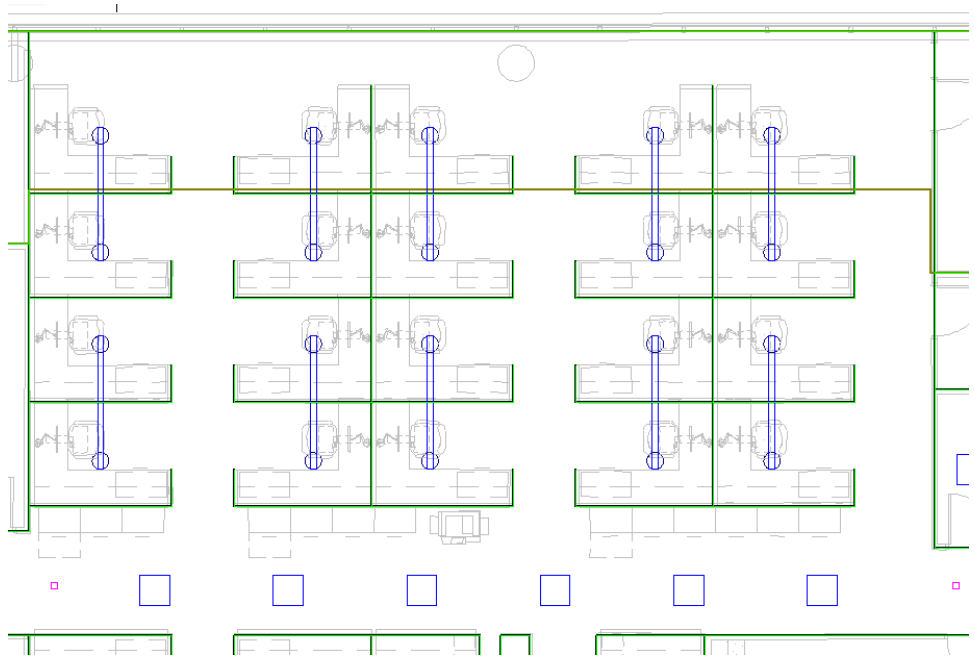
Suspended I/D LED luminaires with individual networked control

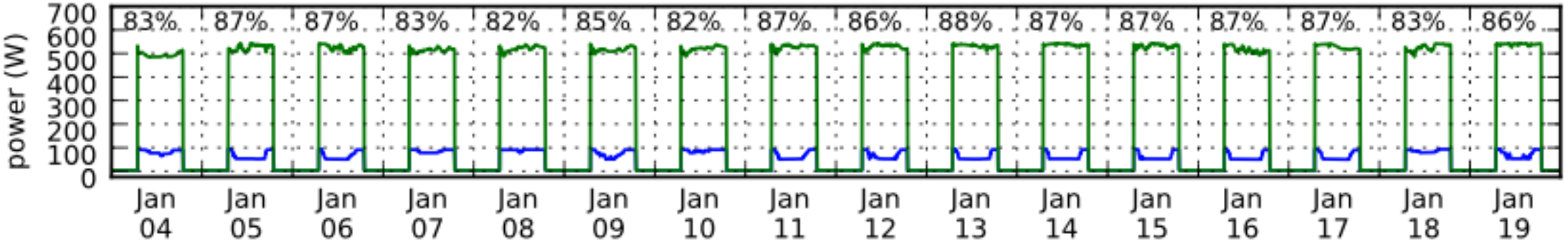
- Maximum energy savings
- Glare free illuminance
- Occupant comfort tailored to each individual's needs

Fixture-integrated sensors:

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



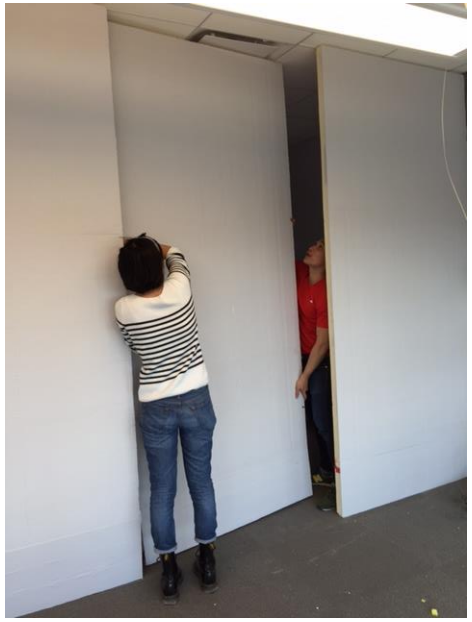




Workstation specific lighting provides ***83-93% lighting energy savings, representing an additional 13-20% lighting energy savings over traditional general zonal lighting approaches***

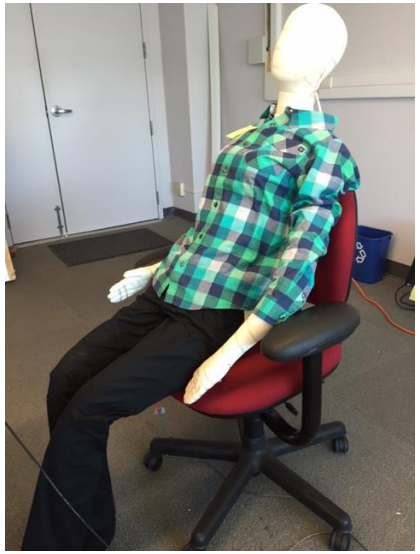
ComEd FLEXLAB Test Setup

Licor sensor grid and HDR cameras



Partitioning for 15’ zone

Paneling for lower window-to-wall ratio

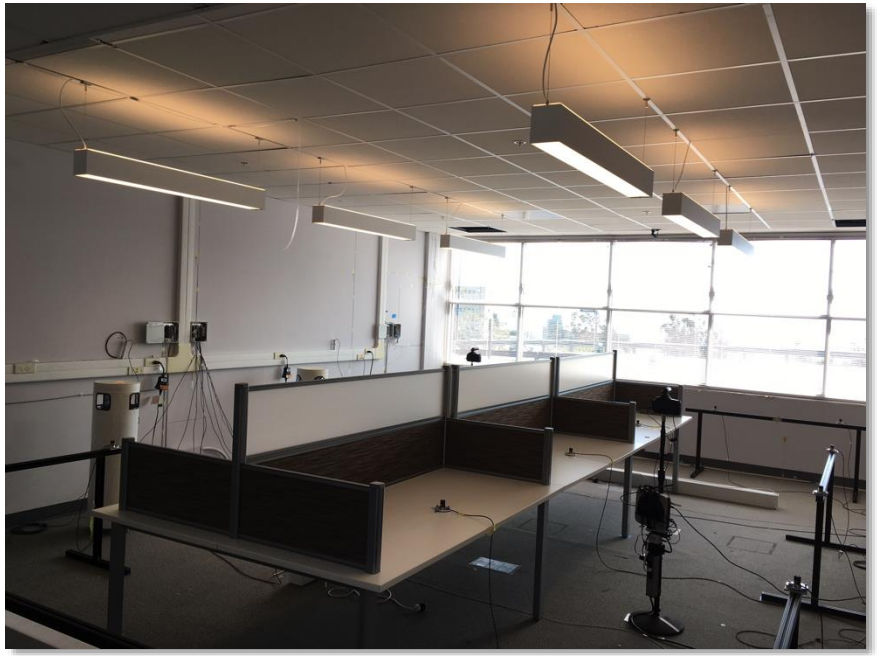


Occupant heat generators

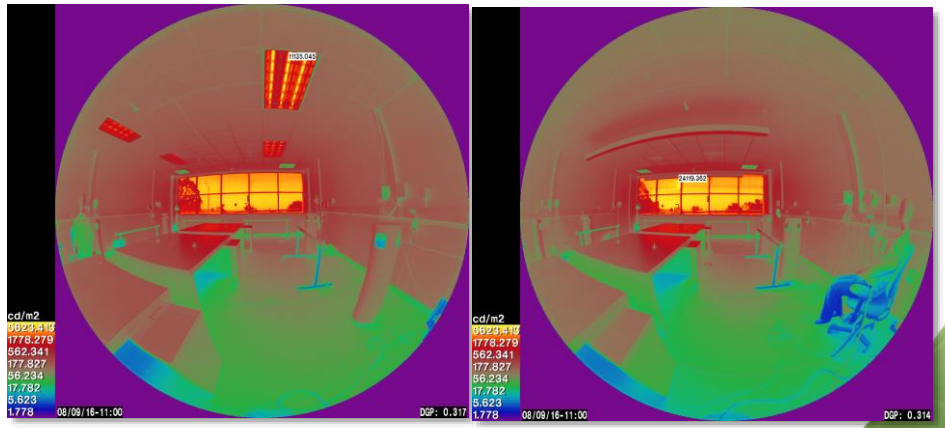
Overall Status and Next Steps

- 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.