Roadmaps to Decarbonization

Strategic Decarbonization Planning for Varied Building Portfolios

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ENGINEERING
CITY OF LOS ANGELES

DGS
CALIFORNIA DEPARTMENT OF GENERAL SERVICES

GLUMAC
A TETRA TECH COMPANY

Agenda

1. Learning Objectives
2. Decarbonization Overview
3. Decarbonization Process
4. Case Studies
5. Q&A

Introductions

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Learning Objectives

01

Identify key **impacts, factors & processes** to help large and small building portfolio owners successfully develop a **portfolio-scale decarbonization plan**.

02

Learn how to distill evaluation of **complex systems** and implementation projects into **simple and manageable steps**.

03

Learn how to drive measurable change assessing challenges and opportunities within **existing data sets**.

04

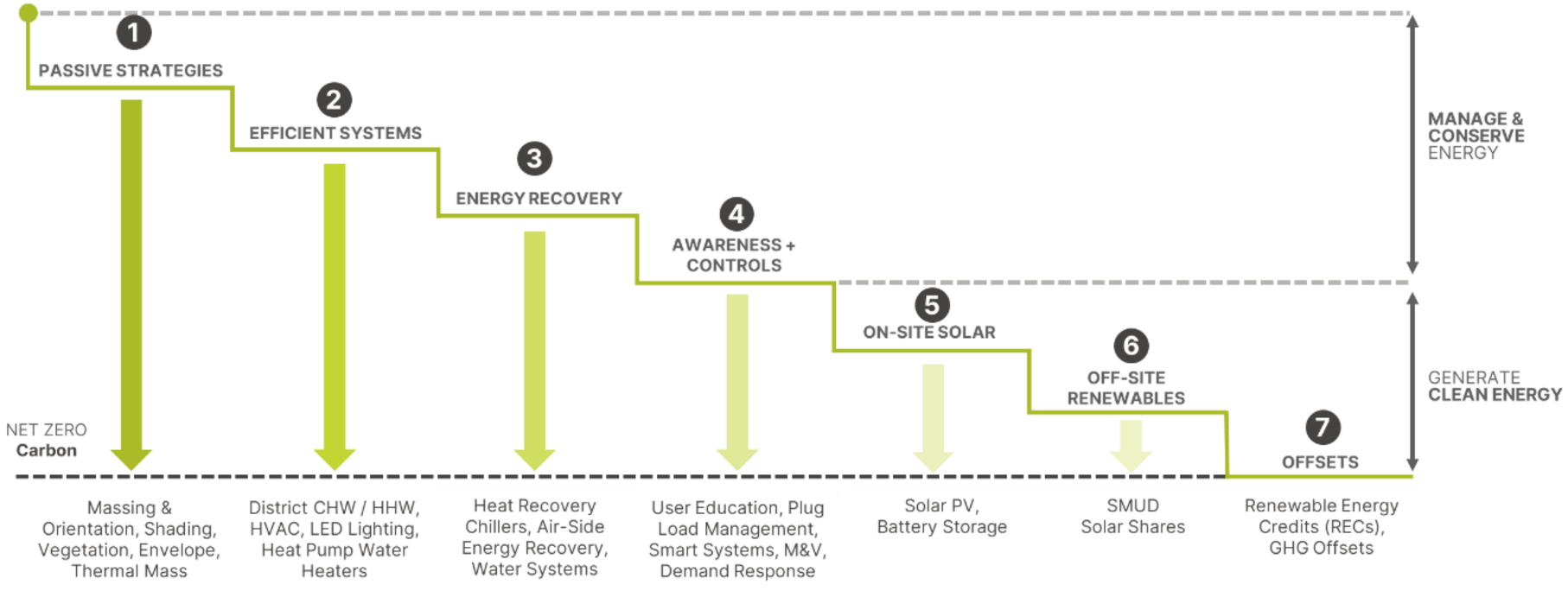
Learn how to balance standardization and flexibility to allow for a **dynamic but usable template for project implementations**.

What is decarbonization?

Practical Definition – ***portfolio electrification, rather than building specific, emphasis of removing the burning of fossil fuels on site and assessing more energy efficient options for building services (space heating, cooling, ventilation, domestic water heating).***

Typically assess:

1. Scope 1 Emissions – pertains to GHG emissions that is emitted from a source that is owned or directly controlled (example: combustion process from traditional natural gas boilers)
2. Scope 2 Emissions – pertains to indirect GHG emissions often through the purchasing of offsite fuel sources – electricity, steam, heating, or cooling



Decarbonization Planning Process

Framework for Decarbonization

1

Assess Drivers

- Climate commitments and goals
- State or Local Mandates
- Infrastructure needs

2

Understand Systems & Energy Use

- Categorize building types
- Understand energy use
- Identify building systems

3

Identify Projects & Opportunities

- Electrification measures
- Energy efficiency measures
- Infrastructure plans

4

Plan for Implementation

- Project Prioritization
- Funding Needs & Opportunities
- Roadmap

Assess Drivers

Assess **Drivers**

Climate Commitments & Goals

What do you aspire to achieve and what have you committed to?

State, Local, Other Mandates

What is required for compliance and how do your decarbonization goals align?

Infrastructure Needs

How does decarbonization align with your existing infrastructure needs?

Stakeholders

Who are the decision makers, who are the users, who will be involved with implementing projects?

CA DGS

Project Drivers

State Requirements

1. **SB 1020 (Laird - 2022)**
   - 100% non-carbon electricity purchases by state agencies by 2035
2. **SB 1203 (Becker - 2022)**
   - State agencies aim to achieve zero emissions from operations by 2035
   - Develop & publish biennial decarbonization plan and costs in Sustainability Roadmaps beginning GHG emissions inventory beginning 1/2026
3. **Executive Order B-18-12**
   - ZNE for all new & renovated state buildings and 50% of existing building area by 2025

Local & Regional

- **Bay Area AQMD Equipment Mandates**
- **South Coast AQMD Equipment Mandats**
- **Local Ordinances**

LA Climate Commitments

Climate Goals

- Make Los Angeles a **green, resilient, and zero carbon** city.
- Improve **health and quality of life** for all Angelenos.
- Build a strong **green and equitable economy.**
- Position Los Angeles as a **global leader** for city climate action.

Climate Targets

- Net Zero electricity by 2035 (LADWP LA100)
- Net Zero municipal operations by 2045
- Net Zero city by 2050

Existing Municipal Building Decarbonization Plan

- Pathway to decarbonize buildings by 2035
- Energy efficiency and electrification program
- Solar PV and energy resilience strategy

Engage Stakeholders: **Create Project Champions**

Early and continuous engagement leads to more implementable, supported, and successful plans.

Facilities Teams
Provide ground-level insights into building systems, maintenance realities, and operational constraints that influence project feasibility.

Sustainability Staff
Align decarbonization projects with broader environmental goals, reporting frameworks, and climate commitments.

Building Users
Offer feedback on comfort, functionality, and programmatic needs, helping ensure that solutions are practical and well-adopted.

Capital Planning Stakeholders
Ensure decarbonization strategies are integrated into long-term budgeting, funding requests, and investment cycles

Understand
Systems & Energy Use

Leverage data to **establish a baseline** for decarbonization planning

Segment Portfolio by Use Type

Group buildings by function (office, healthcare, public safety, etc) to tailor strategies and set appropriate benchmarks.

Inventory Existing Systems

Document age, condition, capacity, and fuel sources to establish a baseline. HVAC, DHW, Lighting, and Envelope.

Benchmark Energy Performance

Assess usage and identify underperforming assets using tools like Energy Star Portfolio Manager and utility data.

What’s Up Next?

Identify deferred maintenance needs and upcoming major projects. Identify where planned investments or existing backlogs can align with decarbonization opportunities.

Tools

Prior Audits & Project Reports

Surveys

Utility Bills

Energy Management Systems

Asset Management Systems

Outcomes

Focus Areas

Priority Buildings & System Types

Understanding of Gaps in Current Practices

Identify
Projects & Opportunities

Key to reaching decarbonization goals is translating system and energy insights into electrification projects aligned with real world constraints.

Select projects based on equipment life cycles – **avoid early retirement.**

Priority Decarbonization Measures

Whole Building Retrofits

Envelope Upgrades
Window Replacement
Increased Insulation
Cool Roofs

MEP Systems
HVAC
Lighting
Domestic Hot Water

Energy Efficiency

HVAC Retrofits
CAV to VAV retrofit
Controls Upgrades

Lighting Upgrades
LED Lighting Upgrades
Controls Upgrades

Retro-Commissioning

Building Electrification

Space Heating
Boilers
Furnaces
RTUs

Domestic Hot Water
Tank Type (<100 gal)
Built Up Systems

Process Equipment
Cooking
Laundry

Distributed Energy Resources

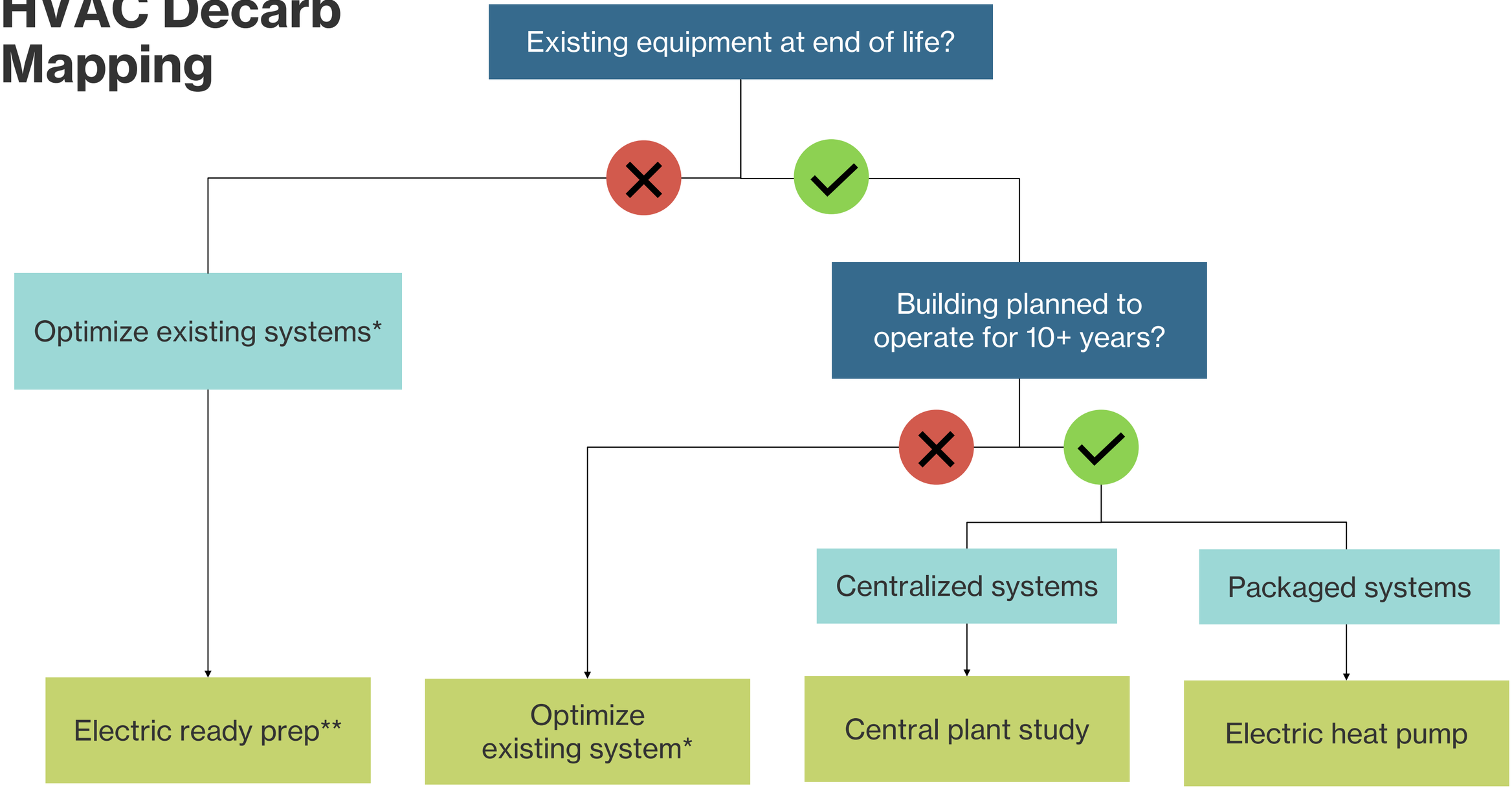
Solar PV
Rooftop
Carport

Battery Energy Storage

Microgrid Systems
Controllers
Load Management

EV Charging Stations

HVAC Decarb Mapping



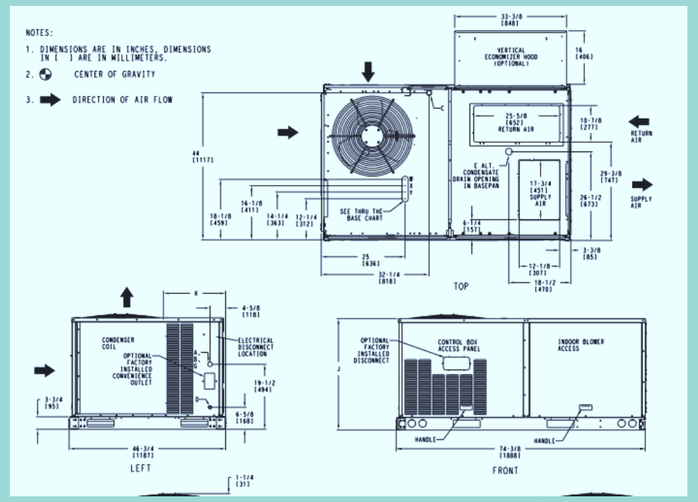
End of Life Equipment Electrification

Prioritize

- Type
- Age
- Condition

Collaborate

- Engineering Review
- Project Scope
- Equipment Specs



Execute

- Contractor Bidding
- Construction
- Warranty

Plan for Implementation

Project Prioritization

Funding Needs & Opportunities

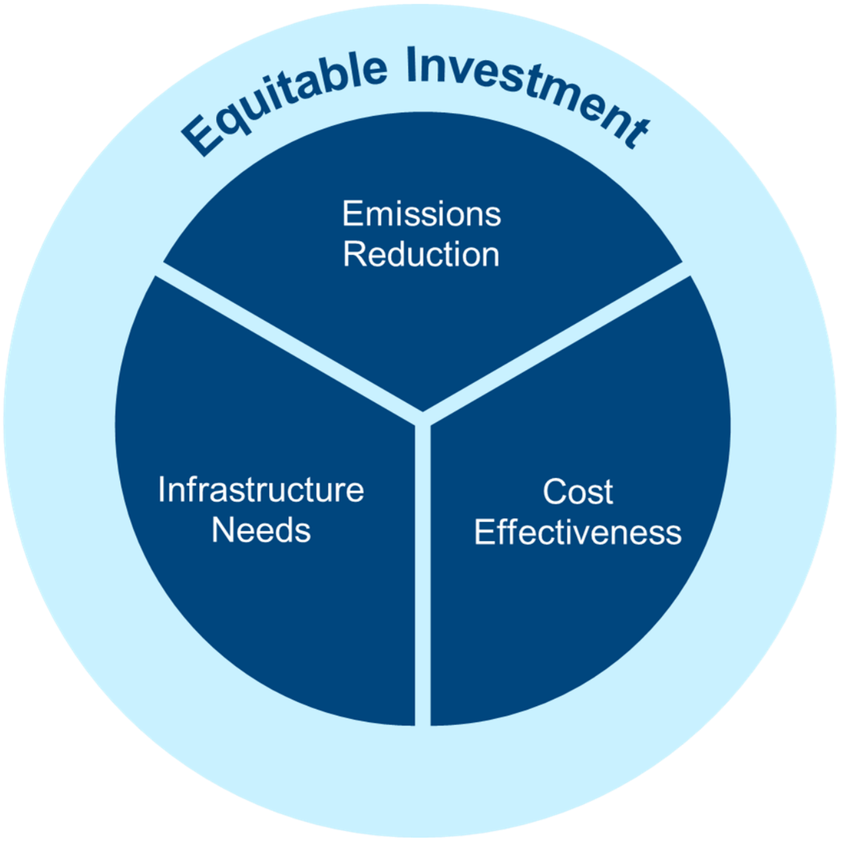
Delivery Methods

Roadmap

Plan for **Implementation**

Prioritization Framework

Site	Natural Gas	Infrastructure Priority	Equity Index
Civic Center Steam Plant	491,100	High	-
Police Administration Building (PAB)	181,700	Medium	-
Hyperion Treatment Plant Buildings	153,500	Medium	-
Expo Center	140,700	Medium	8
Los Angeles Zoo	84,900	Medium	-
Van Nuys Sherman Oaks Park And Pool	81,400	Low	2
Central Library	81,300	Low	3
North Hollywood Fleet Services	78,300	High	4
Piper Tech	72,300	High	0
East Valley Solid Waste Services	71,900	Low	6



LESSONS LEARNED

- Clear prioritization frameworks will improve project/building selection
- Condition of existing infrastructure will be primary factor (deferred maintenance)

Flexible Project Delivery Methods

① Capital Improvement

Complex engineering projects that require planning and engineering design.

- *Boilers*
- *Steam*
- *Pool Heating*
- *Large Water Heaters*

② End-of-Life Equipment

Replacement of smaller natural gas equipment that has reached the end of life.

- *Rooftop Units*
- *Small Water Heaters*
- *Gas Dryers*
- *Ovens & Ranges*

③ Performance Contracts

Full building upgrades at simpler facilities (fire station, library, rec center, etc).

- *HVAC Systems*
- *Water Heaters*
- *LED Lighting*
- *RCx*

④ Portfolio Solar Procurement

Combine solar PV projects across multiple sites for more competitive pricing.

- *Rooftop Solar*
- *Carport Solar*
- *BESS*

LESSONS LEARNED

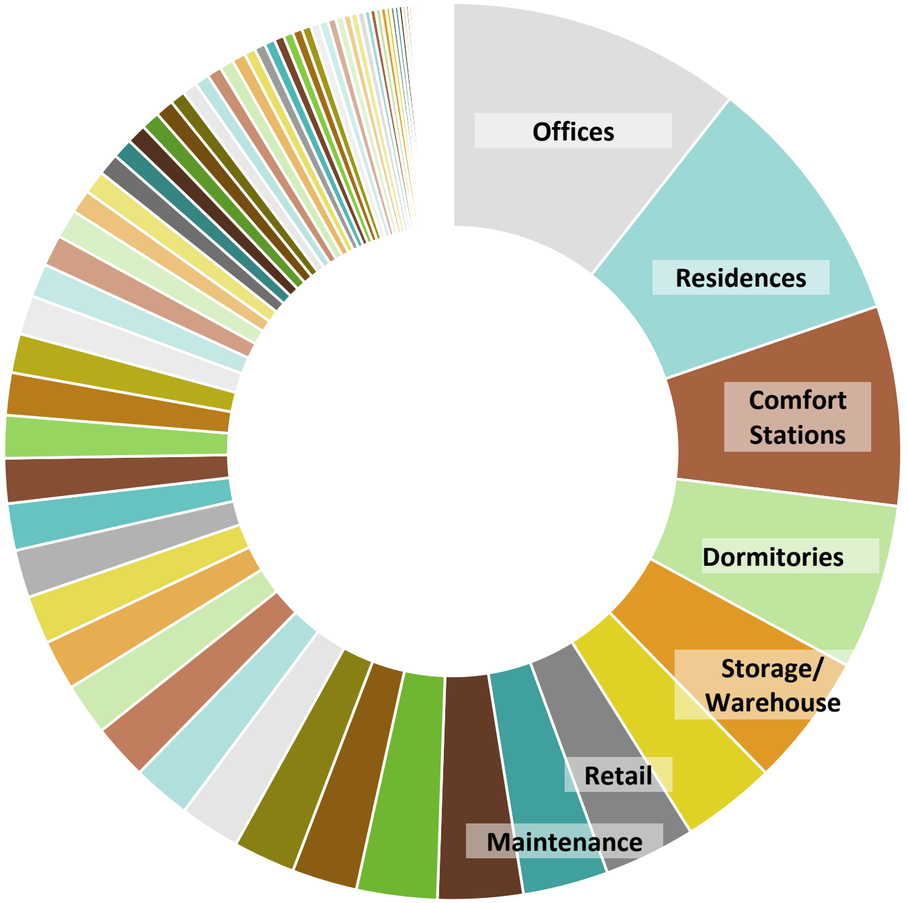
- Develop practical and flexible delivery methods for various project scales
- Provide portfolio design-build delivery models that can scale implementation
- Implement solar and BESS projects separate from electrification

Case Study: **State of CA**

Leveraging data and adaptable frameworks
to segment a very large and diverse building portfolio

Department of General Services Portfolio

- Buildings **spread across 2k+ sites** and **35 departments**
- **Range of building types, services provided** with special considerations like historical significance and security



15k+
Buildings

110M
Square Feet

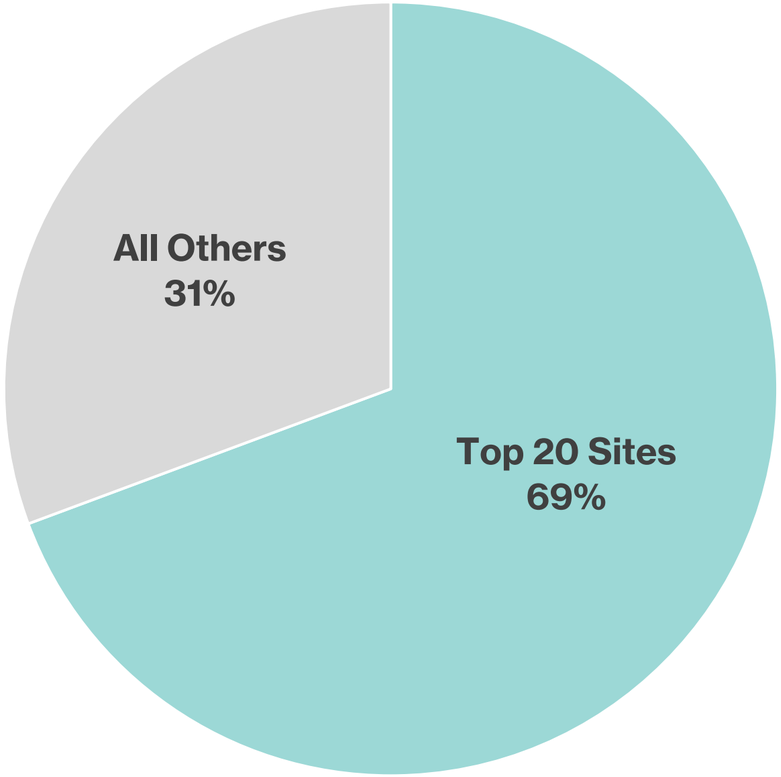
$159M
Annual Utility Cost

LESSONS LEARNED

- Establish a full inventory of existing building stock
- Provide time to review and confirm existing assets

Top Energy Consumers & Plant Analysis

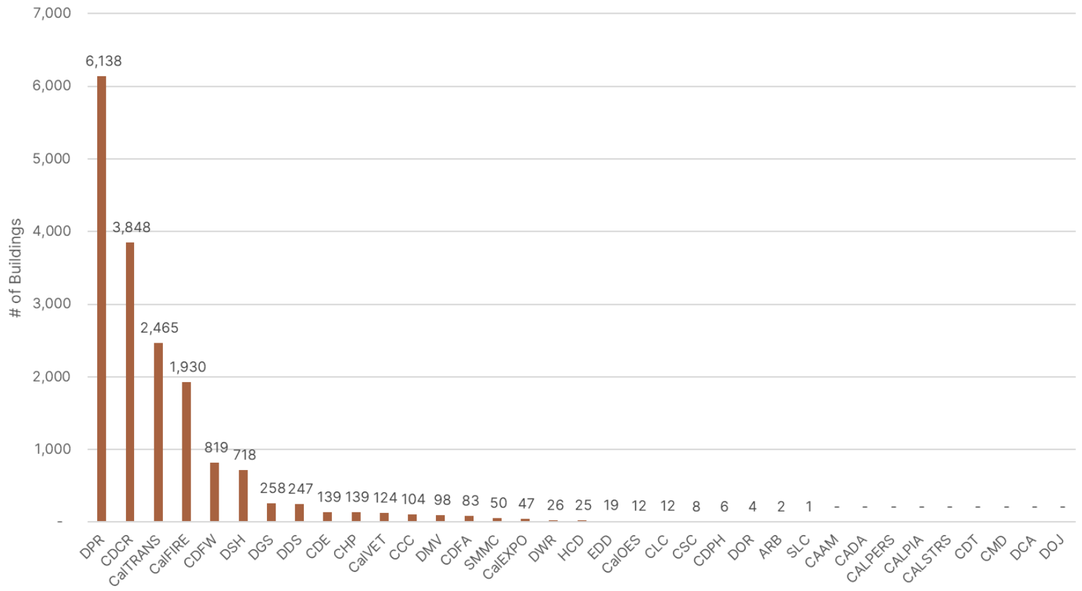
Provide additional consideration for the **top 20 sites that account for nearly 70% of natural gas use** at existing buildings.

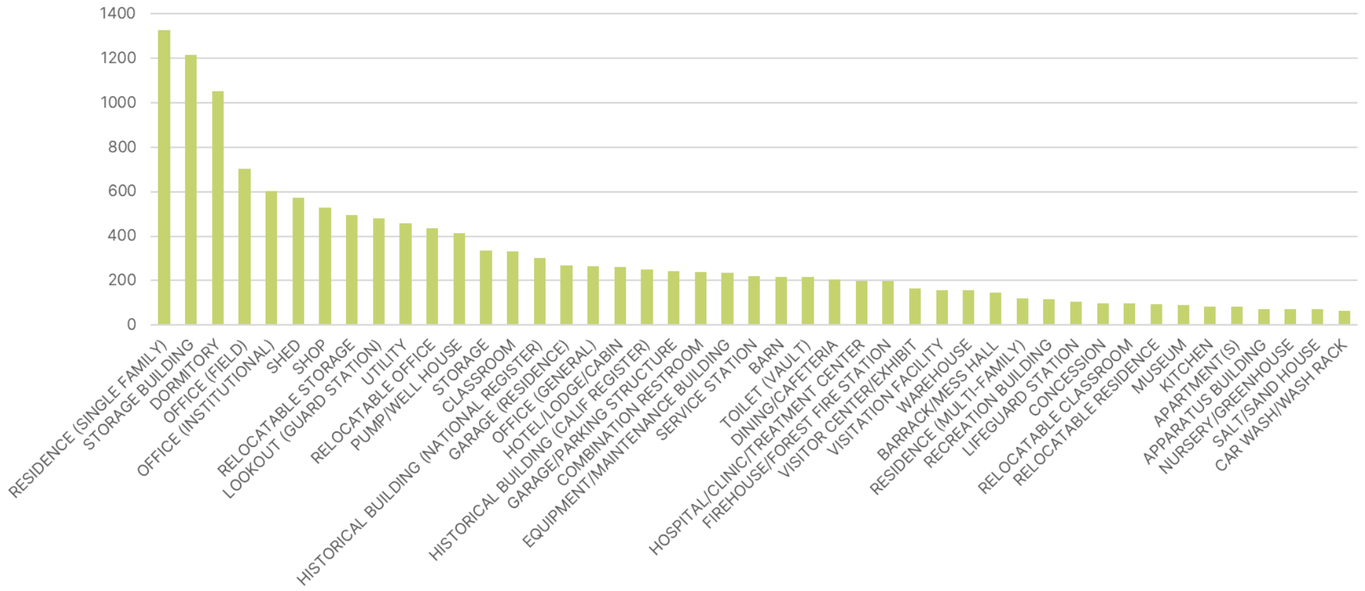


LESSONS LEARNED

- Rank sites based on natural gas and GHG emissions to cut through the noise
- Assess highest emitting facilities in greater detail

Representative Building Types





LESSONS LEARNED

- Small projects still have impact

Energy data and facility information is crucial for large portfolio projects

We can understand building use without going to site

because

DGS uses energy star portfolio manager to track energy data & building info.

We can organize and distill insights based on data

even though

The state portfolio is nearly 20,000 buildings.

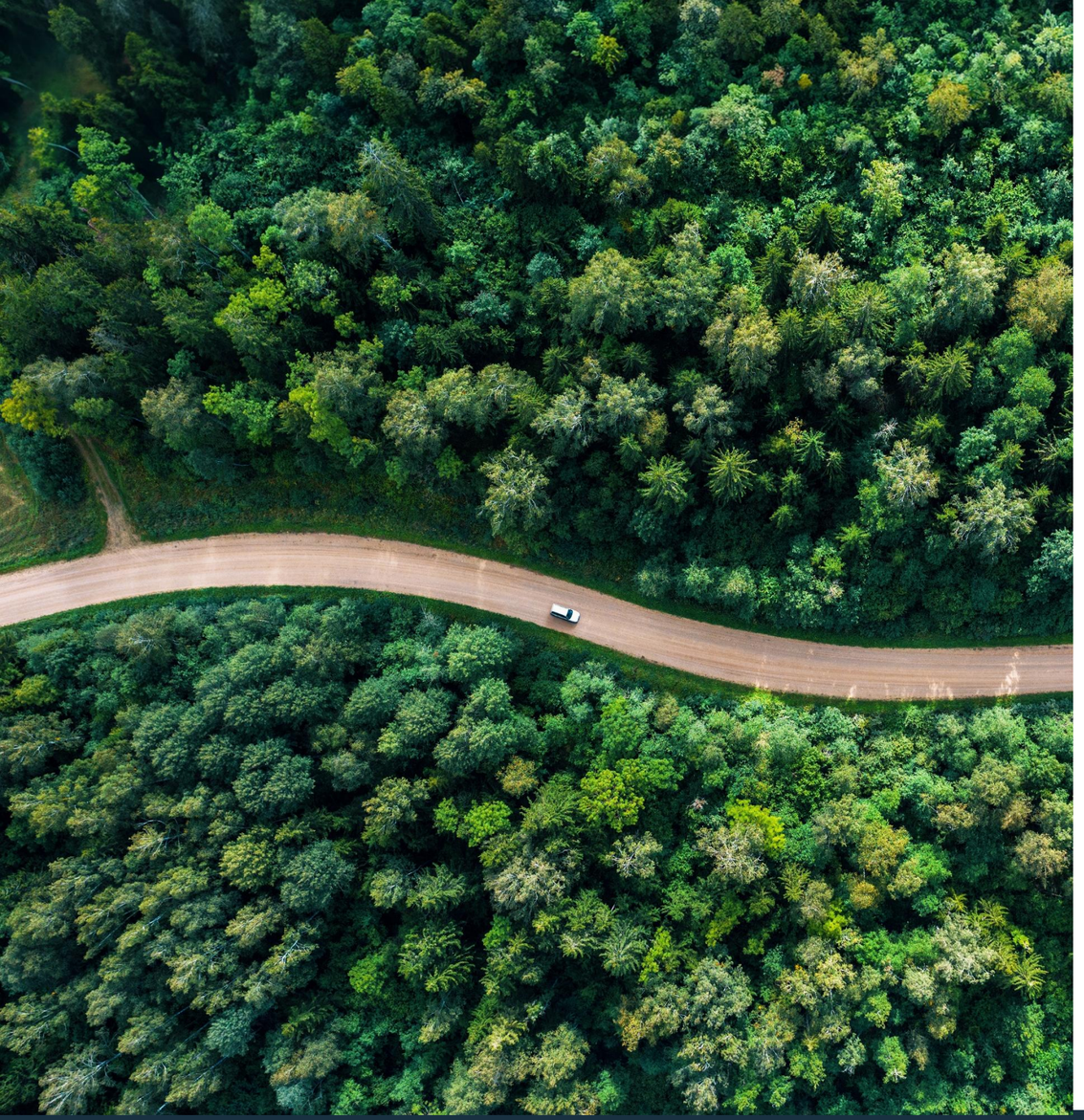
We can benchmark and fill in gaps in our knowledge

due to

Some agencies having extremely detailed databases.

LESSONS LEARNED

- Standardize reporting as much as possible.
- Ensure the building owners have buy-in.
- Small projects still have impact.



Roadmap Integration

Purpose:

Document compliance and progress towards achieve SB 1203 mandates (net zero emissions by 2035)

Content:

- Documentation of existing conditions
- Detailing of electrification and energy efficiency measures applicable to building portfolio
- Outline of project prioritization
- Recommended funding options

Evolution:

Initial compilation by consultant with a handoff to each agency. In future updates, the agencies will own reporting and progress evaluation.

LESSONS LEARNED

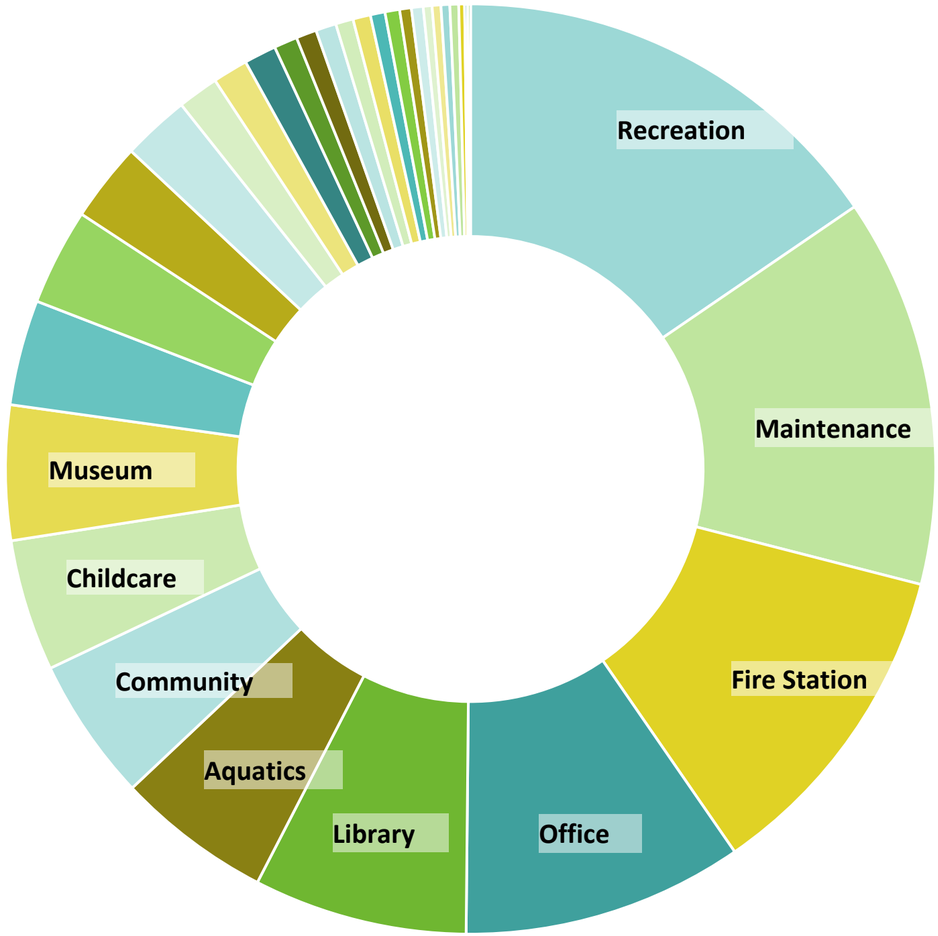
- Identify strategies for keeping portfolio planning as a 'living' document
- Track progress to monitor program impact

Case Study: **City of LA**

Priority Projects & Scaling Up Implementation

City of Los Angeles Building Portfolio

- **Diverse portfolio of buildings** providing critical services
- Buildings account for **34% of municipal emissions:** 100,000 MTE in 2022
- **Net Zero by 2035 requires 80 buildings per year**, a significant increase vs normal operations



980
Buildings

21M
Square Feet

$68M
Annual Utility Cost

LESSONS LEARNED

- Establish a full inventory of existing building stock
- Provide time to review and confirm existing assets

Key Findings

2035 pathway to decarbonize operations.

- Cost effective projects
- Top 25 sites
- Incremental natural gas reduction targets

Requires significantly scaling implementation

- 80 buildings/year
- Additional staffing
- Intradepartmental collaboration
- Dedicated Building Decarb Program Team

Align to infrastructure needs leverage financing.

- Deferred maintenance
- Grants, incentives, new financing strategies
- Consider bond programs
- ESPC programs

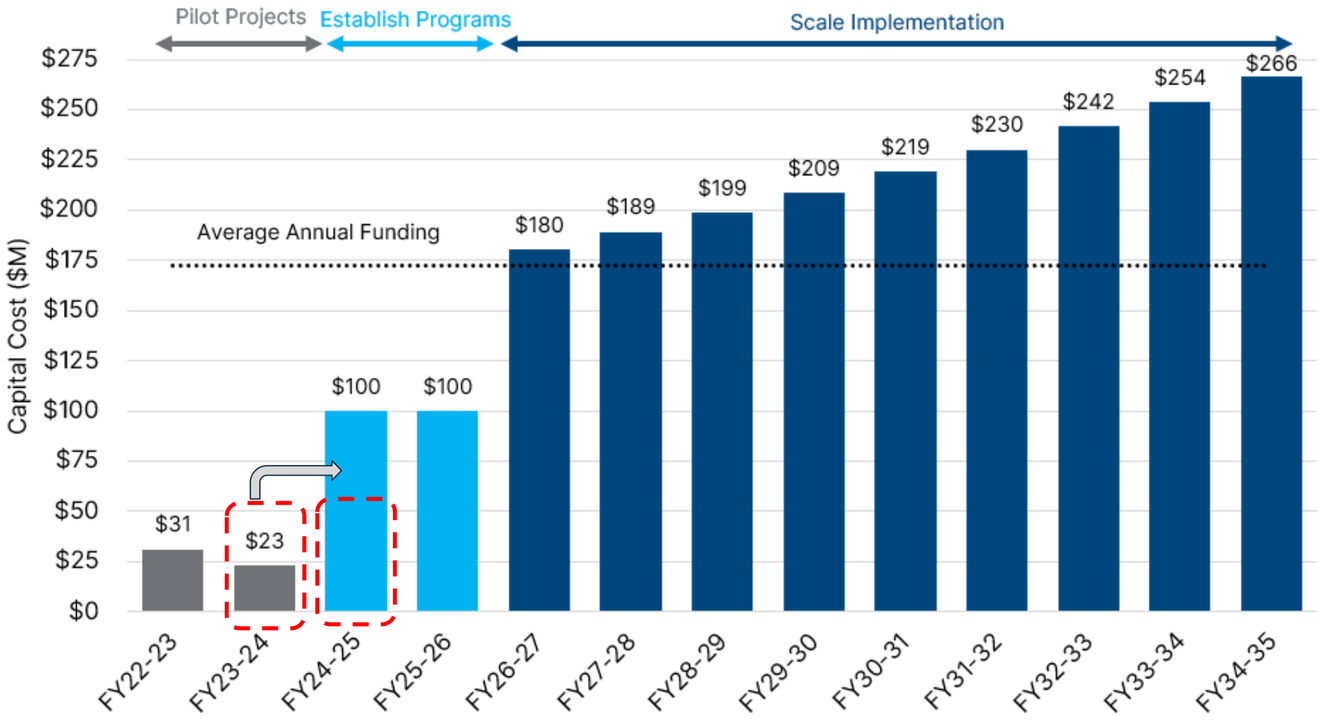
Identify additional community benefits.

- Cooling centers
- Resilient and healthy buildings
- Leading the Way
- Green Jobs

LESSONS LEARNED

- There is a pathway to decarbonize existing buildings; however, existing project delivery methods need to be reexamined

Phased decarbonization program will provide a scalable implementation framework for the City to accelerate investments through 2035.



Building Decarbonization Workplan Estimated Annual Funding

LESSONS LEARNED

- Establish year-by-year funding requirements to meet sustainability targets
- Workplans need to be flexible and adaptable to changing economic environments

Key Takeaways

01

Engage **stakeholders** and create **decarbonization project champions** early in the planning process.

02

Understanding building systems, energy use, and capital planning needs is essential to **identify realistic and impactful projects.**

03

Prioritize projects based on the KPIs most important to your organization & **align with equipment life cycles**.

04

Develop a decarbonization implementation plan with **flexible project options and delivery methods**.

Discussion + Q&A

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