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A River of Energy Solutions

Success is in the Details—Why Invest in a High Quality Greenhouse Gas Inventory

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Presented on behalf of the DOE-Federal Energy Management Program (FEMP)

Outline

- Why invest in a detailed inventory
- Who can benefit
- How to develop a detailed inventory
- Using a detailed inventory
- FEMP resources - coming soon!

Why invest in a high quality greenhouse gas (GHG) inventory?

- Inform the development of more robust strategic sustainability performance plans (SSPPs), operating unit plans, and site-level plans

- Set appropriate targets at lower levels in the organization

- ***Determine the most cost-effective pathway to achieving GHG emissions reduction targets***

vs.

Peanut butter spreading

Strategic portfolio planning

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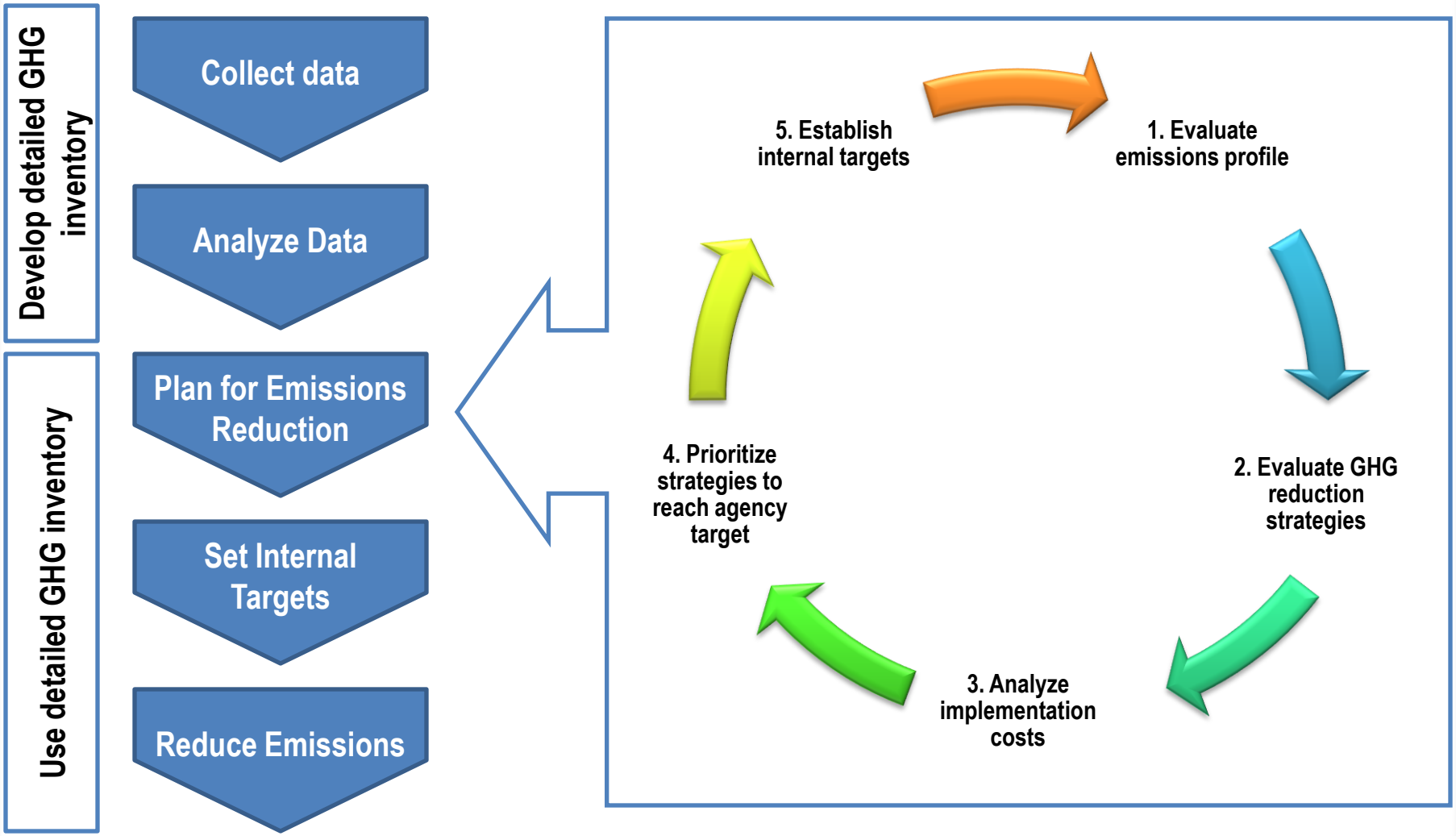
A detailed inventory lays the foundation for an informed strategic planning process



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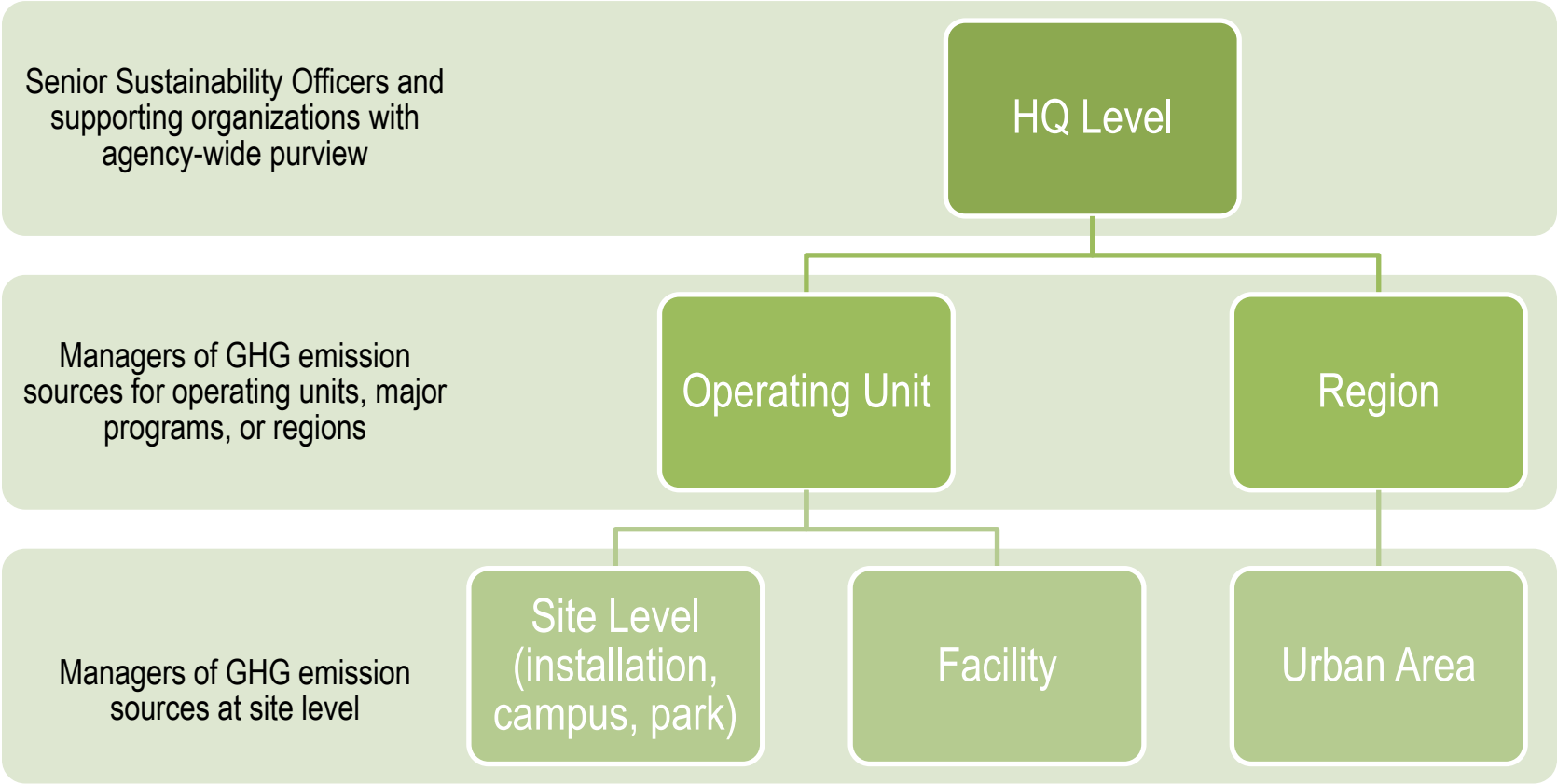
End Users of Detailed GHG Inventory Data

End users have planning and analysis authority for GHG emission sources at different levels in the agency



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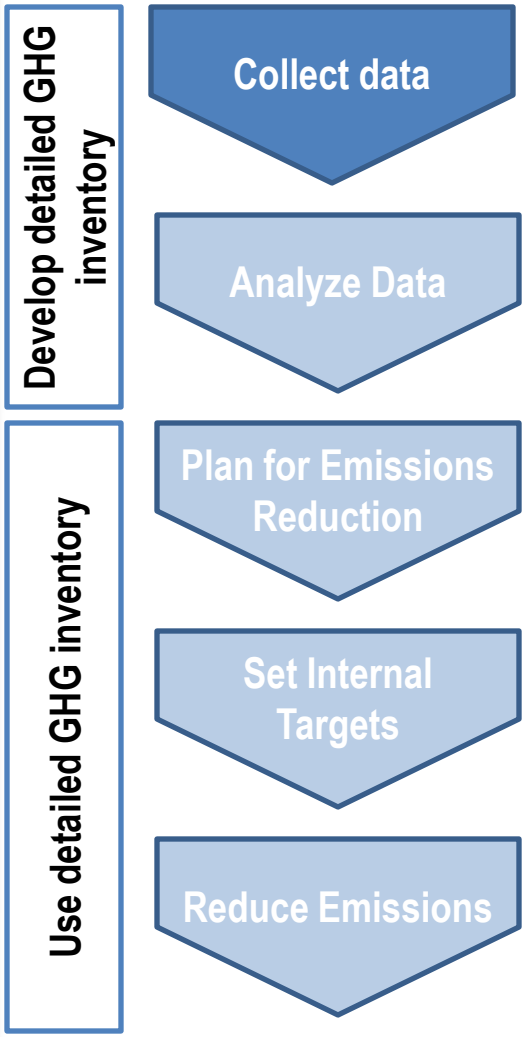
Developing a Detailed GHG Inventory



- What are the biggest emission categories that warrant detailed analysis?
  - Within Scope 1 & 2?
  - Within Scope 3?
- What data is needed:
  - To estimate emissions?
  - To plan for GHG mitigation?

  Data requirements for reporting are not typically enough for mitigation planning purposes!
- What is the best way to get the data?
  - Emissions data: Data calls, surveys, energy mgt systems?
  - Other data to help evaluate emission redn potential: real property database, national averages for benchmarking?
- What is the best way to ensure data quality?
  - Inventory management plans?
  - Enterprise software?

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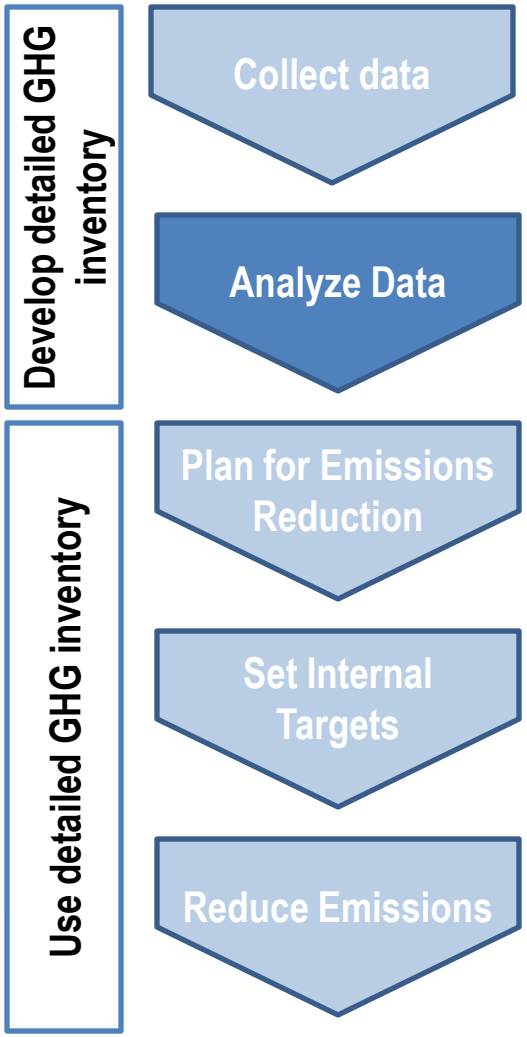
Developing a Detailed GHG Inventory



- What are the biggest sources within the biggest emission categories?
  - By operating unit?
  - By site?
  - By type of asset? (e.g. building type, vehicle type)
- How do those sources perform relative to similar sources (e.g. benchmarks, industry averages)?

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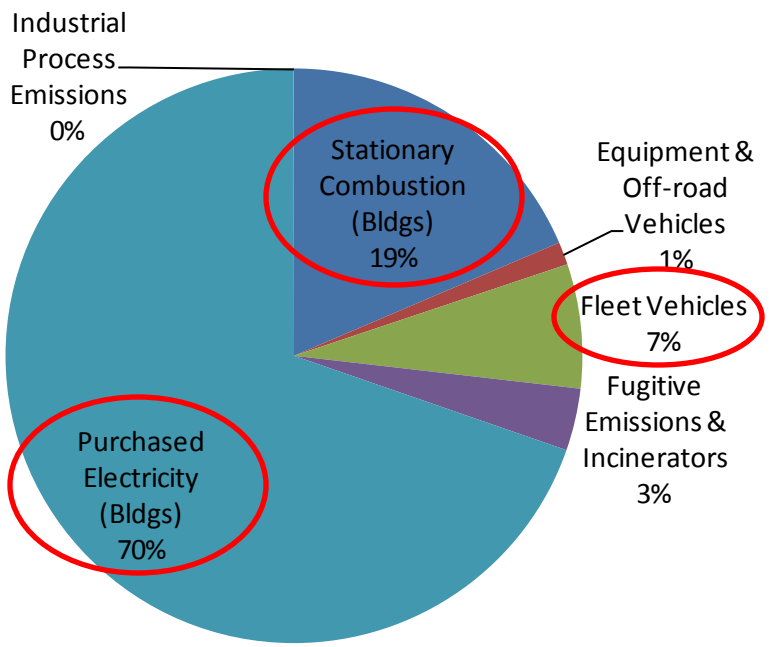
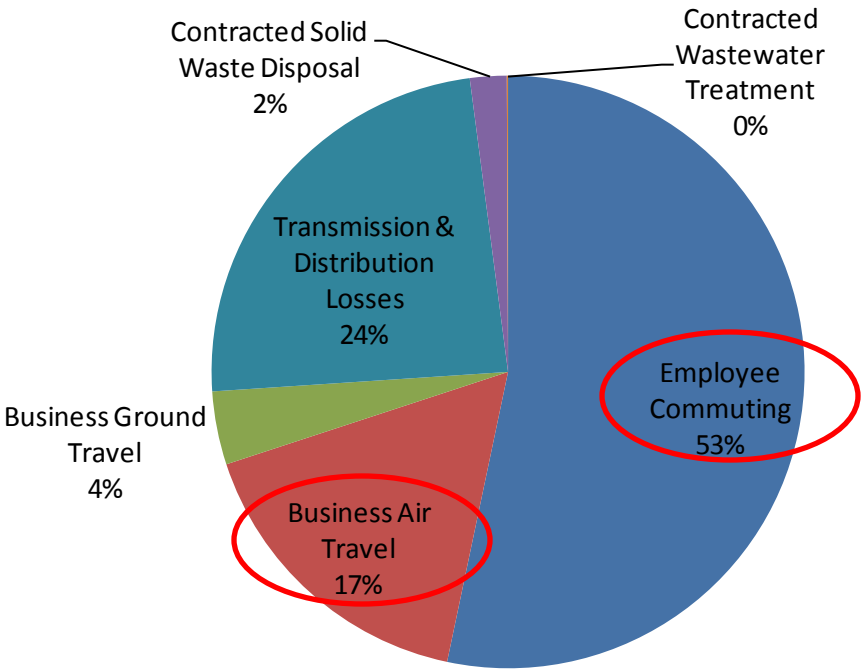
Developing a Detailed GHG Inventory
Where to Focus Data Collection Efforts

Agency ABC: Scope 1 & 2 GHG Emissions



Agency ABC: Scope 3 GHG Emissions



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Collect Data

Buildings Energy Use

Data Element	Example	How it Supports Planning
Building type	Office, school, hospital	• Identifies most common building types • Identifies typical high energy use buildings
Location	eGRID region , climate zone	• Identifies elements that vary according to location, including: energy consumption, emissions profile, efficiency strategies , costs
Ownership	Agency owned and operated, privately owned/agency leased, GSA owned, other agency leased	• Funding sources and level of owner engagement can vary by ownership • Current state of buildings can vary by owner (e.g. type of retrofits completed)
Energy use by fuel type	Electricity, natural gas, fuel oil by installation	• Emissions vary by fuels used in building end uses (HVAC, water heating, and cooking)
Energy use by building/building type	Electricity, natural gas, fuel oil by building/building type	• Indicates the relative performance of a building and helps assess the amount of savings possible
Year built or of last major renovation	HVAC or lighting renovations	• Identifies areas where major investments have been implemented and thus fewer opportunities for additional savings exists
Level at which specific energy mgt strategies have been adopted	Retuning, building controls, HVAC upgrades, thin client computers	• Identifies buildings where specific strategies have not been implemented.
Operating characteristics	Operating hours, occupancy, unusual equipment use	• Identifies reasons for differences in energy use within building types

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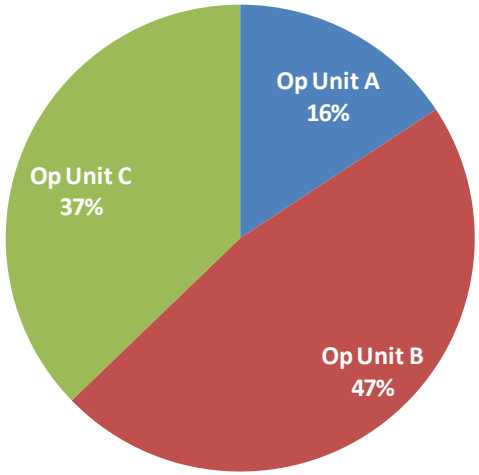
Red text indicates data outside current Federal reporting requirements.

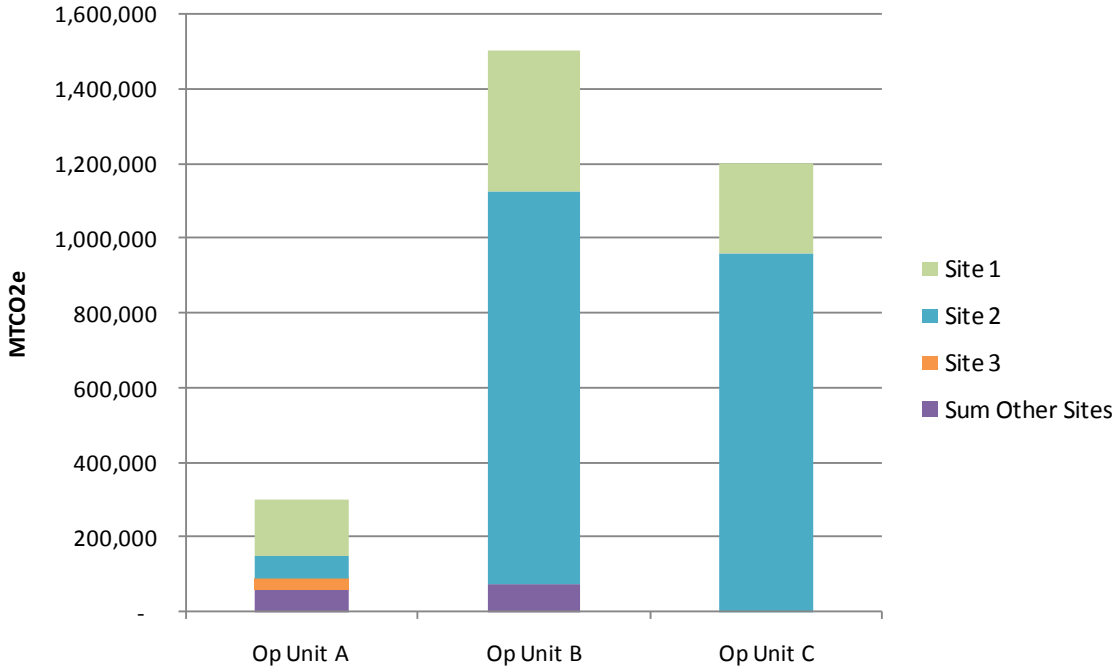
Analyze Data

Buildings Energy Use

Agency ABC: Building Emissions by Program



Agency ABC: Building Electricity Emissions by Op Unit & Site



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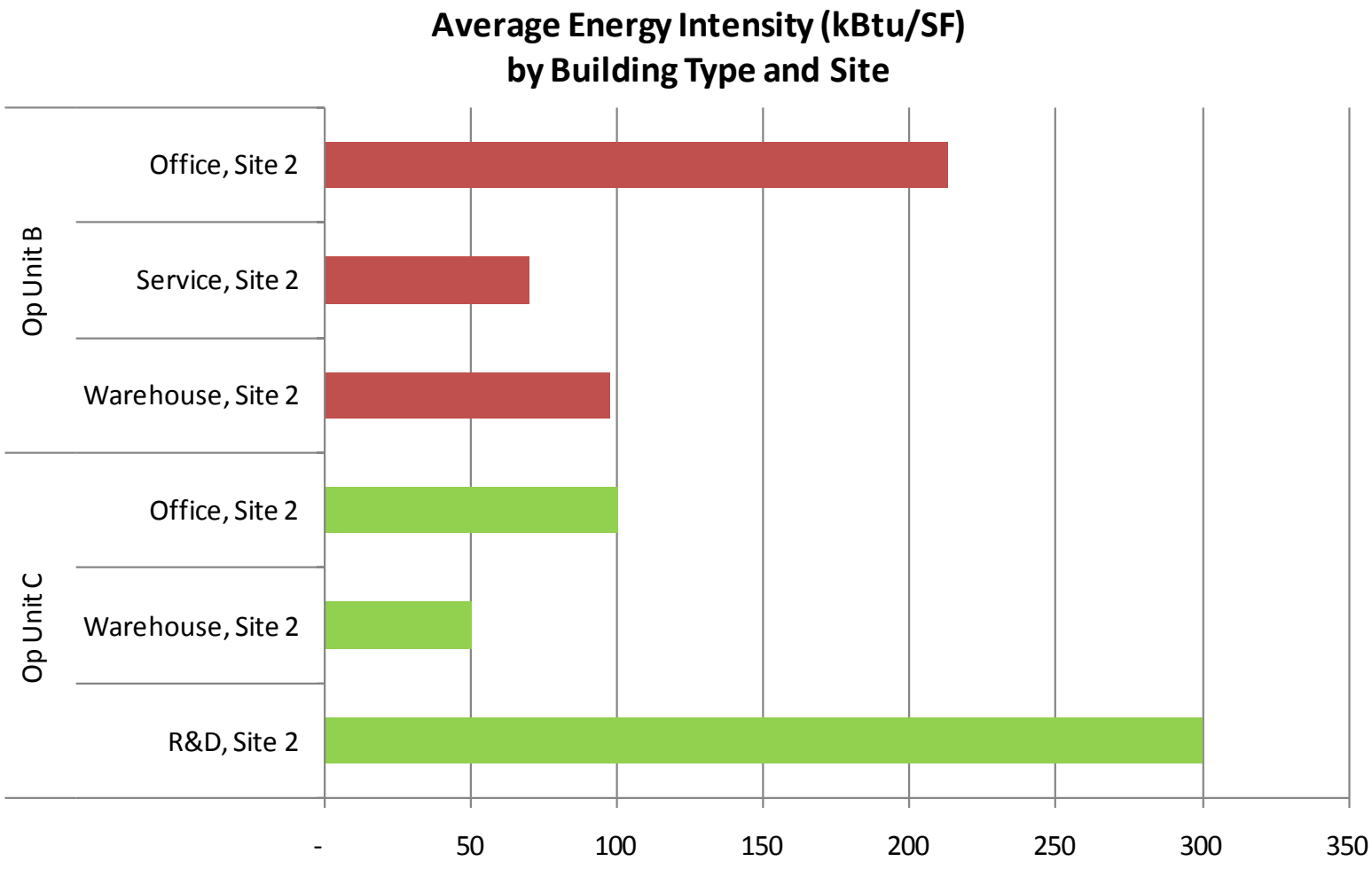
Analyze Data

Buildings Energy Use



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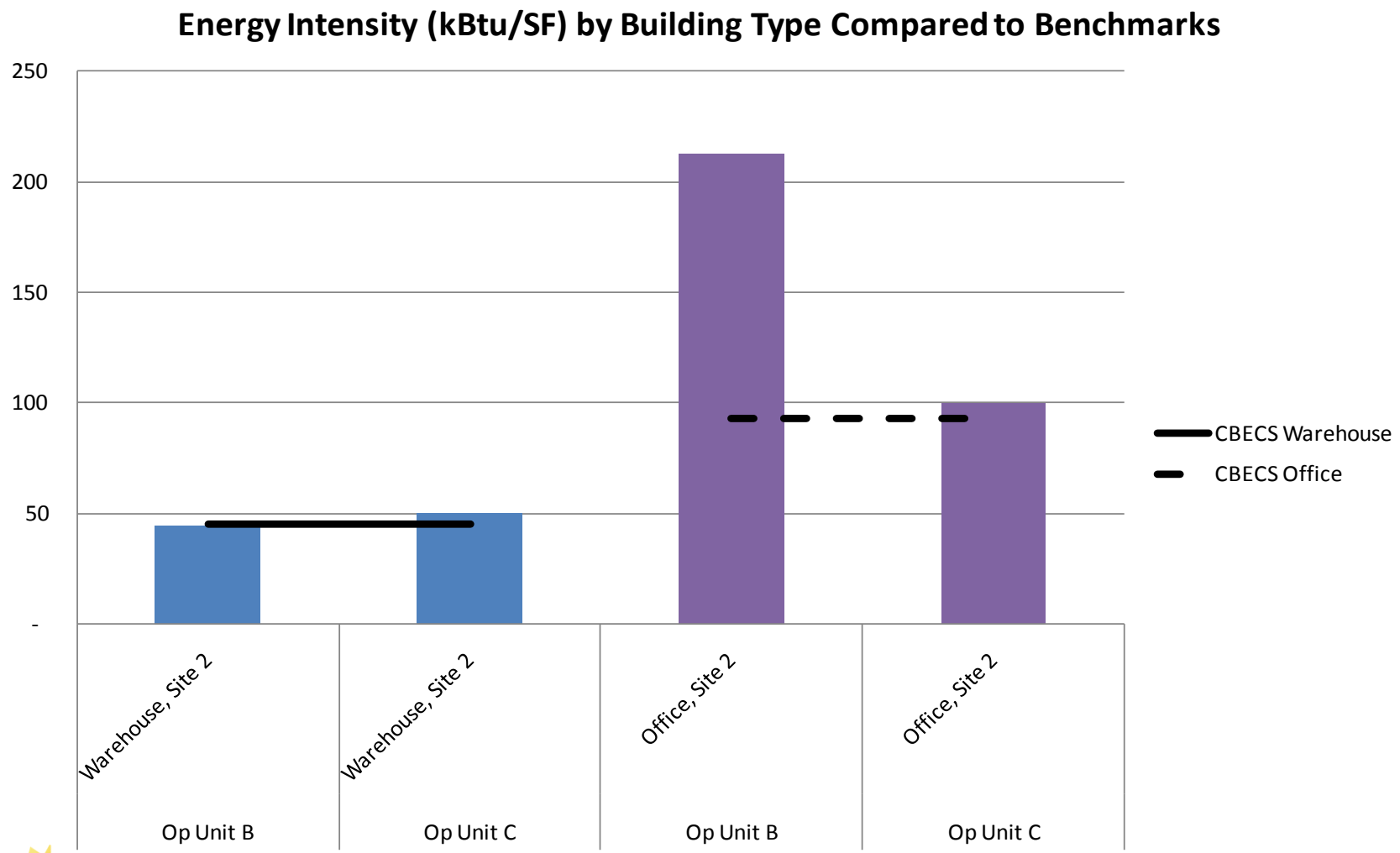
Buildings Energy Use



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Collect Data

Fleet & Non-Fleet Vehicles/Equipment

Data Element	Example	How it Supports Planning
Vehicle inventory	Size/type, fuel configuration, age, EPA-rated efficiency	• Correctly sizing fleet to mission needs • Determine impact of acquiring higher efficiency vehicles within a weight class
Fuel consumption by fuel type by unit/site	Gallons of gasoline equivalent of gasoline, diesel, E-85, biodiesel, etc.	• Focus conservation efforts on areas that will have the greatest impact •Prioritize sites for efficiency upgrades
Vehicle usage by unit/site	Vehicle miles travelled, user or trip to vehicle ratio, passenger/cargo capacity, hours in service	• Focus conservation efforts on areas that will have the greatest impact • Assess candidates for consolidation, reassignment or disposal of vehicles •Prioritize sites for efficiency upgrades
Vehicle mission by site	Law enforcement or exemption status, terrain and climate, type of cargo transported	• Identify vehicles that may represent good candidates for reassignment or disposal
Alternative fuel availability	Location of fleet, waivers awarded, distance between AFVs and garages to nearest alternative fueling station	• Focus outreach campaigns • Encourage siting alt fuel stations at strategic sites • Determine where AFVs might be best reassigned

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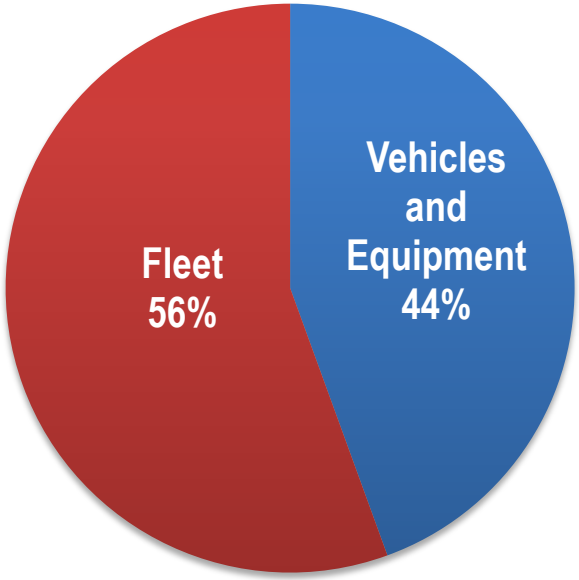
Red text indicates data outside current Federal reporting requirements.

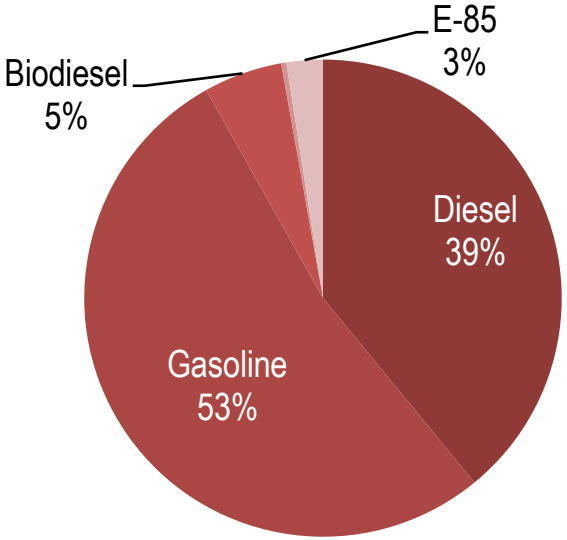
Analyze Data

Fleet & Non-Fleet Vehicles/Equipment

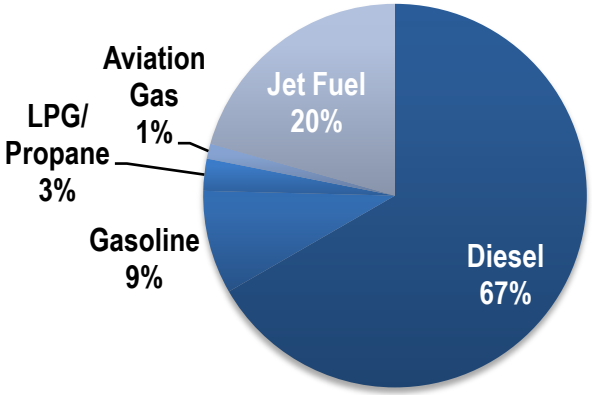
Agency X: Scope 1 Vehicle & Equipment Emissions



Fleet Vehicles Emission Share by Fuel



Non-Fleet Vehicles and Equipment Emissions Share by Fuel



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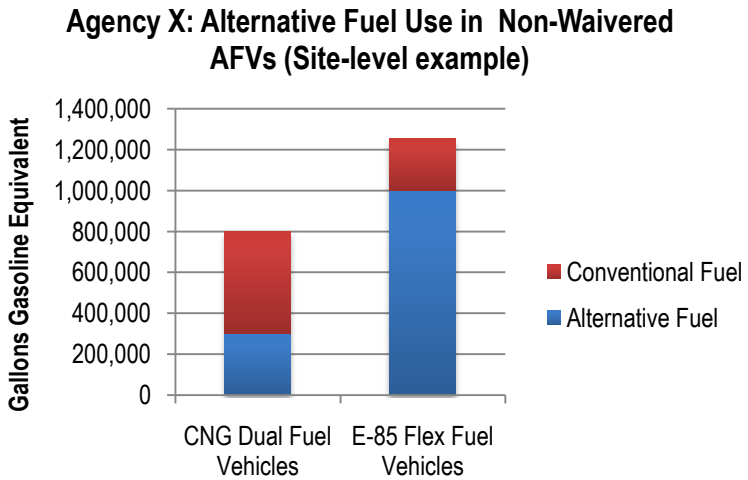
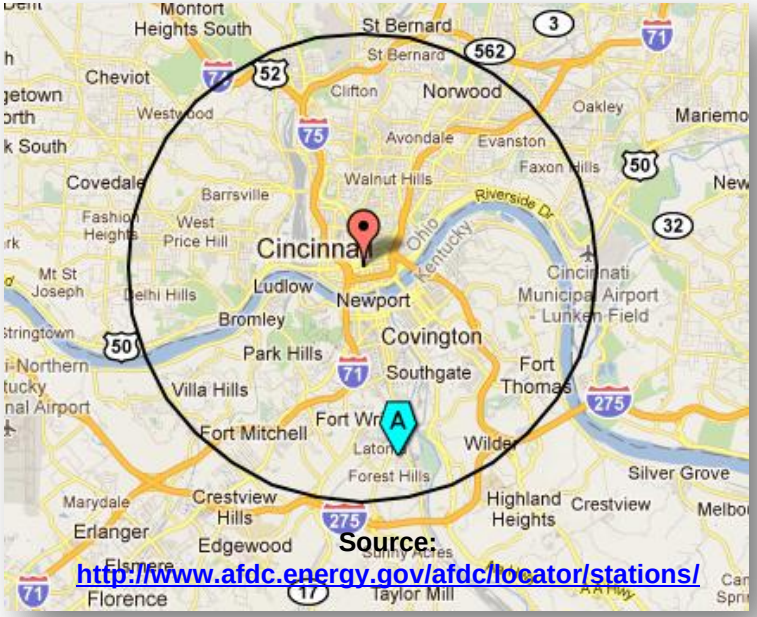
Fleet & Non-Fleet Vehicles/Equipment





Source: http://www.afdc.energy.gov/afdc/locator/stations/

	Inventory (# of vehicles)		Number of Fueling Stations Within 5 miles		
	CNG Dual Fuel	E-85 Flex Fuel	CNG	E85 Fueling Station	Gasoline
Cincinnati Fleet Garage	7	30	0	1	>50

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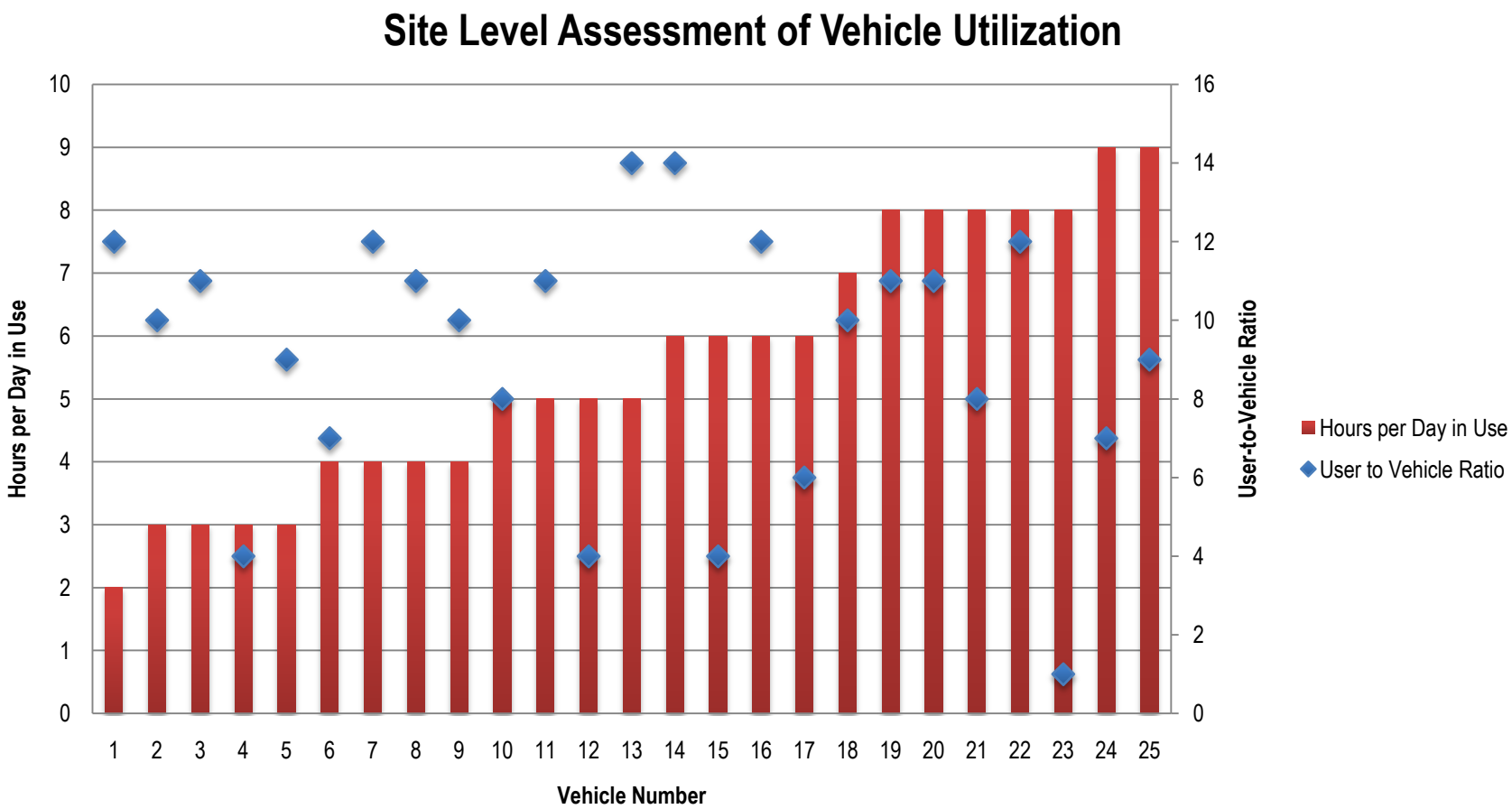
Analyze Data

Fleet & Non-Fleet Vehicles/Equipment



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Collect Data

Commuting

Worksite level analysis best supports planning

Data Element	Examples	How it Supports Planning
Current travel modes and distance	Drive alone, bus, bike, carpool	Establishes baseline for comparison. Target opportunities for improvement by mode. Understand effectiveness of targeted campaigns.
Work s schedules	Arrive 7-8:30am, Leave 3:30-5:00pm	Ensure adequate options are available during peak commute times
Zip codes of employees or home addresses	Neighborhood name, census district	Determine potential demand for services (e.g. new vanpool) by geography.
Demographics	Age, gender	Understand which employee populations may be most likely to adopt alternatives. To tailor incentives to specific audiences.
Awareness of alternative modes and services	50% aware of telework option 25% aware of shower facilities	Understand effectiveness of current communications efforts.
Satisfaction with current choice and options	25% are satisfied with telework program	Establishes baseline for comparison. Provides gauge of effectiveness of programs to support alternatives.
Willingness to try alternatives	55% would try carpool, 25% would try bus	Focus promotion and incentives to promote modes that are most likely to be effective.
Influences on use of an alternative mode	Save money, need car for childcare, access to food service nearby	Define programs to overcome specific barriers or provide incentives that will be most impactful.

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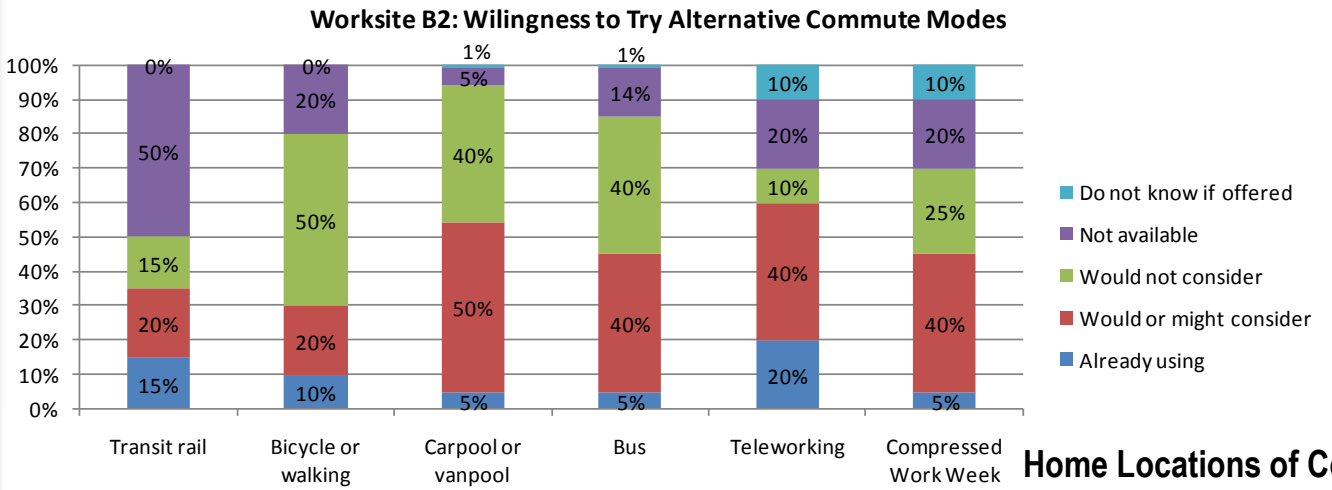
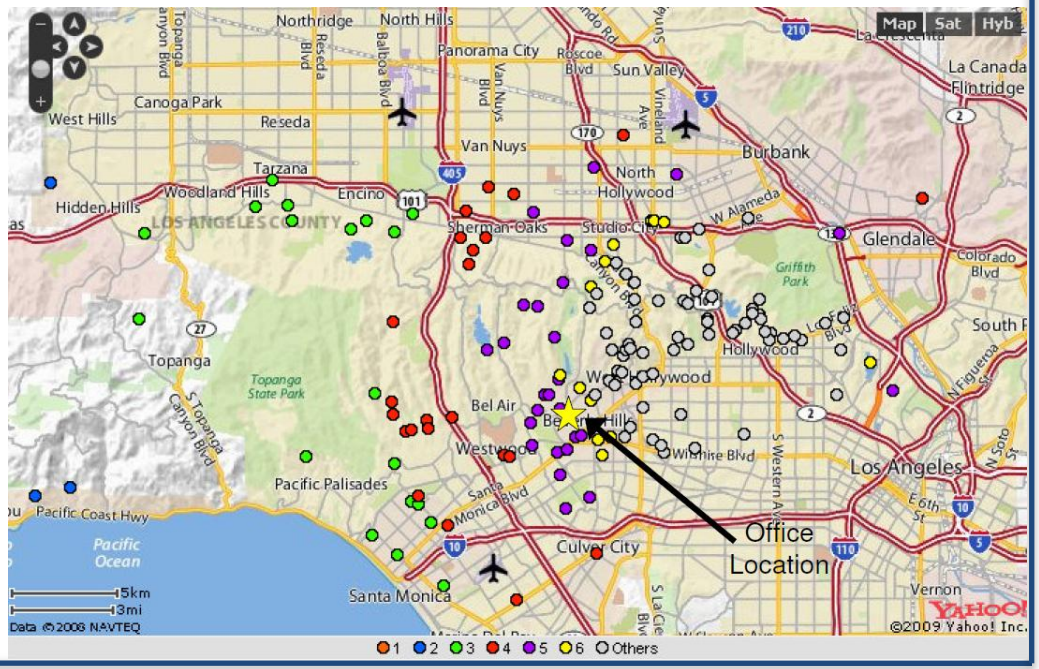
Red text indicates data not required survey Federal survey questions.

Analyze Data

Commuting



Home Locations of Commuters by Site



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Source: HelpSaveEarth.org

Evaluating Strategies for Emissions Reduction

Plan for Emissions Reduction

Set Internal Targets

Reduce Emissions

Buildings Energy Use Example

Category	Strategy	Description
HVAC	Building Systems Recommissioning	Examine every building every four years for operational improvements.
HVAC	Seasonal Temperature Adjustment	Summer: 75-78°F and 85°F for unoccupied. Winter: 68-70°F, and 55-60°F for unoccupied.
Envelope	Envelope Sealing	During a retrofit seal joints and HVAC ducts, install air barriers, and seal doors and windows.
Envelope	Cool Roofs	Install high solar reflectance and thermal emittance roofing material.
Lighting	Advanced Parking Lot Lighting and Control	Install LED outdoor luminaires and control for day lighting levels, schedules, and zoning.
Lighting	Energy-Efficient High Bay Fixtures	Install fluorescent lamps or pulse-start metal halide lamps.
Plug Load	Thin Client	Replacement of desktop systems with devices that function as an access device on a network.
Plug Load	Plug Load Occupancy Sensors	Sensors attached to power strips allow some outlets to be shut off after periods of inactivity.
Hot Water	Gas Condensing Water Heaters	Replace existing gas water heaters with Energy Star gas condensing units.
Hot Water	Solar Hot Water	Add solar systems to buildings with high water use and a south facing roof-line.

Detailed information on energy performance, current building systems, and past adoption of energy conservation measures are used to evaluate which technologies, policies, and other strategies are applicable and to what extent.

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Plan for Emissions Reduction

Estimating GHG Reduction Potential and Cost

Buildings Energy Use Example

Bang for the Buck

Total emissions avoided

Category	Strategy	Applicable Square Feet (ft^2)	Energy Savings KBtu per SF	Energy Savings Total MBtu	Energy Savings Total $	Implementation Cost $ per $MTCO_2e$	Emission Reduction Total $MTCO_2e$
HVAC	Building Systems Recommissioning	1,957,650	24.1	15.4	$978,825	$1,061	5,073
HVAC	Ground Source Heat Pumps	687,704	44.0	30.3	$735,843	$4,318	3,254
Envelope	Envelope Sealing	558,202	2.7	1.5	$24,675	$761	162
Envelope	Cool Roofs	857,105	26.2	22.5	$58,619	$355	2,415
Lighting	Advanced Parking Lot Lighting and Control	630,854	17.2	10.9	$121,937	$541	1,167
Lighting	Energy-Efficient High Bay Fixtures	1,397,025	14.1	19.7	$347,938	$1,099	2,118

Estimates of square footage that can benefit from each strategy are used to estimate efficiency gains and cost of adopting specific energy conservation measures

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Hypothetical data for illustration only.

Plan for Emissions Reduction

Prioritize GHG Reduction Activities

- Score and prioritize with weighted factors of importance to agency
- Prioritize actions *within* emission categories and *across* Scope 1&2 and Scope 3

Strategy	Site / Facility	Rank Order	Score	Weighted Scoring			
				Return on Investment (30%)	Total GHG Redn (30%)	Cost Effective-ness (30%)	Imple-mentation Factors (10%)
HVAC upgrade	B1	1	532	200	209	39	83
Duct sealing	B2	2	228	50	60	68	50
….							
Heat reclaim	C1	25	72	-25	30	17	50

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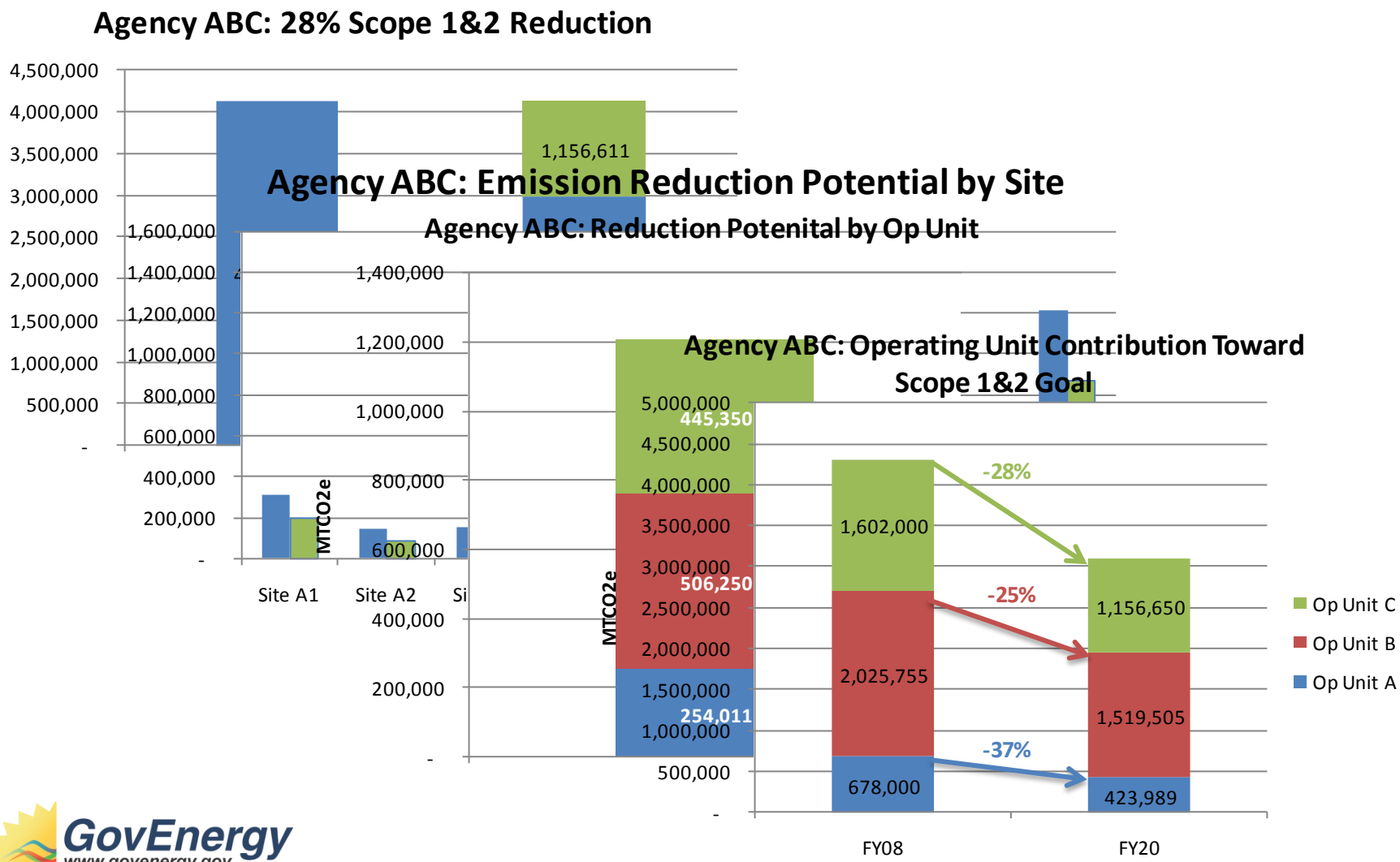
Set Internal Targets

Set Internal Targets for Operating Units and/or Sites



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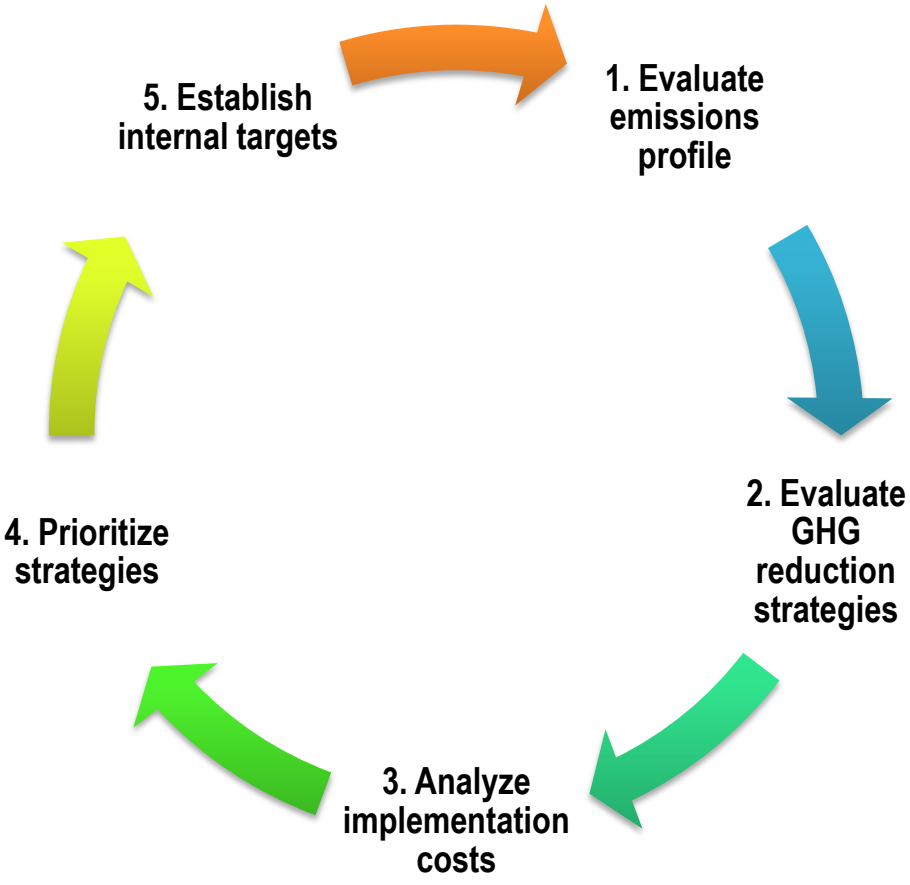
Coming Soon… New FEMP Resources!

- Web-based guidance on portfolio planning process and all emission categories
- Resources to support analysis of agency data and options, e.g.
  - Estimates of efficiency gains corresponding with mitigation strategies
  - Estimates of cost/savings from implementing each strategy



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Thank you!

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