

Welcome to today's presentation:

Understanding Your Workspace Usage With Daily Occupancy Data

March 16, 2023

The presentation will start at 2 pm Eastern

Note: Phones are automatically muted during the presentation. You can send questions to our presentation team via your Q&A pane and team will answer as many questions as possible during the presentation. All questions will be responded to in writing in a formal Q&A document, posted along with the slide deck and session recording, on our website, <http://www.gsa.gov/ces>



Understanding Your Workspace Usage With Daily Occupancy Data

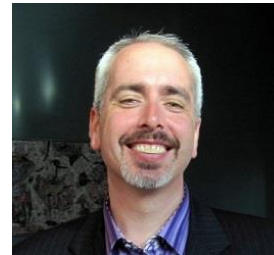
Mar 16, 2023

Presenters

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Agenda

- What is occupancy data and how do we measure it?
 - Methods for tracking daily occupancy data
 - GSA pilots, benefits and use cases
- How does occupancy data further support workplace planning?

Leveraging Occupancy Data

2015 - Reduce the Footprint

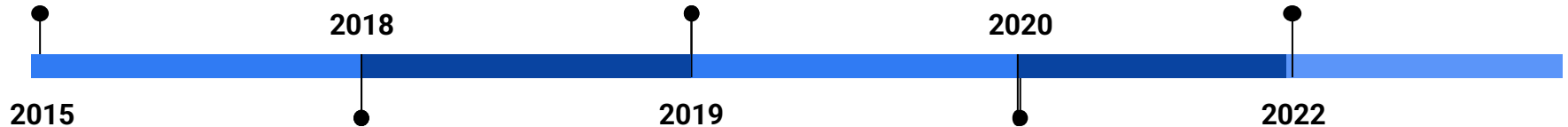
Federal agencies reduce real property through the Reduce the Footprint Initiative by focusing on buildings with persistent vacancy or high utilization rates

2019 - GSA HQ Building Transformation Completion

GSA leverages occupancy data and implements workplace strategies to consolidate 8 locations

2022 - Customer Agency Return to Work Strategies

76% of federal agency survey respondents track occupancy data, and rated occupancy data along with financial data the 2 most important metrics for informing space needs.*



2018 - Value of Occupancy Data

GSA evolves from RTF to right-sizing with an emphasis on office space

2020 - Occupancy Data Program Support

GSA pilots occupancy data collection methodologies and metrics to support agencies in the right type and amount of space, at the right cost. GSA currently has direct access to daily occupancy in 12% of owned assets and .05% of leased assets



*According to GSA's FY22 Future of Workplace Survey sent to customer agencies.

Occupancy Data Use Case

People

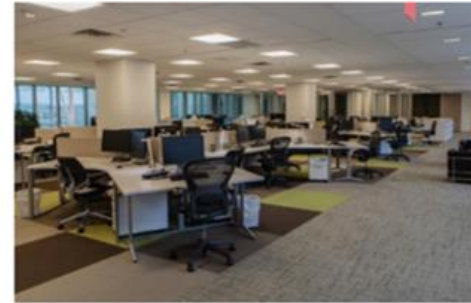
Place

Technology

Work

GSA Headquarters Transformation

Efficient and Cost Effective



4425

Occupants
(from 2500; then 3300)

1.7:1

Desk Sharing Ratio
(4854 Total Seats)

100 UR

Usf/Person
(Total 506,000 usf)

- Shared Space
- Workspace Choices
- Increased Mobility

More Than
40%

Reduction in Space

More Than
\$38

Annual Rent Savings

More than
50%

Reduction in
Energy Consumption

More than
\$6.5M

Annual Admin
Cost Savings

Problem Statement: Adjusting Resources and Operations to the New Way of Work

- Based on daily occupancy data and industry research prior to COVID, occupancies in major office markets are at around 50% occupancy* compared to pre-pandemic levels.
- From FY20-21, PBS compared methods for defining, capturing, and analyzing occupancy data, and partnered with customers to gain better understanding of occupancy at over 1,000 facilities.
- In FY22, PBS is continuing to pilot solutions for collecting occupancy data, and occupancy data is increasingly being used to inform right sizing strategies.

Leveraging Occupancy Data Across Agencies

In GSA's FY22 Future of Workplace Survey sent to customers, agencies were asked if they track their use of space, and 76% say they did, here are the top 4 ways they do that:

- Badging/Reservation Systems
- Daily Check In/Accountability Tool
- Occupancy survey/space walking
- IT systems tracking (IP hits, device monitoring, etc)

Opportunity

GSA has supported agencies to implement tools for collecting daily occupancy data, and leverage the data to support space and portfolio planning to great success in FY22:

- Across 1.5M SF in locations with occupancy data, GSA worked with agencies to identify a 28% reduction in continuing requirements for expiring leases through Client Project Agreement (CPA) engagements, resulting in a total reduction of over 400,000 SF in follow on space needs and an estimated total rent avoidance of \$16M.
- GSA worked with a customer agency on a headquarters campus, one of the largest in the Federal inventory, to analyze and model their daily occupancy data across multiple buildings and as result, secured prospectus funding for their long term space needs, reducing their footprint by over 700,000 SF for a total rent avoidance of over \$124M.

Daily Occupancy Data Collection Mechanisms

	Sensors	Badging/Turnstiles	IT Systems Tracking	Cellular Location Data
Methodology	Total People Count	Badged Swipe Count	Device Count	Est. Mobile Device Count
Accuracy (current capability)	Highest	Very High	Medium	Medium
Real Time Data (current capability)	*			
Can be Integrated with Building Automation Systems	*			
Privacy Protection	*	*	*	*
Delineates Employees from Guests		*	*	*
No additional hardware required				*
Historic Data				*
Use Case	<ul style="list-style-type: none"> - Long-term occ. planning, - Cost increases based on granularity - Supports Building Automation Systems 	<ul style="list-style-type: none"> - Long-term occ. planning - Multi-tenant space 	<ul style="list-style-type: none"> - Long-term occ. planning 	<ul style="list-style-type: none"> - Relative Occupancy Patterns - Single-tenant locations - Locations with at least 500 visitors per day

*Comparison based on ongoing pilots and conditions may change as additional information is gathered.

Pilot Projects and Studies: PIV Card Swipe Data

- Counts the number of anonymized, unique Personal Identity Verification (PIV) card credentials wiped at building access points , excluding duplicate entries.
- Metrics: Historic count of the number of unique credential swiped by each agency, number of employees and contractors, daily building density based on square foot per person, and annual rent per person occupying the space.
- Requires:
 - Report generating the following data points: entry date, location, access indicator, and PIV card credential ID
 - Compliance with [OMB Memo M-19-17](#).
- Benefits: Improves building security and safety, and low or no cost to implement if leveraging existing infrastructure.

Pilot Projects and Studies: Mobile Location Data

- Uses anonymized cell phone data commercially licensed from data suppliers, combined with inputs from other commercial or public sources (e.g., selected geofence, visit data, dwell time data, and census data) to generate occupancy estimates.
- Metrics: Estimated relative occupancy by day, week and month.
- Requires:
 - No hardware installation or manual collection of entry/exit data, but requires contract with a commercially-developed platform.
 - High minimum occupancy counts and a 2 dimensional area for surveying
- Benefits: Commercially available mechanism that is potentially less costly to scale across a broader portfolio to identify relative building usage trends.
- Pilot study ongoing through August 2023.

Other Planned Pilot Projects and Studies

- National Occupancy Sensor Contract
- Workplace Innovation Lab in Washington, DC

Pilot Projects and Studies: Center for Emerging Building Technologies

CEBT's three programs enable GSA to make sound investments in emerging building technologies.

GREEN PROVING GROUND

GPG helps drive building performance beyond business-as-usual

Accelerate Market Acceptance

Help bridge the technology valley of death

Assess Innovative Building Technologies

Testbed deployments in real-world environments

- Select promising emerging technologies at the edge of commercialization
- Pilot emerging technology installations within GSA's real-estate portfolio
- Partner with Department of Energy national laboratories to evaluate real-world performance
- Identify proven technologies with broad deployment potential for GSA

Provide Actionable Data

Evaluation results enable GSA to make sound investment decisions

965 vendor submissions	104 selected for evaluation	51 published reports	30 proven technologies
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The Center for Emerging Building Technologies' three programs, Green Proving Ground (GPG), Pilot to Portfolio (P2P) and Applied Innovation Learning Lab (AILL), enable GSA to make sound investment decisions in next-generation building technologies based on their real-world performance.

PILOT TO PORTFOLIO

P2P supports GSA deployment of proven, innovative technologies

Influence Technology Selection

Calculate return on investment at key lifecycle entry points

NEW CONSTRUCTION	RETROFITS	END-OF-LIFE
Compare incremental savings/costs to code-compliant technology	Calculate direct savings/costs of retrofit technology	Compare incremental savings/costs to like-for-like replacement

Support Deployment

Facilitate technology selection and track deployment

- Identify buildings with aging or inefficient equipment
- Guide selection of proven technologies
- Provide dynamic training to GSA staff
- Track deployment across the GSA real-estate portfolio

Reduce Costs and GHG Emissions

Proven deployments enable GSA to optimize operations

116K tons reduced annual CO ₂	\$28M annual savings	\$375M lifecycle cost avoidance
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APPLIED INNOVATION LEARNING LAB

A whole-building approach to sustainable operations

A Roadmap to Net Zero

Identify replicable technology stacks that deliver net zero operations

Drive Innovation and Operational Excellence

Align efforts with other federal agencies and industry

- Develop a Roadmap for Net-Zero Facilities
- Stack innovative emerging building technologies across regional GSA Applied Innovation Learning Labs (AILL)
- Validate Real-World Performance of IRA Investments
- Detail energy and carbon savings from Inflation Reduction Act (IRA) investments in partnership with DOE National Labs
- Establish Performance Criteria and Best Practices
- Create a training ground to establish best practices and demonstrate real-world net-zero solutions

Ensure GSA Investments Meet Agency Goals

Inform public- and private-sector investment decisions

2030 85% less carbon emissions	2035 100% fleet electrification	2045 100% net-zero operational emissions
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051 NON-INVASIVE, LOW-COST GAS SUBMETER

DECEMBER 2022

OPPORTUNITY

How much energy use comes from natural gas?

30% OF ENERGY USE IN THE U.S. COMES FROM NATURAL GAS*
The global warming potential of leaked natural gas is 34x worse than CO₂ emissions†

TECHNOLOGY

How does the non-invasive submeter work?

Straps on to any existing utility meter to measure real-time, high-resolution data. Integrated into BAS for improved visibility.

Meter Diagnosis: As gas flows, the meter rotates/oscillates, creating a fluctuating magnetic field

Sensor Probe: Detects the fluctuating field magnetic field

Sensor: Rotates meter and calculates flow

BAS: Transmitted data is sent to the BAS to be analyzed

M&V

Where did Measurement and Verification occur?

NATIONAL RENEWABLE ENERGY LABORATORY (NREL) assessed the impact of a non-invasive gas submeter provided by Vista Works at two rooftops in Dallas, Texas: the A. Mazcos Smith and Terminal Annex Federal Buildings.

RESULTS

How did the non-invasive gas submeter perform in M&V?

99% ACCURATE COMPARED TO UTILITY METERS* Largest difference in averaged was 0%	QUICK INSTALLATION NO PIPE-CUTTING* On-site calling and mounting took 1 day. BAS integration took a few days.	70% - 90% LESS EXPENSIVE THAN INCUMBENT* \$3,000 - \$700 equipment, \$2,500 installation versus \$30,000 to \$50,000 for previous GSA submeter installations.
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Lessons Learned

GSA staff plan to install the gas submeter at additional facilities using the following best practices:

- Select the ultra-high resolution submeter option**: For a cost difference of 30%, you get additional functionality, including minimum, maximum, and instantaneous flow readings and higher-resolution data that can detect small leaks.
- Select an integration method: JACE or network switch**: Integration is simpler with a JACE but available ports may be limited. The network switch requires additional permissions to communicate on the GSA network.
- Install when gas is being consumed**: Call during winter months to more accurate, especially for compressed gas meters. The vendor keeps a library of gas meter & factors, which can streamline calibration.
- Work with a single contractor and install in an enclosure**: Work with the same contractor to run cabling and install an electrical outlet. The enclosure should include a dedicated electrical outlet to energize the device.
- Allow for h-factor adjustment within the BAS wire sheet**: Updates can then be made in the BAS, instead of physically connecting to the submeter. Non-GSA sites can remote into the device using Telnet or a web server.
- Work with the BAS subcontractor for integration**: Contracting BAS integrator as part of normally scheduled drives will streamline the process and reduce costs.
- Use terminal emulators**: Terminal emulators such as Serial Terminal PuTTY are needed to configure the submeter.

DEPLOYMENT

Where does MS&V recommend deploying non-invasive submeters?

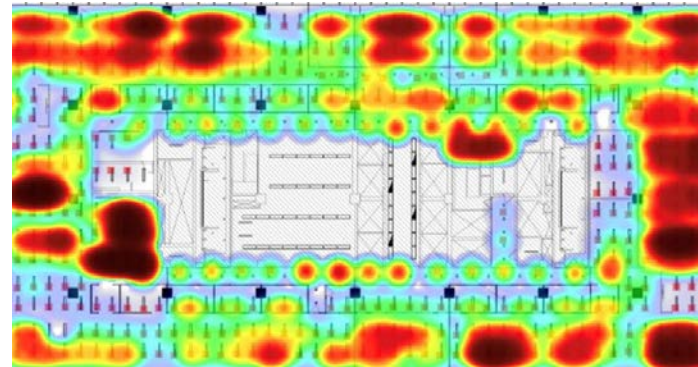
SUPPORTS POLICY/REPORTING GOALS

Including requirements for the Energy Independence and Security Act.† Best suited to buildings that have an integrated BAS and whole-building or equipment-specific meters. Submeter also measures water flow, though this functionality was not tested.

*NREL 2018 Report: U.S. Oil and Natural Gas: Providing Energy Security and Supporting Our Quality of Life. U.S. DOE. National Renewable Energy Laboratory, 7 August 2014. †Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005. ‡Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005. §Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005. ¶Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005. ††Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005. †††Energy Independence and Security Act of 2005 (EISA). U.S. House of Representatives, 2005.

Pilot Projects and Studies: Green Proving Ground Pilots

Lighting-Fixture Based Sensors & Analytics: Leveraging lighting to control multiple building systems, including HVAC



Heat map visualization from the analytics platform for Lighting-Fixture Based Sensors

Energy Management Information System with Automated System Optimization: Using occupancy sensors to reduce heating and cooling based on occupancy



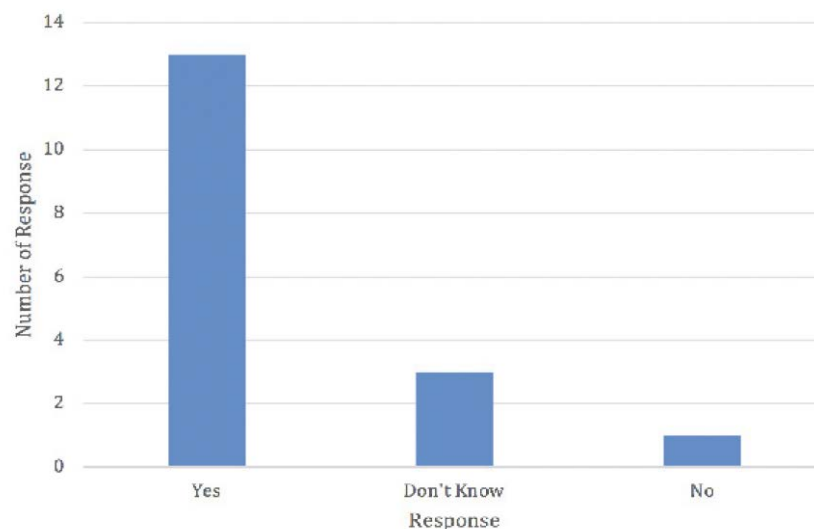
Stereoscopic occupancy counter at Terminal Annex Federal Building,

Green Proving Ground: Lighting-Fixture Based Sensors & Analytics

Leveraging the Same Sensors to Control Lighting and HVAC

- PNNL research has demonstrated that HVAC integration can improve the cost-effectiveness of a lighting control system by 30%.
- In a series of discussion groups, GSA staff thought that occupancy data could improve operations for space allocation, system integration, and health and safety

Is this technology useful to improve operations at GSA?



GPG: Optimizing Heating & Cooling Based on Occupancy

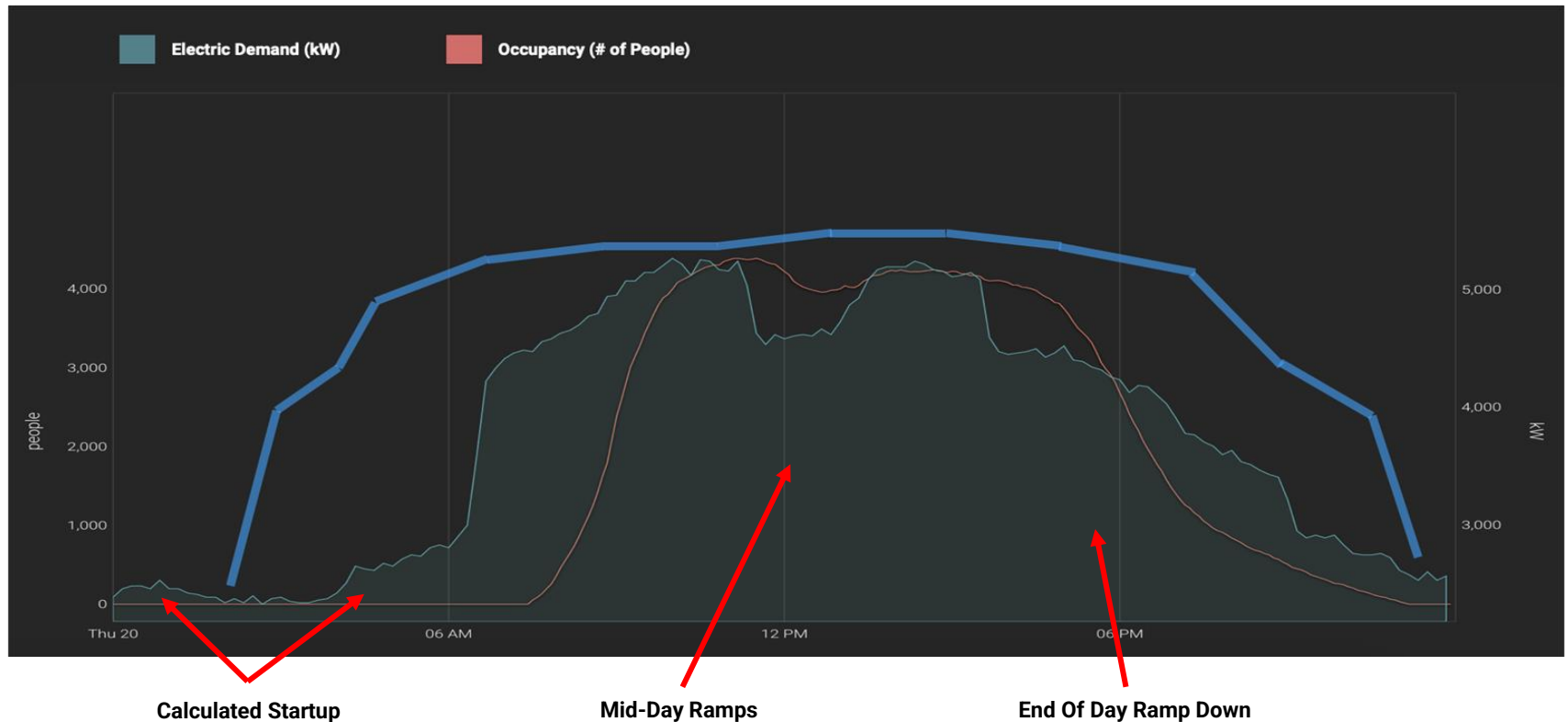
- Green Proving Ground tested 2 kinds of whole-building occupancy sensors (Stereoscopic and LIDAR) during an evaluation of an [Energy Management Information System with Automated System Optimization](#)



Building occupancy pre- and post-work-from-home order *Image from Prescriptive Data*

Green Proving Ground: Using Occupancy Sensors

- Optimizing air handlers based on occupancy reduced energy use between 5% and 11% for buildings that were already well-run.



Pilot Projects and Studies: Using Occupancy Sensors

Types of Occupancy Sensors

Sensor	Functionality	Considerations
Passive Infrared (PIR)	Uses infrared to detect body heat.	<ul style="list-style-type: none">● Good for smaller spaces like restrooms or meeting rooms.● Reliant on line of sight.● Requires significant motion.
Ultrasonic	Detects frequency shifts in emitted and reflected sound waves.	<ul style="list-style-type: none">● Good for open floor environments.● Doesn't require unobstructed line of sight.● Can detect small amounts of motion such as typing.
Image	Uses cameras to capture images.	<ul style="list-style-type: none">● Can detect occupancy regardless of motion.
Dual Technology	Combines PIR and ultrasonic or image.	<ul style="list-style-type: none">● PIR is used to "wake up" 2nd sensor.
Radar	Uses radar to determine motion, speed and direction of an object.	<ul style="list-style-type: none">● Requires no movement for sensing.● Ultra wide band (UWB) radar can detect individual heartbeats.
LiDAR (Light detection and ranging)	Uses lasers to determine objects in line of sight.	<ul style="list-style-type: none">● Good for entryways.● Offers a long line of sight.
Stereoscopic Imaging	Uses 3 dimensional images and stereo vision analytics.	<ul style="list-style-type: none">● Provides anonymous information for privacy.

Using Occupancy Data to Inform Workplace Strategies

- single client agency in the New York City metropolitan area
- occupancy data based on PIV card use at turnstiles from February 2023
- daily counts are averages

Location	OA USF	OA Headcount	UR	Average Daily	Max Daily	Mon	Tue	Wed	Thu	Fri
Building A	158,000	940	164	143	190	90	158	179	168	122
Building B	4,000	10	400	14	17	12	15	15	15	14
Building C	327,000	1,660	197	527	659	359	603	638	597	440
Building D	400	10	40	16	19	13	17	16	18	16
Building E	22,000	80	275	22	30	21	25	20	28	18

Using Occupancy Data to Inform Workplace Strategies – Occupancy Levels

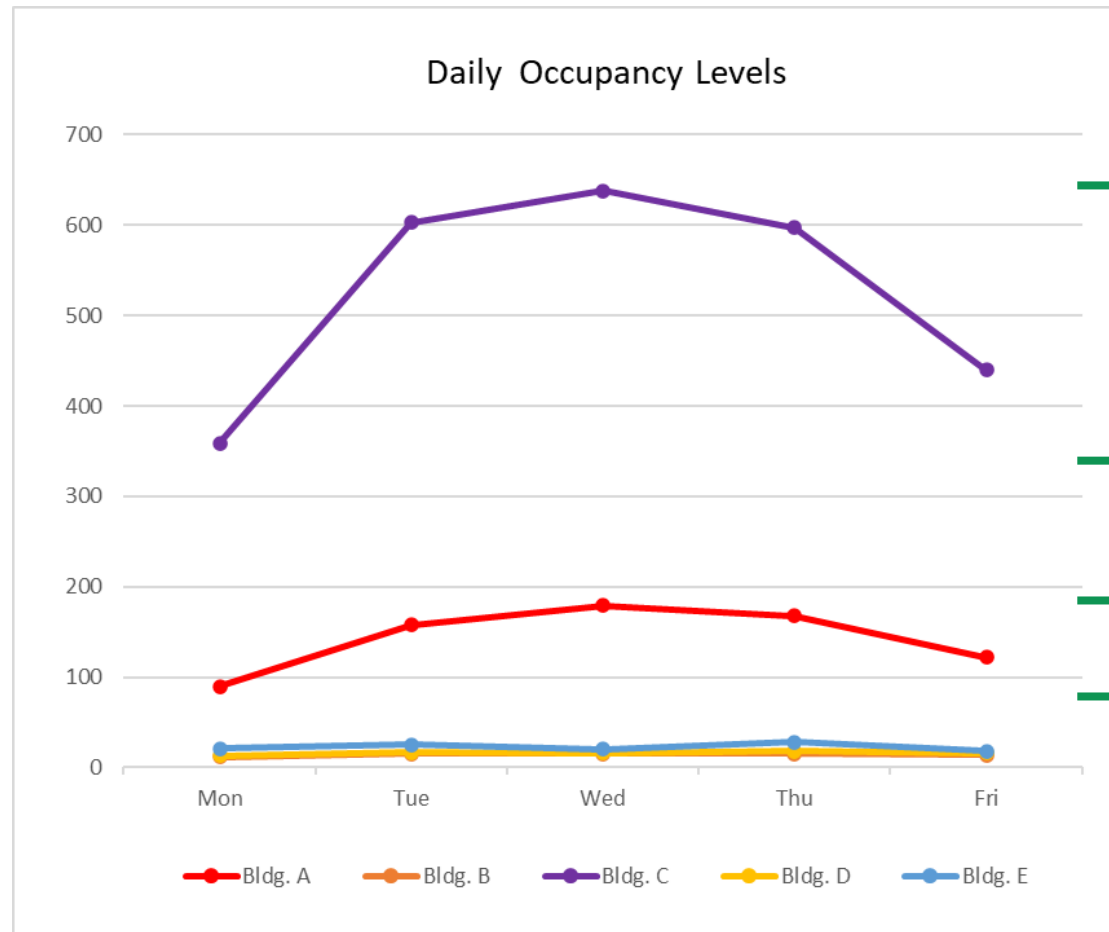
Ideal : Flat Curves

How this is useful

- Identifies overall demand peaks
- Significant differences indicate potential for “smoothing out”

Things to consider

- Doesn't fully show overall space savings opportunities; just individual workspaces
- Doesn't show average daily levels, making it hard to plan changes



Using Occupancy Data to Inform Workplace Strategies - % of Max Daily Occupancy

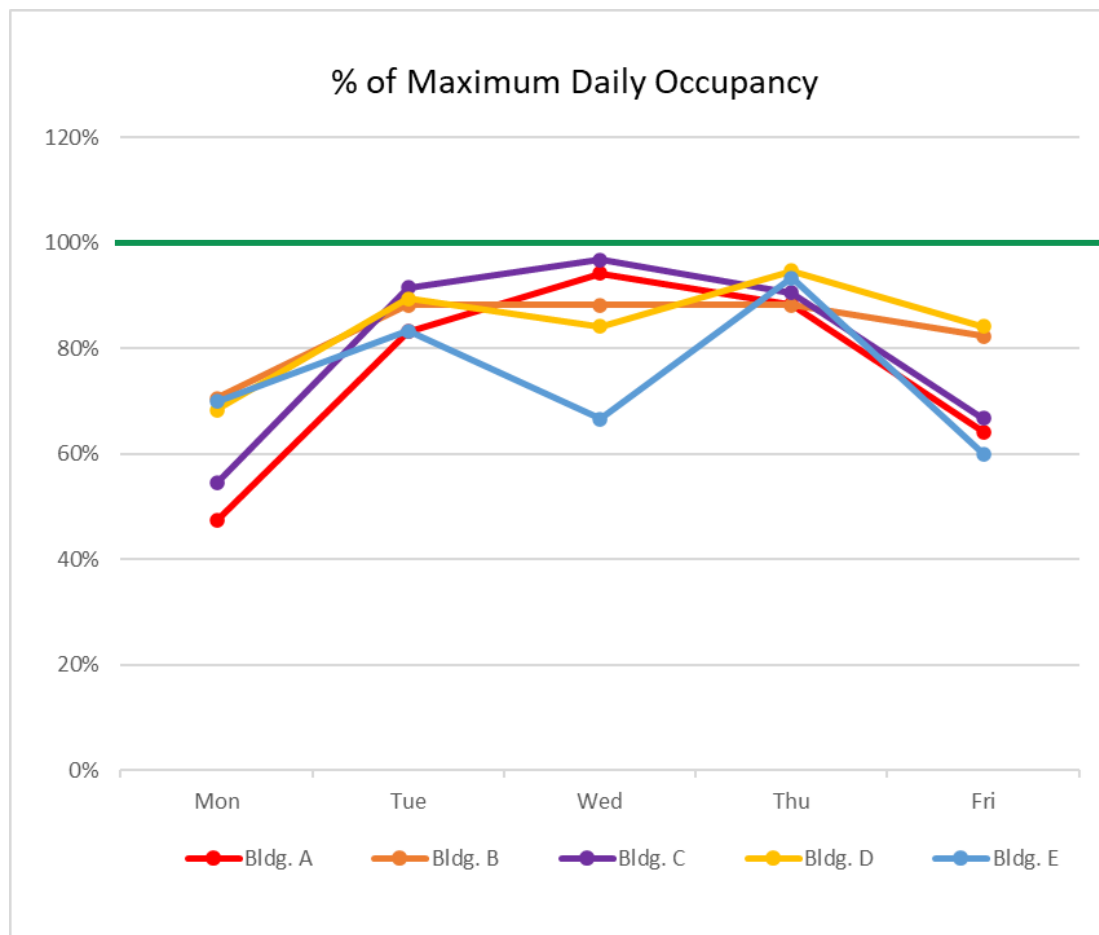
Ideal : Close to 100%

How this is useful

- Significant differences indicate “smoothing out” potential
- Flat curves close to 100% can indicate workplace inflexibility

Things to consider

- When using for basis for design, verify maximum demand
- Doesn't fully show overall space savings opportunities; just individual workspace



Using Occupancy Data to Inform Workplace Strategies - % Deviation from Avg Daily Occupancy

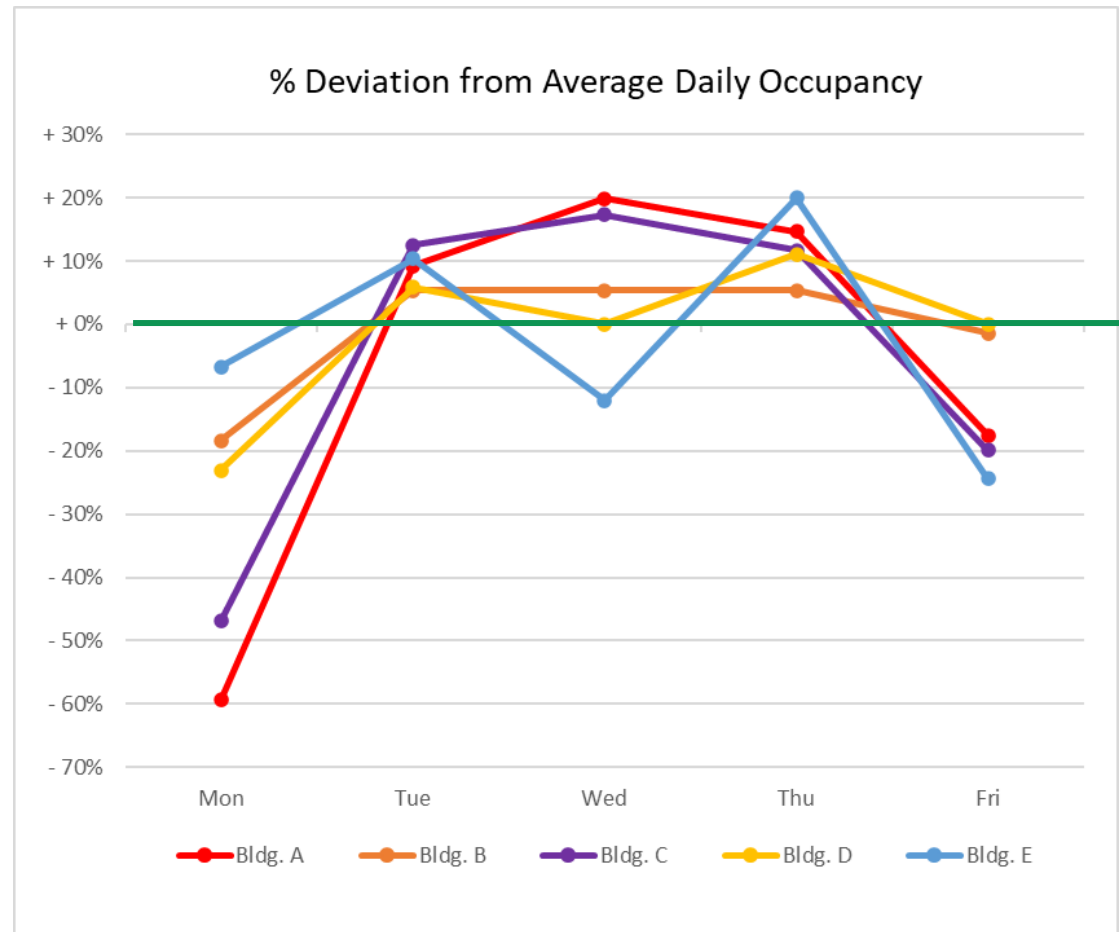
Ideal : Close to 0%

How this is useful

- Good visualization of changes in occupancy levels
- Significant deviations can indicate “smoothing out” potential

Things to consider

- Doesn't fully show overall space savings opportunities; just individual workspace
- Average can be misleading depending single day levels



Using Occupancy Data to Inform Workplace Strategies - % Deviation from OA Headcount

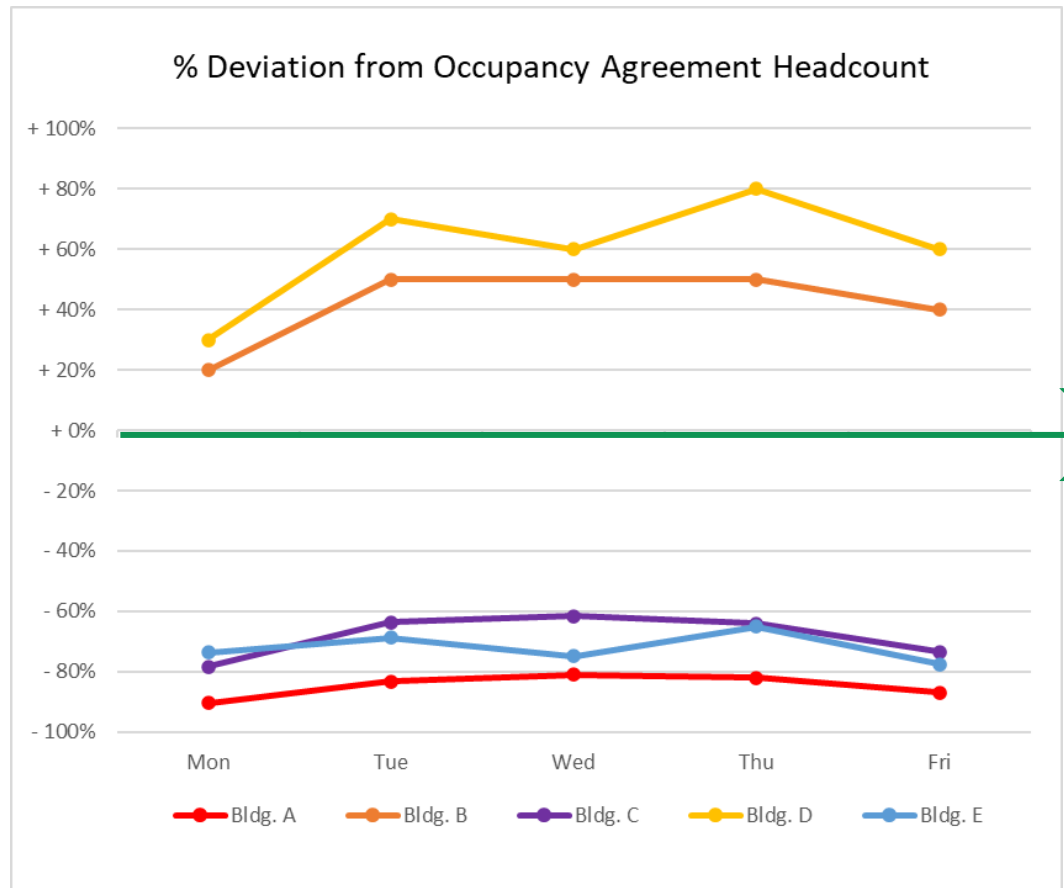
Ideal : Close to 0%

How this is useful

- Negative %s could be big space savings opportunities
- Positive %s could indicate need for future space expansion

Things to consider

- OA headcount could be inaccurate, leading to faulty conclusions
- Doesn't fully show overall space savings opportunities; just individual workspaces



Using Occupancy Data to Inform Workplace Strategies - % Deviation from Overall UR

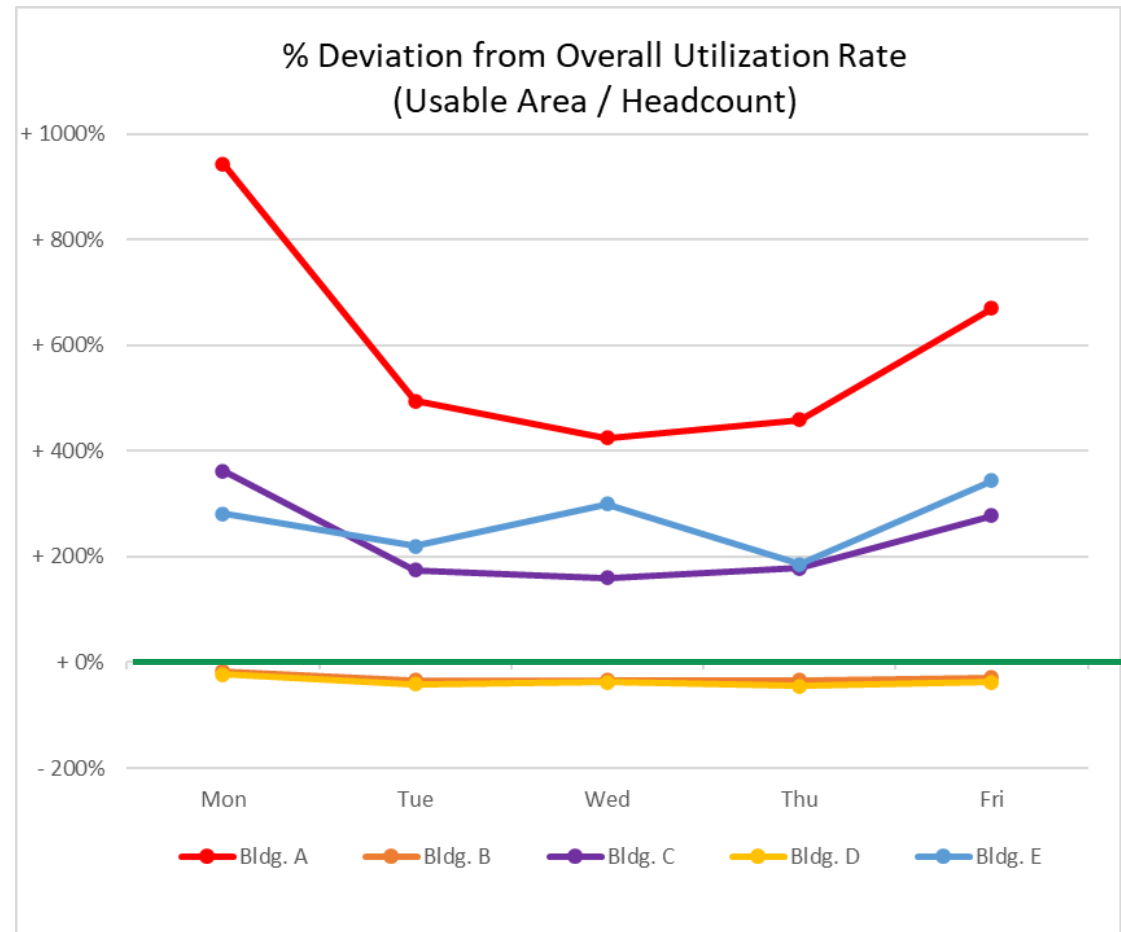
Ideal : Close to 0%

How this is useful

- Identifies potential space inefficiencies due to low occupancy
- Considers the entire workplace, not just individual workspaces

Things to consider

- Utilization rate dependent on accurate OA headcount
- Ideal utilization rate may be different than current utilization rate



Using Occupancy Data to Inform Workplace Strategies – Daily Occupancy Prior to Other Research

- Workplace decisions shouldn't be based just on analysis of occupancy data; doesn't provide a complete picture
- Ideally, its conducted before other diagnostic research efforts as part of a workplace engagement
- Occupancy data results can help prioritize research efforts and topics



Occupancy Data Analysis



Leader Visioning Session



Leader 1: 1 Leader Interviews



Employee Workplace Survey



Employee Focus Groups



Current Space Analysis

Using Occupancy Data to Inform Workplace Strategies

download
this PDF
publication
at [GSA.GOV](https://www.gsa.gov)
(direct
download
link)



Resources: Collecting and Using Occupancy Data

- Contact your national or regional client lead to identify opportunities to explore workplace strategies (find your rep at gsa.gov/nams)
- Occupancy Data Program and Resource Site ([Link](#))
- Fact Sheet: What is Occupancy Data ([Link](#))
- Customer Forum Use Cases ([Link](#))
- Standard Global and AAAP Lease Language:

ACTION REQUIRED: MANDATORY FOR 1) PROSPECTUS LEASES; OR, 2) ACTIONS EXCEEDING 40,000 ABOA SF. THIS ALLOWS DATA TO BE CAPTURED DURING OCCUPANCY TO INFORM FUTURE SPACE UTILIZATION DECISIONS.

7.04 DAILY OCCUPANCY DATA (OCT 2021)

If the Lessor has a means to capture system-generated daily occupancy data identifying the number of people accessing the government occupied space for the period of time specified (e.g., turnstiles, building access system, badges, sensors, WiFi) the Government reserves the right to request daily occupancy data at the Lessor's expense. The data shall cover a 12-month consecutive period of occupancy, and the Government is limited to a total of two (2) separate data requests over the lease term. The LCO (or representative designated by the LCO) shall provide at least 30 calendar days' prior notice to the Lessor for the daily occupancy data period to commence. The Lessor shall provide the daily occupancy data within 30 calendar days after the end of the 12-month consecutive period. Data shall be submitted using either a CSV or Excel file. Data elements shall include, but are not limited to: date, occupancy count, and the tenant agency's name, if the Building contains multiple Government tenant agencies. Data should not include Personally Identifiable Information (PII), e.g., name. If available, additional information may be provided, e.g., date, time of entry, unique card identification number or another anonymous unique identifier, floor accessed, type of occupant - Government employee or contractor, visitor indication, building staff.



Thank you for joining us today for a discussion on

***Understanding Your Workspace Usage With
Daily Occupancy Data***

Q & A



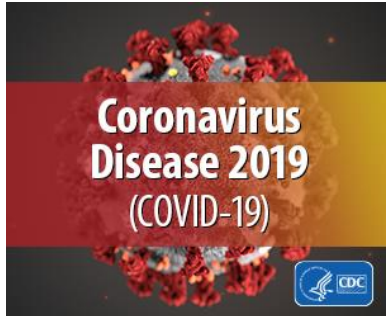
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Climate and Sustainability

Reimbursable Work Authorization (RWA) Policies and Practices

Lease Delegations

Fast Track Space



GSA's COVID-19 Resources for Customers

See our ***Safer Federal Workplaces*** site for our Return to the Workplace and Emergency Response Activities

Watch CES sessions on  **YouTube**

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