Better Buildings Summer Webinar Series

We'll be starting in just a few minutes….

Tell us…

What topics are you interested in for future webinars?

Please go to **slido.com** and use event code **#DOE** to submit your responses.

Everyone has a Data Center: How to Be an Energy Champion for Yours

July 28, 2020

3:00 – 4:00 pm EDT

Ryan Livingston

Boston Government Services, LLC

U.S. DEPARTMENT OF ENERGY

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Enter Event Code

#DOE

Poll #1

On a scale of 1 to 5, how familiar are you with data centers?

(1 = new to the sector and building type, 3 = somewhat familiar, 5 = very familiar)

Please go to www.slido.com and enter code #DOE to respond

Poll #2

What type of data center does your organization have or that you work with?

Please go to www.slido.com and enter code #DOE to respond

Agenda

1. Introduction – Better Buildings Data Center Support
2. Making the Business Case
3. Partner Case Study – Los Alamos National Laboratory
4. Q/A

Data Center Accelerator Results

Data Center Accelerator partners worked to reduce the infrastructure energy intensity of one or more data centers by 25% over 5 years. So far, Accelerator partners have achieved:

- An average **36%** improvement in their data center's infrastructure energy intensity surpassing the Accelerator's original goal.
- **$3.9 million** in annual cost savings

Ongoing Data Center Support

Both targeted data center efforts are concluding, however, we are still providing support in the following ways:

1. Join the Better Buildings Challenge!
   - Commercial Sector, Higher-education, Industrial

2. If you are a federal agency, request assistance from DOE's Federal Energy Management Program for technical and procurement support

3. Reach out to betterbuildingschallenge@ee.doe.gov for question and technical support

Resources:

- Visit the Better Buildings Solution Center
- Visit LBNL's Center of Expertise for Energy Efficiency in Data Centers

Poll #3

What are drivers for your organization to implement energy efficiency in data centers?

Please go to www.slido.com and enter code #DOE to respond

Poll #4

What are barriers for your organization to implement energy efficiency in data centers?

Please go to www.slido.com and enter code #DOE to respond

Today's Presenters

Hannah Stratton
Lawrence Berkeley National Lab

Jason Lee Morris
Los Alamos National Lab

Mike Strevell
Los Alamos National Lab

Steve Greenberg
Lawrence Berkeley National Lab

Hannah Stratton

Lawrence Berkeley National Lab

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U.S. DEPARTMENT OF ENERGY

What Makes Data Center Energy Efficiency Unique?

- Data centers are mission critical operations
- Maintaining continuous up-time is usually the highest priority for data center staff, followed by providing capacity for future growth.
- Data centers are 10 to 100 times more energy intensive than “typical” office space – well positioned to deliver substantial savings
- Individual context (e.g. data center type, organizational structure, internal processes, previous experience with EE) all play a role in shaping the experience a project champion may have with seeing a data center project through.

Project Champions Often Need to Shepherd a Project Through their Organization

Identify drivers that can effectively demonstrate the benefit of energy efficiency in your data center.

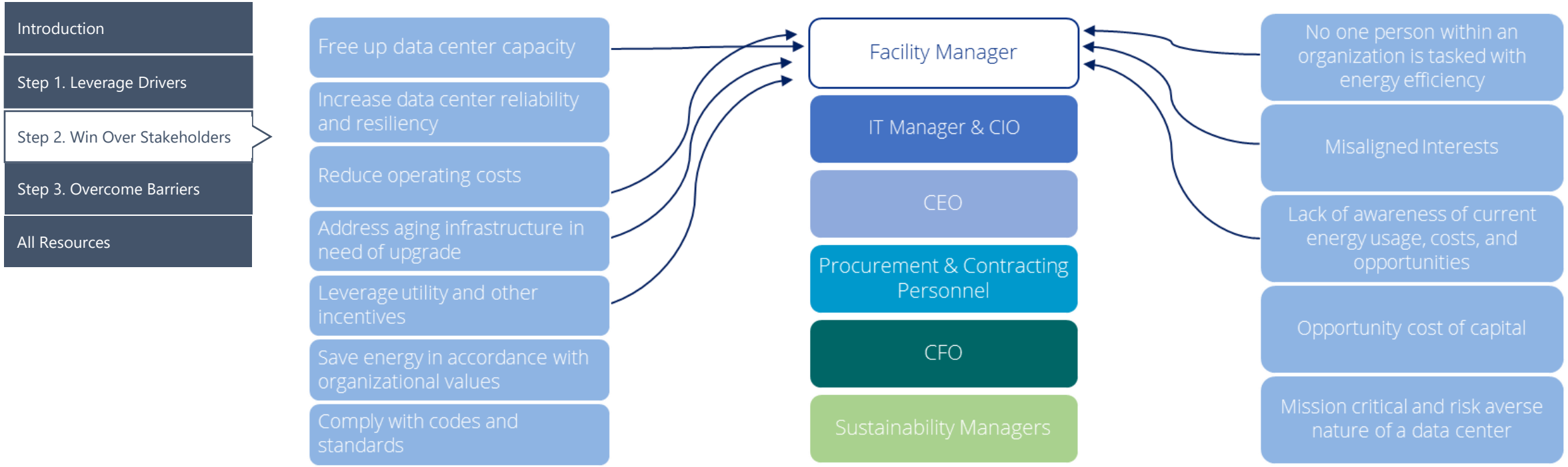
Win over stakeholders within your organization whose buy-in is critical to advancing your project.

Overcome barriers you might encounter during the planning and implementation of your energy efficiency project.

The Center of Expertise's Business Case for Energy Efficiency in Data Centers

New!

- Interactive web resource enables users to identify stakeholders across an organization who are critical to a project's success and assess relevant drivers and barriers.
- Explore resources that can help overcome barriers and win over stakeholders- including successful case studies, CoE tools, training opportunities, etc.

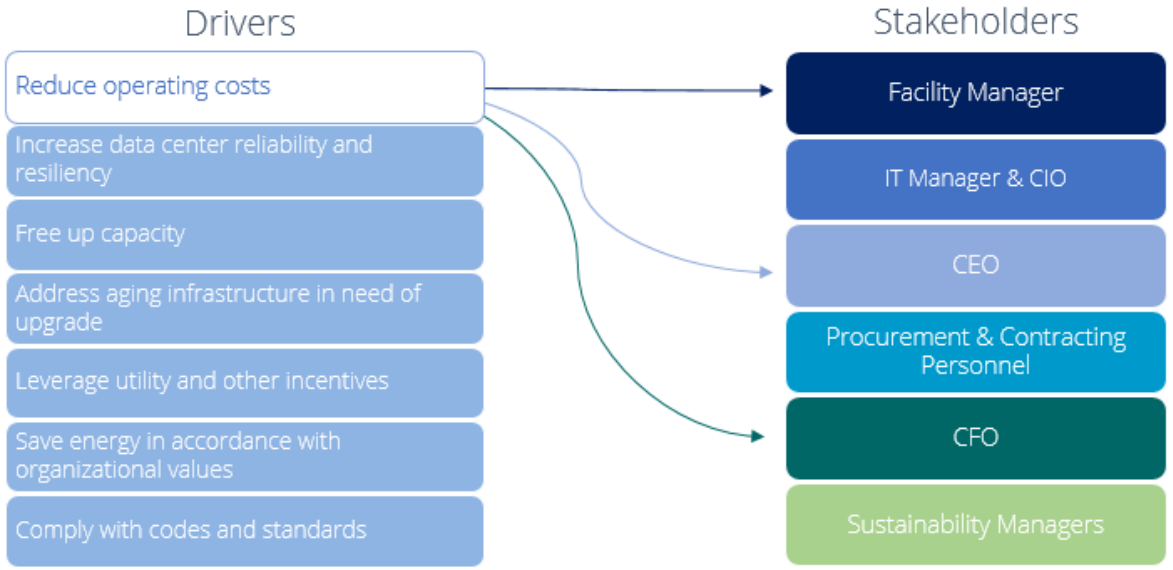


Drivers for Energy Efficiency in Data Centers

- What motivating factors are there to pursue energy efficiency within *your* organization?
- Drivers vary between organizations depending on individual context.
- Consider which drivers resonate with key stakeholders marketing projects to others in your organization.

- Reduce operating costs
- Free up capacity
- Increase data center reliability and resiliency
- Aging infrastructure in need of upgrade
- Utility and other incentives
- Save energy in accordance with organizational values
- Comply with codes and standards

Drivers for Energy Efficiency in Data Centers



Reduce operating costs

Data center operational costs are often driven by energy consumption- and can be extremely expensive, with estimates that the electrical costs for large data centers can exceed $1,000,000 per month. It's no wonder then, that 92% of companies report being influenced by operational savings in their decision to pursue energy efficiency projects. Energy efficiency improvements stand to significantly reduce energy costs in data centers. Larger investments can result in energy savings of 40% or more. Many organizations have found that the operational savings outweigh the upfront capital investment required by a wide margin, with low (under a year) payback periods and notable energy cost savings over the lifetime of the equipment. These savings can be allocated to other organizational activities and goals. With organizations in most sectors increasingly relying on and incorporating data centers as a critical part of their business, the incentive to effectively manage their operating costs will only increase.

Relevant Stakeholders:

Barriers to Energy Efficiency in Data Centers

- What barriers (institutional, technical, and financial) might be encountered during the planning and implementation of your energy efficiency project?
- Which barriers might affect different stakeholders?
- What opportunities are there to overcome these barriers, and what resources are available to help?

No one person within an organization is tasked with energy efficiency

Misaligned Interests

Lack of awareness of current energy usage, costs, and opportunities

Opportunity cost of capital

Mission critical and risk averse nature of a data center

Barriers to Energy Efficiency in Data Centers

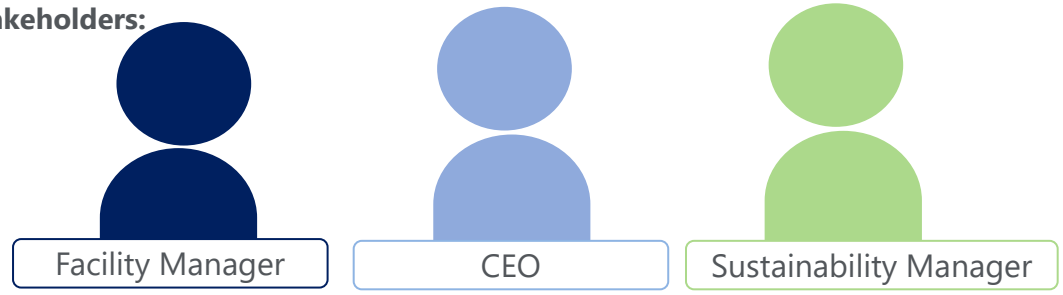
- Each barrier describes:
  - The problem
  - Opportunities to overcome the problem
  - Relevant Stakeholders
  - Resources for the project champion

No one person is tasked with energy efficiency

The Problem: Most organizations do not have an individual who is explicitly tasked with managing energy efficiency in their data center. Whether a product of organizational silos, an oversight, or lack of resources, this makes it less likely that energy efficiency projects will be undertaken. Even if efforts are unofficially assigned, (and participants are well-intentioned), energy efficiency improvements may constantly be pushed to the back burner as stakeholders prioritize other concerns that are formally part of their job (and a measure of their success).

Opportunities to Overcome: Establish a point person or individual who is responsible for periodically assessing data center energy efficiency, as well as initiating, implementing, and tracking projects. This "Project Champion" is most likely to be the Facilities or Sustainability Manager, but could be virtually anybody in an organization. Shepherding a project through initiation to completion and overcoming organizational resistance and inertia often demands an individual's explicit attention in order to be successful.

Relevant Stakeholders:



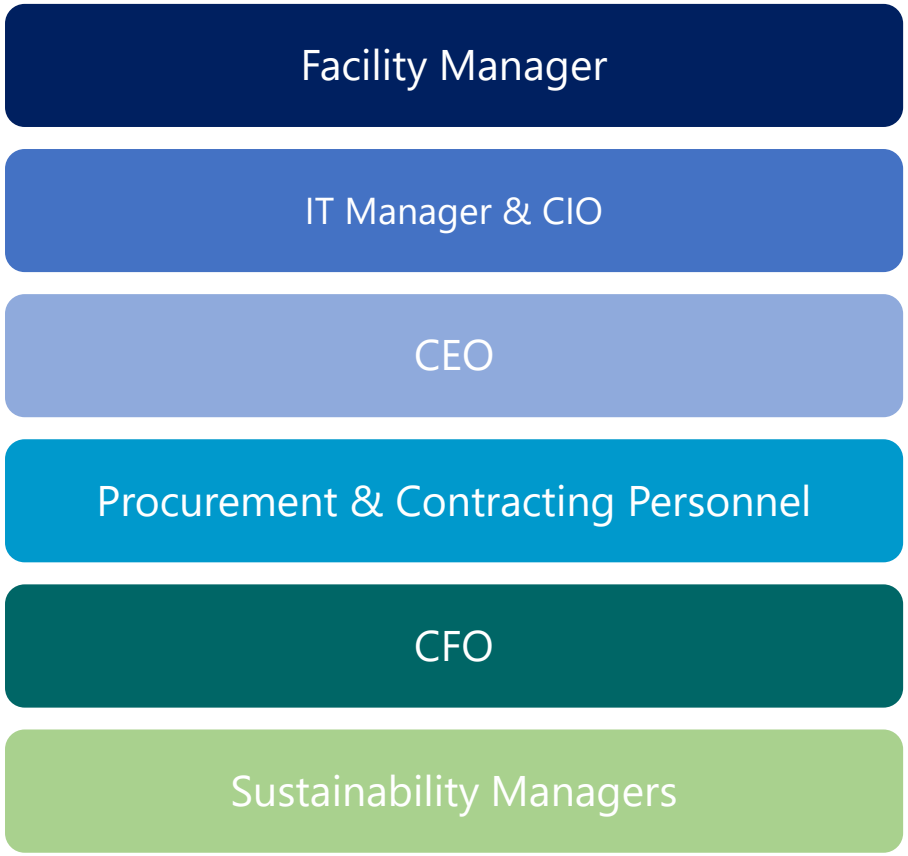
Resources

- ISO 50001 Ready Navigator
- DCEP Training
- Energy Efficiency Toolkit
- Creating a green data center to help reduce energy costs and gain a competitive advantage
- Getting to "Yes" for Energy Efficiency

Engaging Key Stakeholders

- Often is up to the project champion to proactively engage stakeholders in an organization.
- Stakeholders inherently have different responsibilities, concerns, experiences, levels of familiarity with EE, which all affect how they may perceive a proposed data center project.
- Use terminology that resonates with target stakeholder.
- Not all stakeholders have equal weight for a project.

Engaging Key Stakeholders



- Relevant stakeholders will vary organization to organization.
- Anyone can be a project champion!
- *Business Case* resource can help a project champion uncover:
  - *Which stakeholders are relevant for my project?*
  - *What drivers resonate with those stakeholders?*
  - *What barriers might impact stakeholder in order to get their buy-in?*
  - *What resources are helpful to achieve their buy-in on a project?*

Stakeholder Spotlight: Facility Manager

Characteristics

- Most likely “Project Champion”
- Responsible for maintaining a data center’s building and infrastructure as well as replacing equipment to ensure electrical power, air flow, and cooling needs.
- Work to assure uptime and recoverability.
- Accommodate capacity needs coming from an IT Manager/CIO.
- Most likely to pay (or at least see) a data center’s energy bill.

Drivers

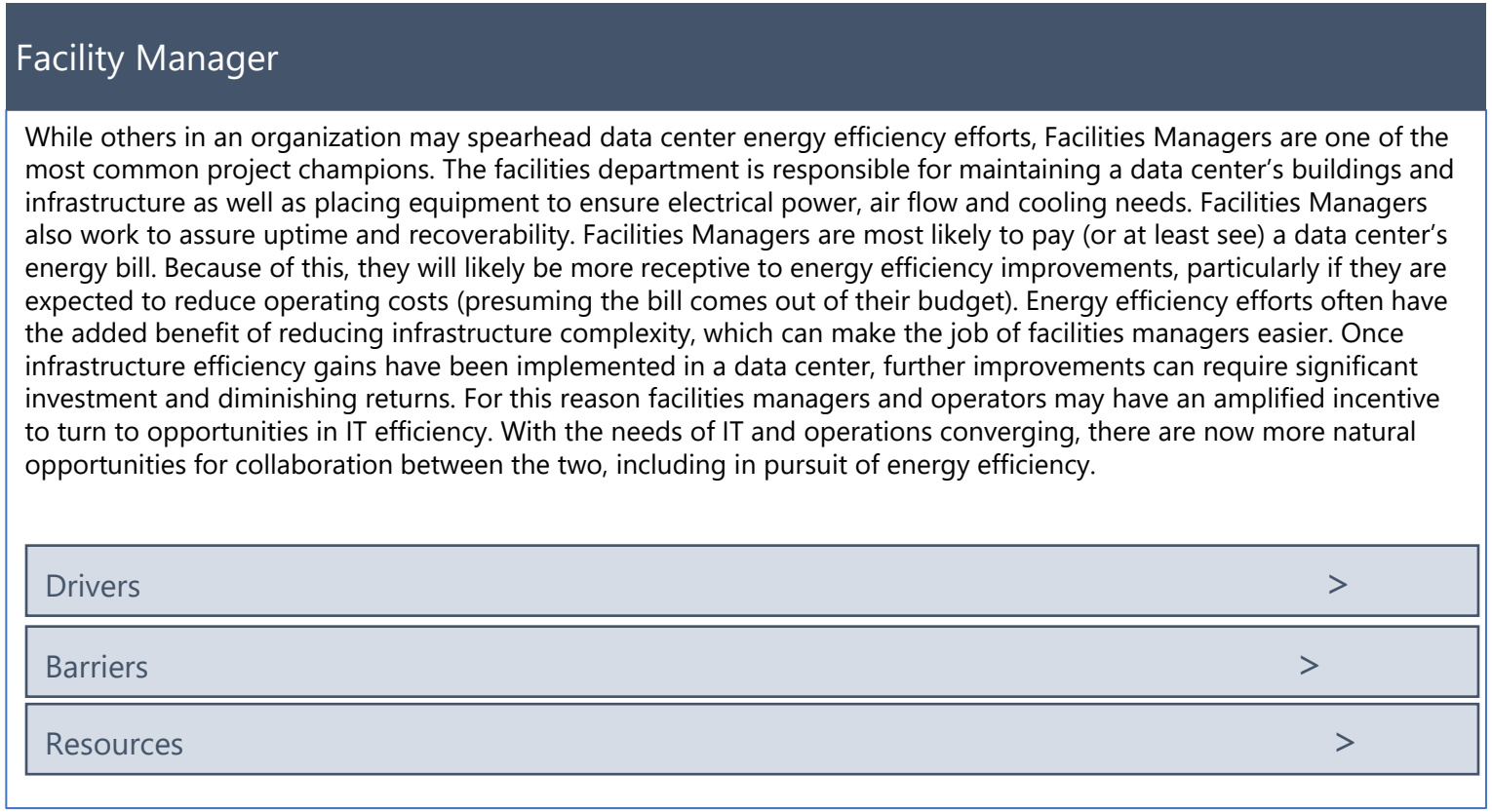
- Reduce operating costs
- Free up capacity
- Comply with codes and standards
- Leverage utility & other incentives

Barriers

- Misaligned interests
- No one person is tasked with energy efficiency
- Lack of awareness of energy usage, costs, and opportunities

Engaging Key Stakeholders

- Each stakeholder has this information in an interactive format that describes:
  - Stakeholder role/responsibilities.
  - Relevant Drivers
  - Relevant Barriers
  - Resources targeted towards that stakeholder (or that a Project Champion can use to win them over).



Key Takeaways

- Data center energy efficiency projects can require a concerted, coordinated effort.
- Project champions should:
  - Consider the drivers and barriers for relevant stakeholders
  - Take initiative to share information and educate others – don't assume familiarity with the topic.
  - Early engagement of stakeholders and establishment of a cross-functional project team can help facilitate mutual understanding and achieve buy-in
  - Develop & present the project in a way that leverages key stakeholder interests, and addresses or mitigates meets their concerns
  - Measuring project outcomes can pave the way for future projects
- CoE's Business Case Resource can help Project Champions on their path towards data center energy efficiency.
  - PDF available at datacenters.lbl.gov
  - Interactive web-based resource available in August!

Jason Lee Morris

Los Alamos National Laboratory

Mike Strevell

Los Alamos National Laboratory

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Los Alamos NATIONAL LABORATORY EST. 1943

Everyone Has A Data Center: How to Be an Energy Champion for Yours

Jason Morris
Mike Strevell
Los Alamos National Laboratory

July 28, 2020

UNCLASSIFIED

Overview

- Data Center Strategic Management
- PUE Monitoring
- Infrastructure Upgrades
- Environmental Advantages

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Strategic Management

- Oversight of Procurements
  - FITARA Requirements
  - Data Center Expansion Notification
- Consolidation Planning
- New Data Center Planning

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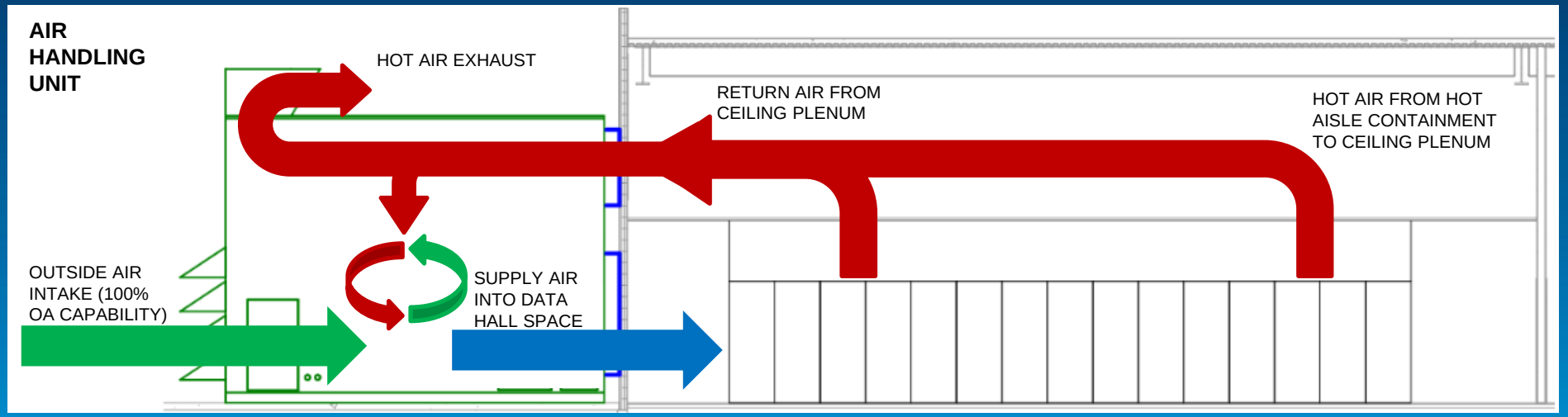
Energy Efficient Conceptual Design

- Low PUE & WUE
- Warm water cooling
- Hybrid dry coolers
- No chillers
- Outside Air cooling
- Rectangular shape
- Transformers outside
- Near substation

Image courtesy of Gensler

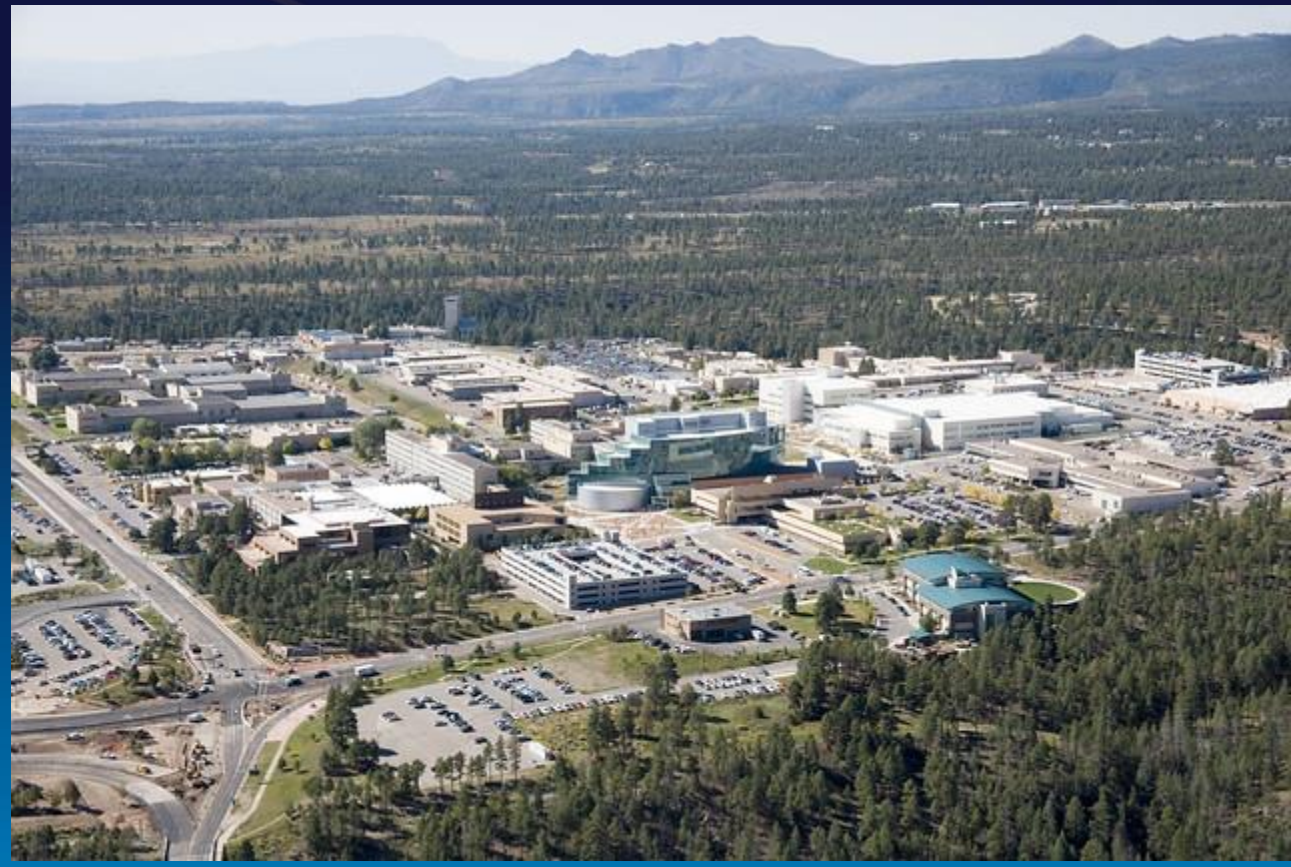
Outside Air Cooling

- Large sidewall supply & roof return required
  - Difficult to retrofit in existing building
- 100% outside air economizer for 85% of annual hours
- Hot aisle containment



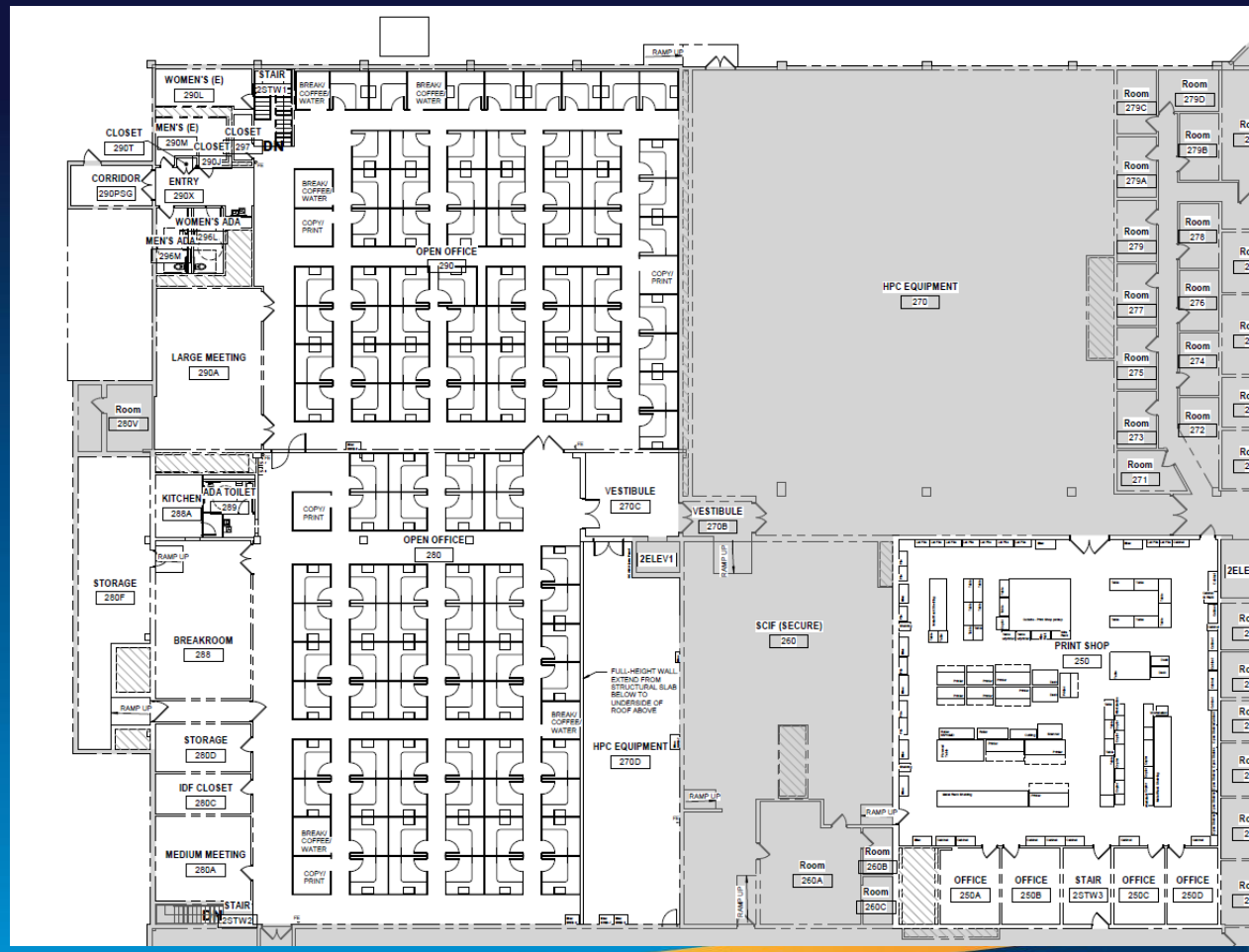
Be Sustainable for Your Environment

- Relatively cool year round (ski area just outside of town)
- Very low humidity (dewpoint)
- Summer: Slightly warm afternoons, but cool evenings
- Water is a valuable resource
- Dry coolers and outside air cooling work 85% of year



Convert 1960's Datacenter to Offices

- Consolidate computing in facility
- Excess space – 24,000 sq ft
- Not enough power or cooling for today's HPC systems



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PUE Monitoring

- Seeing methods to better monitor energy use in the data center
- Obstacles to implementation
  - Dated infrastructure
  - Cyber Security

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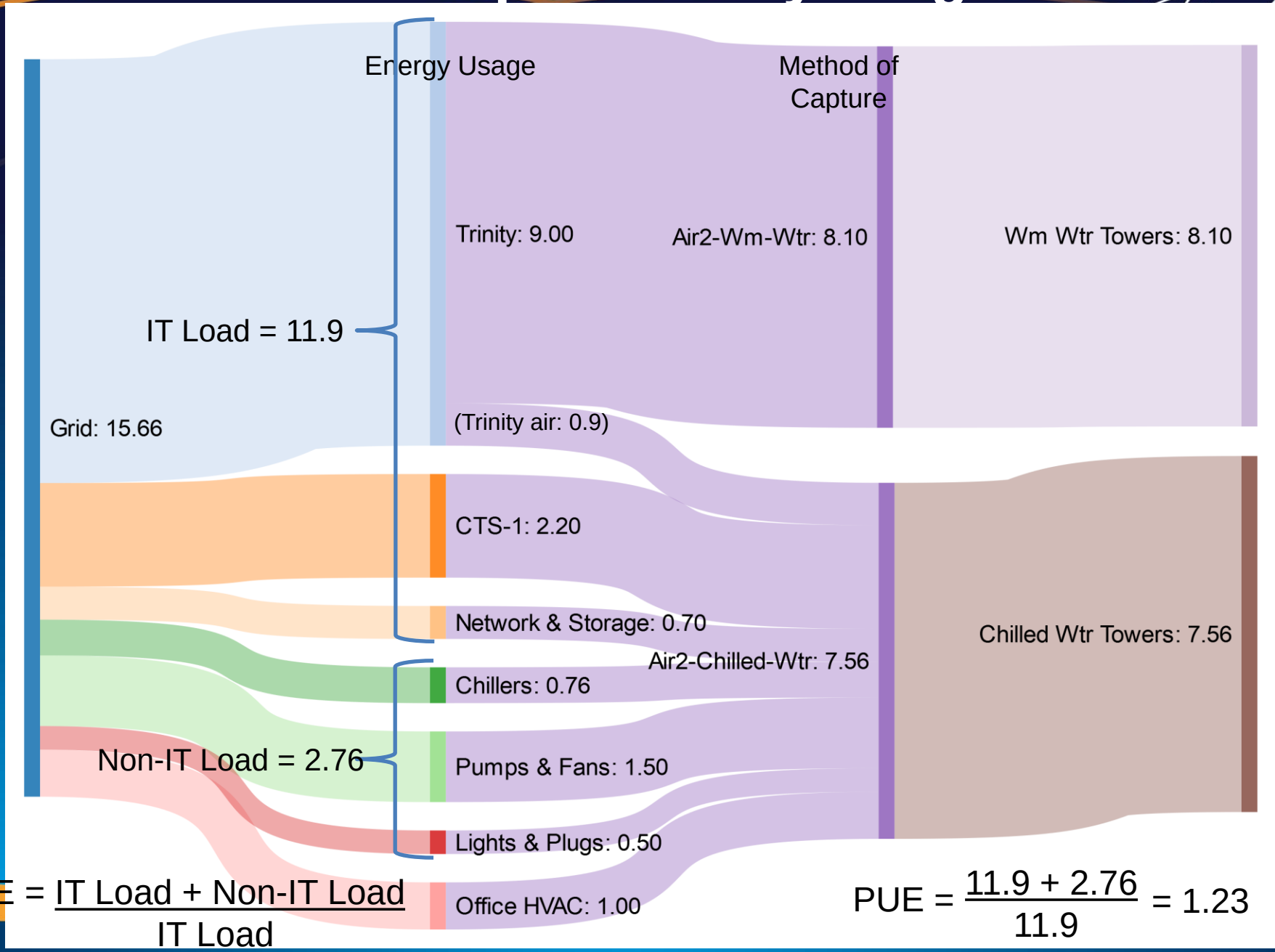
PUE Dashboard Example Sankey Diagram



$$PUE = \frac{\text{IT Load + Non-IT Load}}{\text{IT Load}}$$

$$PUE = \frac{11.9 + 2.76}{11.9} = 1.23$$

Infrastructure Upgrades

- Electrical Updates for better efficiency
- Energy efficient IT gear
  - Increased processing density
  - Infrastructure On Demand

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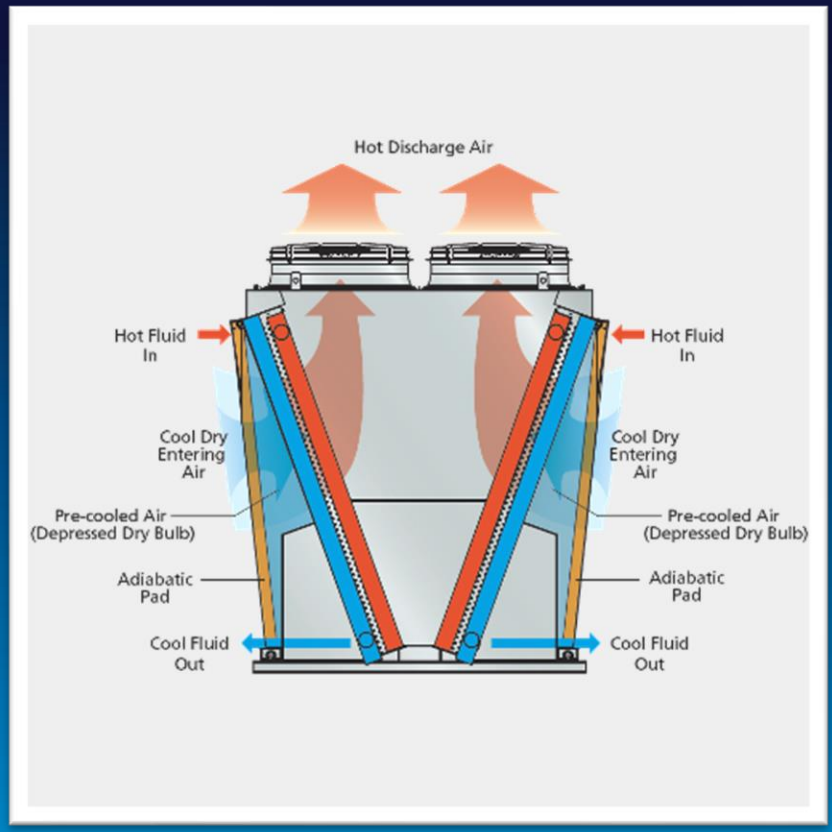
Adiabatic Dry Coolers Maximize Water Savings

- only use water during hot season



Key Energy Efficiency Take-aways

- Take advantage of weather conditions for compressor-less cooling
- Anticipate future cooling system transitions:
  - Air → Chilled Water → Warm Water → ???
- Flexibility is important
- Bring computers to power, rather than power to computers
- Adiabatic dry coolers significantly reduce water consumption
- Integrate datacenter with long-term site plan

Steve Greenberg

Lawrence Berkeley National Lab

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Q & A

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Additional Resources

- Center of Expertise for Energy Efficiency in Data Centers (datacenters.lbl.gov)
  - Energy Assessment Process Manual
  - Master List of Energy Efficiency Actions
  - Data Center Profiling (DC Pro) Tools
  - Data Center Energy Practitioner (DCEP Training)
  - Center of Expertise Training Opportunities
  - Building Your Business Case Fact Sheet
- Better Buildings Solution Center
- FEMP Data Center Program
- ISO 50001 Ready Navigator
- Energy Efficiency HPC Working Group

Discover online training and education opportunities from the U.S. Department of Energy (DOE) and Better Buildings Affiliates who are working with DOE to promote energy efficiency in U.S. buildings and manufacturing plants.

Learn more at: https://betterbuildingssolutioncenter.energy.gov/e-learning-center

Better Buildings: Summer Webinar Series

BEHIND THE METER DISTRIBUTED ENERGY RESOURCES:

BEST PRACTICES FOR INTEGRATING DERS INTO COMMERCIAL BUILDINGS

July 8

NEXT-GENERATION BUILDING PERFORMANCE POLICIES:

MAXIMIZING ENERGY SAVINGS AND ENVIRONMENTAL IMPACTS

July 16

EVERYONE HAS A DATA CENTER:

HOW TO BE AN ENERGY CHAMPION FOR YOURS

July 28

PROGRAM DESIGN WITH EVERYONE IN MIND:

LOW-INCOME SOLAR PROGRAM STRATEGIES

July 9

STRATEGIES TO COMBINE ENERGY + HEALTH UPGRADES IN MULTIFAMILY HOUSING

July 21

SUCCEED WITH SUBMETERING:

HOW TO MAKE THE BUSINESS CASE

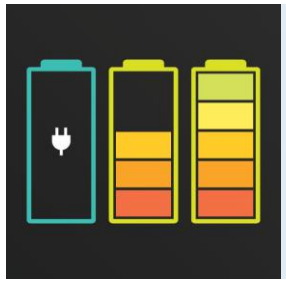
August 4

REGISTER TODAY

THE DYNAMIC DUO:

UNLEASH PUBLIC SECTOR ENERGY SAVINGS WITH FINANCING AND TECHNICAL ASSISTANCE

July 14



CASE IN POINT:

OREGON'S RECENT EFFORTS TO REDUCE PLUG LOAD ENERGY CONSUMPTION

July 22

On-Demand Webinars

Better Buildings U.S. DEPARTMENT OF ENERGY

U.S. DEPARTMENT OF ENERGY

Better Buildings: Summer Webinar Series

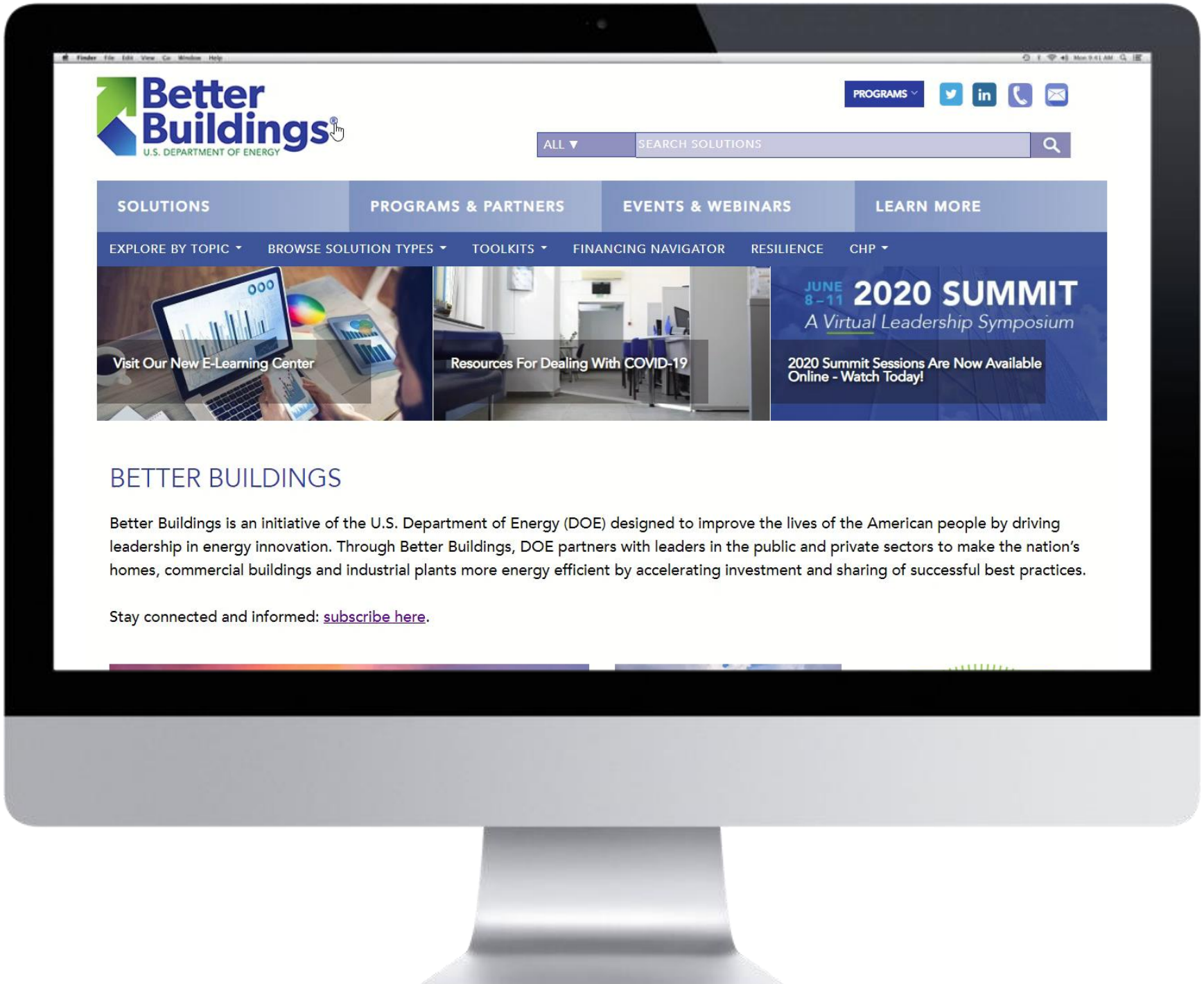
SUCCEED WITH SUBMETERING:

HOW TO MAKE THE BUSINESS CASE

Tuesday, August 4, 2020 | 1:00 - 2:00 PM ET

REGISTER TODAY

Organizations of all shapes and sizes can benefit from better understanding their granular energy usage. Partners from both the public and private sectors will discuss how to persuade decision-makers and make the business case for the value of submetering; they will also share how to tie submetering to benchmarking and data management efforts for greater success.



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Additional Questions?

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