

U.S. DEPARTMENT OF
ENERGY

Office of
Science

Sustainability and Clean Energy Requirements

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Outline

- I. DOE Order 413.3B Update**
- II. 10 CFR 433**
- III. ASHRAE 90.1 (2019)**
- IV. DOE Order 436.1A Update**
- V. DOE Guide 413.3-6B**
- VI. Guiding Principles**
- VII. Carbon Free Electricity Initiative**
- VIII. Vulnerability Assessment and Resilience Plan (VARP)**
- IX. Sustainable Climate Ready Sites (SCRS) Pilot**



DOE Order 413.3B

DOE Order 413.3B requires sustainability to be considered throughout the design process and then validated after construction is completed.

Order 413.3B has been cleaned up a *lot* with Change 7 which was published in June 2023:

Complete a Conceptual Design.

- Incorporate and document compliance with climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version) and/or other high performance and sustainable building considerations (refer to DOE G 413.3-6, current version, and Guiding Principles for Sustainable Federal Building) in the PEP, Conceptual Design Report and Acquisition Strategy as appropriate.

CD-1

Complete and review the Final Design for non-nuclear facilities and less than Hazard Category 3 nuclear facilities.

- Incorporate and document compliance with climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version), and/or other high performance and sustainable building considerations (refer to DOE G 413.3 6, current version, and Guiding Principles for Sustainable Federal Buildings) in the PEP, Final Design, Final Design Report, and EIR as appropriate.

CD-3

Complete a Preliminary and/or Final Design. *Hazard Category 1, 2, and 3 nuclear facilities shall achieve at least 90% design completion prior to CD-2 approval. Non-nuclear project designs shall be sufficiently mature to prepare a project baseline with 70-90% confidence prior to CD-2 approval. (See Appendix C, Paragraph 7a for definition of 90% design complete.)*

- Incorporate and document compliance with climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version), and/or other high performance and sustainable building considerations (refer to DOE G 413.3-6, current version and Guiding Principles for Sustainable Federal Buildings) in the PEP, preliminary and/or final designs, and design review reports as appropriate.

CD-2

Complete and document achievement of climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version), and/or other high performance and sustainable building considerations (refer to DOE G 413.3 6, current version, and Guiding Principles for Sustainable Federal Buildings) which were documented in the PEP, as applicable.

PROJECT CLOSEOUT



DOE Order 413.3B

Appendix C “Topical Areas” has detailed requirements in Section #5 which are referenced in the various Critical Decision tables (from last slide)

5. Climate Adaptation, Resilience and Sustainability

Adopt all practical measures to incorporate clean energy sources and mitigate and adapt to climate change in the design of all capital asset construction, renovation, and modernization projects (see DOE O 436.1, current version).² Accordingly, all projects which achieve Critical Decision (CD)-1, *Approve Alternate Selection and Cost Range*, after January 31, 2022 in conformance with this Order, are to integrate energy efficient, sustainable, healthy, climate-ready measures and climate-resilient building practices into the early stages of building design when designing, locating, constructing, and renovating Federal buildings by:

It is also noted that these “practical measures” also apply to capital assets acquired through projects with a TPC less than \$50M.



DOE Order 413.3B

Some key points from Appendix C “Topical Areas”:

Meeting or exceeding, where appropriate and in conformance with 10 CFR 433, the current building standards and codes defined by ASHRAE (ANSI/ASHRAE/IES Standard 90.1-- Energy Standard for Buildings Except Low-Rise Residential Buildings, current version) as updated, and the existing requirement absent a PME approved waiver to meet the U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) Gold certification.³

Incorporating the Council of Environmental Quality’s Guiding Principles for Sustainable Federal Buildings (Guiding Principles) into the design, or in the case of acceptance of the constructed facility, documenting how the facility meets sustainable design goals.

Assessing localized climate risks and incorporating design features to enhance the resilience of the building design and operations.

Any deviation from these requirements other than for LEED Gold that is in the interest of national security is to be requested by the Project Management Executive, reviewed and endorsed by the Project Management Risk Committee, and approved by the Secretary of Energy.

Reducing scope 1 and 2 greenhouse gas emissions, as defined by the Federal Greenhouse Gas Accounting and Reporting Guidance, for buildings greater than 25,000 gross square feet to achieve net-zero emissions by 2030, and where feasible, net-zero water and waste buildings.⁴

Implementing building electrification strategies in conjunction with carbon pollution-free energy use, deep-energy retrofits, whole-building commissioning, energy and water conservation measures, and space reduction and consolidation.

All new construction and modernization projects are to be designed, constructed, and maintained to meet (and, exceed wherever practicable) Federal sustainable design and operations principles.

Setting design criteria that address climate action through adaptation and resilience as scope requirements or key performance parameters for all new construction projects. Such criteria should comply with applicable legal and regulatory requirements for establishment of climate-related design elements.



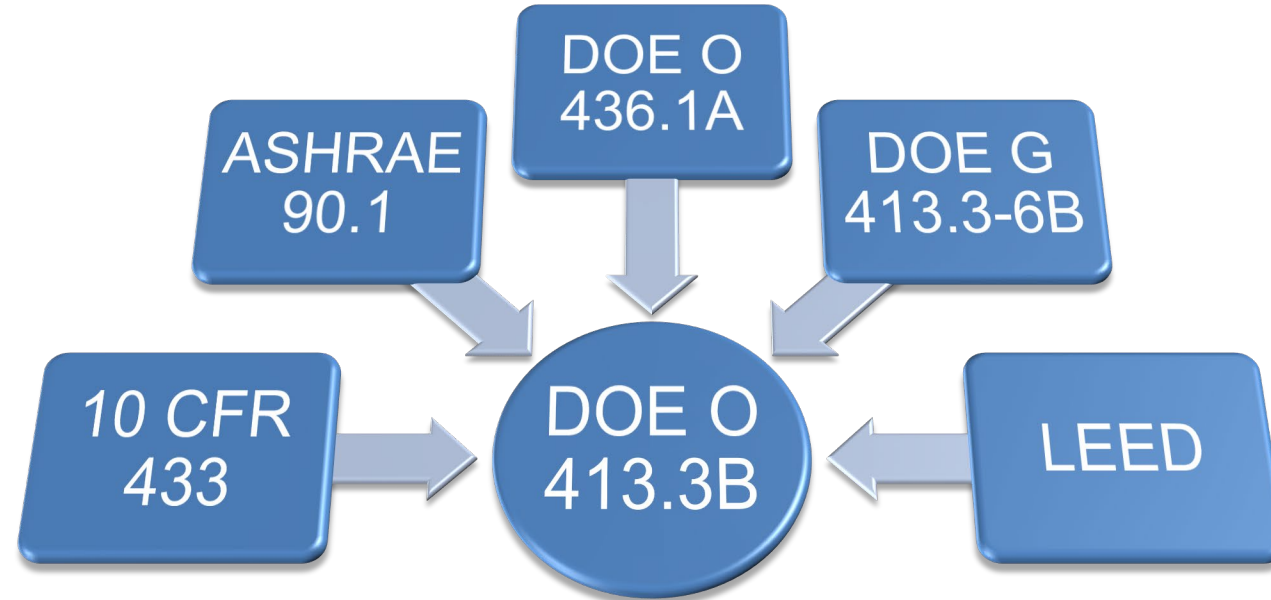
DOE Order 413.3B

Additionally, Attachment #1 (Contractor Requirements Document (CRD)) requires the Contractor's project management system satisfy the following requirement:

15. Climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5 of this Order), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version) and/or other high performance and sustainable building considerations (refer to DOE G 413.3 6, current version and Guiding Principles for Sustainable Federal Buildings) must be applied to the siting, design, construction, and commissioning of new facilities and major renovations of existing facilities. At a minimum, all new construction and major building renovations must meet U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold certification absent an approved waiver from the PME.



DOE Order 413.3B



Confused?



10 CFR 433

All construction that starts on or after April 7th, 2023 must:

1. Meet ASHRAE 90.1 (2019)
2. If lifecycle cost is effective, achieve energy consumption at least 30% below ASHRAE 90.1 (2019) Baseline Building.
 - If 30% reduction is not LCC effective, achieve consumption level at or better than max level that is
3. Determine energy consumption levels for both the ASHRAE Baseline Building 2019 and proposed building by using the Performance Rating Method found in Appendix G of ASHRAE 90.1–2019.

$$\text{Percentage Improvement} = 100 \times (1 - \text{PCI}/\text{PCIt})$$

Where

PCI = Performance Cost Index calculated in accordance with Section G1.2 of ASHRAE Standard 90.1–2019

PCIt = Performance Cost Index Target calculated by formula in Section 4.2.1.1 of ASHRAE Standard 90.1–2019

Exclude energy-intensive process loads that are driven by **mission and operational requirements**, not necessarily buildings, and not influenced by conventional building energy conservation measures.



10 CFR 433

Continued...

4. Green building certification system (such as LEED) must
 - ✓ Allow assessors and auditors to independently verify the criteria and measurement metrics of the system.
 - ✓ Be nationally recognized within the building industry
 - ✓ Be subject to periodic evaluation and assessment of the environmental and energy benefits that result under the rating system
 - ✓ Include a verification system for post-occupancy assessment of the rated buildings to demonstrate continued energy and water savings at least every four years after initial occupancy
5. The building must be certified to a level that promotes the high performance sustainable building guidelines referenced in:
 - Executive Order 13423 (2007) and Executive Order 13514 (2009)
 - Both referenced EO's were revoked by EO 13693 (2015)
 - Then EO 13834 (2018) revoked that one!

ASHRAE 90.1

ASHRAE 90.1 provides minimum requirements for energy efficient design.

- **Five key summary points:**

- Building Envelope: Minimum insulation levels, fenestration requirements, and building envelope performance standards to reduce heat transfer and improve energy efficiency.
- Lighting Efficiency: Lighting power density limits, occupancy sensor requirements, and lighting control strategies to optimize energy use in buildings while maintaining adequate illumination levels.
- HVAC Systems: Efficiency standards for HVAC systems, including equipment performance criteria, system controls, and ventilation rates for indoor air quality.
- Energy Modeling: Encourages the use of energy modeling to predict and optimize a building's energy performance, allowing for the assessment and comparison of different design options.
- Commissioning and Maintenance: Emphasizes the importance of commissioning, operation, and maintenance practices to ensure that building systems perform as intended and continue to operate efficiently over time, reducing energy waste.



ASHRAE 90.1

There are two paths for compliance:

– Prescriptive Path:

- Specific Requirements: Outlines a set of specific requirements for building components, such as insulation levels, lighting power density, HVAC system efficiency, and more. No need for energy modeling or complex calculations.
- Limited Flexibility: This path is less flexible because it prescribes exactly what measures and values must be used for each component.

– Performance Path:

- Energy Modeling: Allows for greater flexibility in design. It involves energy modeling and simulation to demonstrate that the proposed building design meets or exceeds the energy efficiency levels specified in the standard.
- Customized Solutions: Designers can use innovative or customized building systems and strategies to achieve compliance.
- Trade-offs: The Performance Path allows trade-offs between different building components.

ASHRAE 90.1

What is a ASHRAE 90.1 (2019) Baseline Building?

- Standardized Design: The baseline building is designed in accordance with specific criteria defined in ASHRAE 90.1.
- Prescriptive Requirements: The baseline building typically follows the prescriptive requirements outlined in the standard.
- Performance Comparison: The primary purpose of the baseline building is to provide a basis for comparison with the actual or proposed building design.
- Energy Modeling: To assess compliance using the Performance Path, an energy model of the baseline building is created. This model represents the energy use of the baseline building as defined by the standard.



ASHRAE 90.1

How can we design a building to have >30% energy efficiency than the baseline building?

1. Energy Modeling and Analysis:

- Start by conducting an energy model of your proposed building design using approved software.
- Use the ASHRAE 90.1 baseline building as a reference for your initial analysis.
- Identify areas where energy consumption can be reduced based on the baseline model's energy use.

2. High-Performance Envelope:

- Improve the building envelope by enhancing insulation levels, selecting high-performance windows, and minimizing thermal bridging. This can significantly reduce heating and cooling loads.

3. Efficient Lighting Design:

- Implement advanced lighting design strategies, such as LED lighting, daylight harvesting, occupancy sensors, and task lighting, to reduce lighting energy consumption compared to the baseline.

ASHRAE 90.1

How can we design a building to have >30% energy efficiency than the baseline building?

4. Advanced HVAC Systems:

- Opt for energy-efficient HVAC systems with high Seasonal Energy Efficiency Ratio (SEER) and Heating Seasonal Performance Factor (HSPF) ratings.
- Use variable-speed equipment, energy recovery ventilation, and demand-controlled ventilation to optimize HVAC performance.

5. Renewable Energy Integration:

- Consider incorporating renewable energy sources like solar panels or wind turbines to offset a portion of the building's energy consumption.

6. Efficient Controls:

- Implement advanced building automation and control systems to optimize HVAC, lighting, and other systems for maximum energy efficiency.
- Use smart thermostats and occupancy-based controls to minimize energy waste.

ASHRAE 90.1

How can we design a building to have >30% energy efficiency than the baseline building?

7. Plug Load Reduction:

- Address plug loads by encouraging energy-efficient appliances, power management strategies, and energy-efficient office equipment.

8. Optimize Building Orientation:

- Design the building's layout and orientation to take advantage of natural daylight and minimize solar heat gain.

9. Commissioning and Maintenance:

- Ensure proper commissioning and ongoing maintenance to keep systems running at peak efficiency.

10. Continuous Monitoring:

- Install energy monitoring systems to track energy consumption and identify areas for improvement over time.

DOE Order 436.1A

DOE O 436.1A – Departmental Sustainability

- New version approved April 25th, 2023
- Two big requirements for the Labs:
 - Site Sustainability Plan (SSP) – updated annually.
 - Vulnerability Assessment and Resilience Plan (VARP) – updated every four (4) years.
- The Big Change: Capital asset projects need to consider the SSP and VARP in their design, construction, and subsequent operation.

This will be verified as part of project closeout...

Complete and document achievement of climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version), and/or other high performance and sustainable building considerations (refer to DOE G 413.3 6, current version, and Guiding Principles for Sustainable Federal Buildings) which were documented in the PEP, as applicable.



DOE Order 436.1A

Some other key points from the Order:

Incorporate the principles of sustainability early in the project planning and design process equivalent to Critical Decision 1 or earlier in accordance with DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*, current version.

Design new construction projects to meet 10 CFR 433 or if applicable the requirements of the latest ANSI/ASHRAE/IES Standard 90.1, and if life-cycle cost-effective, achieve energy savings levels that are at least 30 percent below the Standard 90.1 baseline.

Design new construction and modernization projects, greater than 25,000 gross square feet, to be net-zero emission by 2030.

Ensure the sustainable and equitable siting of new and leased facilities to promote local infrastructure, public transportation, and equitable economic development.

VARP

VARP
Incorporate location-specific resilience design criteria for new construction and major renovations.

Design new construction, renovation, and modernization projects, greater than 25,000 gross square feet, in accordance with the Guiding Principles for Sustainable Federal Buildings.

Consider implementing renewable distributed energy systems in new construction or retrofit projects, where life cycle cost effective and/or when such a system enhances energy reliability, resilience, or security. **SSP**

SSP
Implement Federal Building Metering Guidance including: (1) meter all buildings for electricity, water, natural gas, and steam except for allowed exclusions; (2) ensure all meters are advanced meters to the maximum extent practicable; (3) input metering data into the DOE Sustainability Dashboard; (4) ensure all advanced meter operations meet site and DOE cybersecurity standards; and (5) ensure compliance with DOE metering plan and relevant instructions.



DOE Guide 413.3-6B

- **DOE G 413.3-6B – High Performance Sustainable Buildings**

- Approved April 5th, 2020
- This DOE Guide provides acceptable, **but not mandatory**, means for complying with requirements included in DOE O 413.3B.
- DOE O 413.3B references two approaches:
 - Earning LEED certification
 - Achieving all of the 2016 Guiding Principles for Sustainable Federal Buildings (GPs) for new construction referenced by Executive Order 13834 (2018) implementing instructions

Criteria	LEED BD+C	GPs
Total Project Cost	≥ \$50M	Any
Individual Building Size	≥ 1,000 GSF	> 5,000 GSF
Real Property Trailers	No	Yes
Human Occupants	Yes	Yes or No
Individual Building Cost	Any	Any

Guiding Principles for Sustainable Federal Buildings

The implementing instruction for EO 13834 (2018) states that agencies may qualify sustainable buildings, including existing buildings, new construction, and major renovations, using one of the following:

- The Guiding Principles for Sustainable Federal Buildings and Associated Instructions (Guiding Principles), developed in 2008 and updated in 2016; or
- Third-party building certifications systems or standards identified by GSA’s Office of High Performance Buildings.
 - BOMA BEST Sustainable Buildings, version 3.0
 - BREEAM In-Use USA, version 2016
 - Green Globes, version 2013
 - **LEED, version 4.0**
 - Living Building Challenge, version 3.1



Guiding Principles for Sustainable Federal Buildings

- **The Guiding Principals (GPs) as revised in 2016 include:**
 - Employ integrated design principles;
 - Optimize energy performance;
 - Protect and conserve water;
 - Enhance indoor environmental quality;
 - Reduce environmental impact of materials; and,
 - Assess and consider climate change risks.
- **DOE has determined that a LEED Gold rating level equates to compliance with the GPs under the following circumstances:**
 - Any contracts supporting constructing a new, or renovating an existing, building invoke 48 CFR § 970.5223-7, Alternate I for Construction Contracts and Subcontracts; and,
 - The LEED credits earned satisfy the GPs per 10 CFR § 433.300(c).



DOE Guide 413.3-6B

- The following schedule is provided in the Guide:

PRE		CRITICAL DECISION	POST	
Action	Basis		Action	Basis
<ul style="list-style-type: none"> Address meeting the GPs in Mission Need Statement and Program Requirements Document. 	Guide	0	<ul style="list-style-type: none"> Ensure IPT and support contractors have adequate expertise. 	Guide
<ul style="list-style-type: none"> Address meeting the GPs and earning LEED certification in the conceptual design report, acquisition strategy, analysis of alternatives, and project execution plan. 	Order	1	<ul style="list-style-type: none"> Ensure design contractors have adequate expertise. Begin commissioning plan. Track work towards complying with the GPs. Submit LEED waivers. 	Guide
<ul style="list-style-type: none"> Address meeting the GPs and earning LEED certification in the preliminary design and design review. 	Order	2	<ul style="list-style-type: none"> Document which parts of specific GPs, if any, do not apply to each building. Ensure the contractor will provide adequate documentation. 	Guide
<ul style="list-style-type: none"> Address meeting the GPs in the final design and External Independent Review (or equivalent). Obtain an initial LEED credit determination Confirm the GPs inclusion in commissioning plans. 	Order Guide Guide	3	<ul style="list-style-type: none"> Document compliance with the GPs and LEED credits. Profile the buildings acquired or renovated in ENERGY STAR Portfolio Manager 	Guide
<ul style="list-style-type: none"> Verify compliance with the GPs. Verify the completion of commissioning. 	Guide	4	<ul style="list-style-type: none"> Confirm completeness of GP compliance records. Obtain a final LEED credit determination Confirm records in FIMS address compliance with the GPs. 	Guide



In Summary ...

In Summary:

1. Sustainability must be incorporated into the design process, starting with the Conceptual Design at CD-1.
2. In lieu of trying to satisfy the convoluted and difficult to understand Guiding Principals, achieving *LEED Gold* is a well-understood and a practical way of satisfy the requirements on DOE O 413.3B.
3. Projects need to consider the Site Sustainability Plan (SSP) **and** Vulnerability Assessment and Resilience Plan (VARP) developed by the Lab.
4. Maximizing the use of Carbon Free Electricity (CFE), with an eye towards net-zero in 2030, is now part of the planning and design.
5. Verifying compliance with the sustainability requirements is mandatory as part of Project Closeout.

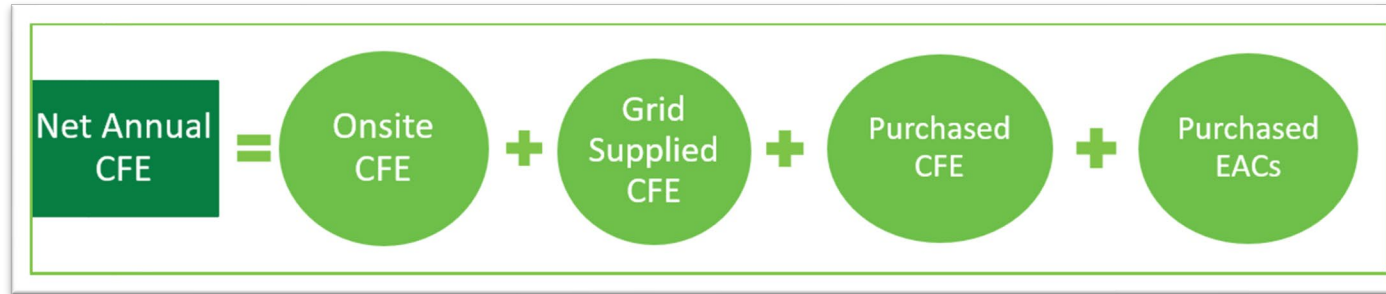


Carbon Free Electricity Initiative

- **Executive Order 14057** mandates that **Federal facilities are powered with 100% carbon pollution-free electricity (CFE), including 50% on a 24-hour-a-day 7-days-a-week (24/7) basis.**
- **Ways to achieve this:**
 - Buy directly from utilities:
 - Work with utility service providers to negotiate supply contracts that include CFE and energy storage for multiple Federal agencies in a service territory.
 - Enter into power purchase agreements:
 - Use physical power purchase agreements (PPAs) that provide for CFE and energy storage to promote 24/7 energy load profile matching and pursue virtual power purchase agreements (VPPAs) to scale procurements to match aggregated purchasing of CFE and energy storage.
 - Develop onsite generation by leveraging Federal real property assets:
 - Leverage opportunities to use Federal real property assets for development of new CFE generation and energy storage.

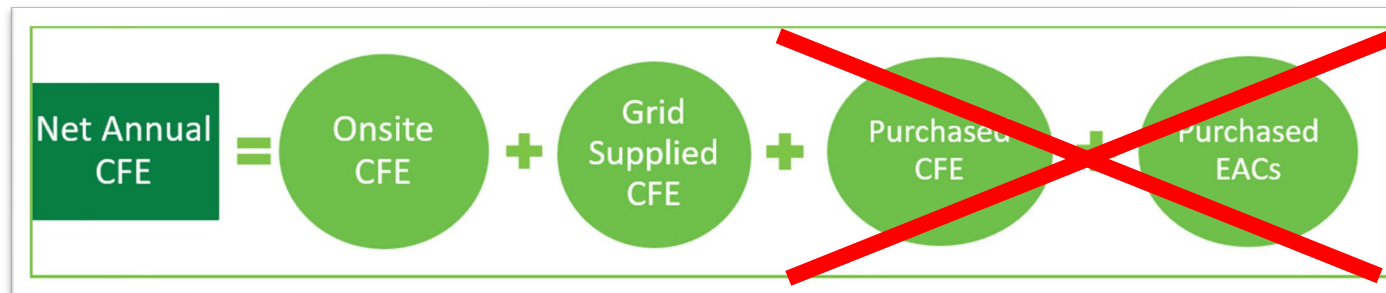
Carbon Free Electricity Initiative

- DOE has used the term “net annual” when describing the 100% CFE requirement. See below graphic which summarizes what this means:



- What about the 24/7 part?

Half of the federal government’s 100% carbon pollution-free annual electricity demand will be procured on a 24/7 basis... meaning that the federal government’s real-time demand for electricity will be met with clean energy every hour, every day, and produced within the same regional grid where the electricity is consumed.



Carbon Free Electricity Initiative

- **How does this impact our projects?**

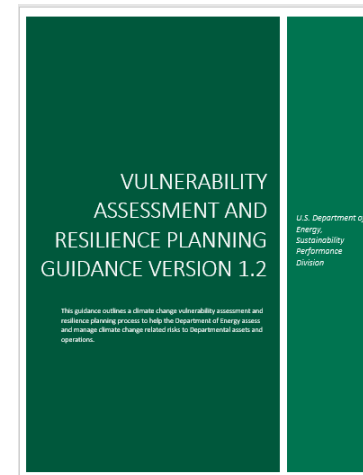
- Labs need to meet aggressive CFE goals in the coming years. This will certainly impact their Annual Lab Plans and influence what projects they want to pursue.
- Building projects will need to incorporate CFE elements such as **electric heat pumps**, solar arrays, wind turbines, etc. to reduce reliance on natural gas and fuel oils and assist in producing CFEs.
Campuses with steam utility will have a tougher time with this.
- Experiments which rely on large amounts of electricity may not be feasible if the CFE goals are not flexible and the Lab is unable to procure sufficient CFE to handle demand.

- **One thing to consider from DOE O 413.3-6A:**

Design new construction and modernization projects, **greater than 25,000 gross square feet, to be net-zero emission by 2030.**

Vulnerability Assessment and Resilience Plan (VARP)

- The vulnerability assessment and resilience plans (VARPs) will enable sites to identify, prepare for, and meet the challenges posed by climate change, and will build upon other existing DOE risk assessments processes.
- Sites will prioritize resilience solutions for implementation by considering the following:
 - Number and magnitude of key vulnerabilities mitigated
 - Mission and operational impacts avoided or mitigated
 - Costs and benefits of resilience investments
 - Co-benefits of greenhouse gas (GHG) emission reductions
 - Enhanced sustainability
 - Effects on energy efficiency
- VARPs will be revised at least every four (4) years to incorporate new information and data from the latest National Climate Assessment (NCA).
 - Labs provided VARPs in 2022



Vulnerability Assessment and Resilience Plan (VARP)

- **How does this impact our projects?**

- Labs identify potential solutions in their VARP which can translate into future projects.
- Projects will need to consider the Lab's VARP, specifically analyses which determine future climatological impacts at the site.

- **DOE Order 413.3B requires achievement of “climate adaptation and resilience” requirements:**

Complete and document achievement of climate adaptation, resilience, and sustainability requirements (refer to Appendix C, Paragraph 5.), support for the Site Sustainability Plan(s) per DOE O 436.1 (current version), and/or other high performance and sustainable building considerations (refer to DOE G 413.3 6, current version, and Guiding Principles for Sustainable Federal Buildings) which were documented in the PEP, as applicable.

- **DOE Order 413.36A has a few other VARP related requirements”**

Incorporate location-specific resilience design criteria for new construction and major renovations.

Incorporate location-specific resilience design criteria for new construction and major renovations.

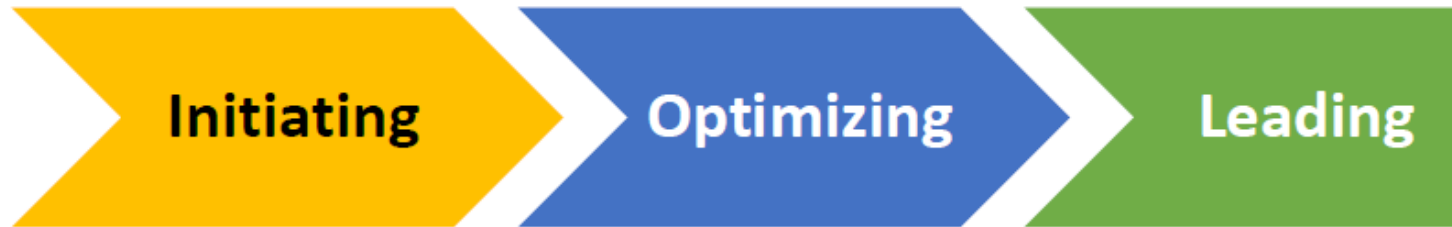


Sustainable Climate Ready Sites (SCRS) Pilot

- In 2022, a pilot program to “incentivize excellence in environmental and natural resource protection, resilience, and sustainability. SCRS recognizes sites’ exemplary performance improvement, and AU-21 will provide related technical and implementation assistance.”
- To participate, sites filled out the SCRS Self-Assessment (up to 15 categories) to receive a whole-site score and category percentage scores, which translate into progressive Performance Tiers under the program: Initiating, Optimizing, and Leading.
- AU-21 is developing an awards ceremony as an aspect of a workshop or annual gathering in which participating sites receive formal recognition for their SCRS achievements when SCRS is formally launched.
- The pilot program was completed in 2022.



Sustainable Climate Ready Sites (SCRS) Pilot



1. An **Initiating** site has met minimum regulatory and E.O. requirements and is identifying opportunities to reach its potential across SCRS categories.
2. An **Optimizing** site has identified opportunities for higher or more enduring environmental performance within and across SCRS categories, has begun to implement those measures and monitor their effectiveness.
3. A **Leading** site has achieved the upper-tier status within or across SCRS categories. Criteria measures and programs are in place at the site and returning environmentally beneficial results. The site continues to seek leading methods and technologies and may present or share findings with other sites and organizations.



Sustainable Climate Ready Sites (SCRS) Pilot

How does this impact our projects?

- Right now, no impact as this was just a pilot program.
- However... be on the lookout for SCRS to become a full-time program that our Labs will participate in and could influence project selection, funding, etc.



Five Take Aways

1. The current Administration is “all-in” on clean energy and sustainability.
2. There are very aggressive requirements (namely CFE) which will impact DOE SC’s mission and influence future projects.
3. FPDs need to be aware of these requirements and what impacts they have on our projects.
4. FPDs will need to understand and verify clean energy and sustainability requirements for capital asset projects.
5. With all that said... a new Administration in January 2025 may scrap all this. But as of now, it is a requirement.





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