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PNNL-34709

Procurement Options for Low Temperature Geothermal Technologies at Federal Facilities

September 2023

1 Miranda Heiland
2 Hannah S. Rabinowitz
3 Christine Walker
4 Julia A. Rotondo

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
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Richland, Washington 99354

Executive Summary

Federal agencies are moving towards more efficient and resilient facilities by increasingly implementing energy projects in an effort to meet federally mandated goals, agency needs, and administration priorities. Low temperature geothermal technologies, which include geothermal heat pumps (GHP) and district geothermal heating and cooling systems, can contribute to meeting these goals. These technologies provide facilities with heating and cooling while reducing facility energy use and improving resilience. However, to implement these solutions, federal facilities must identify and execute a strategy for the procurement of these technologies. Federal facilities have successfully completed energy efficiency projects using a variety of procurement options. The purpose of this document is to provide federal agencies with a comprehensive overview of the procurement options available for low temperature geothermal technologies and other energy efficiency projects. The procurement options discussed include third-party financing mechanisms such as energy saving performance contracts (ESPCs), ESPC energy sales agreements (ESPC ESAs), and utility energy service contracts (UESCs), as well as dedicated funds in the form of federal grants and appropriated funds. Details on each of these procurement options are summarized in Table ES1.

Energy Saving Performance Contracts (ESPCs)

In an ESPC, the facility partners with an energy service company (ESCO) to design and implement a project. The ESCO shoulders the upfront costs to install the project, and the agency uses the savings generated by the project to pay the ESCO in annual installments for the duration of the contract. All ESPC contracts have a maximum term of 25 years. When implementing an ESPC, there are contract vehicles available to help agencies through the process of selecting and energy service company and creating a contract.

The U.S. Department of Energy's (DOE's) ESPC Indefinite Delivery, Indefinite Quantity (IDIQ) contract is available to all federal agencies and is intended for larger, more complex projects. The estimated minimum timeline from acquisition planning to the beginning of project implementation is 12 months, but this is likely to increase depending on project complexity and agency specific requirements.

The DOE's ESPC ENABLE vehicle is also available to all federal agencies, but is intended for smaller projects with a faster turnaround. This is because the contract is tailored for specific energy conservation measures (ECMs) allowing the process to be more standardized and streamlined; however, additional ECMs can be included in this contract through a hybrid method. The estimated minimum timeline from acquisition planning to the beginning of implementation is 2-3 months, which is likely to increase depending on project complexity, specifically for the hybrid method.

The Multiple Award Task Order Contract is a contract vehicle available for U.S. Department of Defense (DOD) facilities only. In addition to functioning as an IDIQ contract for larger projects, it can function similarly to the ENABLE contract vehicle by providing a streamlined process for specific ECMs. The Department of Veterans Affairs (VA) has a Service-Disabled Veteran Owned Small Business (SDVOSB) IDIQ contract vehicle available for their own facilities.

Agencies also have the option to conduct the acquisition process independently, without using any of the contract vehicles described above. This is referred to as a stand-alone contract.

ESPC Energy Sales Agreements (ESPC ESA)

An ESPC ESA contract is used for projects that result in generated energy. The ESCO retains ownership of the installed technology for the duration of the contract, and the facility purchases

the generated energy from them at a rate lower than their typical utility rate. While the ESCO maintains ownership, the project can benefit from tax incentives, which are used to further reduce the costs paid by the agency. All contract vehicles listed above for ESPC contracts can also be used to establish an ESPC ESA contract. All ESPC ESA contracts are limited to a maximum term of 20 years.

Utility Energy Service Contracts (UESCs)

UESCs have the same financing mechanism as an ESPC, but rather than partnering with an ESCO, the facility partners with a local utility company. The maximum contract for a UESC is 25 years. The estimated minimum timeline from the beginning of acquisition planning to the beginning of implementation is 4-7 months. This is likely to increase depending on project complexity and agency-specific requirements.

Additional Options

Enhanced use leases (EULs) and power purchase agreements (PPAs) are included in this document for completeness, and are viable financing options for low temperature technologies, but are better suited for distributed generation projects. EULs are available to a limited number of agencies and allow long term contracts up to 99 years. PPAs are available to all agencies, but their legal status varies from state to state. Civilian agencies are limited to a maximum PPA contract term of 10 years, and the DOD has a maximum contract term of 30 years.

Appropriated Funds

Appropriated funds are those received when Congress passes a funding bill based on an agency's budget proposal. They can be used to supplement one of the financing contracts listed above or used independently to fund an entire project. For DOD facilities, military construction (MILCON) program funds are appropriated for facility improvement projects. Within MILCON, Unspecified Minor MILCON (UMMC) funds or MILCON Operations and Maintenance (O&M) funds are the most likely funding streams to be used for a low temperature geothermal technology project. One other potential avenue for pursuing MILCON funding is the Energy Resilience and Conservation Investment Program (ERCIP). ERCIP is a program that selects project proposals to submit to Congress based on priorities identified for that fiscal year and a list of underlying criteria.

Federal Grants

There are many state and federal grants available that can be used to either supplement another procurement option or used independently to fund a project. The Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program provides grants for energy and water efficiency projects that are available to all agencies. The Readiness and Environmental Protection Integration (REPI) Challenge provides funding to DOD facilities for resilience improvement projects, or projects that promote sustainable land use.

Table ES1. Summary of procurement options

	Procurement Type	Eligible Agencies	Max Contract Term (years)	Minimum Timeline[a]	Partner Entity
DOE ESPC IDIQ	Financing Contract	All federal agencies	ESPC: 25 ESPC ESA: 20	12 months	20 DOE-qualified IDIQ ESCOs[1]
DOE ESPC ENABLE	Financing Contract	All federal agencies	ESPC: 25 ESPC ESA: 20	2-3 months	24 DOE-qualified ENABLE ESCOs[1]
USACE MATOC	Financing Contract	DOD	ESPC: 25 ESPC ESA: 20	Project Dependent	17 DOE approved ESCOs[1]
Stand-Alone ESPC	Financing Contract	All federal agencies	ESPC: 25 ESPC ESA: 20	Agency dependent	114 DOE-qualified ESCOs[1]
UESC	Financing Contract	All federal agencies	25	4-7 months	Local Utility
EUL	Financing Contract	*DOD, GSA, DOE, DOJ, DOI, VA, USDA, NASA, USPS, DOS*	Long term (99)	Agency dependent	Third-party developer
PPA	Financing Contract	All federal agencies	Civilian agencies: 10 DOD: 30	Agency dependent	Third-party developer
Appropriated Funds	Dedicated Funds	All federal agencies	N/A	Annual cycle, approval can require multiple years	N/A
ERCIP	Dedicated Funds	DOD	N/A	Annual cycle, approval can require multiple years	N/A
AFFECT Grant	Dedicated Funds	All federal agencies	N/A	Annual cycle depending on funds available	N/A
REPI Challenge Grant	Dedicated Funds	DOD	N/A	Annual cycle	N/A

GSA = General Services Administration; DOJ = Department of Justice; DOI = Department of Interior; USDA = United States Department of Agriculture; NASA = National Aeronautics and Space Administration; USPS = United States Postal Service; DOS = Department of State; USACE = United States Army Corps of Engineers

[a] Minimum expected timeline based on ideal process. Actual timeline can be longer depending on project complexity and agency-specific approvals processes.

[1] As of October 2023.

Acknowledgments

The authors would like to thank the Geothermal Technologies Office for their support of this work.

Acronyms and Abbreviations

AFFECT	Assisting Federal Facilities with Energy Conservation Technologies
AWC	Areawide Contract
BOA	Basic Ordering Agreement
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOJ	Department of Justice
DOS	Department of State
ECM	Energy Conservation Measure
ERCIP	Energy Resilience and Conservation Investment Program
ESA	Energy Sales Agreement
ESCO	Energy Service Company
ESPC	Energy Savings Performance Contract
EUL	Enhanced Use Lease
FEMP	Federal Energy Management Program
GSA	General Services Administration
GTO	Geothermal Technology Office
IDIQ	Indefinite Delivery, Indefinite Quantity
IGA	Investment Grade Audit
J&A	Justification and Approval
LCCA	Life Cycle Cost Analysis
M&V	Measurement and Verification
MATOC	Multiple Award Task Order Contract
MILCON	Military Construction
NASA	National Aeronautics and Space Administration
NOITA	Notice of Intent to Award
NOO	Notice of Opportunity
O&M	Operations and Maintenance
PA	Preliminary Assessment
PPA	Power Purchase Agreement
REC	Renewable Energy Credit
REPI	Readiness and Environmental Protection Integration
RFP	Request for Proposal
SIR	Savings to Investment Ratio
SOW	Scope of Work

SDVOSB	Service-Disabled Veteran Owned Small Business
TO	Task Order
TEA	Techno-economic Analysis
UESC	Utility Energy Service Contracts
UMMC	Unspecified Minor Military Construction
USDA	United States Department of Agriculture
USPS	United States Postal Service
VA	Department of Veterans Affairs

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2.0 Introduction

Federal agencies have goals and mandates focused on reducing energy use in federal facilities, including the National Energy Conservation Policy Act of 1978, which established energy conservation and renewable energy goals, Energy Independence and Security Act of 2007 (EISA) that requires federal agencies to improve the energy performance of federal facilities and the more recent Energy Act of 2020, which continues to promote energy efficiency and renewable energy project implementation at federal facilities. Additionally, policy requirements such as recent Congressional acts[1] and Executive Orders[2] require agencies to work towards enhancing the resilience of their sites. One example of this is the National Defense Authorization Act (NDAA) which requires Department of Defense (DOD) installations to achieve high levels of energy availability for loads supporting critical missions (see 10 USC 2911[3]). DOD installations are also required to maximize the use of electric technologies in both new construction and existing buildings when practicable (LaPlante 2023). Due to these requirements, federal agencies are increasingly exploring the potential of low temperature geothermal technologies, which include geothermal heat pumps (GHP) and district geothermal heating and cooling systems, for their ability to heat and cool facilities and move away from fossil fuel use. Heating, ventilation, and air conditioning (HVAC) systems are generally responsible for a significant portion of total building energy consumption;[4] switching to more efficient systems such as low temperature geothermal technologies can reduce facility energy use and site emissions. In fact, one analysis estimated that if all existing HVAC systems in residential and commercial sectors were retrofitted with GHPs, energy costs could be reduced by $49.8 billion, carbon dioxide emissions could be reduced by 353.3 million metric tons (equivalent to taking over 79 million passenger vehicles off the road for a year), and national energy consumption for space heating and cooling could be reduced by 46% (Liu, McCabe and Spitler 2019). To capture the potential benefits, however, federal facilities must be able to acquire and install these technologies. This paper provides a high-level overview on procurement options available for federal facilities looking to implement low temperature geothermal technologies at their site and available resources for agencies with more detailed information.

Financing mechanisms that can support the implementation of such technologies include those used to implement energy conservation measures (ECMs) as part of energy efficiency projects as opposed to larger scale electricity generation projects. The procurement options described in this report can be sorted into two types: third-party financing mechanisms and dedicated funding (Table ES1). The third-party financing mechanisms include energy savings performance contracts (ESPCs), ESPC energy sales agreements (ESPC ESAs), and utility energy service contracts (UESCs). Federal agencies have access to these financing mechanisms, whether through indefinite delivery/indefinite quantity (IDIQ) contract vehicles; multiple award task order contracts (MATOC); stand-alone contracts with ESPCs; or Areawide contracts (AWC), basic

[1] Council on Environmental Quality. (2022, December). Federal Building Performance Standard. Retrieved from Office of the Federal Chief Sustainability Officer: https://www.sustainability.gov/pdfs/federal-building-performance-standard.pdf

[2] The White House Council on Environmental Quality. (2022, August). Implementing Instructions for Executive Order 14057 Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability. Retrieved from Office of the Federal Chief Sustainability Officer: https://www.sustainability.gov/pdfs/EO_14057_Implementing_Instructions.pdf

[3] Energy performance goals and master plan for the Department of Defense, U.S. Code 10 (2006), §2911

[4] The U.S. Department of Energy estimated that HVAC can represent 35% of total building energy consumption (DOE 2015).

ordering agreements (BOA) or separate contracts for UESCs. Dedicated funds include federal grants and appropriated funds. Some agencies have the ability to combine dedicated funding and third-party financing mechanisms; however, this varies across agencies and sometimes between financing mechanisms (e.g., DOD can combine funding streams in UESCs but not an ESPC agreement). In addition to these procurement options, many ECM technologies are eligible for tax incentives. Federal agencies are not eligible for direct pay from these incentives, but can still benefit from them if the technologies are owned by a private third party. This is a possibility for some of the third-party financing mechanisms and is addressed in the sections below. Information on federal tax incentives and state incentives is available through Federal Energy Management Program (FEMP) resources[1] and the DSIRE database[2]. For each procurement option, an overview is provided as well as links to resources with additional information and resources to aid in the implementation process.

Key aspects of energy efficiency projects that determine which procurement method may be the most appropriate include agency eligibility, predicted payback period, and expected useful life of the technology installed. Some procurement options are only available to certain agencies or sites, which may narrow down the viable options. Payback period and expected useful life of installed equipment should be considered when determining the appropriate financing contract length. The contract term starts at project award, and includes the installation period, so the payback period for the project as a whole should be shorter than the contract to account for construction time. For commercial GHP systems, reported payback periods range from 10–20 years, depending on the type and size of the system installed and local utility prices (Nguyen, Tamasauskas and Kegel 2022). Smaller, residential scale systems have shorter payback periods ranging from 5–10 years (DOE - EERE n.d.). Depending on the estimated return on investment for the project, ESPCs or UESCs may be the best financing options as they can have a contract term of 25 years, while ESPC ESAs are limited to 20 years. Generally, GHP projects have long life-spans, making a longer-term financing contract (more than 20 years) more viable compared to traditional HVAC systems; for example, indoor components are estimated to have a system life of up to 24 years, while ground loop components can last for more than 50 years (DOE - EERE n.d.). This ensures the ability to complete a financed contract before components reach the end of their life, with remaining useful life benefiting the site.

[1] https://www.energy.gov/femp/overview-inflation-reduction-act-incentives-federal-decarbonization
[2] https://www.dsireusa.org/

Table 1. Summary of procurement options

	Procurement Type	Eligible Agencies	Max Contract Term (years)	Minimum Timeline[a]	Partner Entity
DOE ESPC IDIQ	Financing Contract	All federal agencies	ESPC: 25 ESPC ESA: 20	12 months	20 DOE-qualified IDIQ ESCOs[1]
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AFFECT Grant	Dedicated Funds	All federal agencies	N/A	Annual cycle depending on funds available	N/A
REPI Challenge Grant	Dedicated Funds	DOD	N/A	Annual cycle	N/A

GSA = General Services Administration; DOJ = Department of Justice; DOI = Department of Interior; USDA = United States Department of Agriculture; NASA = National Aeronautics and Space Administration; USPS = United States Postal Service; DOS = Department of State; USACE = United States Army Corps of Engineers

[a] Minimum expected timeline based on ideal process. Actual timeline can be longer depending on project complexity and agency-specific approvals processes.

[1] As of October 2023.

3.0 Third-party Financing Mechanisms

Third-party financing mechanisms allow federal agencies to procure energy efficiency and facility improvements without up-front capital costs or direct appropriations from Congress. The third-party financing mechanisms highlighted in this section are ESPCs, ESPC ESAs, and UESCs. These are viable options for all federal agencies and multiple examples can be found of agencies successfully using them to finance energy efficiency projects that include a broad range of ECMs. These financing mechanisms follow a similar high-level process, including acquisition planning, selection of third-party partner (ESCO or utility), project development, project construction, and performance period. However, there is significant variability in projected timelines for these different mechanisms. EULs and PPAs are also discussed, but in less detail as they have limited eligibility and there are fewer examples of agencies successfully using them to finance energy efficiency projects. They are less likely to be viable procurement mechanisms for low temperature geothermal projects. All financing mechanisms described are governed by a contract with a third-party partner; resources for identifying eligible partners and obtaining a contract are provided.

3.1 Energy Savings Performance Contract

Applies to all federal agencies

An ESPC allows a federal agency to work with an energy service company (ESCO) to develop, implement and finance energy savings projects. The ESCO develops, designs and implements the project and is paid over time via realized cost savings from the project for the duration of the contract, which has a maximum term of 25 years. Figure 1 shows a schematic representation of this process. Mandatory provisions of ESPCs laid out in Federal statutes include the requirement of guaranteed savings and that savings must exceed the payments for each year of the contract (see 42 USC 8287[1]) (DOE - FEMP n.d.). Savings are determined by comparing the baseline or pre-implementation energy and energy-related (e.g., operations and maintenance (O&M)) costs and the post-implementation energy and energy-related costs. (DOE - FEMP 2019).

[1] Authority to enter into contracts, U.S. Code (2006), §8287

Figure 1. ESPC financing system schematic (DOE - FEMP n.d.)

For ECMs that have a longer simple payback, bundling ECMs that have both longer and shorter payback periods within a project that fits within the maximum 25-year contract term allows facilities to include a broad range of ECMs within the financed project. In the case of low temperature geothermal systems with typically longer payback periods, this bundling strategy may be a helpful approach for financed projects.

In an ESPC, the ESCO is not required to retain ownership of equipment installed as part of the project for the contract term. Because tax incentives can only be claimed by private entities, the potential transfer of ownership to the agency can limit the opportunity to benefit from these incentives.

With ESPCs, the federal agency awards a task order to a private contractor, the ESCO. This can be accomplished through several different vehicles depending on the agency seeking to implement an ESPC. These vehicles are described below.

3.1.1 DOE ESPC Indefinite Delivery, Indefinite Quantity

Applies to all federal agencies

The Department of Energy's (DOE's) ESPC Indefinite Delivery, Indefinite Quantity (IDIQ) contract vehicle is a master contract that connects federal agencies with the ESCOs to enter into an IDIQ contract (DOE - FEMP n.d.). This vehicle can be used worldwide, and is intended for larger, more complex projects. When required by the federal agency, a preliminary assessment is completed (DOE - FEMP 2023); the contract requires an investment grade audit (IGA), with a more in-depth M&V process compared to the ENABLE process (DOE - FEMP 2022). A project developed under the DOE ESPC IDIQ contract can take approximately 12-24 months between the beginning of acquisition planning to the beginning of project implementation, as seen in Figure 2. Generally, acquisition planning is anticipated to take about a month. ESCO selection and PA are anticipated to take about 3 months. This process includes

the agency issuing a notice of opportunity (NOO), the ESCO developing a PA, and, if the agency goes forward with the project based on the PA, conditionally committing to the project via a Notice of Intent to Award (NOITA). Project development can take approximately 8 months, which includes the agency issuing a task order request for proposal (TO-RFP), the ESCO conducting an IGA to refine and update data used in the development of the PA, record baseline measurements and provide a technical and price proposal with the proposed project's financial schedules. After review of the proposal, the agency awards the TO. The next steps include final design, implementation, commissioning and acceptance of the included ECMs, followed by post-acceptance performance, including an annual measurement and verification (M&V) report. The timeline of this process is dependent on the complexity of the system(s) installed, agency-specific requirements, and whether the project is dispersed across multiple locations. More information on the timeline, process[1] and ESCOs holding a DOE ESPC IDIQ contract[2] can be found on FEMP's website.

Figure 2. DOE ESPC IDIQ process and estimated 12-month timeline. Note that timeline may take up to 24 months or longer depending on project complexity and agency-specific approvals requirements

For the contract vehicle described above, FEMP provides an ESCO Selector[3] tool that can help agencies create an NOO. For a more detailed look at the process as well as available resources and document templates, refer to the FEMP ESPC Project Development Resource Guide[4] (DOE - FEMP n.d.).

[1] https://www.energy.gov/femp/process-procuring-federal-energy-savings-performance-contract
[2] https://www.energy.gov/femp/doe-espc-generation-4-gen4-idiq-energy-service-companies
[3] https://esco-selector.ornl.gov/
[4] https://www.energy.gov/femp/articles/femp-espc-project-development-resource-guide

3.1.2 DOE ESPC ENABLE

Applies to all federal agencies

The DOE's ESPC ENABLE vehicle provides a standardized and streamlined procurement process for ESPC projects, resulting in a shorter duration from the start of a project through award. ESPC ENABLE contracts still are required by statute to have a maximum contract length of 25 years. ESPC ENABLE uses a General Services Administration (GSA) Supply Schedule (SIN 334512) contracting vehicle, which is intended for smaller projects with a faster turnaround. ESPC ENABLE is tailored to the implementation of specific ECMs: lighting, water, HVAC controls, boiler and chiller replacements, and solar photovoltaic systems, though project awards can add additional ECMs available under the GSA Supply Schedule (DOE - FEMP n.d.).

As seen in Figure 3, acquisition planning is anticipated to take about 2 weeks. The second phase of ESCO selection, including issuing notice of opportunity (NOO), developing a scope of work (SOW), and conditionally committing to the project via a NOITA, takes approximately 3 weeks. The third phase, project development, can take approximately 5 weeks if the agency decides to move forward. This phase includes conducting an IGA that forms the basis of the final proposal (inclusive of the SOW, the schedules, and the measurement and verification plan) and the agency awarding the TO once the ESCO has secured financing. After the award has been issued, the installation, commissioning, and acceptance of ECMs identified in the award occurs and M&V is performed to ensure that the new equipment meets guaranteed savings in the TO. This construction phase is expected to take approximately 8 weeks. Finally, ongoing M&V activities and contract administration occurs during the performance period of the contract, including annual audits and submission of the M&V report. The timeline of this process may be extended if a hybrid approach is taken, or if the project is dispersed across multiple locations. Additionally, project complexity and agency-specific requirements can lead to an extended timeline.

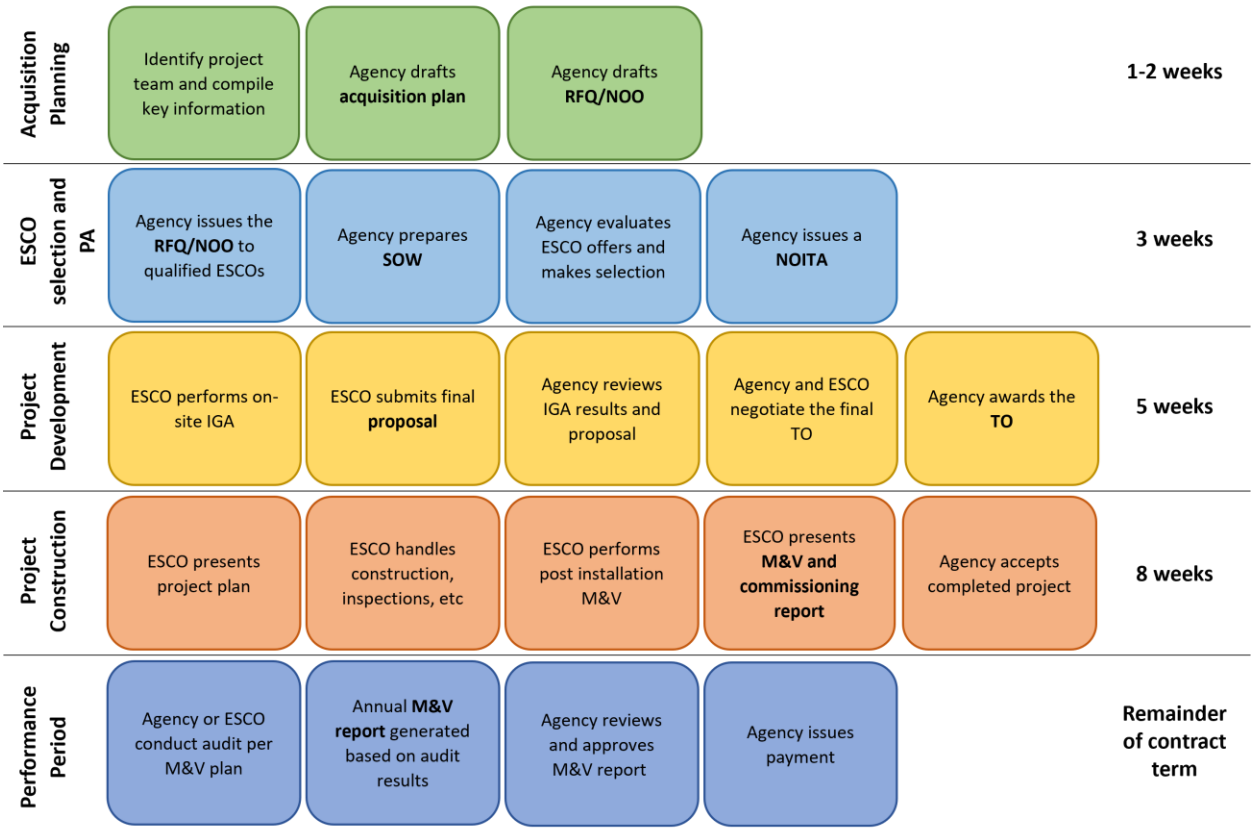

Figure 3. DOE ESPC ENABLE process and timeline. Note that steps may take longer depending on project complexity and agency-specific approvals requirements

It is possible to finance additional ECMs or resilient technologies by bundling them with one of the specified ECMs. This hybrid approach would be necessary to implement low temperature geothermal technologies using the ESPC ENABLE contract because these technologies are not included in the list of ECMs specified for this vehicle (see list above). ESPC ENABLE is a shorter process than ESPC IDIQ because it includes an IGA, but a PA is not required, and the M&V process is more streamlined than it is for other vehicles (DOE - FEMP n.d.).

For the contract vehicle described above, FEMP provides an ESCO Selector for ENABLE[1] tool that can help agencies create an NOO. More information on the timeline and process[2] and list of ESPC Enable ESCOs[3] can be found on FEMP's website.

3.1.3 Multiple Award Task Order Contract

Applies to DOD only

Similar to the IDIQ program, the Multiple Award Task Order Contract (MATOC) is a master contract through the Engineering and Support Center, Huntsville within the United States Army

[1] https://esco-selector-enable.ornl.gov/
[2] https://www.energy.gov/femp/energy-savings-performance-contracts-enable-process-and-resources#
[3] https://www.energy.gov/femp/energy-savings-performance-contract-enable-energy-service-companies

Corps of Engineers (USACE) that supports ESPC projects with 17 approved ESCOs (USACE 2022). It is the primary contract vehicle for Army ESPC projects and is limited to DOD entities. The MATOC contract can also be used to award ESPC ENABLE-like projects or can be used in a hybrid process, which blends ESPC ENABLE-like and standard processes to incorporate resilience or more complex ECMs in a multi-phased approach. USACE notes that the ENABLE-like process can reduce project development time by removing the PA and using DOE templates (USACE 2022). MATOC can be used for projects both domestically and in international locations.

More information about MATOC can be found on USACE's website.[1]

3.1.4 Department of Veterans Affairs (VA) ESPC Service-Disabled Veteran Owned Small Business (SDVOSB) IDIQ

Applies to VA only

Like the DOE ESPC IDIQ program, the VA ESPC SDVOSB IDIQ contract is a master contract, however it is only used by the VA to award multiple contracts to SDVOSB and joint-venture ESCOs. The VA created this first ESPC for SDVOSB, awarding to four companies in May 2020. All VA medical centers and sites can award task orders under this contract to implement energy efficiency projects. As of July 2023, there are six companies on the VA ESPC SDVOB IDIQ awardee list.[2]

3.1.5 Stand-Alone

Applies to all federal agencies

For a stand-alone ESPC contract, the agency can conduct the acquisition process without using any of the established programs described above. A stand-alone contract may be chosen over one of the other vehicles if the agency finds and ESCO that best fits the project that is not on the limited list of ESCOs approved for DOE IDIQ or DOE ENABLE contracts (Shepherd, Shah and Gagne 2019). A stand-alone contract vehicle allows the agency to select an ESCO through a request for proposal (RFP) process, but the selected ESCO must be on the DOE's qualified list of ESCOs[3] prior to contract award (DOE - FEMP 2023). Being on the DOE qualified list does not guarantee that an ESCO is a viable project partner and additional evaluations are required before a contract can be awarded. A stand-alone contract also allows for more flexibility regarding contract terms when compared to the other vehicles, which is another reason why it may be chosen. However, federal acquisition regulations still apply in stand-alone ESPCs, including competitive selection process. Specific deliverables for this vehicle are up to the ordering agency and may still include a PA or an IGA. FEMP identified seven necessary steps for the successful completion of a standalone project (DOE - FEMP 2017):

1) Form a strong project team
2) Acquisition planning
3) Request for proposal, NOO

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[1] https://www.hnc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/484226/energy-division-energy-savings-performance-contracting-espc-program/

[2] https://department.va.gov/administrations-and-offices/management/asset-enterprise-management/energy-environment-and-fleet-program/

[3] https://www.energy.gov/femp/articles/doe-qualified-list-energy-service-companies

4) Project development
5) Project evaluation, negotiations and contract award
6) Construction
7) Performance period

3.2 Energy Savings Performance Contract Energy Sales Agreement

Applies to all federal agencies

An ESPC ESA uses the same ESPC authority that allows federal agencies to partner with an ESCO to implement ECMs, but is used for distributed energy projects or ECMs that result in energy output generated (typically electricity) that the agency then purchases from the ESCO at an agreed upon rate. These are referred to as ESA ECMs, which may be a single measure within an ESPC or bundled with other ECMs. In an ESPC ESA contract, the ESA ECM remains privately owned by the ESCO until it is purchased by the agency at the end of the project at fair market value. This allows both the agency and the ESCO to benefit from tax incentives and the potential sale of renewable energy credits (RECs). Cost savings are typically achieved by the agency purchasing the generated energy from the ESCO at a reduced rate. A diagram of this system is seen in Figure 4. When applied to a low temperature geothermal project, savings would be achieved in a similar manner by paying the ESCO for heating and cooling energy at a cheaper rate than what was being paid before (e.g., in utility and O&M costs). While this has not previously been applied to low temperature geothermal projects, with current tax incentives (e.g., Inflation Reduction Act) it could be viable for a district geothermal heating and cooling system.

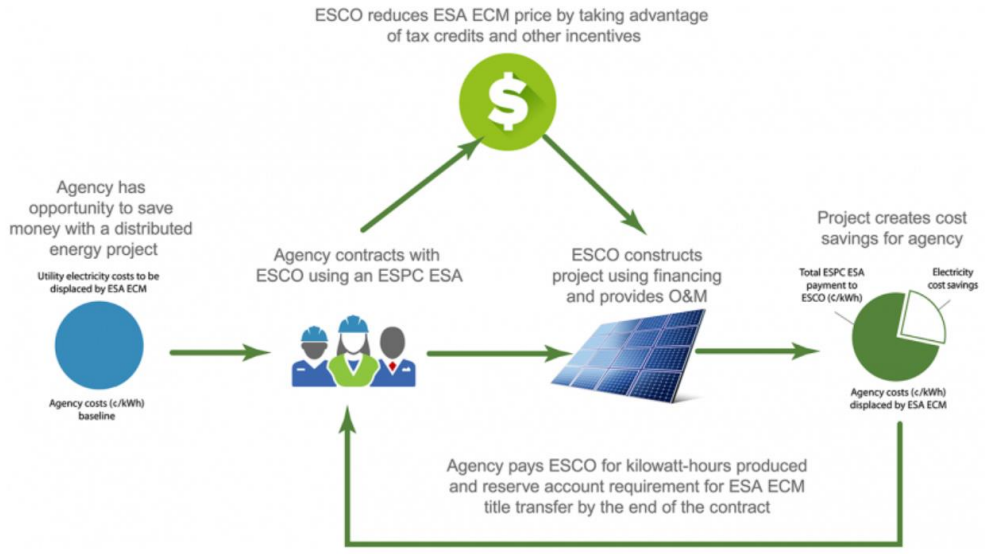

Figure 4. ESPC ESA financing system diagram with solar photovoltaic example (DOE - FEMP n.d.)

ESPC ESA contracts are governed by the same federal statutes[1] as traditional ESPC contracts, and therefore have the same mandatory savings guarantees, but contracts are limited to a maximum term of 20 years rather than the 25 year maximum for ESPCs. The same contracting vehicles described for ESPCs can be used to establish an ESPC ESA contract.

For more information and resources refer to FEMP's ESPC ESA Toolkit[2] (DOE - FEMP 2017).

3.3 Utility Energy Service Contract

Applies to all federal agencies

UESCs allow federal agencies to finance energy and water efficiency improvements using the cost savings generated after project completion by partnering with a local utility provider. However, it is important to note that not all utility providers offer UESCs. When pursuing a UESC, federal agencies should notify their serving utilities of the opportunity, review responses and then select one utility to perform a PA. The selected utility is responsible for assessing improvement opportunities, designing solutions, and implementing the appropriate ECMs. Often the utility will partner with an ESCO to develop and implement the UESC. This financing mechanism is shown in Figure 5. UESCs are appropriate for any size project, however it is important to note that unlike ESPCs, there is not a statutory annual savings requirement for UESCs. The term of the UESC should be calculated so that payments are lower than the estimated cost savings, and savings should exceed payments over the term of the contract. The maximum contract length for a UESC is 25 years.

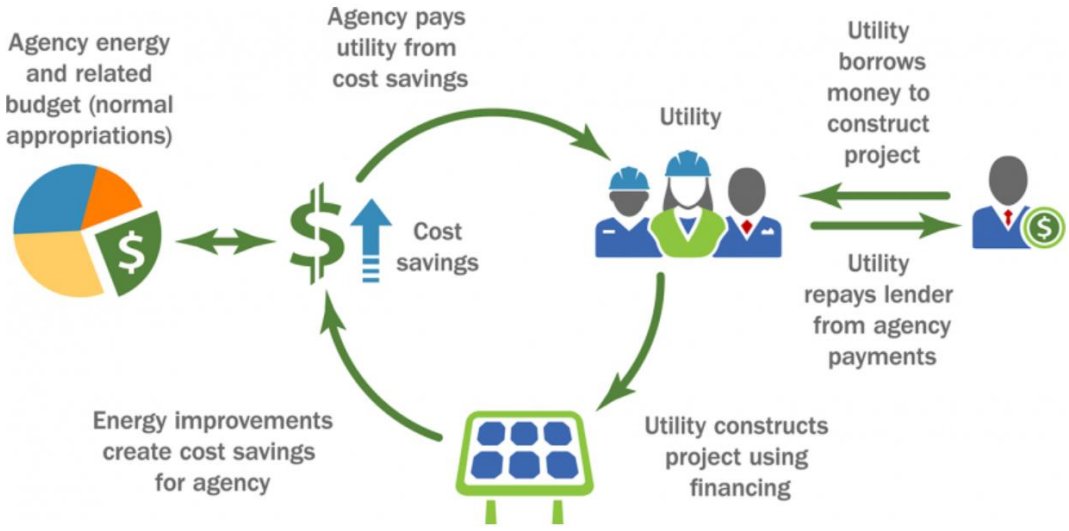

Figure 5. UESC financing system diagram (DOE - FEMP n.d.)

UESCs are estimated to take approximately 4–7 months between the beginning of acquisition planning and the beginning of implementation. The acquisition planning phase is generally

[1]https://www7.eere.energy.gov/femp/requirements/laws_and_requirements/energy_savings_performance_contract_authority
[2] https://www.energy.gov/sites/prod/files/2018/12/f58/espc_esa_toolkit.pdf

anticipated to take 2–4 weeks to develop a SOW and acquisition plan. Some agencies or sites may be subject to requirements under the Competition in Contract Act that require a justification and approval (J&A) document that establishes the purpose of procurement to meet energy goals and cites authorities relevant to restricting competition to serving utilities. The second phase can take 4–6 weeks to provide fair consideration to all serving utilities, select a utility, and conduct a PA (some agencies may not require a PA or skip to an IGA). Utilities are typically awarded projects through an AWC, BOA, or stand-alone contracts. The project development phase can take 12–16 weeks to conduct an IGA, finalize the J&A document (if applicable), and develop and award the TO. After award, project implementation and construction begins, followed by post-acceptance performance and closeout at the end of the contract term. This timeline may be extended depending on agency specific requirements and complexity of the project.

A diagram summarizing the process is shown in Figure 6 and additional information can be found in the FEMP UESC Guide[1] (DOE - FEMP 2022). More information about UESCs and resources can be found on FEMP's website.[2]

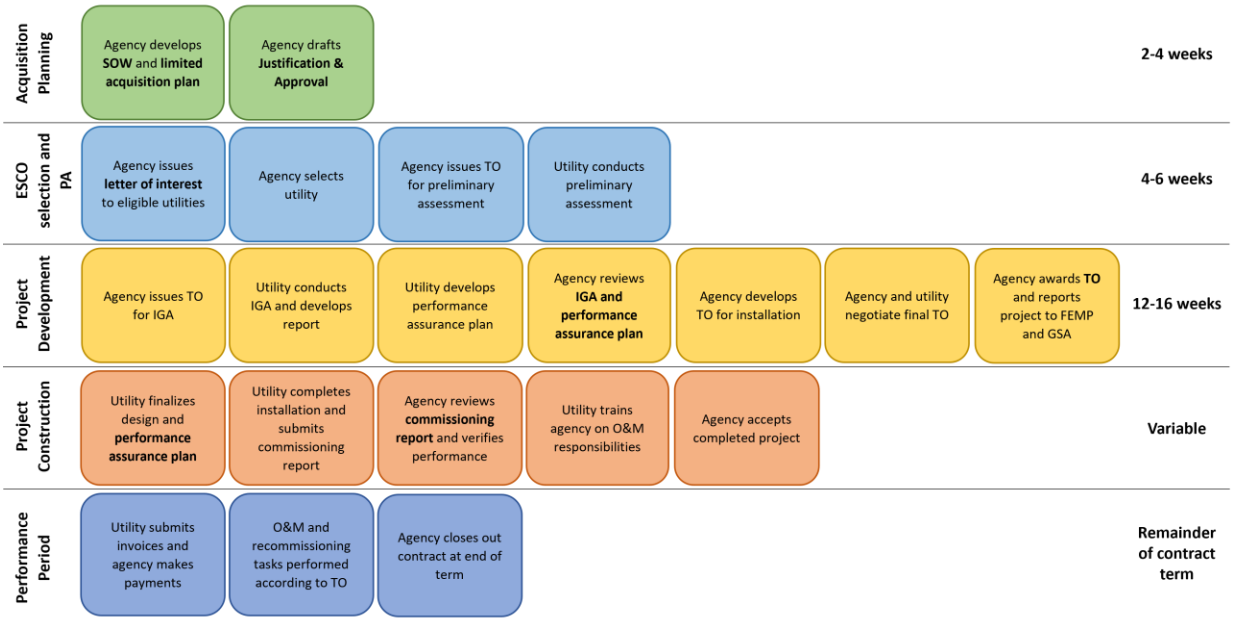

Figure 6. UESC process and timeline. Note that steps may take longer depending on project complexity and agency-specific approvals requirements

3.4 Additional Options

Other financial arrangements are available to federal agencies, but likely do not apply for low temperature geothermal projects. These two options, enhanced use leases and power purchase agreements, are described below for completeness.

[1] https://www.energy.gov/femp/articles/utility-energy-service-contract-guide
[2] https://www.energy.gov/femp/utility-program-and-utility-energy-service-contracts-federal-agencies

3.4.1 Enhanced Use Lease

Applies to DOD, GSA, DOE, DOS, DOJ, DOI, VA, USDA, NASA, USPS

An enhanced use lease (EUL) is a tool intended to utilize underused property more effectively for the benefit of the federal agency. This allows an agency to partner with industry to accomplish various projects, including distributed energy generation and ECMs. EULs are long-term leases (different from ESPCs and UESCs) and can last well past 25 years (USACE n.d.). However, not all agencies have the authority to execute EULs. The eligible agencies are DOD, GSA, DOE, Department of State (DOS), Department of Justice (DOJ), Department of Interior (DOI), VA, Department of Agriculture (USDA), National Aeronautics and Space Administration (NASA), and the United States Postal Service (USPS) (GAO 2009). While this approach may be viable for low temperature technologies such as district heating, EULs are typically used for generation projects.

3.4.2 Power Purchase Agreement

Applies to all federal agencies

A power purchase agreement (PPA) is a financing mechanism used most commonly for distributed energy projects and is therefore unlikely to be used for a low temperature geothermal system. A private third party installs, owns, and operates an energy system on the agency's property in exchange for discounted electricity. It is important to note that the legal status[1] of PPAs varies from state to state. It differs from an ESPC ESA in that any benefit from tax incentives or the sale of RECs goes directly toward the third party rather than the agency. PPA contracts are limited to 10 years for civilian agencies, while the DOD has the authority to execute a 30-year contract (DOE - FEMP 2020).

[1] https://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2021/12/DSIRE_3rd-Party-PPA_Aug_2021-2.pdf

4.0 Dedicated Funds

This section describes funding sources that could directly fund a low temperature geothermal project at a federal site. In some cases, dedicated funding can be paired with third-party financing mechanisms for larger projects or projects with non-energy savings benefits (e.g., resilience) or requirements for cost-sharing or third-party funding. Indeed, in some cases, the terms of the grant require that the project implementation strategy includes third-party financing. In such cases where third-party financing and dedicated funds are used to implement a project, the dedicated funds can be used to help the project meet required savings guarantees.

4.1 Appropriated Funds

Appropriated funds are those given to a federal agency after Congress passes a funding bill and the bill is signed by the President. The amount allocated to each agency, as well as the specific uses for appropriated funds, are informed by each agency's budget proposal and justification which is submitted to the President every year. If a site is able to obtain appropriated funds to support an energy project, the total sum of the funds is received at once with no payback required and can be earmarked for use on a specific project or left unspecified. If appropriated funds are not enough to implement a project, they can be leveraged with a third-party financing mechanism described above and be used to expand the scope of work, or add additional ECMs or technologies that do not fit within a self-funded project within the contract term (Walker and Shonder 2023). If appropriated funds are used independently, without any additional funding methods, there is no third party involved and the responsibility of risk falls entirely on the agency.

The general process for obtaining appropriated funds follows a cycle throughout the calendar year. Agencies spend July through February structuring budget proposals under the guidance of the Office of Management and Budget. Once the proposals are finalized, they are submitted to the Appropriations Committee who creates, amends, and eventually approves bills for budget requests from March through June. The bills then go to the House and Senate floors where they are amended and finalized from July through October before being sent to the President for signature (NSF n.d.).

In order to have a particular project considered for funding through appropriations, the site must communicate the need for the project to agency leadership. The process for consideration of a project to be included in an agency's budget request varies between agencies, but may require multiple years to move from the site's request to incorporation into the agency's budget request. Check with your organization for further information on the appropriations process, as each agency's process for requesting and distributing appropriations may vary.

4.1.1 Military Construction and Energy Resilience and Conservation Investment Program

Applies to DOD

The DOD's military construction (MILCON) program funds work in facilities across all DOD components. MILCON funding supports a range of activities, including facility planning, programming and budgeting, and project design and construction. MILCON funds can also be used to reduce the cost of a project implemented through a UESC to achieve a contract term within the 25-year maximum. MILCON dollars are available through multiple funding streams with different cost limits and application processes. For example, Unspecified Minor MILCON (UMMC) funds can be used by smaller construction projects that are estimated to cost less than

$9 million (see H.R. 7776[1]). These funds are appropriated as a lump sum to DOD and are left unspecified by Congress. However, the Secretary overseeing the funds may allocate them for use on a specific project. The application process for these funds may involve environmental reviews and can take several months to complete. Another MILCON funding stream is MILCON O&M. MILCON O&M funds can be used for up to $4 million in construction (Tilghman 2023) where the project qualifies as new work. The process for obtaining O&M funds is the shortest and most simple, while UMMC funds have a slightly longer process due to additional review and documentation requirements. To receive funds greater than $9 million, agencies must acquire funds from other MILCON sources, which typically have a significantly longer application and approval process compared to UMMC or O&M funds.

The Energy Resilience and Conservation Investment Program (ERCIP) is a subset of the MILCON, Defense-Wide account through which projects can acquire funds greater than $9 million (see 10 USC 2914[2]). ERCIP accepts project proposals from DOD facilities and selects a subset to submit to Congress for appropriated funding based on the priorities identified for that fiscal year and a list of underlying criteria. The development of energy and water resilience projects is the current priority for ERCIP, and a strong preference will be given to proposals that achieve resilience while also reducing GHG emissions. A minimum Savings to Investment Ration (SIR) is not required for resilience projects, but a minimum of 1.25:1 is required for conservation projects and all ERCIP projects require a life cycle cost analysis (LCCA). Project documentation is typically submitted by the agency in September or October three years in advance of the project's intended fiscal year, with individual sites having earlier deadlines. For example, documentation for FY24 projects was submitted October of 2021 (Kidd 2021). It is estimated the process for obtaining and using MILCON funding may take five to seven years or more to prepare project plans and documentation, acquire congressional approval, and execute the project construction. For additional information as well as documentation templates, refer to the current program guidance[3].

4.2 Federal Grants

There are several federal and state grants available to support energy savings and resiliency projects at federal facilities. Similar to appropriated funds, federal grants are dedicated funds that require no payback; depending on the grant, the total funds can be awarded once or awarded over a period of time. Depending on the project, grants can act as the primary financing method or used as supplemental funds to help a project meet its cost savings requirements.

4.2.1 Assisting Federal Facilities with Energy Conservation Technologies (AFFECT)

Applies to all federal agencies

The Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) program is a grant program managed by FEMP. AFFECT provides grants for the development of energy and water efficiency projects. This grant has historically supported projects that leverage third-party financing for greater impact. Therefore, for some topic areas, applicants are required to

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[1] U.S. Congress, *House, National Defense Authorization Act for Fiscal Year 2023,* HR 7776, December 23, 2022. https://www.congress.gov/bill/117th-congress/house-bill/7776/text.

[2] Military construction projects for energy resilience, energy security, and energy conservation, U.S. Code 10, §2914

[3] https://www.acq.osd.mil/eie/ie/FEP_ECIP.html

demonstrate that the project will be supported by third-party financing, such as a performance contract.

Applications are submitted within three topic areas that can change annually. For example, the topic areas for fiscal year 2023 were (DOE - FEMP n.d.):

- Assistance with Net-Zero Buildings Opportunity Development
- Modification of Existing Projects for Net-Zero Buildings
- New/In Development Net-Zero Building Projects

The funding received by a federal site through an AFFECT grant can be spent on equipment, technical assistance, or other services related to the planning, development, or implementation of a project. Updated information on topic areas and submission deadlines can be found by visiting the Clean Energy Infrastructure Funding Opportunity Exchange[1] and filtering the Office category by “Office of Federal Energy Management Programs”.

4.2.2 Readiness and Environmental Protection Integration (REPI) Challenge

Applies to DOD

DOD’s Readiness and Environmental Protection Integration (REPI) Challenge[2] dedicates funding to support projects that improve resiliency or promote sustainable land use at DOD facilities. Once an RFP is released, new applicants are able to use the REPI Challenge Online Portal to fill out a user account request form and submit project pre-proposals. The deadline to submit a pre-proposal is during the summer before the project’s intended fiscal year.

[1] https://infrastructure-exchange.energy.gov/Default.aspx#FoaId7397f57a-df4f-4974-875a-bd7f3b0de785
[2] https://www.repi.mil/Buffer-Projects/REPI-Challenge/

5.0 Additional Support

The range of procurement strategies available for implementing low temperature geothermal technologies can be difficult to navigate prior to understanding the potential for these systems at a particular site. For a site interested in implementing low temperature geothermal solutions, a preliminary analysis can help to identify the best-fit funding mechanisms and inform any required documentation to pursue them. Preliminary analysis should include assessing potential available areas at the site that could host a geothermal heat exchanger (GHEX), identifying buildings that could benefit from these technologies to support heating and cooling loads, and evaluating the hydrogeology of the area to understand the types of systems that could be viable. Based on preliminary data collection, a preliminary design can be developed for a low temperature geothermal system, and a technoeconomic analysis (TEA) can be conducted.

These preliminary analyses can support pursuing a range of procurement options. For example, this information can be included in an NOO as a basis for narrowing the scope for proposals (e.g., to focus on projects that include geothermal systems supporting a particular subset of buildings at the site). Additionally, the preliminary analysis can provide the foundation for the design and TEA requirements for some agency appropriations processes or can provide a basis for building a strong proposal for grant funding. Note that TEA for appropriations may be required to follow FEMP and NIST guidance for lifecycle cost analysis (Kneifel and Webb 2020). In the case of dedicated funding options, the preliminary analysis can also clarify the amount of dedicated funding that may be required to help a low temperature geothermal solution meet cost savings requirements under a performance contract.

The DOE Geothermal Technologies Office (GTO) is providing technical assistance to federal sites through an FY 2022 lab call that can support such preliminary analyses. Through this effort, technical experts at four DOE national laboratories as well as multiple university and industry partners are providing analysis to support the implementation of low temperature geothermal systems at federal sites.

Once a federal site has decided to pursue low temperature geothermal solutions based on a preliminary analysis, many resources are available to support them through the procurement process. FEMP offers development and procurement services for performance contracts to help agencies implement energy and water efficiency projects. In addition to training resources (e.g., live and on-demand trainings available via the Whole Building Design Guide[1] or the Performance Contracting National Resource Center[2]) and tools (i.e., eProject Builder[3] or ESCO selector[4]), FEMP also has regional federal project executives (FPE) that can help agencies launch a performance contract by providing assistance with acquisition planning tasks and can assist with retaining a project facilitator to guide and support the agency acquisition team.[5] For any further questions or for additional information, it is recommended to use the FEMP Assistance Request Portal[6] or reach out to one of the federal project executives[7].

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[1] https://www.wbdg.org/continuing-education/femp-courses
[2] https://www.energy.gov/femp/performance-contracting-national-resource-center
[3] https://eprojectbuilder.lbl.gov/login
[4] https://esco-selector.ornl.gov
[5] https://www.energy.gov/femp/project-facilitators-federal-espc-uesc-and-espc-enable-projects
[6] https://www7.eere.energy.gov/femp/assistance/
[7] https://www.energy.gov/femp/federal-project-executives-espc-uesc-and-espc-enable-projects

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