

**Financing Energy Security—Approaches to Increase
Power Reliability, Reduce Costs, and Save Energy
(Without Depending on Appropriations)**

**Prepared for the 29th Environmental and Energy Symposium—“DoD
Transformation: The Role of Environmental and Energy Programs in
Sustaining Readiness”**

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Keith Kline
Patrick Hughes, P.E.
Oak Ridge National Laboratory
P.O. Box 2008, MS 6070
Oak Ridge, TN 37830

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Keith Kline
Oak Ridge National Laboratory
P.O. Box 2008, MS 6070
Oak Ridge, TN 37830
865.574.4230 (fax 865.574.9329)
klinekl@ornl.gov

Patrick Hughes, P.E.
Group Leader, Oak Ridge National Laboratory
P.O. Box 2008, MS 6070
Oak Ridge, TN 37830
865.574.9337 (fax 865.574.9329)
hughespl@ornl.gov

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ABSTRACT

Energy supplies for critical missions can be vulnerable to natural and terrorist events. Effective protection strategies include on-site generation capacity; however, appropriations for large, on-site power systems are scarce, leading facilities to look for alternative financing or cheaper, less reliable solutions. The utility privatization process underway on military bases involves transfer of energy distribution assets and does not typically address needs for improved energy security through on-site generation. And some common alternative financing vehicles are perceived to create risks that can be costly in the event of base closure, or to conflict with privatization and other policies. This paper discusses efforts supported by the U.S. Department of Energy’s Federal Energy Management Program (FEMP) to assess options that address these concerns and that could facilitate best-value for the U.S. government when acquiring energy services from distributed generation and combined heat and power (DG/CHP) systems. The authors consider examples of using various existing authorities to finance upgrades or replacements of obsolete energy-generation equipment and discuss alternatives that may be more compatible with present policies and objectives. FEMP’s assessment contemplates approaches based on outleases where a private party designs, builds, finances, owns, and operates DG/CHP equipment at federal sites, using agreements structured to avoid the long-term federal payment liability common in other public–private partnerships. Oak Ridge National Laboratory (ORNL) is coordinating this assessment for FEMP and welcomes input on whether out-leasing approaches are a desirable addition to the military’s portfolio of public–private partnerships. Comments received from DoD reviewers were incorporated in this version. Please send additional comments to the authors.

Vulnerability and Energy Security Requirements

Energy security is paramount for military installations—energy for critical missions could be compromised by natural disasters, terrorist attacks, or other events leading to failure of electric grid and loss of space conditioning for command and computer centers or heat for industrial processes. The North American Electric Reliability Council documented 58 system disturbances in 2000 and noted, “Systems are being run ‘closer to the limit’ than ever before, and the risk of a disturbance precipitating a cascading outage is great” (NERC 2001). Many informed observers have highlighted the vulnerabilities of the grid to physical and cyber threats. The National Academy of Sciences report on the role of science and technology in countering terrorism (NAS 2002) included recommendations for installing more distributed generation (DG) technology to decrease power grid susceptibility to terrorist attacks. According to this study, “technology should be developed, tested, and implemented to enable an intelligent, adaptive electric-power grid.” The report goes on to indicate that DG and “adaptive islanding” would be key elements to minimize damage and enable faster recovery. Various studies recognize that interconnected, distributed generating capacity at appropriate facilities can benefit national security at multiple levels—it not only helps protect critical missions, but can also contribute to the overall stability of the grid and reduce costs to society (ACEEE 2003, ORNL 2002, Casten 2002, NEPDG 2001, DOE 2000).

The conclusions of vulnerability assessments to date have been consistent: In their present state, the electric grid and interstate natural gas pipeline systems cannot be protected. Therefore, facilities such as military installations must assume responsibilities for ensuring that critical missions can continue using on-site infrastructure. These responsibilities have been formalized in Executive Order 12656, Emergency Preparedness Responsibilities (Pres. R. Reagan 1988) and the Executive Order on Critical Infrastructure Protection (Pres. G. Bush 2001).

The bottom line is that federal agencies must ensure an adequate energy supply for all critical mission operations. The most common response to this requirement is to depend on uninterruptible power supply (UPS) battery back-up and emergency generators. Unfortunately, in the event of a real emergency (which could easily last longer than normal testing periods and occur under different conditions), these systems often fail. Even the best-maintained systems experienced failure rates in routine testing that raised concerns. In a study of diesel backup systems at nuclear power plants, the probability of failure to complete a 24-hour run was found to exceed 13% (INEEL 1996). A separate study, sponsored by the U.S. Army Engineering and Housing Support Center, looked at maintenance records for standby diesel and gas turbine generator sets (600 to 1800 kW) at industrial plants and found failure rates ranging from 5 to 45 failures per unit-year of operation (IEEE 1998). Some experts suggest that the probability of failure at a typical facility is much higher than at those studied, with risk increasing under actual emergency situations and as the duration of an emergency is prolonged (Fairfax 2002).

Distributed Generation—Part of the Solution

While there are various approaches to address these energy security concerns, one component in many strategies is on-site power, or DG that is proven to be reliable through everyday use. These systems can be the backbone of a strategy to supply power during a prolonged emergency or grid failure. They typically operate with dual fuels (and/or a highly secure fuel supply) and may include multiple, redundant, and/or distributed units.

The critical energy demands at military sites are often large and may include electrical and thermal energy requirements, such as cooling for data processing centers. Where critical demand

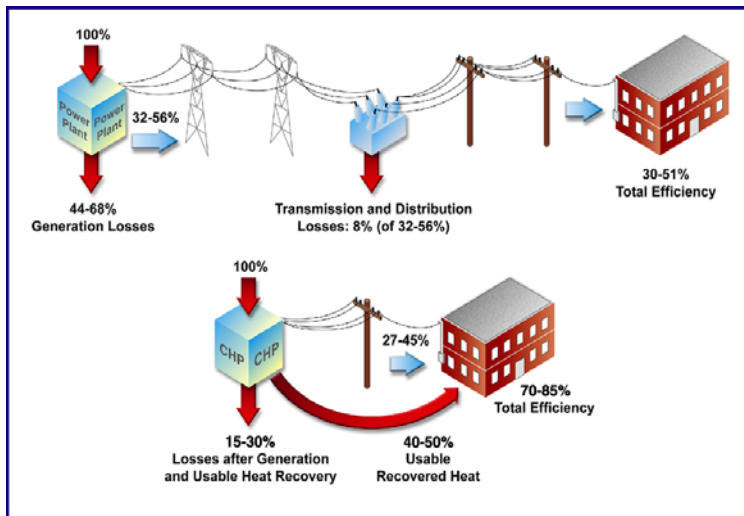


Fig. 1. Combined heat and power (cogeneration) systems recover usable heat and avoid transmission and distribution losses to offer potential total efficiencies of 70–85%.

for electricity and thermal energy coincide, combined heat and power (CHP), or cogeneration, should be considered. CHP is a more efficient form of DG. Heat from electricity generation that is normally wasted by conventional power plants is recovered with CHP for productive uses such as heating, cooling, dehumidification, or other processes. And because a CHP system generates electricity near the point of use, it avoids transmission and distribution losses from distant central stations (and reduces system vulnerability). Properly designed CHP systems can have twice the efficiency of an average U.S. fossil fuel power plant

(Fig. 1). CHP can be configured to operate full-time (or daily for peak shaving) to meet site requirements and critical loads and can also fulfill mandates to reduce energy consumption and emissions. Systems that operate daily or continuously are more reliable than intermittent ones, and are generally easier to finance because the high initial costs can be offset by savings on baseline costs for electricity, chilled water, steam, and/or high-pressure/high-temperature water. Some states offer financial incentives for installing efficient CHP systems.

Federal CHP Potential

An assessment of the national potential for CHP applications at federal facilities was recently completed (ORNL 2002a, FEMP 2002). The assessment estimated that economically viable CHP could help the federal sector conserve 50 trillion Btu of source energy per year, increase energy security, significantly reduce air pollutant emissions, provide about 1600 MW of new power, and be largely self-financed by more than \$170 million per year in energy savings. The investment potential for public-private financing partnerships is approximately \$1.1 billion. The Department of Defense (DoD) and Veterans Affairs (VA), with a potential for 1,115 MW in 500 projects, represent over 70% of total estimated capacity for economical CHP in the federal sector (see Fig. 2).

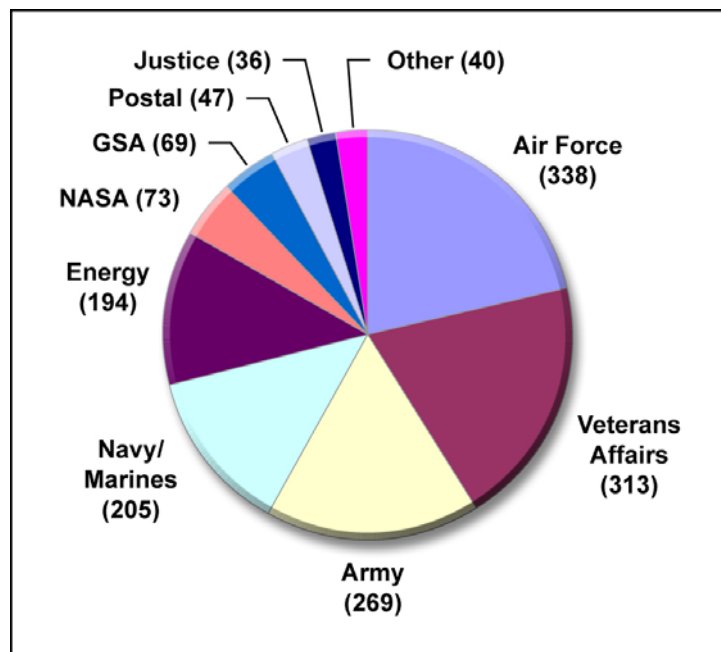


Fig. 2: Results from market assessment of potential CHP capacity for projects with simple payback <10 yr; MW by agency; total capacity = 1590 MW. (ORNL 2002)

CHP systems already in place at military installations demonstrate that DG/CHP is a viable option with today's technologies. Federal facilities in some regions have seen rates soar when they renegotiated long-term electricity contracts, making a stronger economic case for CHP where it was not competitive in the past. States with the best CHP opportunities have rules that facilitate grid interconnection, offer incentives through public benefit programs, and/or expect electricity costs to remain high or escalate relative to long-term gas prices.

Overcoming hurdles to CHP

Although DG/CHP technologies are proven and the potential savings and benefits can be significant, project development over the past decade has been modest in the federal sector. Given the potential for CHP, why haven't more federal facilities installed this technology? Discussions with federal facility managers suggest that reasons include the following:

- Low historical tariffs for electricity
- High initial cost of CHP systems
- Complexity of CHP systems partly because of the need for custom application engineering to address the special circumstances at each site
- Limited direct funding for the required stages of project development: surveys, feasibility studies, design, and construction (agencies rarely have sufficient appropriations for even much smaller energy conservation investments)
- A lack of time and expertise to evaluate potential applications and benefits
- Obstacles related to local utility, air quality, and other regulations for interconnection, backup/standby fees, siting, and emissions (ORNL 2002a)
- High maintenance costs and poor condition of many old steam distribution systems
- Lack of adequate fuel (natural gas) supply at the site
- Agency policies and priorities, such as utility privatization within DoD
- Negative experiences (in a few cases) due to the terms of past "public-private venture" contracts involving CHP

Facility engineers universally express a need for independent, unbiased sources of information about the costs, operation, financing, and performance of CHP systems. FEMP offers support services to address these and other challenges faced in developing an efficient DG/CHP project. In response to federal agency interest, FEMP developed a free CHP screening service implemented by Oak Ridge National Laboratory (ORNL). Since beginning the service last year, 117 sites have requested and received CHP screening reports (as of January 2003); seventy of these were DoD and VA facilities. A key driver for interest at military sites appears to be energy security.

Screening results are provided to the agency representative who submitted the prerequisite data and request. The screening report offers an estimate of CHP economics and sensitivity to important variables such as electric rates, fuel costs, and level of waste heat utilization. The purpose is to highlight opportunities that merit further study based on potential cost and energy savings. FEMP staff at the Department of Energy's (DOE's) Regional Offices offer follow-up to the agencies if they desire support with next steps, including education about public-private financing partnership options and additional technical assistance if needed.

More than half of the sites screened to date (69) were ranked as having medium to high merit for further study (generally, this meant that the simple payback period for a CHP project was ten years or less). Figure 3 illustrates the distribution of CHP capacity potential among agencies based on the CHP screening results for those 69 sites. The large number of requests for the free screening service reflects a high level of interest in CHP among agencies, and screening results illustrate where payback periods for the required capital investments were estimated to be reasonable. Although Fig. 3 is based on self-generated participation from agencies, the results from screening those sites mirror the market assessment: over 70% of total potential capacity from sites with favorable screening results is in military and VA facilities.

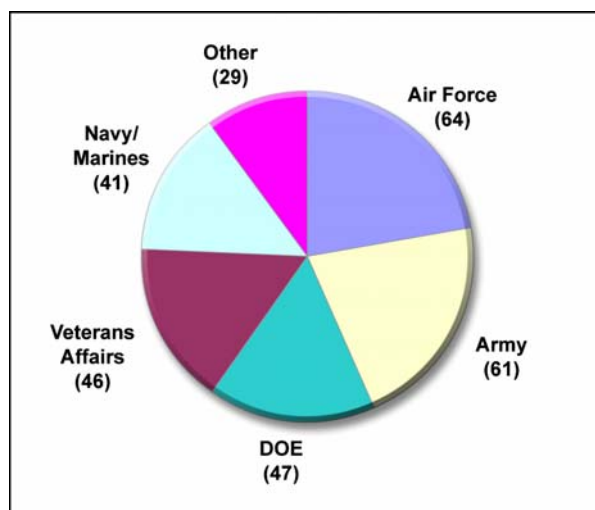


Fig. 3. Results from agencies requesting CHP screening—distribution of CHP capacity, in MW—among sites with high and medium merit (total 287 MW for 69 screened sites).

Existing Financing Options

Planning, designing and installing effective DG/CHP systems are complex and costly undertakings. At facilities that have strong technical and economic potential for CHP, the most common hurdles are the limited staff time and funding to develop and build projects. Several financing options exist to help facility managers address these hurdles.

Appropriations/Military Construction (MILCON): Paying for a DG/CHP project can involve federal and/or private resources. Federal appropriations have commonly been used for capital improvements such as emergency back-up generator sets and for some small CHP systems. Special appropriations have subsidized demonstration DG/CHP projects employing small turbines (30 to 60 kW) and fuel cells (5 to 200 kW) at dozens of military installations. Appropriations are likely to continue to fund small projects and new technology demonstrations. But given utility privatization policies and budget priorities, the approval of scores of large DG/CHP systems with MILCON funding is unlikely. Nearly all of the recent, large CHP projects in the federal sector have been privately financed, and future projects will most likely continue to rely upon private funds. There are several private-financing options available to military sites interested in DG/CHP— ESPC, UESC, public-private ventures, and leasing authorities —and each is discussed briefly here. See references for sources with more detailed information (FEMP 2003, 2002a, 2001; Hughes et al. 2003).

Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts (UESCs) have been the most common mechanisms used over the past decade to finance large federal CHP systems. These contracts are based on authorities that allow federal agencies to leverage private funds to implement energy conservation improvements in federal facilities without relying on appropriations. Since 1988, \$2 billion in private-sector investment for energy-efficiency improvements at federal sites have been made using these two authorities.

With ESPC, an energy service company (ESCO) develops and finances projects and guarantees a specified level of annual cost savings resulting from the project. The ESCO provides all surveys, studies, designs, labor, materials, and equipment, and is repaid from the guaranteed savings over the contract term. Contract terms are typically 10 to 20 years (the maximum is 25), after which the savings accrue to the agency. ESPCs require measurement, verification, and guarantees in a highly structured delivery order. Their standardized structure and pay-from-savings approach enable effective implementation of typical energy conservation measures (e.g., lighting, controls, HVAC) without waiting for appropriations. However, ESPC is intended to make improvements to government-owned facilities, and it sometimes creates hurdles for complex, unique projects like CHP that might more appropriately be privately built, owned, and operated. Examples of recent ESPCs for CHP at DoD sites include Portsmouth Naval Shipyard (10 MW), Southwest Division Naval Amphibious Base (120 kW), and the Marine Corps Base at Twentynine Palms (7 MW), where energy security was a driving factor in the decision to proceed (see box).

Security Without Appropriations: CHP at USMC using ESPC

In 2001, the U.S. Marine Corps Air Ground Combat Center near Twentynine Palms, California, was concerned about rising utility bills and potential grid failures. Now the base is completing a 7.2-MW CHP system serving four critical load lines. The gas combustion turbine has dual-fuel capability to make a seamless switch to diesel if the natural gas supply fails. After generating electricity, hot turbine exhaust is captured to contribute to a central high-temperature water loop and to power a 200-ton absorption chiller for turbine inlet air-cooling. When complete, the overall system efficiency is expected to be 75%, more than double the average efficiency of the U.S. electric grid. The \$16.2 million cost of the system, including surveys, design, construction, and over three miles of high-pressure natural gas lines, was financed by a private ESCO partner through an ESPC and is being repaid from guaranteed cost savings. In addition, savings from the CHP plant are helping to finance 1.1 MW of renewable solar (photovoltaic) electric DG, three additional chillers, and several other critical infrastructure improvements.

UESCs are similar to ESPCs, but are contracts with the serving utility for energy services and equipment. Special authorities permit streamlined, established-source selection and flexibility in contracts. Guarantees and measurement and verification of savings are optional in UESCs, and some utilities prefer not to be involved in other follow-up services such as operations and maintenance and repair and replacement. Contract terms are generally limited to ten years, making it more difficult to finance projects with long-term benefits (often the case with CHP).

Security Without Appropriations Through UESC: Patrick Air Force Base

At the 45th Space Wing at Patrick Air Force Base (PAFB) in Florida, a 6.6-MW, utility-interconnected, back-up power plant costing \$3.5 million was installed using UESC without requiring government appropriations. The net savings from incorporating the generators into the utility's demand-side management program exceeded the monthly debt service for the installation. The project allows PAFB to produce, inside the fence, over 30% of its total power requirements, enhancing the ability to support mission in times of crises or natural disasters. Similar projects—7.5 MW and 11 MW of interconnected back-up—were done for Cape Canaveral and Kennedy Space Center, respectively, by Florida Power and Light, the serving utility.

Viability of this approach also depends on the relationship with, and services offered by, the utility; some utilities are not interested in pursuing UESCs to develop DG/CHP projects. And an ongoing utility privatization process (discussed below) reduces interest at many bases in developing parallel energy generation projects with utilities.

Federal facilities can save time and expense by using pre-competed ESPC umbrella contracts or existing area-wide contracts and basic ordering agreements for UESCs to streamline procurement procedures. Both ESPC and UESC authorities allow agencies to make improvements to government-owned facilities. The federal customer accepts the operating project and agrees to repay the investment plus

interest and pay for any negotiated follow-up services over the term of the agreement. Standard federal contractual clauses (e.g., those for termination for convenience) in ESPC and UESC contracts dictate that the federal government must pay the remaining termination costs set forth in the contract if the equipment is no longer needed before the term is completed. This is sometimes referred to as “contingent liability” and basically means that the federal agency carries the risk and must make a cancellation settlement if something unexpected occurs that eliminates the need for the project. Contingent liability has not been an issue with most agencies, who view the cancellation payment as just another cost of facility closure, which declines over contract term. However, some agencies would prefer a more privatized style of project development without the contingent liability if it can be financed at reasonable rates. The options below describe how the DoD could lease property to a private developer who would then build, own, and operate the CHP plant and sell the commodities (electricity, steam, or chilled water) to the military and/or other customers.

Public–Private Energy Ventures offer an alternative to government ownership and can permit energy services to be sold to third parties, thus spreading project risk. This authority was used successfully by the Navy to privately develop a geothermal energy project at China Lake, California. In the 1980s and 1990s, the military recognized that the MILCON budget was insufficient for some critical energy infrastructure improvements, and a few CHP energy projects were pursued using DoD’s public–private venture authorities. The CHP projects were developed as procurements governed by Federal Acquisition Regulations (FAR) and were generally structured so that the government was locked into a long-term, take-or-pay contract for energy services. In two cases of subsequent base realignment, the government had to pay a significant cancellation settlement, or continue paying for a greater amount of energy (steam) than required. Those experiences, coupled with the significant time and administrative costs required for a special, nonstandard procurement process compliant with FAR, and more recent mandates for utility privatization, apparently quelled interest in developing new CHP systems using the public–private venture authorities.

Utility Privatization: DoD facilities are actively implementing a policy to privatize the ownership of energy distribution assets (poles and wires, pipes, etc.) on military bases unless continued ownership is required for security purposes or privatization would be uneconomical. The privatization guidance requires transfer of ownership and allows the bases to sign long-term contracts for related energy services as the distribution assets are sold. The ongoing assessment involves about 450 electrical utility systems. Federal regulations must be followed to ensure open competition and that a fair price is received for assets. These are large and complex undertakings. Though commodity may be included, very few utility privatization contracts include the electrical commodity. The contracts do not generally include an incentive to improve energy security and efficiency or to expand on-site generation capacity. If this were an important need at a specific site, it would be possible to incorporate terms for this purpose in the privatization contract. DoD installation managers responsible for addressing energy security could benefit from being informed about all available financing authorities, including utility privatization, in order to choose the approach that is most advantageous in meeting their needs.

Enhanced-Use Lease: At the James H. Quillen Medical Center in Johnson City, Tennessee, the VA recently demonstrated how an agency can privately finance a large DG/CHP project (6.7 MW) while avoiding the risk of paying large cancellation costs. This was accomplished by structuring the transaction around their outleasing authority, known as Enhanced-Use Lease (EUL). Using EUL, a developer was selected and given full responsibility to design, finance,

permit, own, and operate the CHP systems on VA property transferred under a long-term (35-year) lease. Under the EUL business plan, the VA agreed to purchase energy commodities (electricity, steam and chilled water) from the new plant under favorable terms (compared to those of the existing utility providers), based on a two-year contract with automatic renewal provisions. The developer was also authorized to sell energy commodities to third parties. It took a little over two years to complete the transaction and reach an arrangement that balanced the federal desire to limit risk with the private-sector need for sufficient guarantees to permit financing. This balance was achieved through an energy service agreement that will automatically renew for two-year terms unless the VA informs the developer within the first six months of a term that specific conditions (such as a major change in mission, funding, and/or closure) will require a modification or cancellation of the agreement.

The final agreements provided adequate security to the developer based in part on the automatic renewal provisions of the contract, an exemption from any “termination for convenience” clause, long-term energy sales to a third party and the security of the long-term lease, as well as on VA strategic plans, site investments, and other factors verified through due diligence by the financier. The energy service agreement avoided federal liability to pay remaining costs of the CHP system should specific conditions (closure or significant reduction in hospital occupancy) dictate that the VA not renew the energy services agreement prior to full term for financing. The Office of Management and Budget (OMB) approved the two-year energy service agreement as an “operating lease” without the need to score the capital costs of the project. The energy services are financed from the VA’s annual appropriations for operations and maintenance.

DoD’s Enhanced Lease Authority

The military’s long-standing leasing authorities were recently enhanced to facilitate projects similar to the VA’s, but these have not yet been applied for a large DG/CHP system. The expanded military authority is flexible, but few energy managers are aware of how it could be used to finance a DG/CHP project and, like the VA’s, it requires project approval at the Secretary’s level. Both authorities allow long-term outlease contracts, up to 75 years for VA and longer, if found to be in the best interest of the military, under DoD authority where the lease term is determined on a case-by-case basis. The basic steps in the DoD lease process are to 1) identify the potential project, 2) prepare property for approval to lease, 3) market the property (notice of intent to lease), 4) select a developer, 5) develop a business management and leasing plan, and 6) sign and manage the lease. The Department of the Army has prepared a special website with a guide to outleasing Army assets, and forms and spreadsheets to facilitate the process for installation managers. An Army Enhanced Use Leasing Policy Memorandum describes leasing authority as “an important tool for reducing infrastructure costs, providing facilities and services, and making additional funds available for Army readiness, modernization, and quality of life initiatives.” (Van Antwerp 2001).

Table 1 summarizes relevant characteristics of the various authorities that could permit a federal site to finance and install a CHP system. The “maximum term” refers to the limit, in years, that an agreement could be effective under a given authority. The “Risk if T for C” refers to who would pay the remaining cost of the project in the event of termination for convenience (e.g., if unforeseen base realignment or closure meant the project was no longer needed by the government). Assignment of risk can vary depending on specific contract terms and is often shared to some degree. The table reflects who carries the majority of risk in the CHP projects

studied to date using different authorities. The “agile option” refers to whether or not streamlined [indefinite delivery, indefinite quantity (IDIQ) or established source] procurement is presently available. Of course, exceptions to most rules are possible.

**Table 1. Options to Finance Federal DG/CHP—
Comparison of Typical Project Characteristics**

Authority	Legal basis	Source of Funds	Max. term (yrs)	Asset owner	Risk if T for C	Agile option	Approval level
Appropriations	Congressional budget line item	Federal approp.	NA	Govt.	Govt.	Varies	Congress, military appropriations legislation
UESC	42 USC 8256 10 USC 2865	Private funds	10	Govt.	Govt.	Yes	Agency contracting officer
ESPC	10 USC 2865 42 USC 8287	Private funds	25	Govt.	Govt.	Yes	Agency contracting officer; after notice to Congress if over \$10M
Public–private Venture	10 USC 2394 10 USC 2867	Private funds	30	Private owner	Terms define	No	Secretary of Defense
Utility Privatization (DoD)	10 USC 2688	Private funds	50	Private owner	Terms define (either)	No	Secretary of military dept. after 21-day notice to Congress
Enhanced Use Lease (VA)	38 USC 8161	Private funds	75	Private owner	N.A.-- Private	No	Secretary of VA after 60-day notice to Congress
Enhanced Lease (DoD) as proposed	10 USC 2667	Private funds	Indefinite	Private owner	Private owner	No	Secretary of military dept. after 45-day notice to Congress

All of the private financing approaches could allow the DoD to tap private-sector project development expertise as well as overcome the lack of direct MILCON funding. Site-specific characteristics may make one option more appealing than another. Despite the availability of financing alternatives, projects awarded appear to represent only a small fraction of potential savings from DG/CHP. Of the various forms of financing, ESPC and UESC have been used much more than other authorities for large energy conservation projects. Two primary reasons for this are the ease of procurement and focused marketing and support of services by contractors (and special agency teams). In the case of ESPC and UESC, FEMP and federal user agencies working with private partners have invested significant resources to streamline, standardize, and continually improve the processes, and experienced teams devoted to the use of these authorities are in place.

IDIQs Facilitate Federal Procurement

Ease of procurement is an important factor in determining the development of DG/CHP. Experience shows that a solicitation for bids in compliance with a “full and open competition” under the Federal Acquisition Regulations (FAR) can easily result in more than 2 years of effort prior to a contract award for large federal projects. With scores of potential projects, if a competitive process were followed for each, it would add notably to the time and costs for all

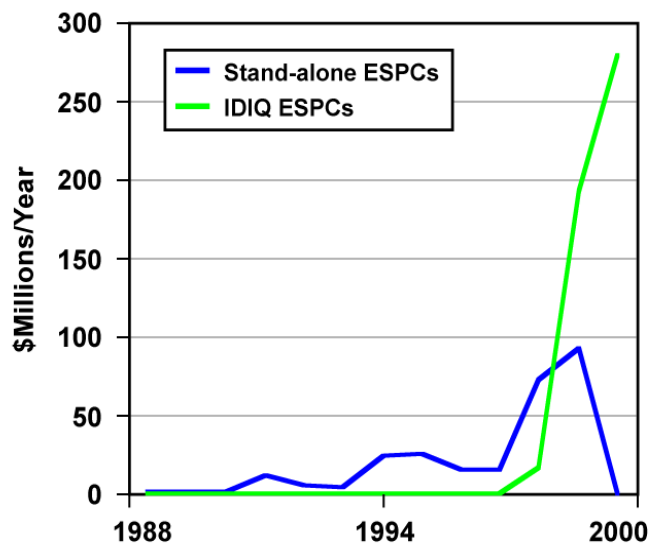


Fig. 4. Umbrella IDIQ contracts quickened the pace of implementation of ESPC awards, and could do the same for awards designed to take advantage of special leasing authorities.

parties involved. To reduce these costly lead times, the government has employed umbrella, or IDIQ contracts for specialized goods and services. Indeed, federal ESPCs were first authorized in 1988 and offered a great opportunity for the government to save energy and money, but few projects were awarded until IDIQ contracts such as DOE's Super-ESPCs and similar Army and Air Force ESPCs became available (see Fig. 4). Most of the large CHP systems recently installed in military facilities were financed through IDIQ ESPC awards. Agencies can take advantage of IDIQ contracts to obtain services from various providers that were selected based on their specialized capabilities. Since IDIQs are pre-

competed, using these contracts saves agencies the time of developing and administering a formal RFP/bidding/selection process. The necessary legal opinions, rules, and regulations to implement a new authority can be put in place prior to the IDIQ so that ordering agencies can focus on implementing their projects. Standard practices and templates can also be developed to streamline project proposals and the negotiation of delivery orders under these contracts. Agencies have developed specialized centers of expertise with qualified staff to support many projects under IDIQs for ESPC, sharing valuable experience that saves time and money. Because they can be awarded in a fraction of the time it takes to award a stand-alone contract, delivery orders under these umbrella-type contracts have accounted for the vast majority of federal ESPC activity.

Under appropriations, each step of a procurement—award, administration, and payment—must be managed in compliance with FAR. Under ESPC and UESC, the delivery order award and administration during both the implementation and performance phases are also structured to meet FAR requirements for construction and services in federally owned facilities. Under other alternative mechanisms, after a developer is selected, project contracting and financing is handled privately and can often follow more flexible and agile commercial practices. This can also save time and money. The enhanced lease approach is based on federal real property laws and regulations rather than the FAR. Developer selection must still be documented for an outlease DG/CHP project, and the energy commodity purchase would be a separate agreement (in compliance with FAR) based on the lease business plan, but most project development tasks in between can be done on a commercial basis.

Developing any large DG/CHP project will be complicated. Doing it a novel way, using leasing authorities that are typically managed by a different department than those addressing energy security and energy conservation, could be a challenge, especially for an installation doing so for the first time. The only completed CHP project to date using the VA's EUL authority (Mountain Home) took two years to develop conceptually before the RFP was issued in November 1997 and two more years for selection, negotiations, and approvals prior to project award in December 1999. The project was managed privately from that point, and construction of a large new energy

plant was completed in June 2001. Another CHP project that evolved from an RFP let by the VA in 1997 was finally awarded in May 2002, after several delays. It now involves many of the same actors as the Mountain Home project (developer, legal/finance advisors) and is moving more quickly as they can capitalize on their prior experience.

In sum, most of the large federal CHP projects developed over the past decade have been financed under IDIQ ESPC and UESC authorities, with streamlined (pre-competed or established-source) standardized contracts and delivery order structures. But some DoD sites are unable to use ESPC and UESC for CHP because of limited contract terms. They are interested in a more “privatized approach” to enhancing energy security with DG/CHP. The authorities for public-private ventures and leasing could address these issues, but they do not have a similarly streamlined and structured option available.

Finding Opportunities—Focused Marketing

The development of IDIQ contracts creates a special incentive among the selected companies to identify and develop sound projects. The big jump in ESPC awards shown in Fig. 4 was perhaps as much a result of focused marketing by contractors as it was a product of a streamlined procurement mechanism. Once they were selected, the ESPC IDIQ contractors were among a select few who had a vehicle for identifying, developing, and financing pay-from-savings projects. The DOE, Army, and Air Force all pre-competed ESPC IDIQs to select “all-purpose” contractors qualified to implement common ECMs, such as lighting, HVAC, and controls that are relatively easy to design and price with an assured level of guaranteed savings. Developing projects using new technologies, or large complex projects such as CHP, requires specialized expertise and carries higher risk, especially for the contractor. The project development costs are borne entirely by the contractor until the project is awarded, and there is no guarantee that the project will ultimately be awarded.

To help address these issues, a few “technology-specific” ESPC IDIQs were let to support adoption of technologies that were clean, efficient, commercially available, and underutilized in the federal sector. Firms specializing in the technology do the marketing and identify potential projects. This approach proved to be effective in accelerating access to geothermal heat pump (GHP) technologies through the ESPC vehicle (See Fig. 5). Given the characteristics of CHP and its potential in the federal market, it appears to be a good candidate for a technology-specific IDIQ if the approach addresses the needs of customers.

Seventy-two percent of federal CHP potential lies in DoD and VA facilities, where present policies promote a privatized approach to building, owning, and operating energy infrastructure. Currently, there are no streamlined (pre-competed) alternative financing vehicles

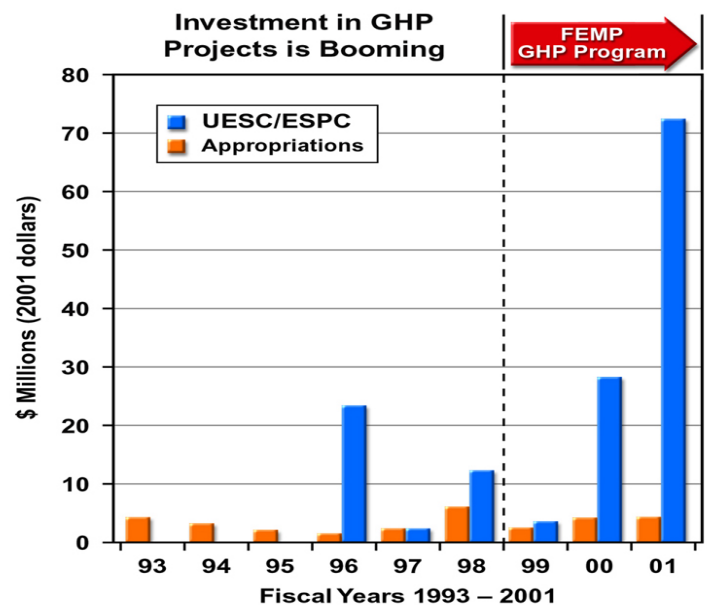


Fig. 5. A special tech-specific procurement vehicle quickened the pace of federal geothermal heat pump installation, and could do the same with CHP.

that specialize in DG/CHP projects where a private partner will build, own, and operate the energy plant on outleased federal property and sell back electricity, chilled water, and steam. While DoD's lease authority could permit private financing to upgrade and replace obsolete equipment, improve energy security and reliability, and contribute to energy and emissions-reduction goals, it has yet to be applied for this purpose. Given the complexity of the projects and authorities, past federal experience suggests that such projects are unlikely to materialize unless there is an agile mechanism for this purpose, similar to an IDIQ that catalyzes a focused marketing effort by private partners having the specialized skills necessary to develop such projects.

FEMP Assessment of Alternatives to Access DG/CHP

While successes using ESPC and UESC are noteworthy, they may not meet the needs of some federal facilities that want to finance DG/CHP while complying with utility privatization policy and avoiding contingent liabilities. Recognizing this, for fiscal year 2003, FEMP tasked ORNL to lead an assessment of alternatives to permit easy access by any federal agency to firms that specialize in efficient, on-site power systems that could be provided under leasing and other financing authorities. As reflected in the discussion above, ORNL has begun to analyze the legal basis behind the various authorities that permit third-party financing and is studying cases involving DG/CHP and outleasing. Specifically, the analysis now underway is designed to:

1. Review experience to date with third-party leasing and similar authorities at VA, DoD, and DOE sites, and document the steps needed to get approvals and generate an awarded contract.
2. Determine federal agency interest in using various options for procuring DG/CHP systems, and identify any concerns, recommendations, and contingencies they may place on participation. Key sectors include Air Force, Navy/Marines, Army, and VA, given their CHP potential and security needs.
3. Estimate the degree to which a pre-selection process or an umbrella contract could reduce time and costs, assuming that agencies collaborate to clarify their authorities in advance through legal opinions, rules, and regulations; and, as part of the process agree to pre-negotiated procedures, requirements and conditions. All parties (federal and private) would benefit from greater efficiency and economy of scale if agencies could commit to using a common mechanism, rather than having multiple agencies create their own.
4. Determine private-sector interest in responding to the potential invitation to participate in such transactions and any contingencies this group might place on participation. Some characteristics that would be desirable to federal agencies (e.g., some forms of risk assignment) may not be practical for the private sector and financiers.
5. Determine if any "show-stoppers" exist, such as procurement, legal, or technical obstacles to the proposed alternatives, and the requirements of customers and private-sector providers.

Progress in Assessing the Options

The assessment began with the collection of information on existing projects and the analysis of the advantages and disadvantages of the different approaches now available. As noted, several DG/CHP projects have been successfully implemented using ESPC and UESC, and there does not appear to be a need for, nor significant advantage to the government from, a new CHP technology-specific IDIQ based on present ESPC authorities. The authorities require that payments to contractors be made from reduced costs that derive from the project installed by the

contractor on federally owned facilities. They do not permit the risk assignment and private ownership and operation desired by some federal sites. It may be possible to combine ESPC with a separate but complementary EUL-style project in special cases, but this would require the management and oversight of parallel procurement and property leasing transactions and greater administrative burdens for the site.

The key barriers with UESC are the 10-year term limits and a lack of interest in some serving utilities. Also, similar to ESPC, UESC was designed primarily to provide for improvements to federal facilities, not for new construction that would be owned and operated by a private third party. Authorizing legislation for ESPC and UESC is completely different from the property management authorities underlying EUL, making it difficult to combine the two. The possibility of developing and receiving congressional approval for new legislation to explicitly allow outleasing of land, private ownership of power system facilities, and the sale of energy commodities to federal and nonfederal customers under ESPC and UESC appears unlikely.

The VA has limited experience using its EUL authority successfully for DG/CHP. Participation of additional customers is not possible at many sites, and project development time has been long, as much as six years to reach an award. It appears that a standardized approach for using EUL authority to build DG/CHP plants to serve federal sites (VA, DoD and others with similar authorities) could reduce project development time significantly. Perhaps just as important, the process of developing the standards and conducting the selection of preferred developers could generate a team of specialists on both sides of the table, private sector and federal, who would be positioned to help interested agencies to use the mechanism. According to the General Accounting Office (GAO), the latest improvements in DoD leasing authorities are poorly understood and underutilized. In comments to the GAO report (GAO 2002), the DoD Deputy Under Secretary for Installations and Environment indicated that expanding leasing opportunities is a key element of DoD's efficient facilities initiative. A standard approach, with guidelines and expertise available to assist sites in issuing leases under it, appears to be helping the Army overcome the barriers to EUL for more traditional purposes, such as upgrading old office facilities. Could similar tools assist federal managers to identify and capitalize on opportunities to use this real estate management authority for energy security with DG/CHP projects?

Agency needs and interest in using such an approach are vital considerations. DoD recently commissioned studies to identify opportunities for locating energy generation facilities to use both renewable and fossil fuel resources on DoD properties in the western U.S. The execution of projects in the future, where merited, could be greatly facilitated with a streamlined vehicle for energy projects using leasing authority. In the coming months, FEMP will continue to discuss the options with potential customers to identify what would be required to provide agencies with a superior tool for developing and financing DG/CHP projects. Thus far, it appears that facility managers would have interest in a mechanism with the following characteristics:

- Consistency with DoD utility privatization guidelines
- No contingent liabilities in the event of at least a few major named perils (private sector carries risk)
- Minimum red tape and administrative costs
- OMB acceptance of related energy service agreements without scoring (avoid capital lease classification)
- Assurance of low costs for energy commodities to the government
- Availability of multiple, pre-approved, qualified contractors

- A mechanism similar to IDIQ that facilitates rapid contractor selection and award and provides the necessary structure to enable learning-based streamlining.

Based on the authorities identified, FEMP is investigating approaches that could address these criteria and is reviewing legal and contractual issues and potential show-stoppers. For example, the legal basis for outleasing in DoD and the VA is similar, but based on separate authorities, and the National Aeronautics and Space Administration (NASA) received “EUL demonstration” authority for two projects in the FY03 Omnibus Appropriations bill. The Postal Service and some DOE facilities also have property management authorities that may be applied to this approach. Other civilian agencies may not be able to effectively use the leasing option under a new DG/CHP IDIQ until they, or GSA on their behalf, obtain explicit authorities to develop private projects on leased federal property and provide energy commodities services (e.g., electricity or thermal power) to federal and nonfederal customers. Could a process be structured that is specific enough to allow effective selection of qualified developers, but flexible enough to be used globally by any federal facility with outlease or similar authority? To what degree could a competitive process for DG/CHP be structured to allow selected developers to use the financing authority considered most beneficial for the specific case, based on whatever property management or private financing option the government prefers?

Some private firms have developed a specialized business model that conforms to many of the desired characteristics, in which the developer takes responsibility for design, permits, construction, ownership, and operation of the CHP system. The customer provides the physical site for the project and purchases the energy commodities (electricity, steam, hot and/or chilled water) at discounted rates. But most of these models include a long-term, take-or-pay energy service agreement that would create “scoring” problems for federal agencies (CBO 2003). The energy service agreements developed by the VA demonstrated an approach that avoided the scoring issue and transferred some of the risk to the developer. Using EUL, the VA developed energy service agreements limiting their contractual commitment to two years (with automatic renewals unless named perils occurred). The OMB reviewed the VA energy service agreement and confirmed that it could be used without being scored as a capital lease. Combining long-term outleasing authority, ability to sell energy services to third parties, and use of a two-year (renewing) energy service agreement, appears to be an advantageous approach for federal DG/CHP if it can be financed by the private developer (e.g., when risks are acceptable and/or non-federal customers will sign up long-term).

Informal discussions on these topics are ongoing with private companies active in this sector. Many have expressed strong interest in participating if a technology-specific DG/CHP IDIQ or similar process (for outleasing opportunities) were to be offered. Some of the issues expressed by the private sector are similar to those of the public sector (minimize red tape and administrative costs). But many companies are concerned that very few projects could be financed if the host federal site is unwilling or unable to make long-term commitments. How this risk is managed will be a “make or break” factor for many projects. In some states, if the federal customer terminates its energy service agreement, the electricity is saleable at retail, in others only at wholesale. The value of thermal services might be lost or possibly recovered from new tenants in the same facilities. Regardless, the level of perceived risk will affect interest rates and the viability of project financing from the start.

Initial assessment efforts identified a new IDIQ, recently signed by the Department of Interior for global use in support of “critical infrastructure protection and energy resources (CIPER).”

This contract appeared to offer flexibility to meet many of the criteria desired by facility managers for privately financed and owned DG/CHP systems, but it was yet to be tested.

Reviewing Lessons Learned

A large amount of information has been generated over the past 18 months on federal CHP. In addition to more than 100 screenings for new CHP, through a process of discovery, over 50 federal sites were identified that have been served by CHP systems or have CHP projects in development. Several generalizations can be drawn from the screening experience and characteristics of existing federal CHP systems.

- Opportunities for CHP are usually most cost-effective where thermal requirements are significant and electric rates are high (or expected to increase significantly).
- Larger (>1 MW) CHP plants where waste heat can be fully utilized in existing steam or hot-water distribution systems tend to offer the best economic returns.
- Larger systems require larger capital outlays, but appropriations for design and implementation of large projects are very scarce.
- In some cases, plant upgrades or investments in energy security that are required anyway could be completed more cost-effectively with CHP.
- DoD sites with recent DG/CHP projects have tended to use ESPC and UESC vehicles. This has allowed several sites to improve energy security and reduce costs and emissions while upgrading existing central plants and/or installing new generation capacity on site. Ease of procurement (IDIQ for ESPC) and focused marketing were key enabling factors.
- Future ESPC and UESC use for CHP at DoD and VA sites may be limited because of concerns about contingent liability and interest in privatized approaches to energy generation infrastructure.
- An alternative based on outleasing authority was demonstrated by the VA and appears to address some of these concerns. However, the process to develop the EUL projects on a site-specific basis took a great deal of time, and the availability of financing may depend upon the willingness of adjacent non-VA customers to sign long-term agreements.
- Recent improvements in DoD leasing authorities are poorly understood, underutilized, and managed separately from energy security and energy savings. We are not aware of a project combining CHP with DoD's outleasing authority.
- A technology-specific IDIQ can catalyze the adoption of new technologies in the federal sector.

Given this experience, the hypothesis is that DG/CHP will have a better chance of meeting its potential to improve energy security, save energy, and reduce costs if it is readily accessible under a pre-competed, technology-specific, mechanism that permits third-party design, construction, ownership, and operation. This mechanism will be more likely to succeed if it offers a variety of qualified firms with extensive experience in design/finance/build/operate

power systems, and allows the sale of energy commodities and services to nonfederal as well as federal customers. DoD, VA, NASA, USPS and some DOE facilities have authorities that could permit such an approach. FEMP is trying to determine the degree to which this type of approach could overcome present procurement barriers, reduce administrative costs, and be of interest to federal customers and potential private partners.

Conclusions

Despite the present barriers, as of January 2003, at least 40 federal sites were investigating CHP opportunities with capacity in excess of 150 MW (see Fig. 6). A few of these projects are now well beyond the initial feasibility phase and are supported by private financing (ESPC, UESC, and two new VA EUL projects) with little or no allocation of appropriations for design and construction. Note that in Fig. 6, the graph's blue bars denote number of sites that are investigating their CHP potential; the red bars show the CHP potential of these projects in megawatts.

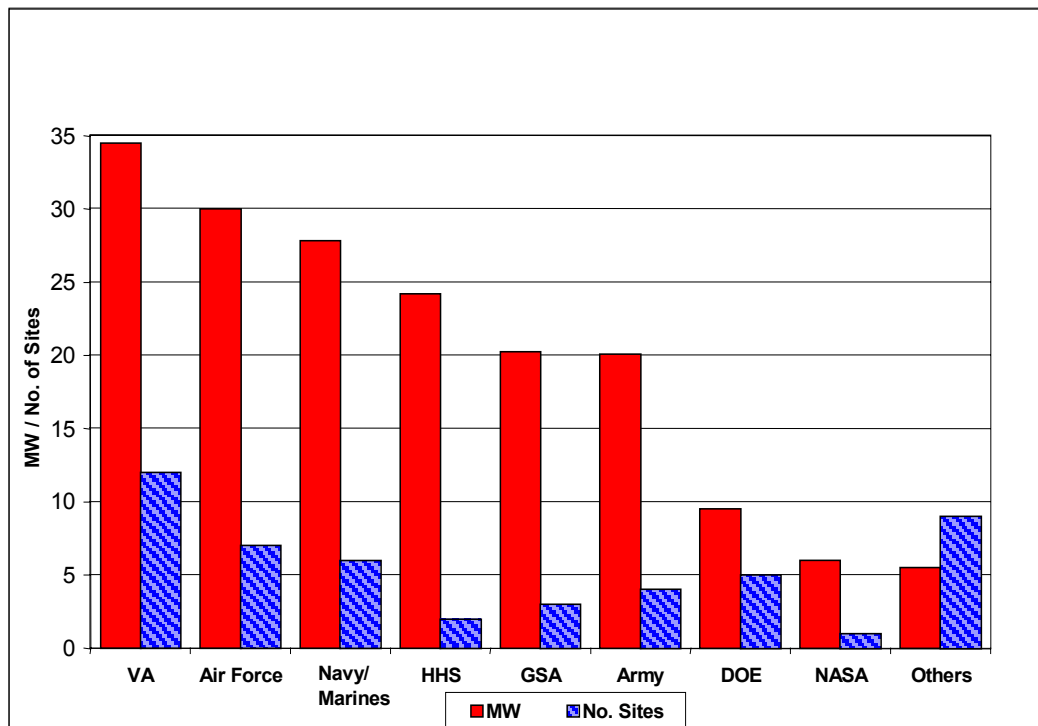


Figure 6. Federal facilities investigating CHP or moving forward with projects, shown here by number of sites and megawatts, by agency (ORNL January 2003).

Federal facility managers appear to be interested in a means to finance DG/CHP in situations where ESPC and UESC cannot meet specific site needs. A technology-specific approach to outleasing could provide access to privately owned and operated DG/CHP without needing to reinvent the wheel for selection and procurement each time. DoD facilities interested in improving energy security as well as saving money through DG/CHP could pursue this while complying with utility privatization policy and without being diverted from their core missions. Much of the burden associated with design, financing, permits, privatization, and procurement could be transferred to the private sector. However, just as with ESPC, agencies using a new

technology-specific approach would need to commit resources to facilitate its effective use. Is there sufficient interest in this option to justify the effort?

ORNL is leading FEMP's assessment to answer some of these questions and optimize value and ease of access to DG/CHP in the federal sector. The assessment attempts to consider all reasonable options, ranging from a new technology-specific outleasing approach to the development of improved procedures and templates to facilitate access under existing contracts (see Table 2). This paper presents status on a work in progress. ORNL welcomes comments to make this assessment more effective and useful for federal agencies. Please send your suggestions to the authors listed on page 1 of this paper.

Table 2. FEMP Preliminary Assessment of Options to Facilitate Federal Access to DG/CHP Using Private Development & Financing

Option Considered	Advantages	Disadvantages
No action	No extra cost/effort needed Projects move forward on case-by case basis where possible with ESPC, UESC and EUL (existing authorities) Agency support systems in place for ESPC and UESC	Several market obstacles limit use of existing options New project development pace likely to be slow Difficult for many sites interested in acquiring energy security through DG/CHP to access private development funds High transaction costs associated with reinventing the wheel as EUL is used on a site-specific basis.
Support new tech-specific ESPC for DG/CHP	Would likely bring new specialized firms into program Creates incentive for more focused marketing efforts by ESCOs specializing in DG/CHP	Large effort required to bid new contract that does not address many key CHP market barriers Not likely to have large impact on rate of project development Tech-specific ESPC not needed if ESCOs with ESPC contracts already investigate CHP
Modify ESPC authority to allow lease option and do tech-specific	Incentive for more focused ESCO marketing Lease option would be an additional financing tool for sites with special needs Could address privatization, outlease, and capital scoring issues	Involves two fundamentally different authorities that may be difficult to combine Requires Congressional action that is not likely to occur or could take a long time Large effort required to bid out a new tech-specific contract, subsequent to Congressional action, and develop related tools to use new authority
Support public-private Ventures	Existing authorities Tested (with mixed success) 30-year time frame	Perceived as time-consuming, cumbersome process Past use for CHP locked customers into long-term, take-or-pay contracts. Alternatively, private sector may be unable to accept risk (e.g., where no third-party customer sales are possible and perceived uncertainty exists about site's long-term commitment) Outlease option appears to offer same capabilities with more flexibility
Utility privatization (DoD)	Existing authority High priority for DoD Support system in place Process already underway (note: there is not necessarily a conflict between this and other options; they can often serve different purposes)	Does not usually address energy security-DG/CHP goals: new on-site equipment/capacity for security and environmental benefits Process is long, complicated and already in advanced stages at many sites. Approach is not appropriate for all sites--dependent on security issues and ability to get fair market value for assets.
Support new tech-specific approach that allows enhanced leasing (similar to VA model) for DG/CHP	Flexibility to adapt to different site needs and conditions VA model provided CHP dollar savings and greater security, and avoided capital lease scoring issue Could foster focused marketing by group of specialized developers Authority in place for key agencies Lease term determined per best interests of DoD	Outlease projects to date have been highly site-specific Complicated effort may be required to effectively pre-select qualified developers Limited support systems in place—would need to train agency staff Unproven for energy projects at DoD sites Lease option not appropriate for all; private sector may be unable to accept risk in some cases (e.g., where no third-party customer sales are possible and perceived uncertainty exists about future federal mission) Research underway to assess feasibility and interest in this approach

Option Considered	Advantages	Disadvantages
Support use of CIPER IDIQ (possibly in conjunction with lease authority)	IDIQ is available immediately without need for competition Flexibility to adapt to different site needs and conditions Counts toward small business goals Experienced developers could be accessed as subcontractors	No clear advantage to using this IDIQ in conjunction with private financing and outleasing (would require two separate, parallel processes) Unproven—new IDIQ Small business may have limited administrative capacity compared to potential demand Would require effort to develop tools for broad use and perhaps conduct a competitive process to identify “pre-qualified providers” for DG/CHP focus Requires some up-front funding from the federal agency. Private sector may be unable to accept risk in some cases (e.g., where no third-party customer sales are possible and perceived uncertainty exists about future mission)

Source: ORNL, preliminary assessment status as of May 2003.

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