U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

FEMP Federal Energy Management Program

Energy Improvements & Alternative Funding Options

May 1, 2018

Scott Wolf, ORNL
Tom Hattery, ORNL
Richard Oram, LIGO
Rob Reid, NCAR
Kevin Porter, NSF

Federal Energy Management Program

U.S. Department of Energy

Work Shop Session Objectives

- Should NSF pursue DOE programs for financing energy saving initiatives?
- What Facilities are interested?
- Learn some alternative approaches to saving energy

Work Shop Session Overview

- DOE Federal Energy Management Program (FEMP) – Scott Wolf, Tom Hattery, ORNL
- NASA Jet Propulsion Lab Case Study
- LIGO Case Study – Richard Oram
- Gemini Case Study
- NCAR Case Study – Rob Reid
- Q&A
- Next Steps

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FEMP Federal Energy Management Program

DOE-FEMP Energy Finance Options for NSF Consideration

May 1, 2018

Scott Wolf, ORNL, Federal Project Executive
Tom Hattery, ORNL, Federal Project Executive

Federal Energy Management Program
U.S. Department of Energy

FEMP's Mission

The U.S. Department of Energy's Federal Energy Management Program works with key individuals to accomplish energy change within organizations by bringing expertise from all levels of project and policy implementation to enable federal agencies to meet energy-related goals and provide energy leadership to the country.

Financing Vehicles for Federal Energy Projects

These vehicles can finance energy improvements without up-front capital costs or special appropriations

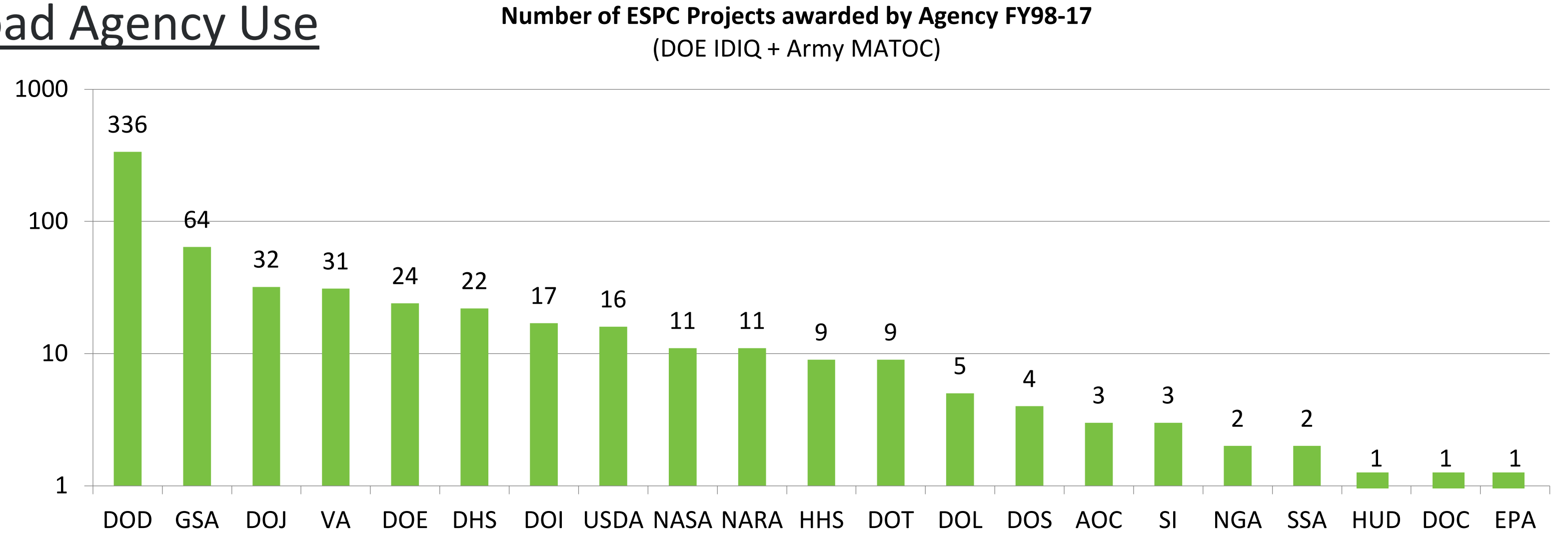
- **Energy Savings Performance Contracts (ESPCs)**
- **Utility Energy Services Contracts (UESCs)**
- **ESPC ENABLE**
- **Energy Sales Agreements (ESPC ESAs)**

ESPCs, ESPC ENABLE, and UESCs have much in common:

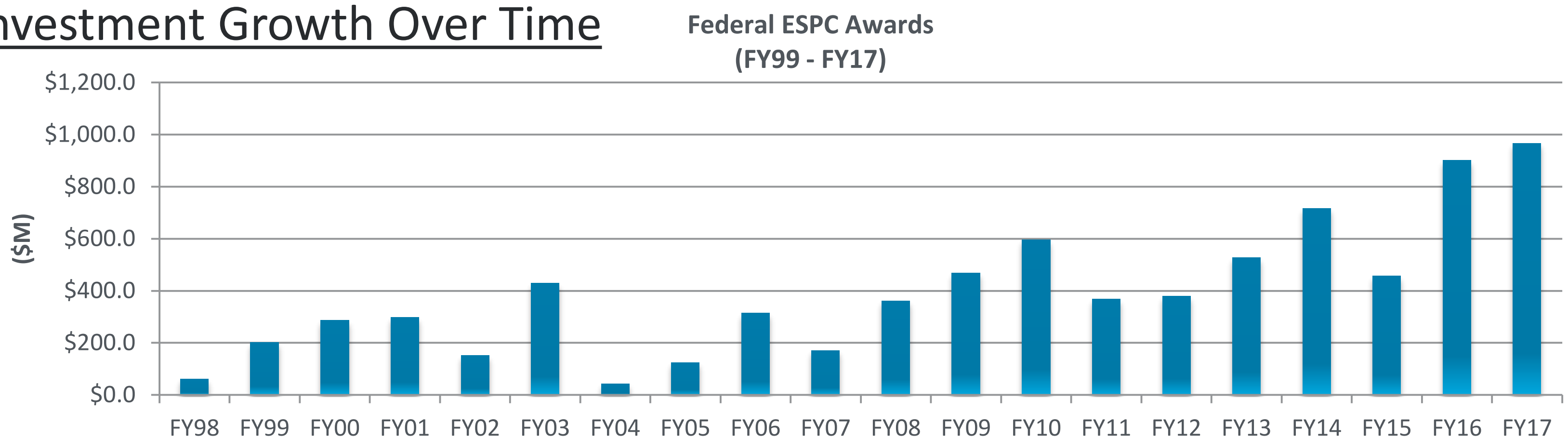
- Private sector provides audits, designs, labor, materials, financing
- Agency pays for the project over time out of cost savings
- After project is paid off, all further savings accrue to the agency
- FEMP can provide project facilitation and other support

Agency use of ESPCs

Broad Agency Use



Investment Growth Over Time



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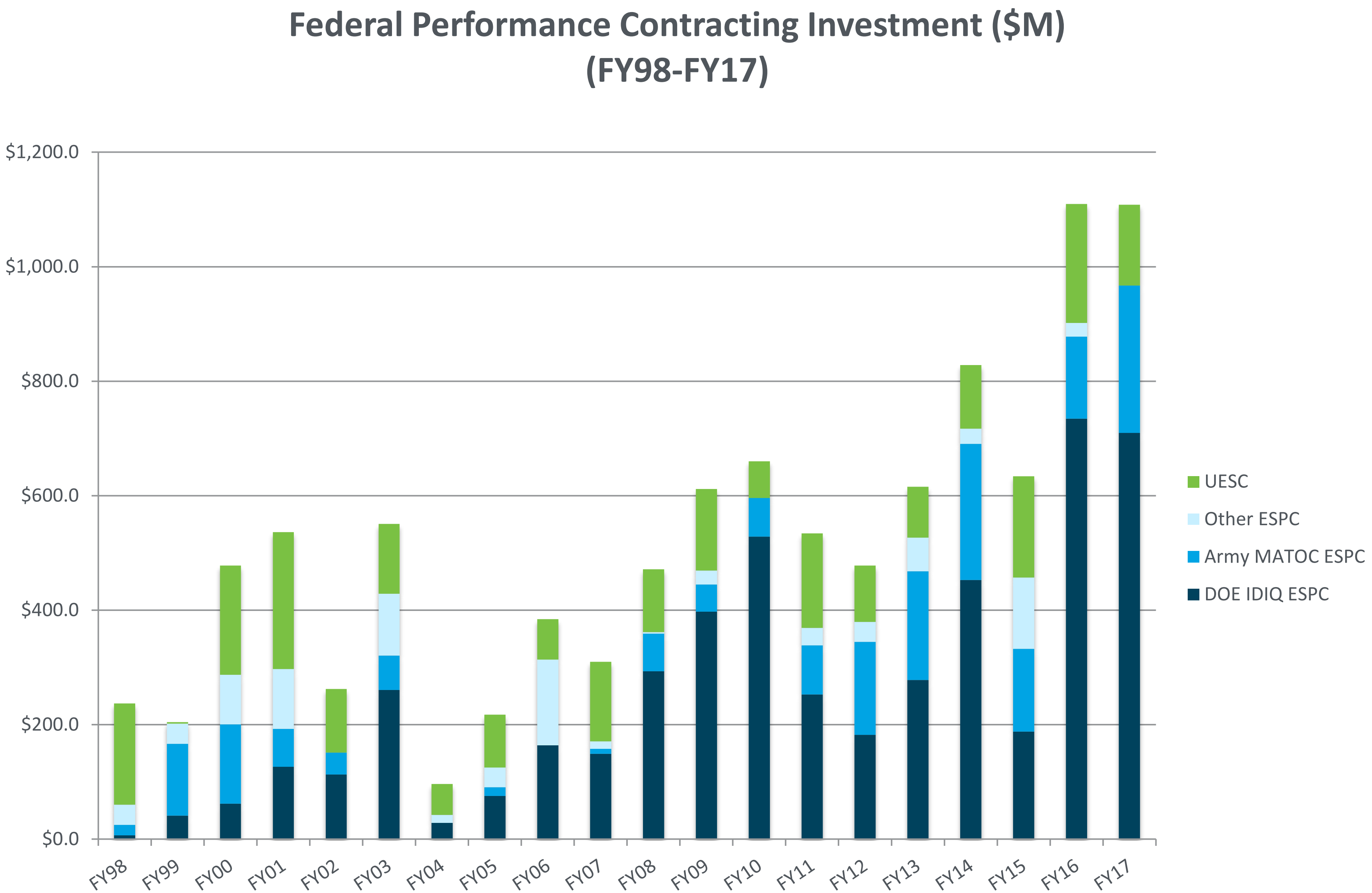
Federal Performance Contracting History



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At-a-Glance Comparison of Financing Options

	DOE ESPCs	ESPC ENABLE	ESPC ESAs	UESCs
Contract type	Task orders under DOE IDIQ	GSA Schedule 84 (SIN 246-53)	May be either a stand-alone contract or a task order under the IDIQ, as an ECM within an ESPC	GSA Area-wide contracts; basic ordering agreements
Private-sector partner	ESCO	ESCOs on GSA Schedule 84 (SIN 246-53)	ESCO on Qualified List	Serving utility company
Eligible facilities	Federally owned worldwide	Federally owned facilities	Federally owned facilities, or on federally owned land.	Where government pays utility bill; where offered/ authorized

GSA = General Services Administration
ECM = Energy conservation measure
ESCO = Energy services contractor
O&M = Operations & maintenance
M&V = Measurement & verification

At-a-Glance Financing Options (continued)

	DOE ESPCs	ESPC ENABLE	ESPC ESAs	UESCs
Project size	$1 – 2 million or larger	No fixed size or $ limits; suitable for smaller projects	Typically 500 kW or larger	Any
ECMs	Unlimited	Lighting, water, basic HVAC controls and equipment, and solar PV; boilers, chillers, motors being added	Renewable generation that is initially privately owned	Unlimited
Savings guarantees / M&V	Required	Required; simplified M&V	Required; option B M&V metering is recommended	Negotiable; performance assurance required for annual scoring
O & M	ESCO responsible; tasking is negotiable	Government or ESCO; ESCO provides training	ESCO must perform	Negotiable

What are ESPCs?

Contracts that allow energy service companies (ESCOs) to identify and implement energy efficiency upgrades paid for by energy savings without additional appropriations

Energy Services Company (ESCO)

- Provides development and installation of energy and water conservation measures
- Guarantees resulting cost savings sufficient to cover project cost

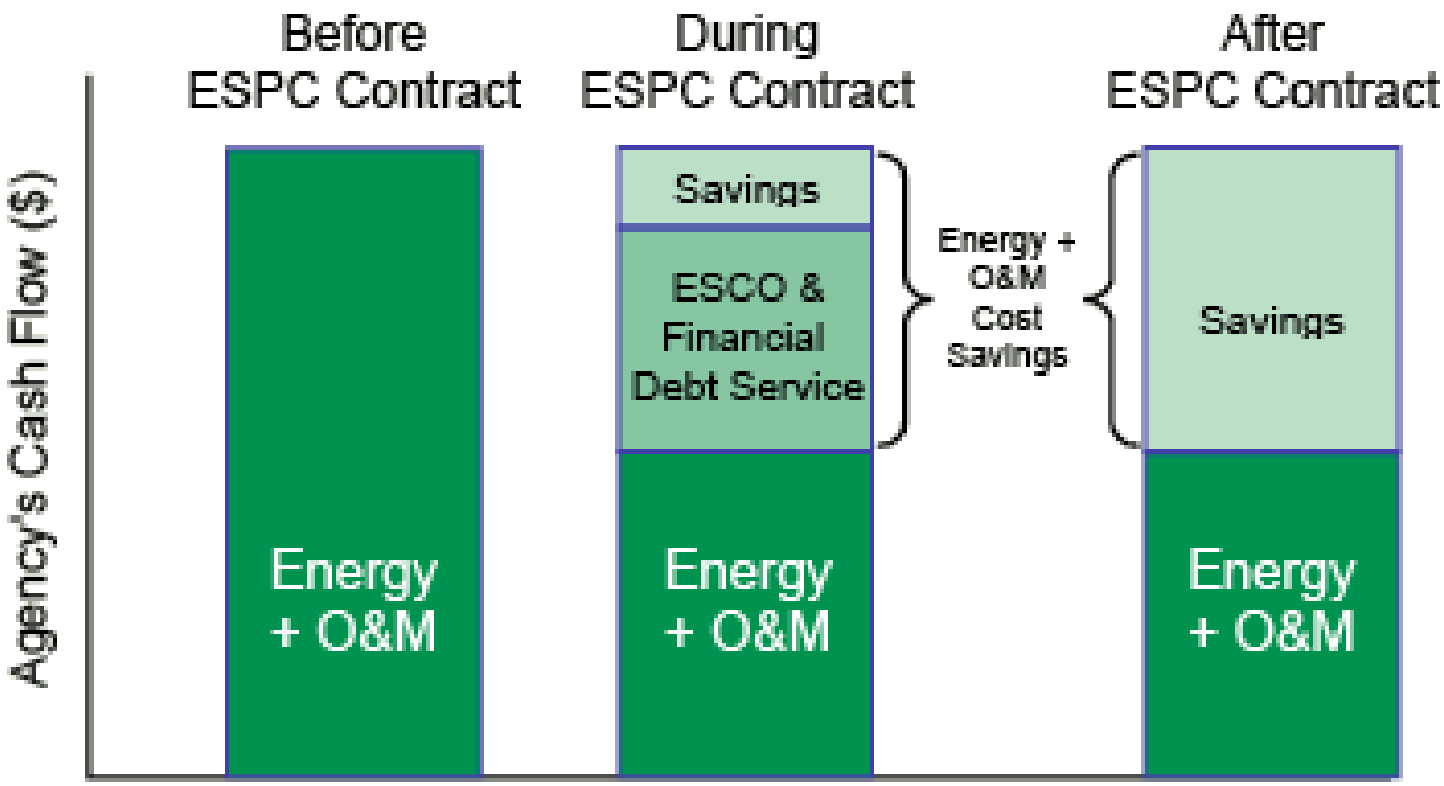
Agency

- Requests/reviews ESCO proposals
- Pays ESCO over term of contract from guaranteed cost savings
- Monitors annual Measurement and Verification protocol to ensure savings

ESPCs Are Budget-Neutral

Reallocate the Government's Utility Bill:

♦ Stop paying for waste and pollution ♦ Start paying for efficiency ♦



Benefits: Decreased Costs, More & Better Science

- Fund energy improvements with no up-front capital costs (save appropriations for other needs)
- Required Guarantees:
  → Annual Cost savings
  → Equipment performance and standards of service
- Reduce maintenance costs, downtime
- Increase reliability, capacity, functionality, resiliency
- Provide critical facility data
- Free up $ for Science
- More operations time (science "uptime") = reduced maintenance + increased reliability
- Improved Environmental Quality, Detector Performance

Project Example – NASA Jet Propulsion Laboratory

- Overview
  - Expand on-Laboratory high efficiency data center capacity
  - Build out a high efficiency data center in an existing facility
  - Install a scalable Modular Data Center (MDC) to allow for geographic separation of IT assets
  - Allow for existing lower efficiency data center to be retired
- Benefits to NASA
  - Help facilitate NASA JPL's data center consolidation efforts
  - Reduce NASA JPL's data center-related energy costs, including utility and IT costs
  - Provide lower PUE data centers with more efficient cooling infrastructure
  - Allow NASA JPL to consolidate and virtualize IT assets
- **Projected Annual Savings: $2.6 Million**

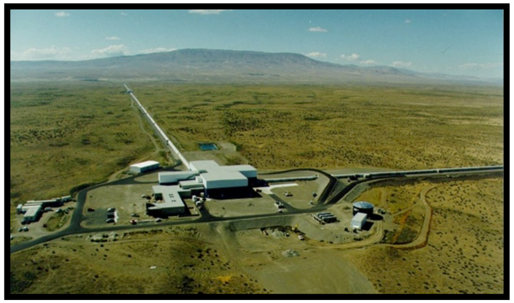
ESPC and IT/Data Center

- IT/Data Center ESPC projects can stand alone or be part of a comprehensive project including any other building systems.
- IT projects can save a very high percentage of energy
- Technical solution is in the control of the agency IT departments.
  - Performance should be enhanced, security increased.

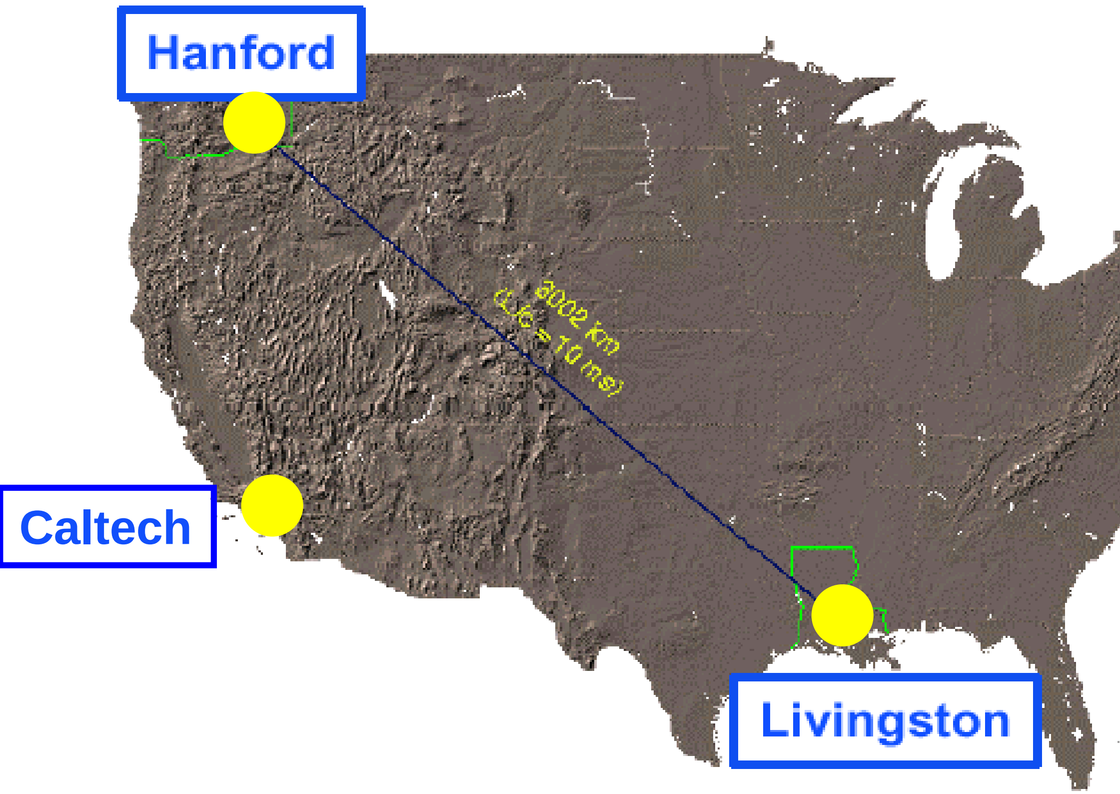
Energy Case Study #1 – LIGO Facilities

- Facility Mission ✓
- Stated Energy/Facility Improvement Needs to Support Mission ✓
- Energy Rates and Costs: ✓
- Building & Land Ownership Status: ✓

LIGO Laboratory: two observatories, Caltech and MIT campuses

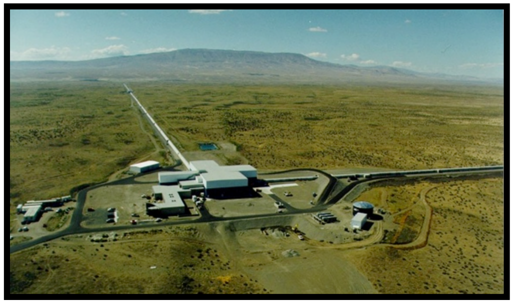


- Mission: to develop gravitational-wave detectors, and to operate them as astrophysical observatories
- Jointly managed by Caltech and MIT; responsible for operating LIGO Hanford and Livingston Observatories
- Requires instrument science at the frontiers of physics fundamental limits



Observatory Sites overview

LIGO operates and maintains two observing sites:



- LIGO Hanford Observatory (LHO), located on 1500 acres of shrub-steppe on the Department of Energy's Hanford reservation in Washington State;

- LIGO Livingston Observatory (LLO) located on 180 acres of wetland surrounded by pine forest leased from Louisiana State University (LSU), in Livingston Parish, Louisiana.

- Both observatories sit in rural settings, remote from MIT and Caltech, in environments with low intrinsic ground vibration. Their locations afford level, orthogonal 4 km long laser beam lines paths separated by a 3000 km baseline.

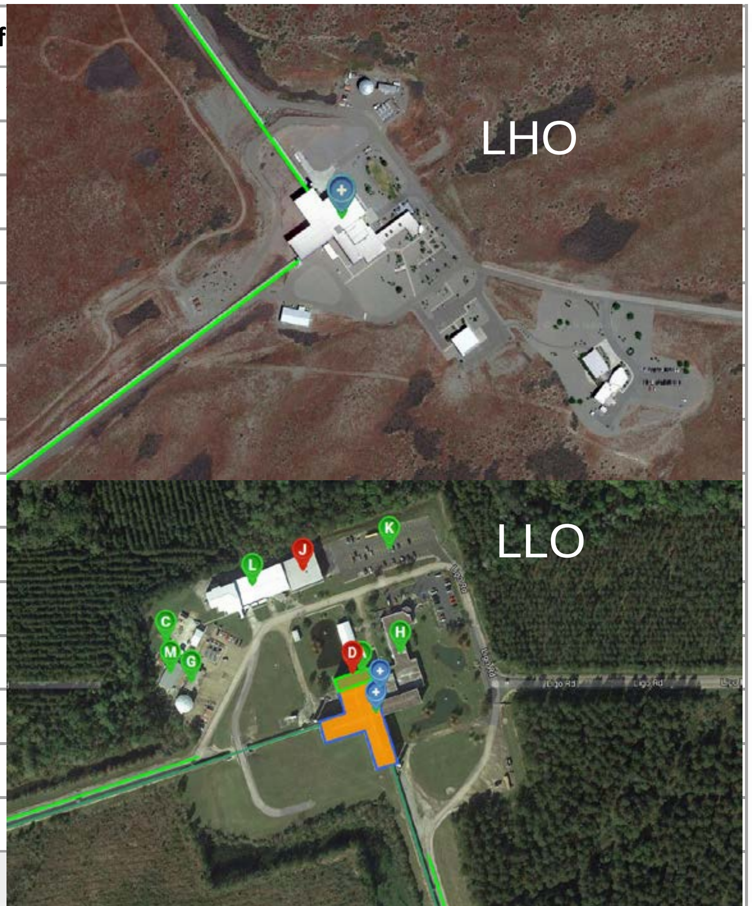
- We plan LLO & LHO facilities maintenance and refurbishment anticipating at least 20 more years of operation.

Observatory Sites overview

The LIGO detector must run 7x24 during runs
(since Nature can send events at any time)

- Each site hosts over 98,000 ft^2 of climate-controlled laboratory, office, and auditorium space, totaling 26 buildings and associated assets (13 buildings at each observatory).

Campus Name: Hanf
Asset
Corner Mech. Rm.
H2 Electronics
Lab areas
Laboratory Science Building (LSB)
LVEA
Maintenance Building
OSB
Staging Building
VPW
X Arm End Station
X Arm Mid Station
Y Arm End Station
Y Arm Mid Station
Subtotal for Building



- To meet detector noise and environmental requirements, HVAC systems employ geographically-isolated chillers (with backup redundancy), special low-vibration constant-velocity fan units, humidity suppression, HEPA filtration, and tight temperature regulation (+/- 0.25 ºC year round).

Electrical Consumption

- The facilities electricity budget covers the cost of electrical utilities.
  - Each site consumes approximately 1 MW of AC power from local utilities.
  - At each site 13.6 kV 3-phase power is distributed to widely-separated stations, where it is stepped down to various 480V 3-phase panels and specialized DC power systems that provide quality power to the sensitive detector electronics.
  - The maintenance of the electrical systems is critical to detector performance.

- LLO uses approximately 20000 KWH per day at a cost of ~ 8 c per KWH and this is fairly consistent year round. When we are science observing for multiple months periods there is less engineering activity and so we consume a little less power.

- LLO averages around 1MW power usage at any time, however, the event of a power glitch or interruption often causes many pumps and motors to start up and this demands a peak load of around 1.3 MW. LLO's electricity supplier DEMCO monitors our load continuously and calculates a "capacity fee" derived from the maximum or peak load used in any 15 min interval over that month.

LIGO Efforts to Reduce Electrical Consumption

The LIGO Facilities group has successfully made improvements in energy efficiency, specifically by installing more energy efficient chillers, improved tuning and operating point of facility HVAC, modern computer cluster facility designs, all of which have resulted in measurable energy cost savings.

- We will continue the drive for cost saving measures that reduce the observatories energy consumption through the next five year period.
- LIGO Laboratory Property Lifecycle Maintenance Plan (PLMP) identifies strategic renewals/ modernization of aged building systems that will deliver improved reliability and performance as well as energy saving.
- Other new initiatives are being studied as part of DOE's Federal Energy Management Program the scope of which includes cost saving measures in Heating and chiller plants, energy management control systems, building envelope, HVAC, chilled/hot water distribution, lighting, electric motors/drives, refrigeration, renewable energy, water and wastewater, and electrical peak shaving/load shifting.

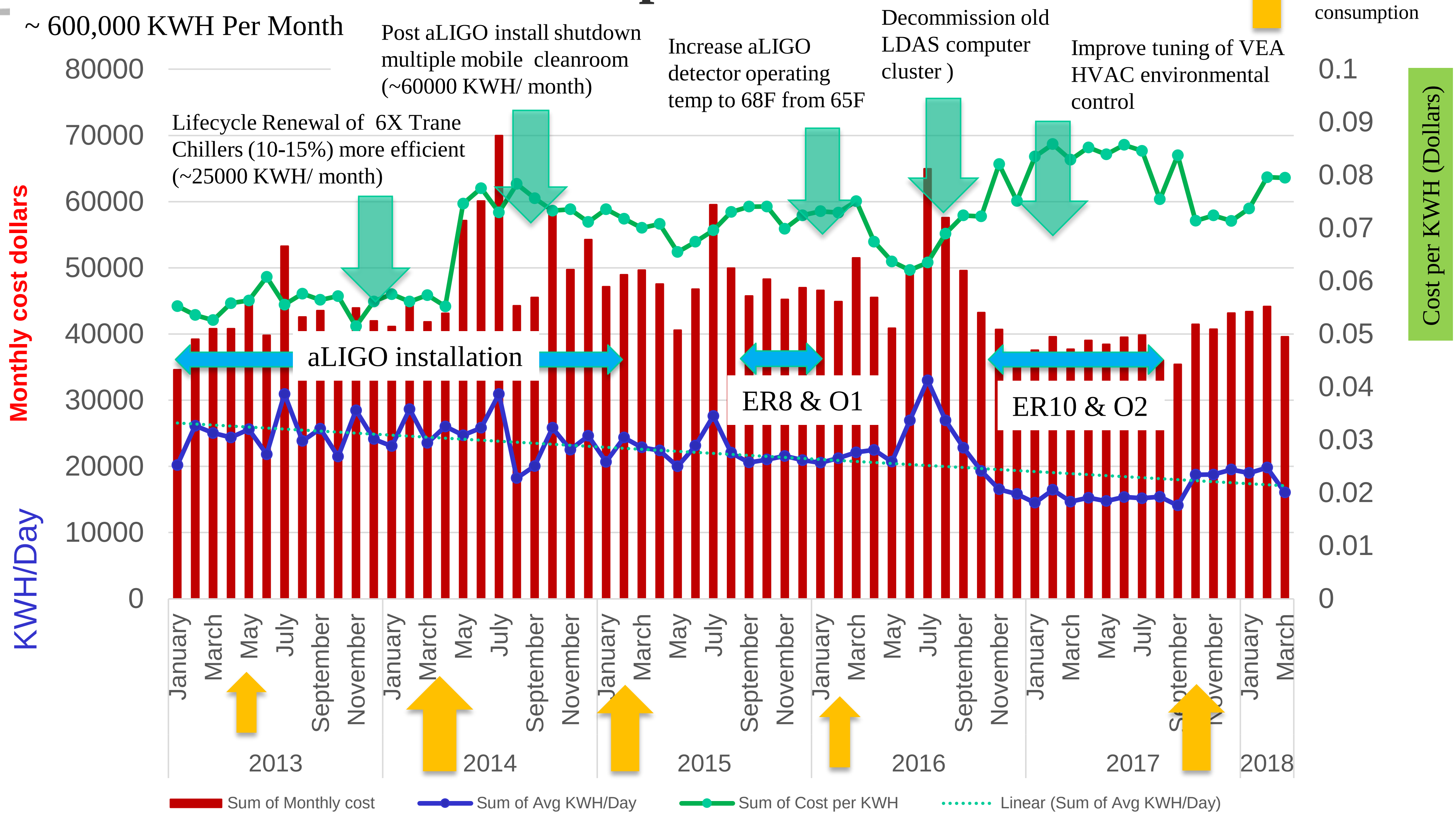
Some Major Facility Lifecycle Renewals completed ahead of O1.

- **Re-roofing of Twelve original roofs & reinstall lightning protection- Completed Feb 2014 with a 20 year warranty**
- **Renew original Main and End station chillers: 6 new & 1 refurbished- Completed Feb 2014**

LLO Operations: Site Electrical Power Consumption 2012- 2018

Activities that reduce consumption

Activities that increase consumption



Add 28X 25KVA transformers along X and Y arms (~7000 KWH/ month)

Add 6X Dehumidifier Engines along arms (~28,000 KWH/month)

Extra cost of maintaining VEA building temps @ extremely narrow (+/- 0.25 F) control band

Addition of new (more efficient) DCS computer cluster room 72,000 KWH/ month

Post O2 switch on multiple mobile cleanroom (~60000 KWH/ month)

R. Oram, April 4th 2018

Energy Case Study #1 – LIGO Facilities, Continued

- Utility Bill Payer: ✓
- Potential Approaches Researched: ✓
- Discussion Topics with FEMP: ✓
- Additional Topics to Explore: ✓
- Recommended Approach?: ✓

Very preliminary discussions with DOE FEMP: *Focus on education*

ORNL Adjustments
ORNL Concurs with original assessment

Total annual electric cost $1.3 M

Total annual cryogen cost $0.45M

Categories	Comment	Project Cost Implement	$ cost reduction per annum	ROI Time	ORNL Notes
Energy management control systems	LLO had upgrade in 2015, LHO in 2017	$350,000	$45,000	7.8	
Boiler and chiller plants	LLO had chiller upgrade in 2014, LHO chiller upgrade is planned 2020	$1,162,500	$80,085	14.5	1550 total tons @ $750/ton replacement cost
Building envelope	Re-roofing of Twelve original roofs & reinstall lightning protection- Completed Feb 2014 with a 20 year warranty	$500,000	$55,000	9.1	Basic weatherization would likely be on the order of $100K. The assumption of $500K would likely address some windows and/or insulation measures. Savings set to DOE ESPC program average of 5000 MMBTU/$ invested
HVAC		$500,000	$40,042	12.5	uncertain if $500K of HVAC opportunity exists
Chilled/hot water and steam distribution		$400,000	$26,695	15.0	$400K sounds high unless making large modifications to distribution of chilled water
Lighting	Already begun in selected LIGO buildings	$375,000	$33,000	11.4	based on estimated of lighting density per sq-ft, burn hours, implementation of LED lighting and lighting controls (occ sensors)
Electric motors/drives		$500,000	$40,042	12.5	$500K sounds high for facilities of this size.
Refrigeration	Both sites use significant Liquid Nitrogen	$1,200,000	$57,960	20.7	uncertain of level of investment opportunity
Renewable energy	200 kW PV per site	$1,200,000	$42,000	28.6	Modelled PV output for each site with NREL PV Watts tool and calculated savings based on site electrical rates
Energy/utility distribution	Transformer replacement	$400,000	$13,347	30.0	uncertain of level of investment opportunity
Water and wastewater	Both site run potable water treatment and sewage treatment plants	$150,000	$13,347	11.2	
Electrical peak shaving/load shifting	We average a little under 1MW at any time . However, in the event of a power glitch that often causes many pumps and motors to start up we get a peak load of around 1.3 MW.	$120,000	$13,347	9.0	uncertain of level of investment opportunity
Energy-related process improvement	Closed down little used spaces	$100,000	$26,695	3.7	uncertain of level of investment opportunity

Preliminary Assessment with DOE FEMP:

Agency Site - ESPC ENABLE Project Assessment

Scenario	Total Estimated ECM Installation Cost*	Yr 1 Energy Savings	Yr 1 O&M Savings	Total Estimated Annual ECM Cost Savings	Upfront payment	Simple Payback	Estimated Total Contract Cost Utilizing ESPC	Estimated ESPC Contract Term (yrs)**
#1: ALL ECMs	$8,049,000	$537,280	$25,000	$562,280	$0	14.3	$13,303,096	19 yrs.
#2: COMMON BASE ECMs (Controls, Boiler/Chiller, HVAC, Lighting, Water)	$3,045,000	$211,475	$25,000	$236,475	$0	12.9	$5,236,577	18 yrs.
#3: Common Base + Solar PV	$4,485,000	$253,475	$25,000	$278,475	$0	16.1	$8,433,479	23 yrs.

Total Estimated ECM installation cost includes estimates for ESCO's Investment Grade Audit (IGA) expense, indirect costs and mark-up

****Project Assumptions**

Financed Interest Rate	4.5%
Utility Rate Escalation	3.0%
Percent of Estimated Savings Guaranteed by ESCO	98.0%
Performance Period Annual Audit	Conducted by Agency

DOE FEMP executives: ESPC process phase 1

The project steps are outlined at https://www.energy.gov/eere/femp/federal-espc-process-phase-1-acquisition-planning

Step 1: Agency Contacts a Federal Project Executive

The agency contacts a FEMP federal project executive (FPE). The FPE helps the agency take its first steps toward an ESPC project by:

- **Leading an initial briefing to educate staff and management about ESPCs**
- **Helping determine whether an ESPC project is feasible**
- **Helping gain management support for the project**
- **Helping determine needed FEMP project support services**
- **Coordinating FEMP services including engaging a FEMP-qualified project facilitator.**

Step 2: Agency Considers Procurement Requirements

The agency contracting or procurement staff prepares to address agency-specific procurement requirements. The FPE advises about the unique aspects of ESPC procurements in these tasks, such as:

- **Assembling an ESPC acquisition team**
- **Determining the agency's requirements for the procurement at a high level**
- **Identifying review, business clearance, and approval requirements and responsible managers**
- **Beginning to develop an acquisition plan.**

Step 3: Agency Develops a Plan of Action for the Project

The agency lays the groundwork for soliciting the interest of energy services companies (ESCOs) through a notice of opportunity. This includes:

- **Determining project motivations and site needs**
- **Defining project requirements (and preparing the agency requirements document as needed)**
- **Determining the ESCO selection procedure**
- **Determining preliminary milestones for project award and implementation**

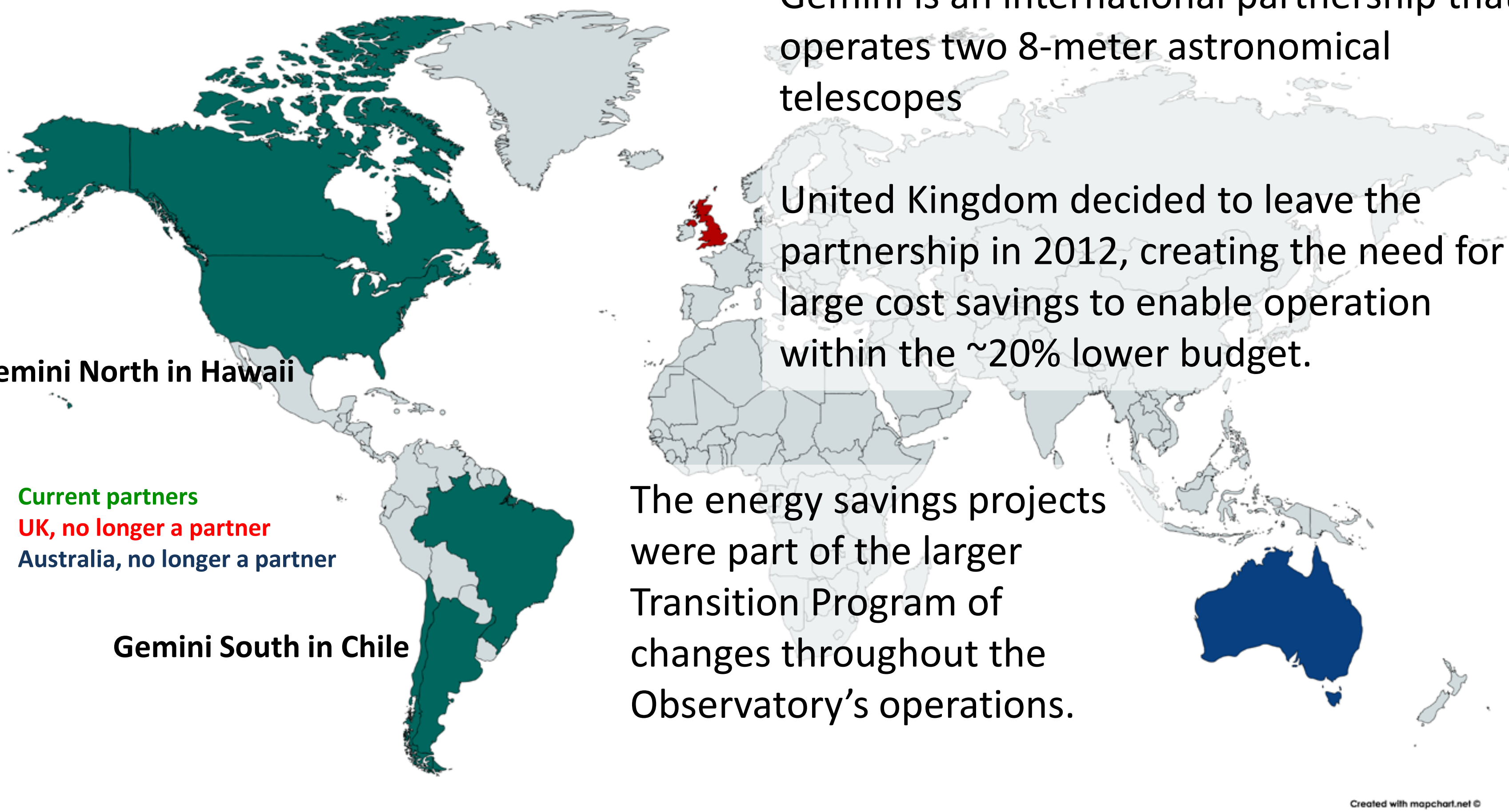
Planning for advanced technologies such as combined heat and power and renewable energy

Gemini Observatory: Energy savings projects

Gemini is an international partnership that operates two 8-meter astronomical telescopes

United Kingdom decided to leave the partnership in 2012, creating the need for large cost savings to enable operation within the ~20% lower budget.

The energy savings projects were part of the larger Transition Program of changes throughout the Observatory's operations.



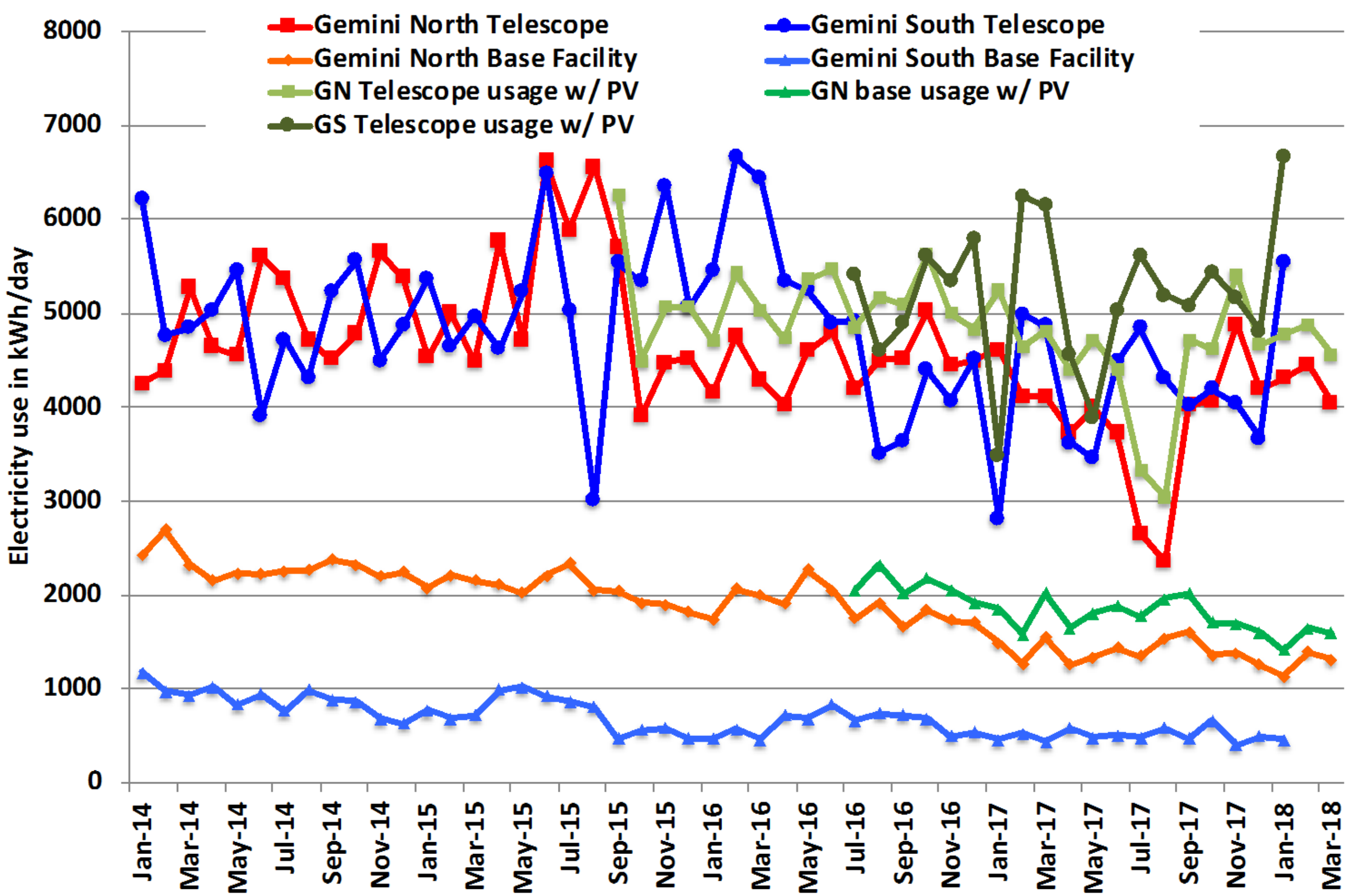
Energy savings projects

Description
Computer room hot/cold zones at all four sites to facilitate lower A/C load.
Gemini South Base Facility energy management to lower the A/C load.
Gemini North Telescope Photovoltaic system. 98.1kW system. Size limited by available space on roof and local regulations preventing ground installation. *Production at the Maunakea summit is ~63% larger than for the similar size system at the base facility in Hilo.*
Gemini North Base Facility Photovoltaic system. 94.5kW system. Size limited by local utility rules.
Gemini South Telescope Photovoltaic system. 206.5kW system. Size limited by available space on roof and flat ground.
Gemini South Telescope chiller replacements
LED lights at Gemini North Telescope and Base Facility
Gemini North Base Facility A/C upgrades
Transformer replacements at Gemini North Telescope and Base Facility
Gemini North Telescope variable frequency drive pump installation
Gemini North Telescope fluid cooler installation
Gemini North Telescope chiller replacement

All funding for all projects came from Gemini operations funds

25% reduction in kWh

40% reduction in $$ ~ $500k annually

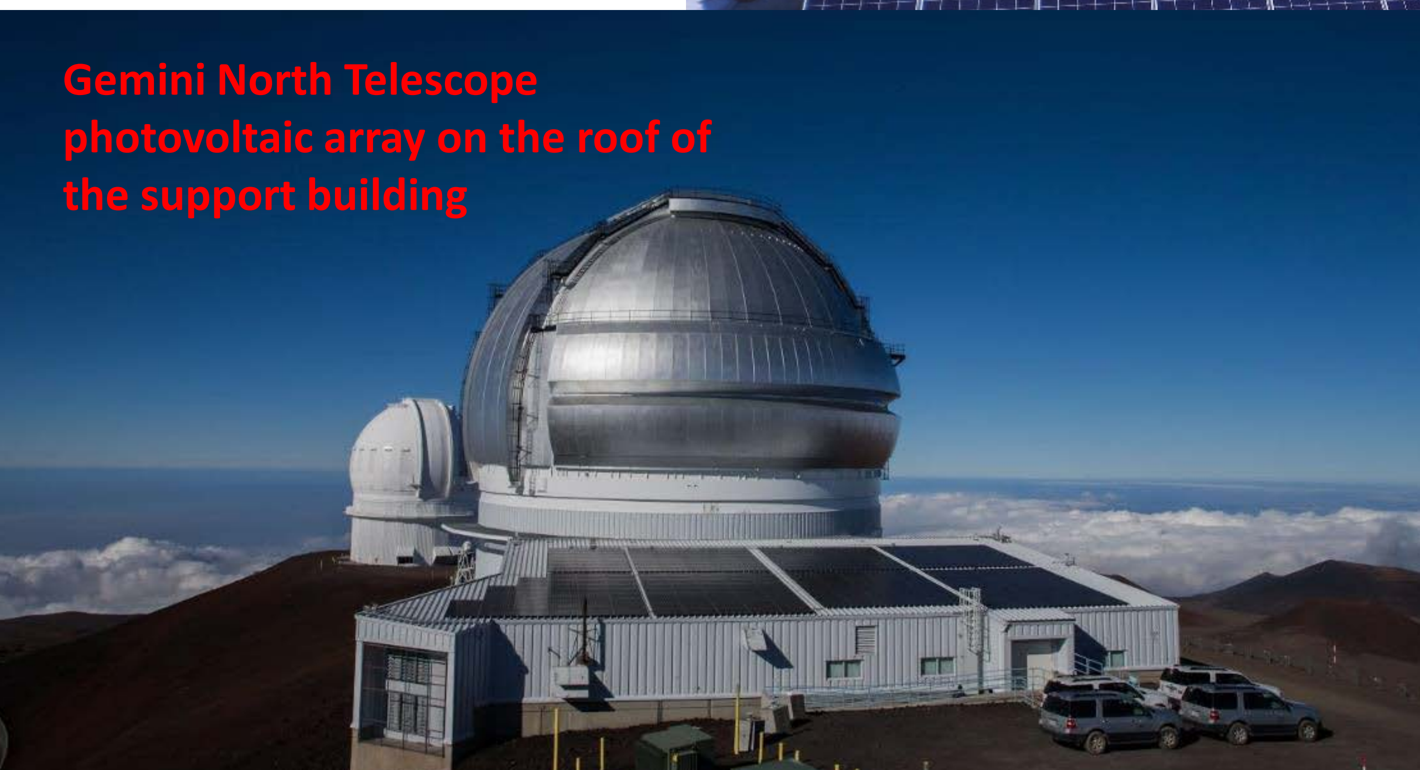


Electricity price in Hawaii decreased from 2014 to 2017. Implemented energy savings projects will shield us from the effect of rising prices later.

Considerations

- Review all electricity use for potential savings.
  - Simple changes in A/C configurations and airflow may save thousands of $$.
- A comprehensive plan for prioritization
  - Incorporate other reasons for replacement of equipment, e.g. end-of-life, environmental requirements for coolants
- Expert staff members for design, review, and oversight
  - Gemini staff members have expertise in photovoltaic panels, A/Cs and chillers.
- Plan for time required for NSF approvals
  - (1) Request for Bids and (2) Contracts
- Even with background checks, not all companies deliver on time or at cost.
  - Gemini parted ways with one contractor after partial implementation of contracted work.
- If at all possible, purchase equipment out right
  - Gemini's early attempt to enter into a electricity purchase agreement with a photovoltaic installer could not be approved by NSF, and in retrospect would have given lower savings.


Part of the Gemini South
Telescope photovoltaic array


Gemini North Telescope
photovoltaic array on the roof of
the support building

NCAR | UCAR

air • planet • people

Potential Projects For Inclusion into Performance Based Contracting Program

April 24, 2018

Past and Future Opportunities

- LED Lighting Upgrades
  - Research Aviation Facility Hangars
  - Parking Areas
  - Mesa Lab Lighting Upgrades

- Infrastructure
  - Multiple Sub metering installations
  - Research Aviation Facility Circulation Fan Installations
  - Mesa Lab Data Center Waterside Economizer and Heat Recovery System

- Facilities Condition Assessment Projects
  - Cooling Tower EOL Replacement
  - Chiller Replacement
  - Steam System Replacement
  - Air Handling Unit Replacements

Q&A?

- Questions?

- Comments?

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Q&A?

- Ok if facility is located in foreign country, Antarctica?
- How does an Energy Savings Performance Contract (ESPC) work with an NSF Cooperative Support Agreement (CSA)?
- What if ESPC payback period is longer than NSF CSA duration?
- Typical uses?

What Are Next Steps

- Should NSF pursue DOE programs for financing energy saving initiatives?
- Who's interested?
- How can we share information & experiences
  - DOE training for core groups of technical and procurement professionals – ESPC Workshop
  - DOE FEMP resources/references/info/contacts
  - Other forum for NSF facilities?
- NSF provide list of facilities and POCs to DOE FEMP?

Speaker Information

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Additional Background Slides

The Money Flow

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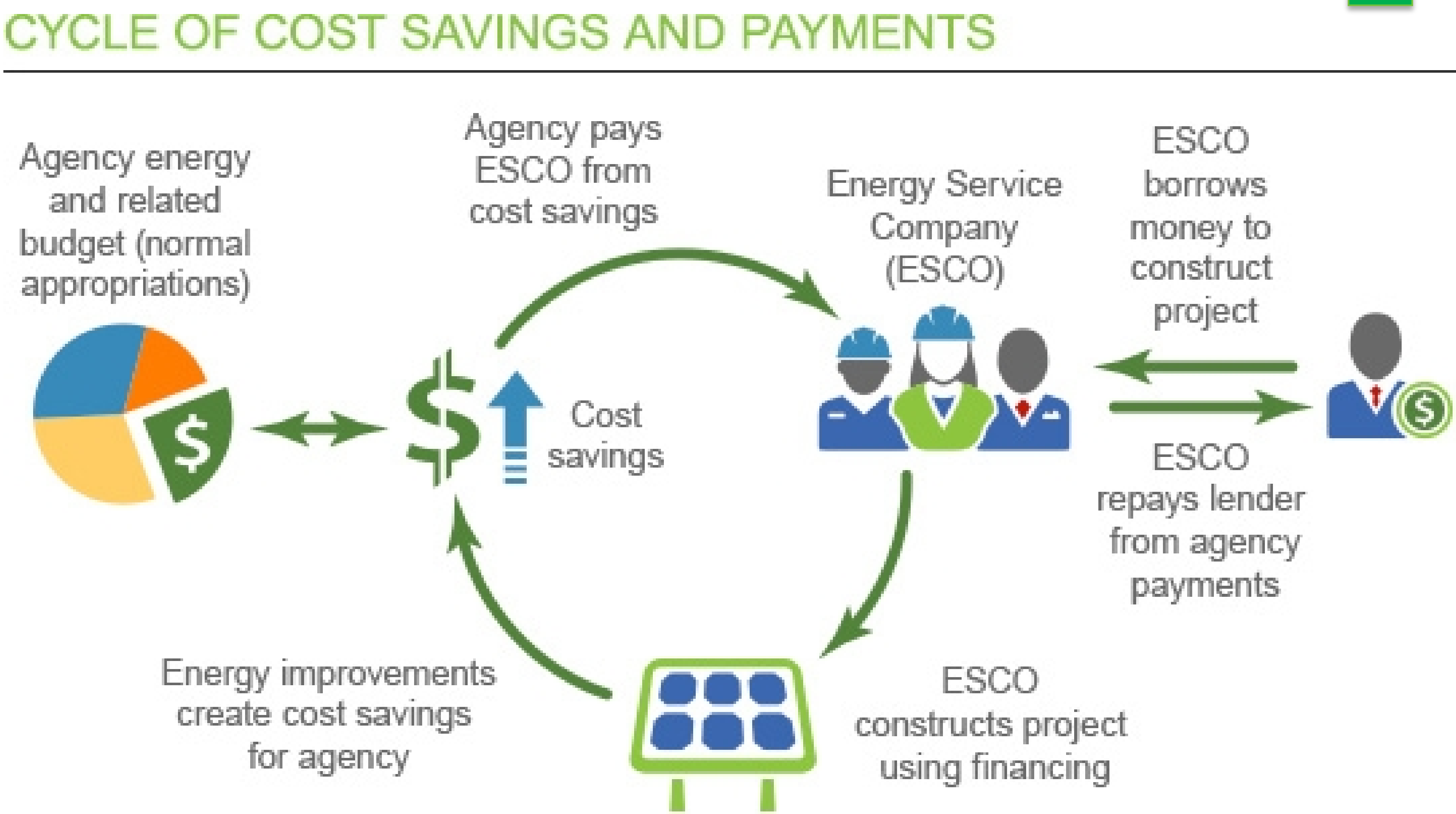
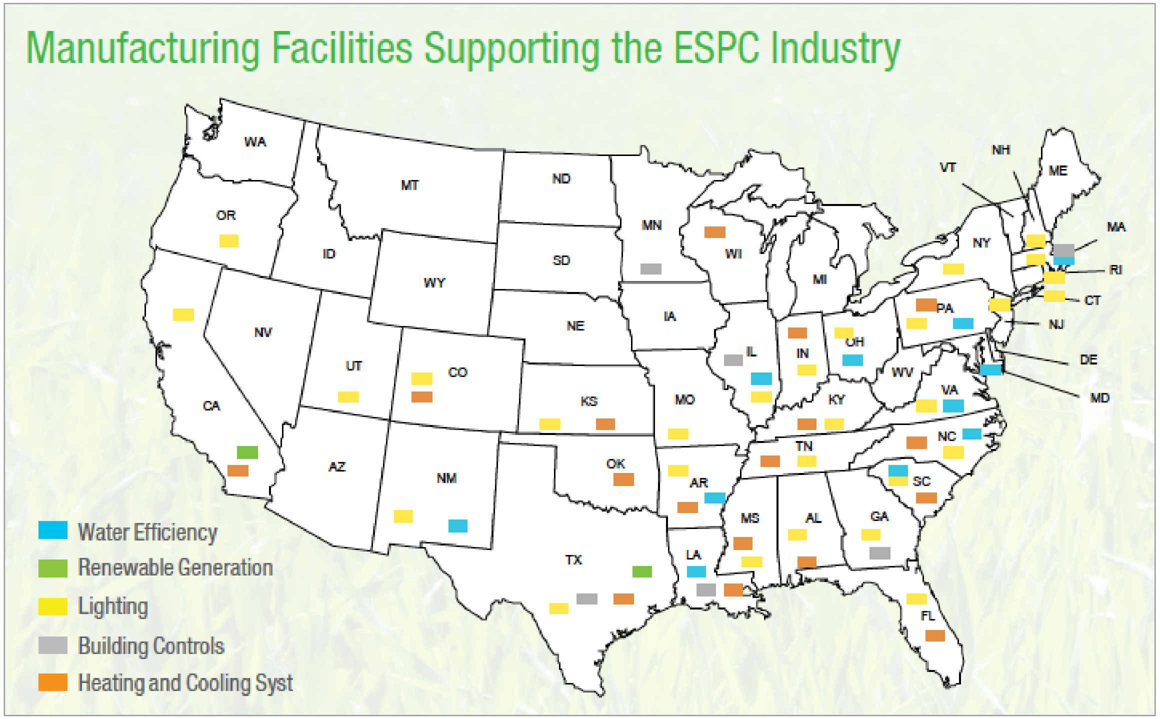


Federal ESPC Benefits

- **Infrastructure:** $7.9 B in investment since 1998 addresses a portion of the backlog in federal buildings and maintenance needs
- **Jobs & Economic Impact** of $7.9 billion investment created 63,200 jobs (job-years)
- **Support for U.S. manufacturing**



Typical trades supported through ESPC investment:

- HVAC Technicians
- Electricians
- Plumbers
- Construction Labor
- Construction Management
- Manufacturing Labor
- Engineers
- Project Managers

* http://www.nam.org/Issues/Energy-and-Environment/Affordable-Energy/Domestic-Energy/Improving-Federal-Energy-Savings-Through-Performance-Contracting--Full-Report/

ESPC Basics

back up

- *What are ESPCs?*
- *Benefits*
- *Supports Mission*
- *Budget Neutral*
- *ESPC Planning Process*
- *Key Features and Authorities*

The New Carrolton Deep-Retrofit ESPC

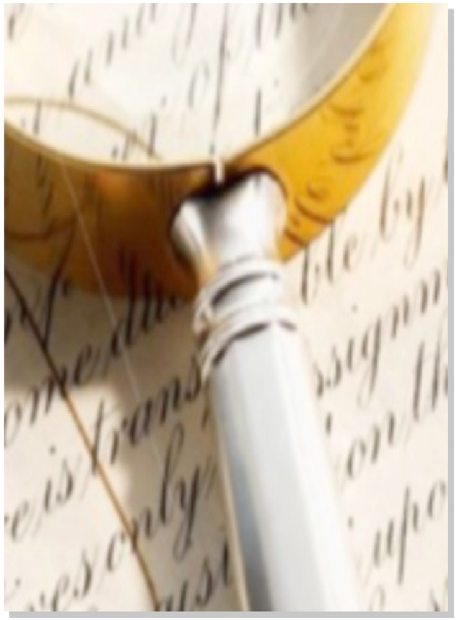
- Hinged on a complete re-design of the existing HVAC system to reduce chiller tonnage by 40%
- 11,000 LEDs, 808 kW solar PV, window glazing, and “rain gardens” installed

Key Features of ESPCs

- ➲ Legislated purpose: Achieve energy savings & ancillary benefits
- Savings guarantees are mandatory
- Measurement and verification (M&V) is mandatory
- Savings must exceed payments for each year
- Contract term cannot exceed 25 years (starting with award of the task order)
- May combine financing and appropriations

Authorizing Legislation

- ESPC statute:
  - 42 USC § 8287
- Regulations governing ESPCs:
  - DOE Rule: 10 CFR 436 Subpart B
  - FAR Part 23.205



DOE-FEMP IDIQ ESPCs and Agency ESPC Task Orders

- IDIQ contracts awarded competitively to ESCOs by DOE-FEMP to streamline the process (IDIQ 3 awarded in 2017)
- Agencies negotiate and award task orders (TOs) under the IDIQs

➲ Can be used for federally owned facilities anywhere in the world

- Firm fixed-price contracts
- USACE has a very similar IDIQ

21 DOE ESPC IDIQ ESCOs: New Awards

- ABM Government Services, LLC of Hopkinsville, KY
- AECOM Technical Services, Inc. of San Diego, CA
- Ameresco, Inc. of Framingham, MA
- The Brewer-Garrett Company of Middleburg Heights, OH
- CEG LLC of Arlington, VA
- Consolidated Edison Solutions Inc. of Valhalla, NY
- Constellation NewEnergy, Inc. of Baltimore, MD
- EDF Renewable Energy of San Diego, CA
- Energy Solutions Professionals, LLC of Overland Park, KS*
- Energy Systems Group, LLC of Newburg, IN
- Honeywell of Golden Valley, MN
- Leidos Engineering, LLC of Oklahoma City, OK
- Lockheed Martin Corporation of Rockville, MD
- Noresco United Technologies of Westborough, MA
- OpTerra Energy Services of Overland Park, KS
- Schneider Electric of Austin, TX
- Siemens Government Technologies, Inc. of Arlington, VA
- SmartWatt Energy of Ballston Lake, NY
- Southland Energy of Dulles, VA
- Trane U.S. Inc. of St. Paul, MN
- WGL of McLean, VA

DOE ESPC IDIQ Technology Categories

Scope includes energy- and water-conservation measures (ECMs) covered in the Technology Categories in IDIQ Attachment J-3

- Boiler and chiller plants
- Energy management control systems
- Building envelope
- HVAC
- Chilled/hot water and steam distribution
- Lighting
- Electric motors/drives
- Refrigeration
- Distributed generation
- Renewable energy
- Energy/utility distribution
- Water and wastewater
- Electrical peak shaving/load shifting
- Rate adjustments
- Energy-related process improvements
- Commissioning
- Advanced metering
- Appliance/plug load reductions
- Other/Future ECMs

ESPC Project Milestones

• Acquisition Planning	**Phase 1**
• ESCO Selection	**2**
• Preliminary Assessment	**2**
• Notice of Intent to Award	**2**
• Request for Proposal	**3**
• Investment-Grade Audit	**3**
• Proposal and Proposal Review	**3**
• Negotiations and Task Order Award	**3**
• Final Design and Construction	**4**
• Project Acceptance	**4**
• Post-Acceptance Performance Period	**5**

Performance Contracting Delivers Results

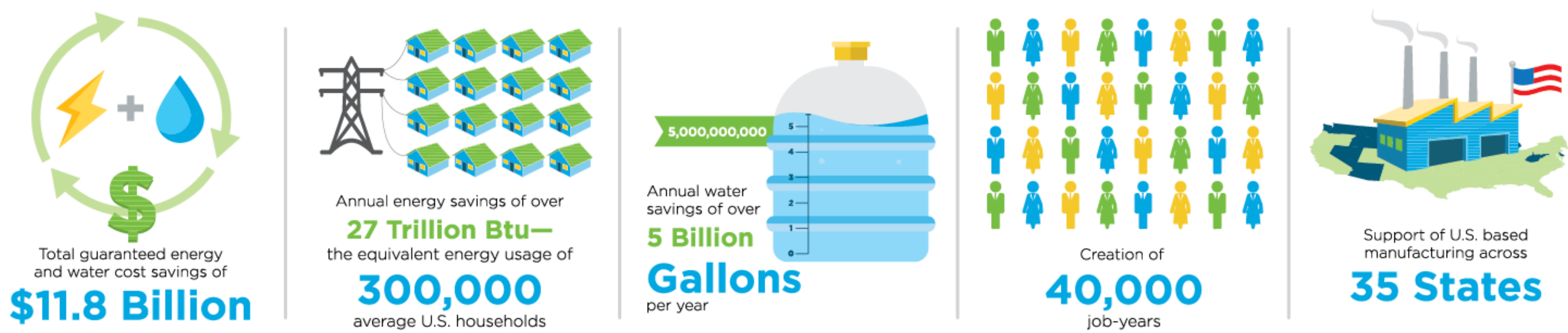
3rd Generation DOE IDIQ Contract Awarded

$55 billion contract ceiling available

***$10-15 billion of federal cost-effective investment potential available**

"This program highlights how the public and private sector partnerships can align with the Administration's objectives for increased energy efficiency and job creation without burdensome regulations"
- U.S. Secretary of Energy Rick Perry

ESPC IDIQ Contract Accomplishments
1997-2017



Estimate is based on data from the Federal Energy Management Program's Compliance Tracking System Database and Lawrence Berkeley National Laboratory's "Updated Estimates of the Remaining Market Potential of the U.S. ESCO Industry," April 2017

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ESPCs Provide Reliable Savings

- Annual measurement of savings verifies that savings performance contracting delivers more reliable savings,
  - ESPC savings achievement: 103% of guaranteed savings[1]
  - Savings achievement for appropriations-funded projects: 67%[2]

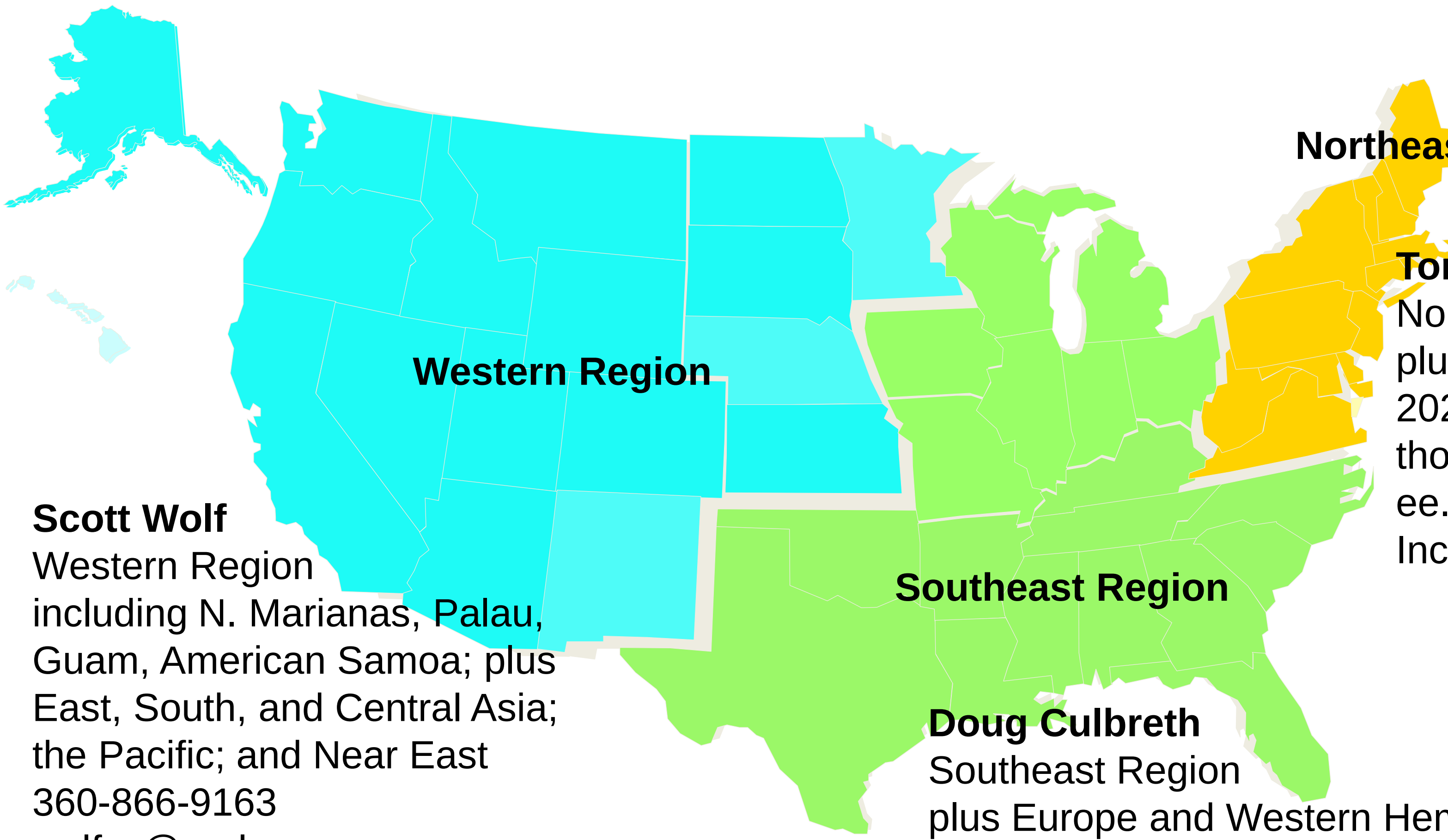
- Actual annual savings to agency: 174% - 197% of contract savings[3]
  - Guaranteed savings calculation assumes baseline equipment continues to operate “as is” – rather than assuming normal deterioration of equipment and efficiency
  - Savings beyond term
  - Underestimate of utility escalation
  - ESCO guarantees only 96% of estimated savings

FEMP's ESPC Team

Dedicated to helping agencies succeed with ESPC

- The FEMP Federal Project Executive (FPE)
  - Your first point of contact
  - Coordinator of all FEMP ESPC assistance for agencies
- FEMP Project Facilitators (PFs)
  - Hands-on project support
- DOE Golden Field Office – FEMP@ee.doe.gov
  - DOE-FEMP ESPC IDIQ contract administration
- National Lab subject matter experts
- Legal counsel
- Interagency policy and program improvement through Federal ESPC Steering Committee

FEMP Federal Project Executives (FPEs)



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http://energy.gov/eere/femp/energy-savings-performance-contract-federal-project-executives-0

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ECMs for Data Centers: Specific Measures

Infrastructure (Cooling, Power)

- Install metering and implement data center infrastructure management (DCIM) controls and power monitoring
- Improve air management / Install Cold or Hot Aisle Containment
- Increase temperature setpoints toward the high end of the range set by ASHRAE
- Turn off active humidity control
- Install Variable-Speed Drives on cooling system fans
- Install rack and/or row-level cooling
- Implement dedicated room cooling (vs. using central building cooling)
- Use air- and water-side economizers
- Retro-commission system and plant controls
- Use high-efficiency UPSes in eco-mode
- Use high-efficiency lighting
- Install liquid cooling and adopt warm water cooling

Information Technology (IT)

- Turn off unused servers
- Improve server power management
- Minimize requirements for Uninterruptible Power Supplies (UPS)
- Refresh the oldest IT equipment with new high-efficiency equipment
- Virtualize applications
- Consolidate applications, servers, closets, and data centers
- Move applications and/or hardware to higher-efficiency internal or external data center or to the cloud
- Implement network storage optimization
- Joint training for IT and Facility staff
- Upgrade IT equipment to more energy efficient models and that are rated to higher ASHRAE thresholds
- Implement VoIP, network printers, thin-client,

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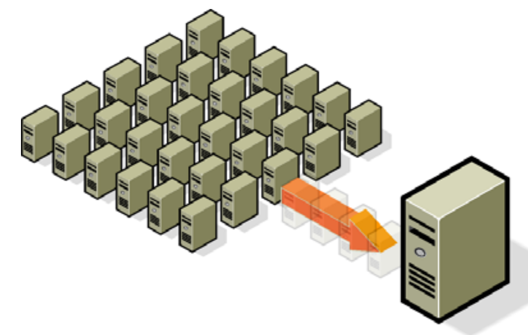
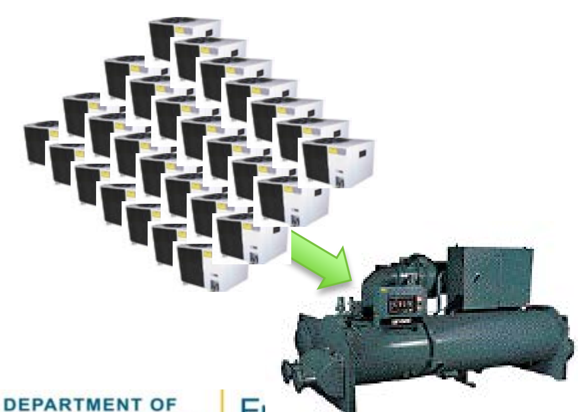
Consolidation/Virtualization Example

- Savings/avoided cost attributed to:
  - Energy savings for server reductions and cooling
  - Energy related savings
    - Operation and Maintenance (O&M) savings
    - IT refresh avoided cost/savings
    - Software/licensing
    - Labor (IT staffing, subcontracts)
    - Frees up floor space
  - Other facility ECMs
    - Energy and water
    - Deferred maintenance
    - Resilience & energy security





Project Example – Naval Base Coronado

- Critical Goals: reliability, sustainability, resiliency, and efficiency
- 95% of the ESPC is in a mission critical data center with comprehensive ECMs
- Task Order awarded February, 2016 with a value of $114 Million.
- Performance guarantee is structured around ESCO guaranteeing temperatures on the server floor, uptime of critical equipment, and full O&M, in addition to energy savings.
- **Guaranteed savings are $4.4 million/year.**

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