

Leveraging Procurement to Achieve Energy Savings



Liyang Wang



Sravan Chalasani



Molly Morabito

Current Success & Potential of Federal Procurement

1

2

3

4

Policy progress so far...

- Oil Embargo of 1972
- National Energy Conservation Policy Act

1970s



- Requirement to procure energy efficient products
- Energy Policy Act of 1992 (amended by EPAct 2005)

1990s



E.O. 13834: Efficient Federal Operations

2010s

2000s

- Federal Acquisition Regulation Part 23.2
- E.O. 13221: Energy-Efficient Standby Power Devices
- Energy Security and Independence Act of 2007

Assisting in the implementation of E.O. 13834

Requirements and Priority Strategies:

Section 2(g): “Mandates for Purchasing Preference: Agencies must give purchasing preference to products that:

- Are certified by ENERGY STAR or designated by FEMP as energy efficient products (42 U.S.C. § 8259b, 10 CFR part 436, subpart C).”

Tracking and Reporting:

“data points tracked as indicators currently include:

- Number of applicable contract actions containing sustainable clauses.”

Assisting in compliance with FAR Clause

FAR Part 23.203

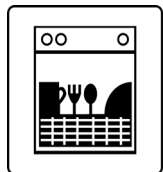
“Energy-efficient product means a product that –

*(i) Meets Department of Energy and Environmental Protection Agency criteria for use of the **Energy Star** trademark label; or*

*(ii) Is in the **upper 25 percent of efficiency** for all similar products as designated by the Department of Energy's Federal Energy Management Program.”*

Covered product categories

Appliances



Commercial Food Service Equipment



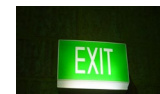
Electronics and IT Products



Heating and Cooling Products



Lighting Products



Meeting mandates for purchasing preference

Purchasing Energy-Efficient Water-Cooled Electric Chillers

Home » Facility & Plant Optimization » Energy Efficient Products » Product Search » Purchasing Energy Efficient Water-Cooled Electric Chillers

The Federal Energy Management Program (FEMP) provides acquisition guidance for water-cooled electric chillers, a product category covered by FEMP efficiency requirements. Federal laws and requirements mandate that agencies purchase ENERGY STAR-qualified or FEMP-designated products in all product categories covered by these programs and in any acquisition actions that are not specifically exempted by law.

FEMP's acquisition guidance and efficiency requirements apply to water-cooled chillers that provide space cooling in federal buildings. Product performance must be measured in accordance with [ASHRAE 55/55.100 test procedures](#). Free-cooling, condensateless, and combination chiller-heat pump units are excluded.

This acquisition guidance was updated in July 2018.

Find Product Efficiency Requirements

Federal purchases must meet or exceed the minimum efficiency requirements in Table 1.

| TABLE 1. EFFICIENCY REQUIREMENTS FOR WATER-COOLED ELECTRIC CHILLERS (OPTIONAL) | | | | | |
|--|-----------------|--|-----------------------------|--|-----------------------------|
| Chiller Type | Capacity (Tons) | Full-Load Optimized Applications (Minimum Annual Energy Use (kWh/ton)) | | Part-Load Optimized Applications (Minimum Annual Energy Use (kWh/ton)) | |
| | | Full-Load Efficiency (EER) | Integrated Part-Load (IPLV) | Full-Load Efficiency (EER) | Integrated Part-Load (IPLV) |
| Positive Displacement | < 75 | 0.756 | 0.600 | 0.760 | 0.500 |
| | 75 to 149 | 0.75 | 0.580 | 0.750 | 0.490 |
| | 150 to 299 | 0.743 | 0.560 | 0.740 | 0.480 |
| | 300 to 449 | 0.740 | 0.540 | 0.735 | 0.470 |
| | ≥ 450 | 0.736 | 0.520 | 0.730 | 0.460 |
| Centrifugal | < 100 | 0.810 | 0.500 | 0.815 | 0.380 |
| | 100 to 149 | 0.810 | 0.500 | 0.815 | 0.440 |
| | 150 to 299 | 0.810 | 0.500 | 0.815 | 0.420 |
| | 300 to 449 | 0.810 | 0.500 | 0.815 | 0.390 |
| | ≥ 450 | 0.810 | 0.500 | 0.815 | 0.380 |

Make a Cost-Effective Purchase: Reduce Operating Costs by Buying a FEMP-Designated Product

FEMP has calculated that a 105-ton water-cooled positive displacement chiller meeting the required 0.715 kW/ton efficiency level saves money if priced no more than \$8,200 above the less efficient model. The best available model saves the average user more \$13,000 above the less efficient model. Table 2 compares three types of product purchases and calculates the lifetime cost savings at purchasing efficient models. Federal purchasers can assume products that meet FEMP-designated efficiency requirements are life cycle cost-effective. FEMP provides [cost calculators](#) that enable comparison between the cost-effectiveness of chillers of different efficiency levels.

| TABLE 2. LIFE-CYCLE COST SAVINGS FOR AN EFFICIENT 105-TON WATER-COOLED POSITIVE DISPLACEMENT CHILLER IN A WATER-LOAD APPLICATION | | | | |
|--|----------------|----------------|----------------|--|
| Performance | Best Available | Required Model | Less Efficient | |
| Full-Load Efficiency (kW/ton) | 0.715 | 0.715 | 0.737 | |
| Annual Energy Use (kWh) | 75,500 | 78,800 | 84,300 | |
| Annual Energy Cost (\$/yr) | \$15,800 | \$16,500 | \$17,600 | |
| Lifetime Energy Cost (25 years) | \$282,500 | \$289,300 | \$306,500 | |
| Lifetime Energy Cost Savings | \$13,000 | \$8,200 | — | |

View the Performance and Model Assumptions for Table 2

Determine When FEMP-Designated Products Are Cost-Effective

An efficient product is cost-effective when the lifetime energy savings (from avoided energy costs over the life of the product, discounted to present value) exceed the additional up-front cost (if any) compared to a less efficient option. FEMP considers up-front costs and lifetime energy savings when setting required efficiency levels. Federal purchasers can assume that ENERGY STAR-qualified products and products that meet FEMP-designated efficiency requirements are life cycle cost-effective, in high-use applications or when energy rates are above the federal average; purchasers may save more if they specify products that exceed federal efficiency requirements, as shown in the Best Available column above.

Claim an Exception to Federal Purchasing Requirements

Products meeting ENERGY STAR or FEMP-designated efficiency requirements may not be life cycle cost-effective

This cost calculator is a screening tool that estimates a product's lifetime energy cost savings at various efficiency levels.

Learn more about the calculator assumptions and definitions.

Project Type

Is this a new installation or a replacement?
☒ New ☐ Replacement

How many chillers will you purchase?

Energy Cost Savings

You save **\$53,022!**

You Can Spend
Up to **\$53,022 more per unit**

Performance Factors

What's the new design condition?
☐ Full Load ☒ Partial Load

What is the cooling capacity of the new chiller?

What is the full-load efficiency of the new chiller?

What is the partial-load efficiency of the new chiller?

Cost Factors

What is the current cost of energy?

What are the annual hours of operation in equivalent full-load hours?

A chiller of the efficiency you specified will save \$53,022 in lifetime avoided energy costs.

| | BASE MODEL | FEMP MIN. EFFICIENCY REQUIREMENT | BEST AVAILABLE | YOUR CHOICE |
|-------------------------------|------------|----------------------------------|----------------|-------------|
| LIFETIME ENERGY COSTS | \$282,355 | \$229,333 | \$174,725 | \$229,333 |
| ANNUAL ENERGY COSTS | \$17,280 | \$14,035 | \$10,693 | \$14,035 |
| ANNUAL ENERGY USE (KWH) | 192,000 | 155,845 | 118,812 | 155,845 |
| EFFICIENCY (EER) | 12.5 | 15.39 | 20.2 | 15.39 |
| LIFETIME ENERGY COST SAVINGS* | \$0 | \$53,022 | \$107,630 | \$53,022 |

*Note that these savings have been discounted to present value and non-discounted savings would be higher.

Electric Chillers, Air-Cooled and Water-Cooled

The table below includes minimum efficiency requirements for the following FEMP-designated covered product categories: [electric chillers, air-cooled](#); and [electric chillers, water-cooled](#).

These ASHRAE 90.1-2013 Table 6.8.1-3 equipment types are excluded: air-cooled absorption, single effect; water-cooled absorption, single effect; absorption double effect, indirect fired; and absorption double effect, direct fired chillers.

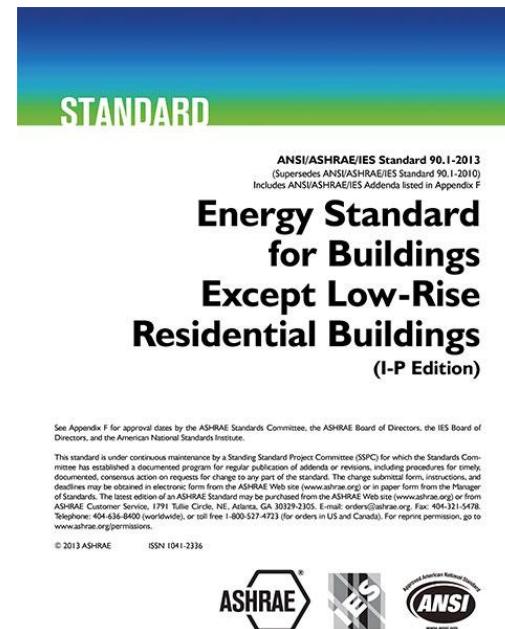
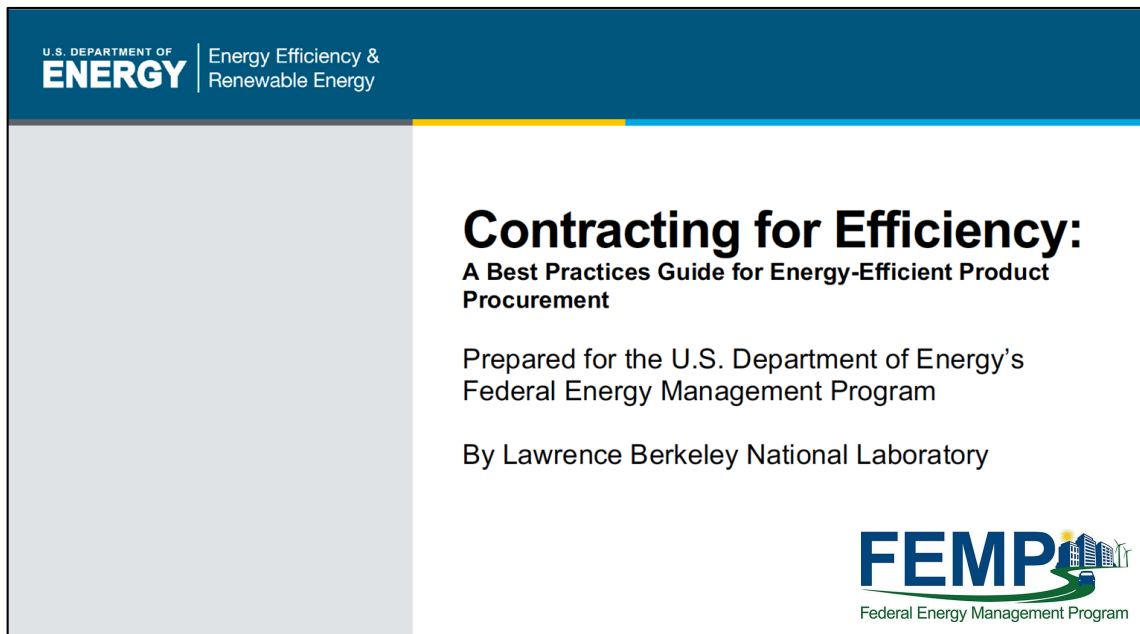
| WATER-CHILLING PACKAGES: MINIMUM EFFICIENCY REQUIREMENTS | | | | | |
|---|-------------------|-------------|---|---|--|
| Equipment Type | Size Category | Units | Minimum Efficiency | | |
| | | | Path A (Full-Load Optimized Applications) | Path B (Part-Load Optimized Applications) | |
| Air-cooled | <150 t | EER (Btu/W) | ≥10.40 FL | ≥9.70 FL | |
| | | | ≥13.69 IPLV | ≥15.81 IPLV | |
| Air-cooled | ≥150 t | EER (Btu/W) | ≥10.50 FL | ≥9.70 FL | |
| | | | ≥14.00 IPLV | ≥16.10 IPLV | |
| Water-cooled, electrically operated positive displacement | <75 t | kW/t | ≥0.73 FL | ≥0.78 FL | |
| | | | ≥0.60 IPLV | ≥0.50 IPLV | |
| Water-cooled, electrically operated positive displacement | ≥75 t and <150 t | kW/t | ≥0.72 FL | ≥0.75 FL | |
| | | | ≥0.56 IPLV | ≥0.49 IPLV | |
| Water-cooled, electrically operated positive displacement | ≥150 t and <300 t | kW/t | ≥0.65 FL | ≥0.68 FL | |
| | | | ≥0.54 IPLV | ≥0.44 IPLV | |
| Water-cooled, electrically operated positive displacement | ≥300 t and <600 t | kW/t | ≥0.61 FL | ≥0.62 FL | |
| | | | ≥0.52 IPLV | ≥0.41 IPLV | |
| Water-cooled, electrically operated positive displacement | ≥600 t | kW/t | ≥0.56 FL | ≥0.58 FL | |
| | | | ≥0.50 IPLV | ≥0.38 IPLV | |
| Water-cooled, electrically operated centrifugal | <150 t | kW/t | ≥0.61 FL | ≥0.69 FL | |
| | | | ≥0.55 IPLV | ≥0.44 IPLV | |
| Water-cooled, electrically operated centrifugal | ≥150 t and <300 t | kW/t | ≥0.61 FL | ≥0.63 FL | |
| | | | ≥0.55 IPLV | ≥0.40 IPLV | |
| Water-cooled, electrically operated centrifugal | ≥300 t and <400 t | kW/t | ≥0.56 FL | ≥0.59 FL | |
| | | | ≥0.52 IPLV | ≥0.39 IPLV | |
| Water-cooled, electrically operated centrifugal | ≥400 t and <600 t | kW/t | ≥0.56 FL | ≥0.58 FL | |
| | | | ≥0.50 IPLV | ≥0.38 IPLV | |
| Water-cooled, electrically operated centrifugal | ≥600 t | kW/t | ≥0.56 FL | ≥0.58 FL | |
| | | | ≥0.50 IPLV | ≥0.38 IPLV | |

Download table

CALCULATE

RELOAD DEFAULTS

Additional FEMP resources



These guides are aimed at educating and enabling COs to communicate the specific energy-efficiency requirements to vendors in solicitations

FEMP provides direct technical assistance for

ENERGY.GOV

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Federal Energy Management Program

FEMP Assistance Request Portal

Need help meeting a federal energy management goal or requirement? Can't find a document or tool? The Federal Energy Management Program (FEMP) can help.

FEMP also offers [technical assistance for renewable energy projects](#).

Ask FEMP a Question

Ask FEMP a question by completing the fields below. A FEMP staff member will contact you with an answer soon.

* Required

Service Area *

- Select a service area -

Email Address *

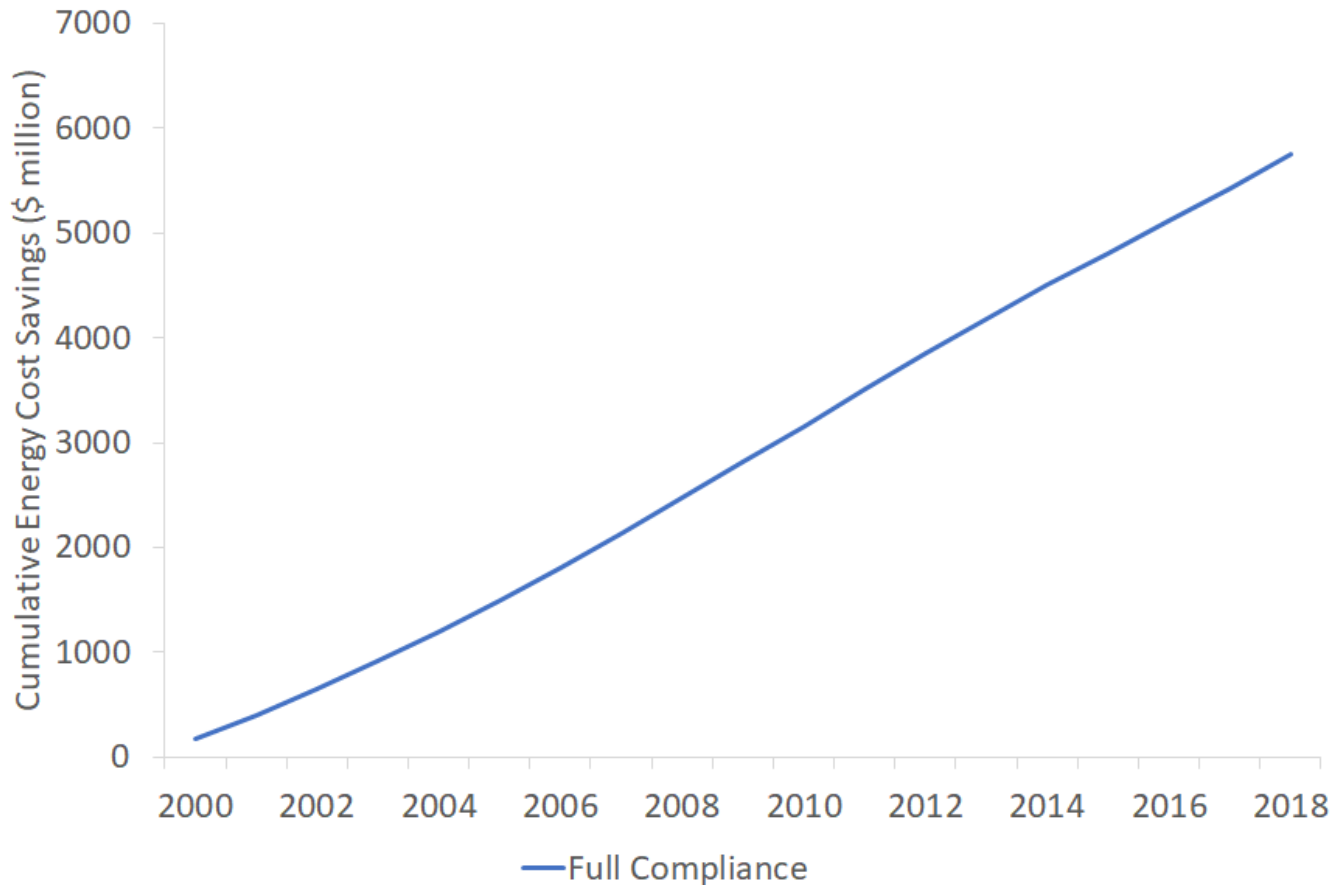
Enter your email address.

Message *

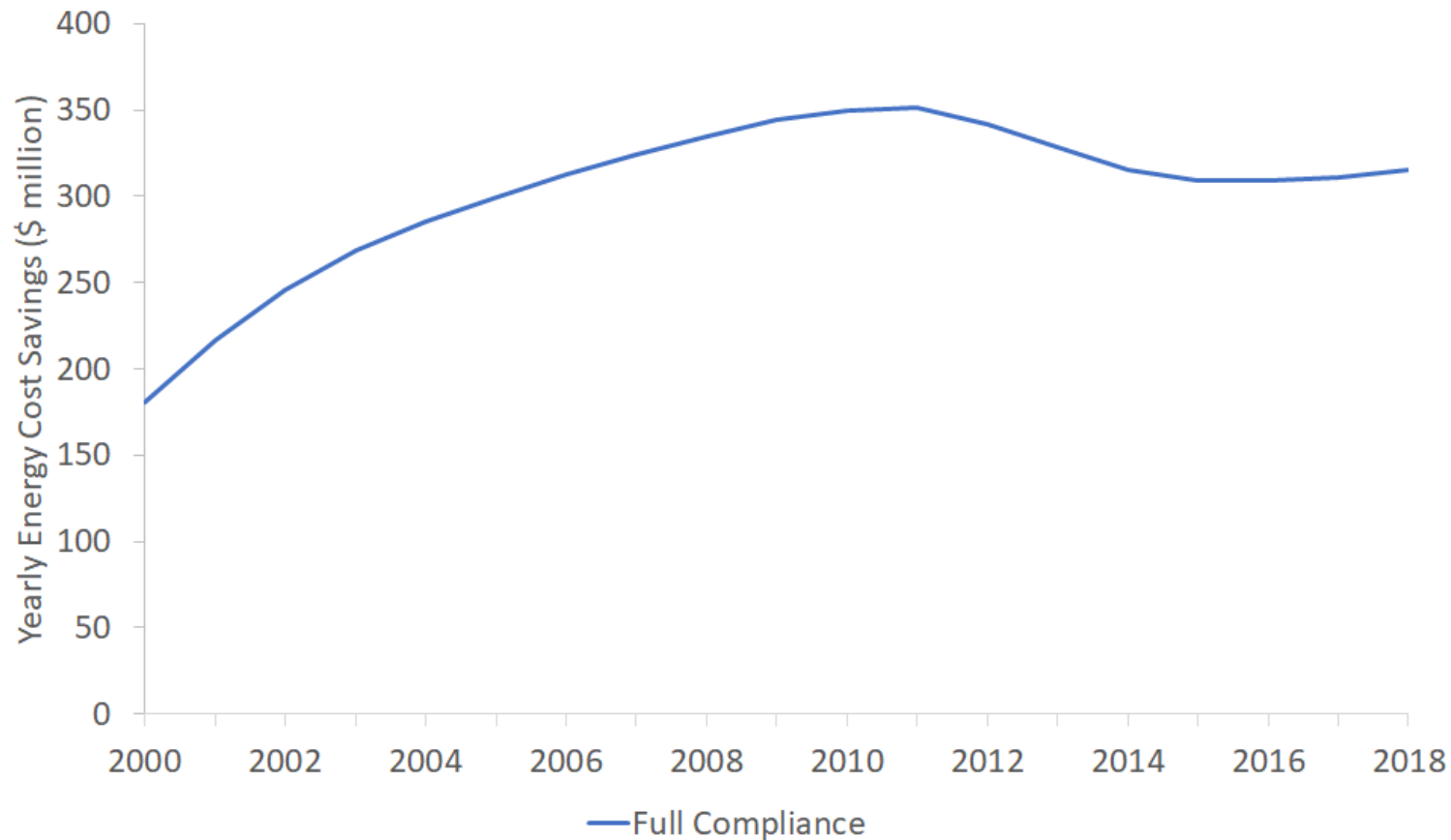
Briefly describe the assistance you need from FEMP.

- Energy-efficient products & technologies
 - ESPC
 - Fleets
 - Laboratories
 - Metering
 - Operation & Maintenance
 - Resilience planning
 - Water management
 - Awards
 - Distributed Energy (renewables, storages, CHP)
 - Auditing
- and more!

Cumulative potential program savings



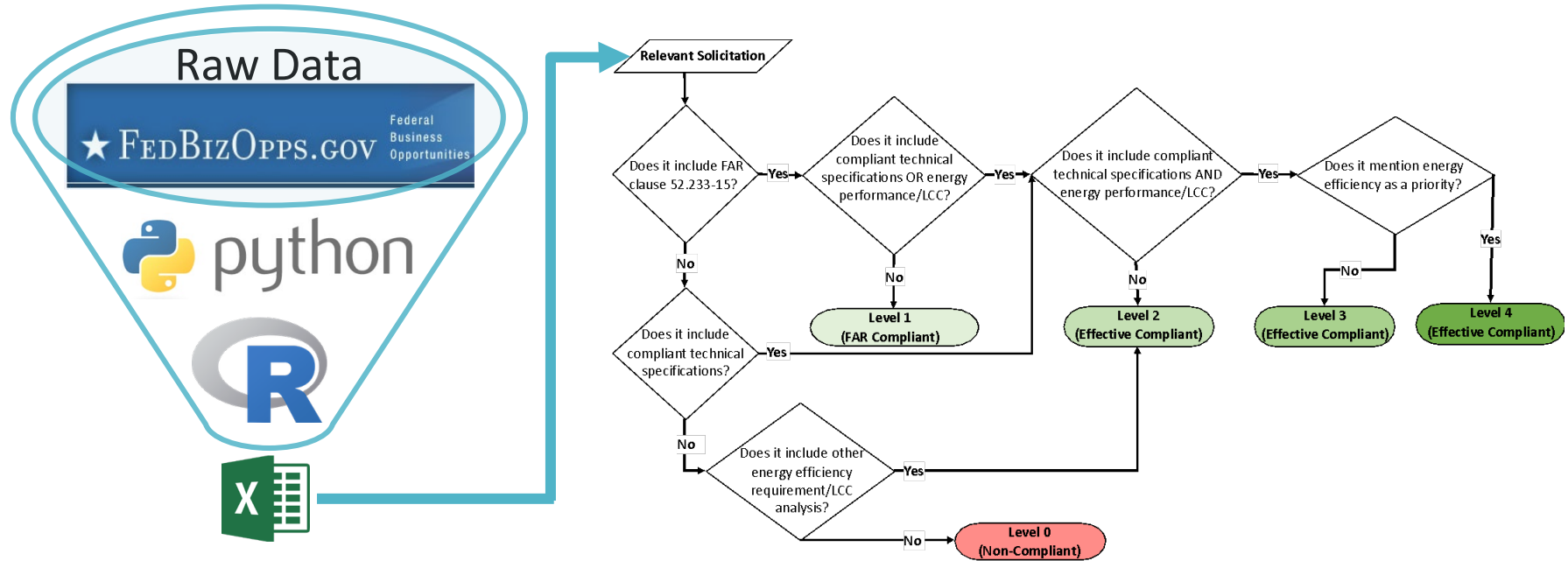
Potential program savings



Analyzing Federal Procurement Activities



FedBizOpps Database



Key terms and caveats

- Evaluated two “compliance” types:

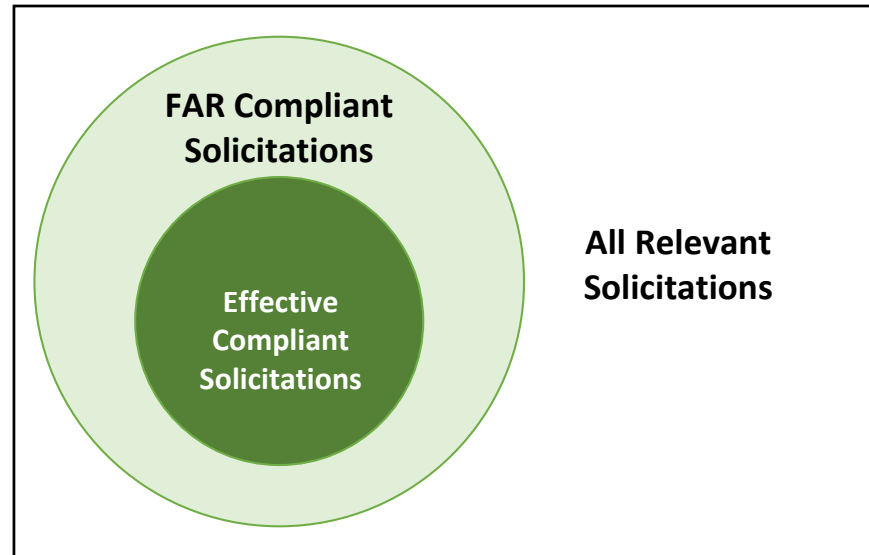
- FAR
- Effective

- Defined two solicitation categories:

- Direct
- Indirect

- Solicitation \neq Awards

- Indicator of federal compliance with energy-efficiency requirements

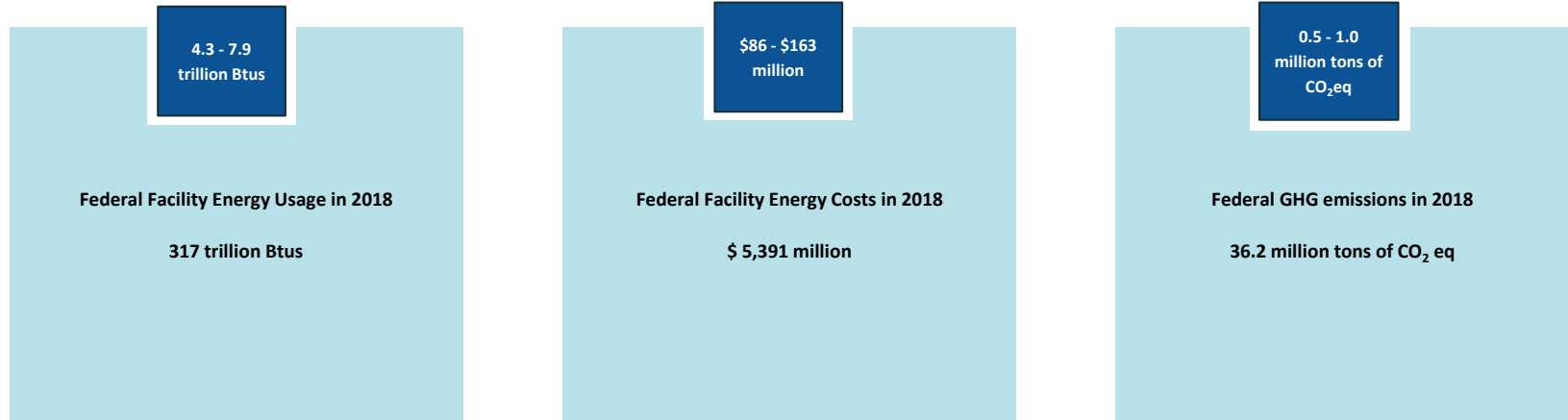


Our analysis shows that during the procurement process,
**federal buyers request energy-efficient
products only 55% of the time.**

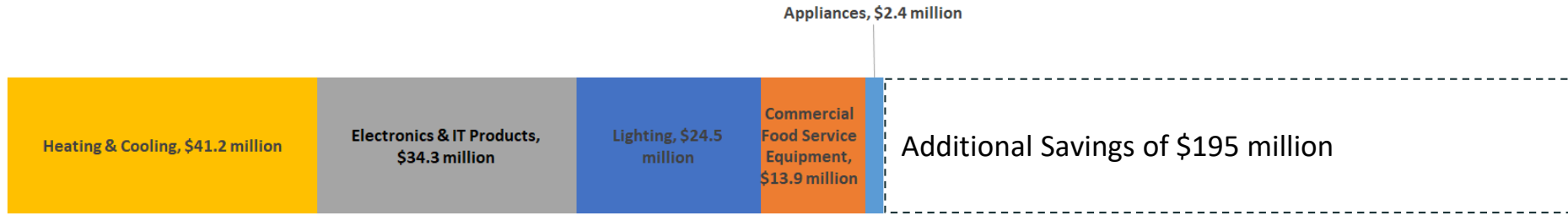
What does a 55% compliance rate mean?

We've saved some already ...

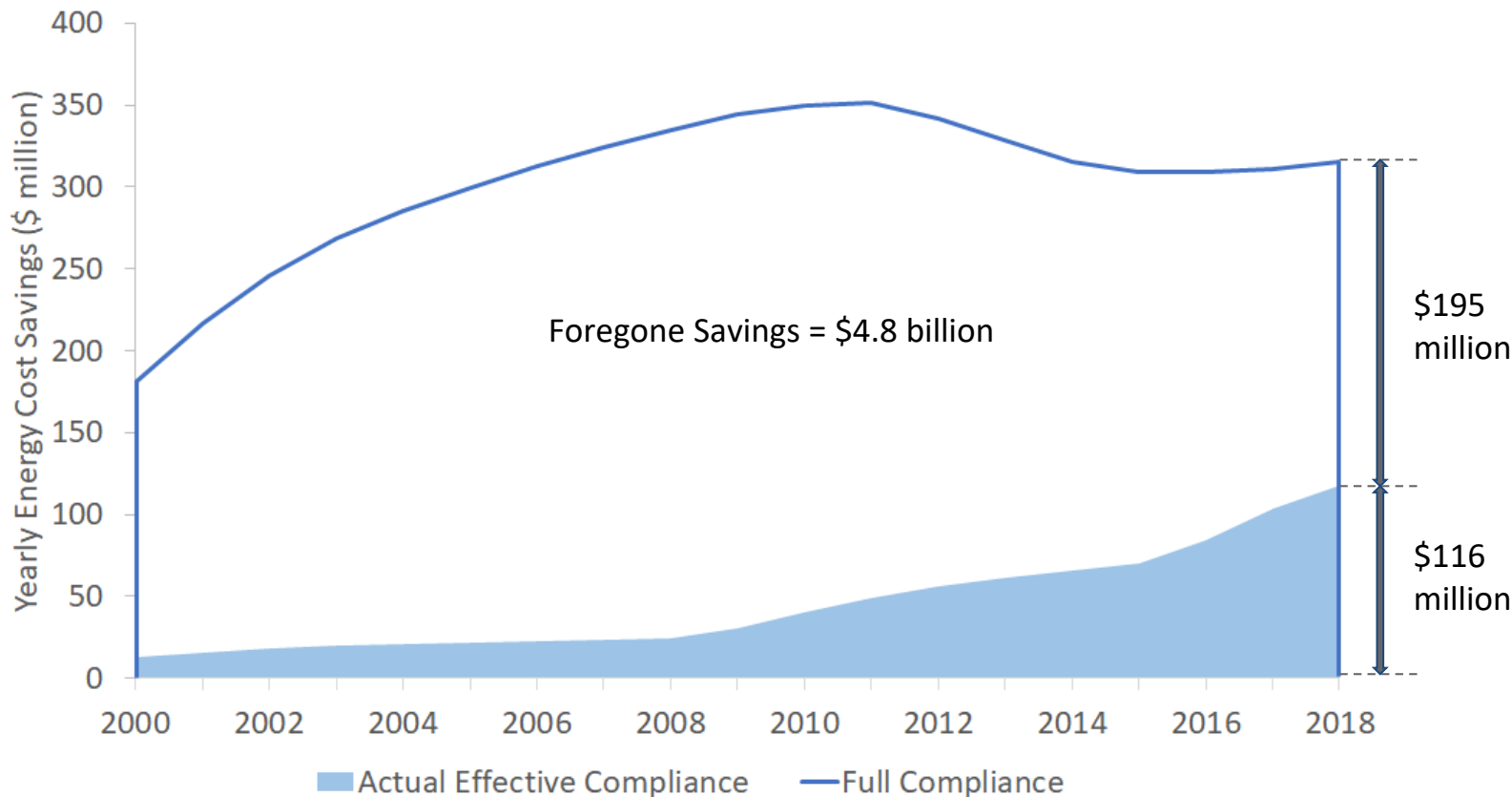
- Federal Operational Energy Savings of 4.3 - 7.9 trillion Btu in 2018



Energy Cost Savings in 2018



But we could have saved more ...



So what?

Energy Savings (2018)

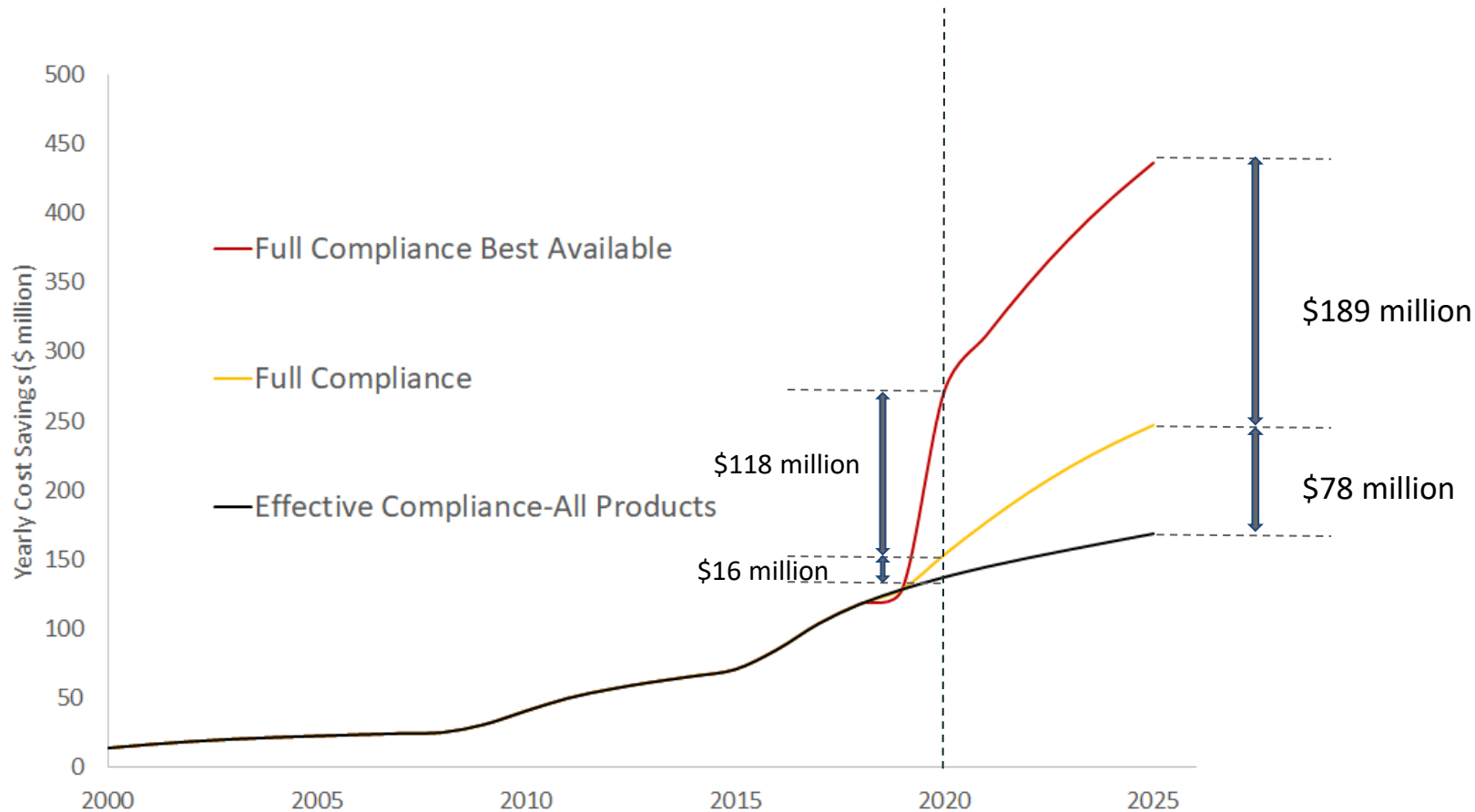
- 16 trillion BTU/year
- \$300 million/year in energy cost



Social Benefits

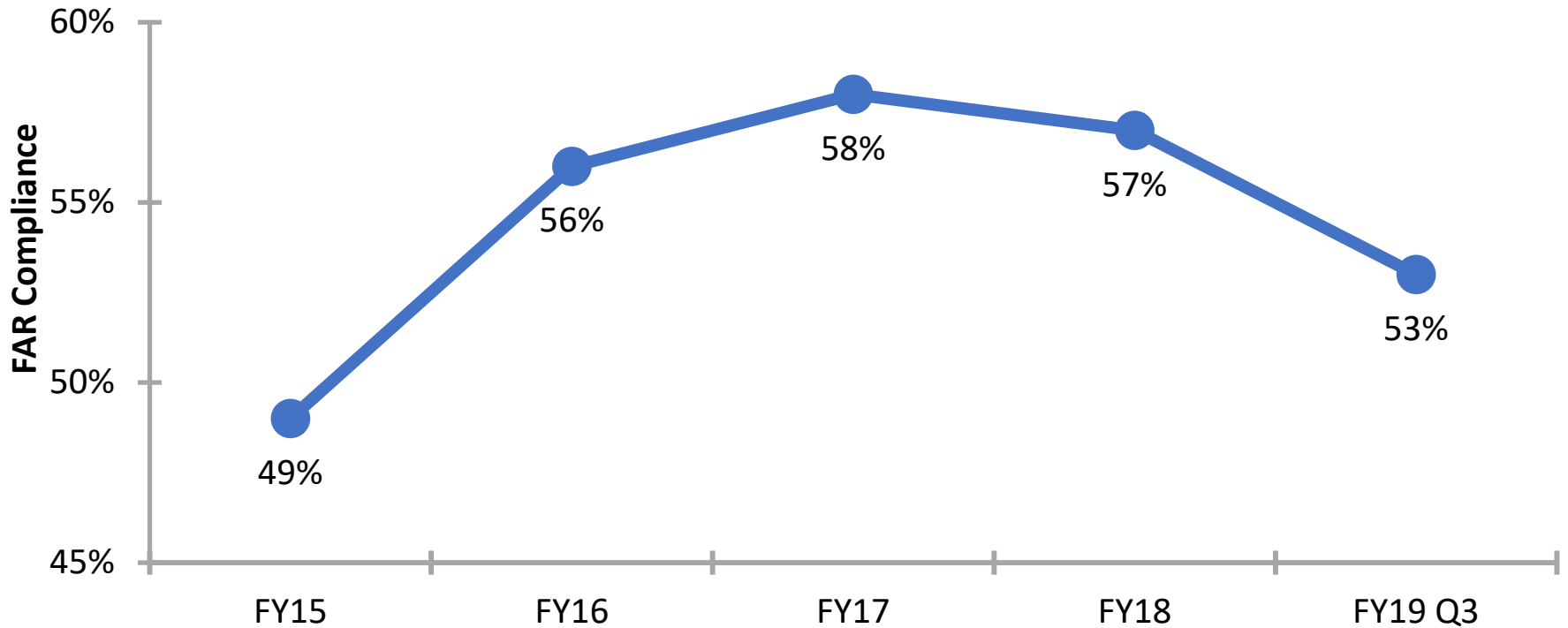
- Reduce public spending
- Demand-pull power
- Lead the adoption of emerging technologies

What more could we save in the future?

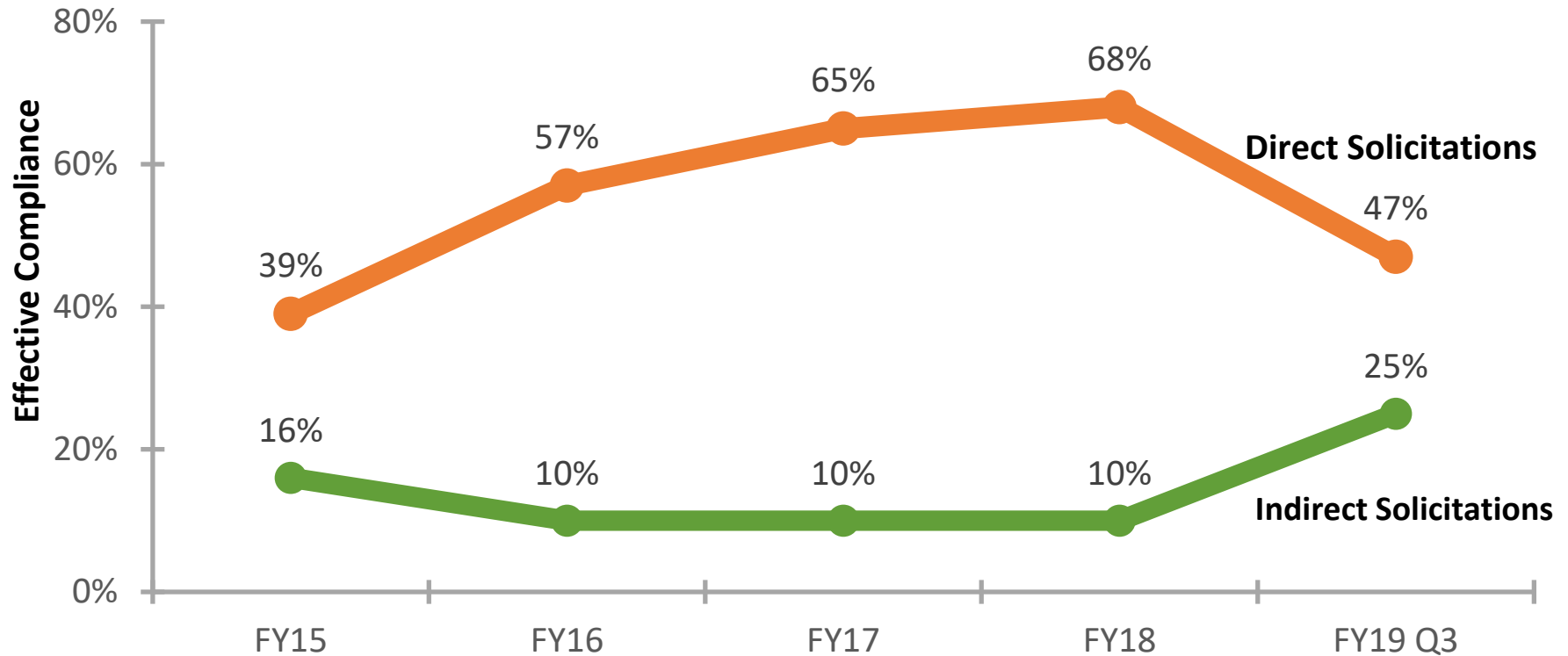


To get there, we need to understand what is keeping compliance rates at 55%...

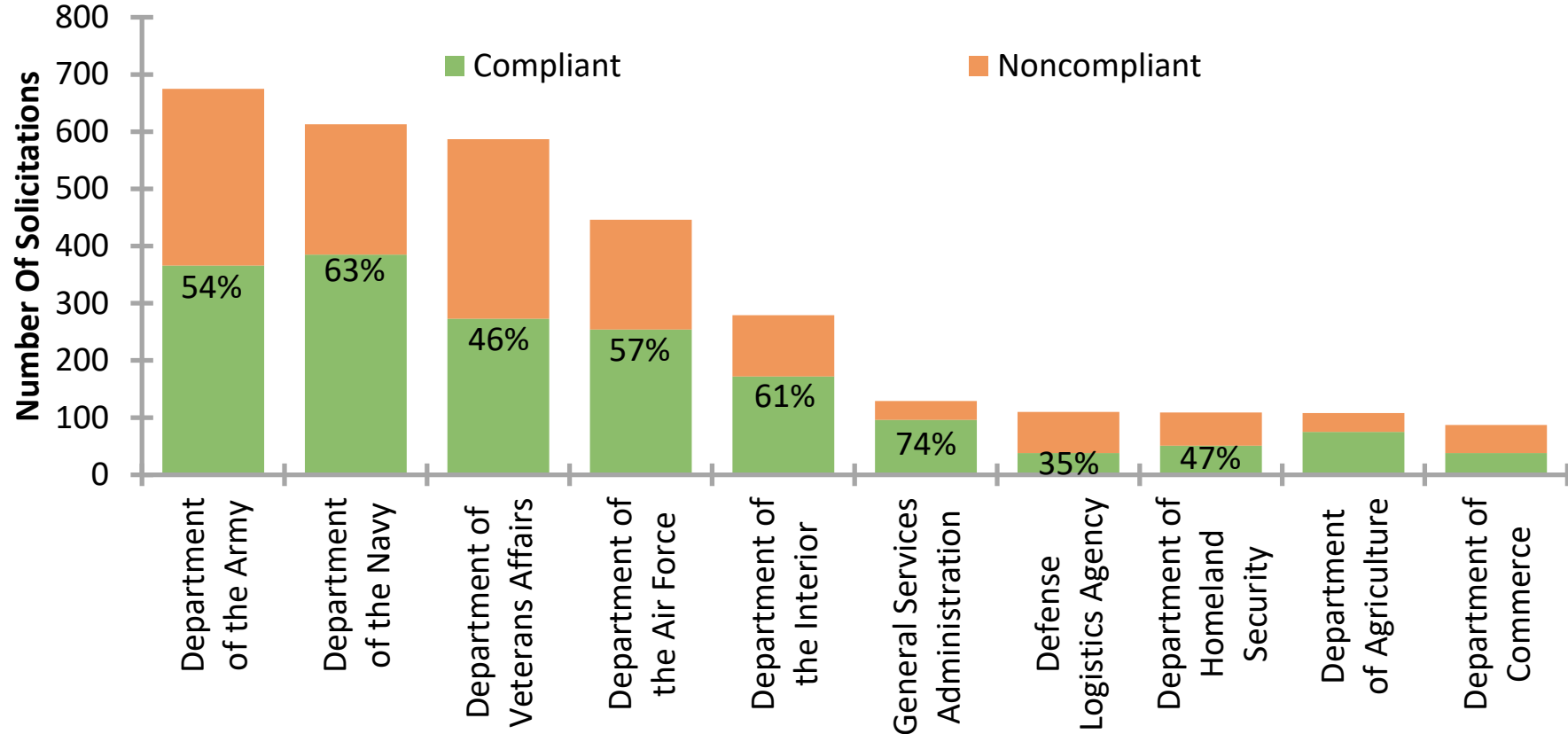
What is causing the annual variance in compliance rates?



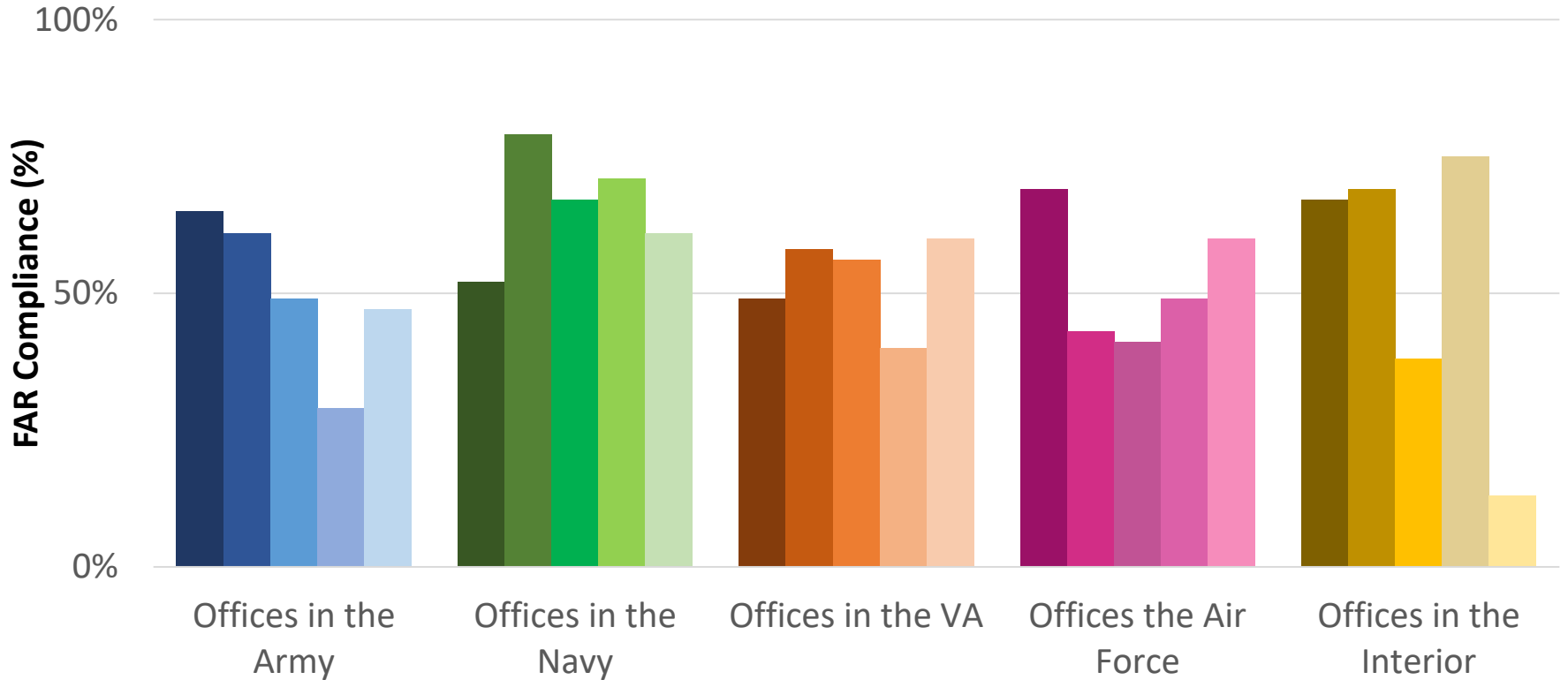
What is causing the annual variance in compliance rates?



Why are there large variances when everyone follow the same rules?



Why are there large variances among the same agencies?



But we still had questions

- **Who** is involved in the procurement process?
- What impact do they have on buying energy-efficient products?
- What are the **rules and practices** that guide procurement behavior related to energy efficiency?
- What are the **tools and resources** used in the procurement process and do they help agencies buy energy-efficient?

The Federal Procurement Survey

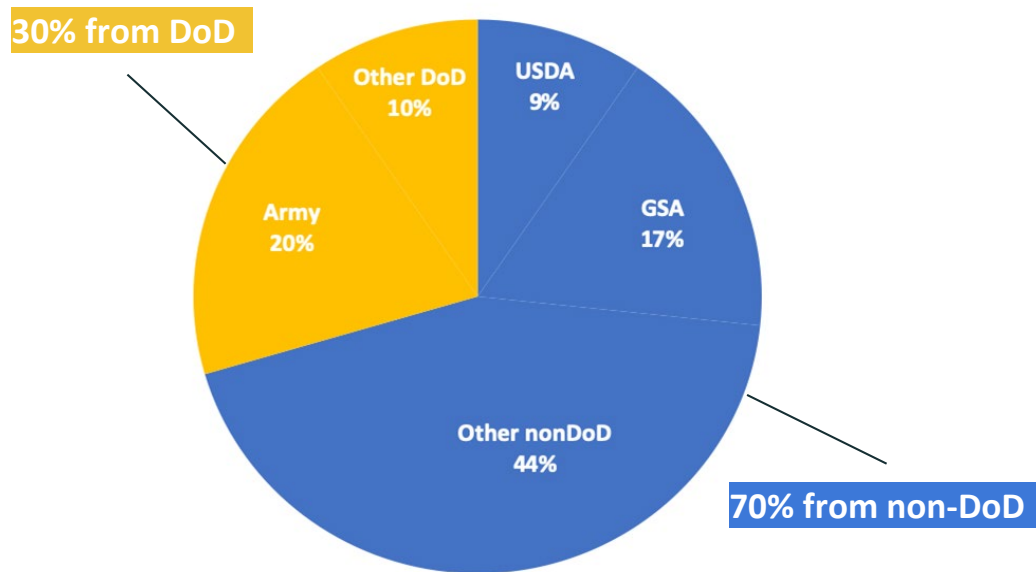
Survey objectives

- To what extent do federal procurement officials take energy efficiency requirements into account when making purchasing decisions?
- How do **organizational factors (i.e., roles, rules, and tools)** impact the inclusion of energy efficiency requirements in purchasing?



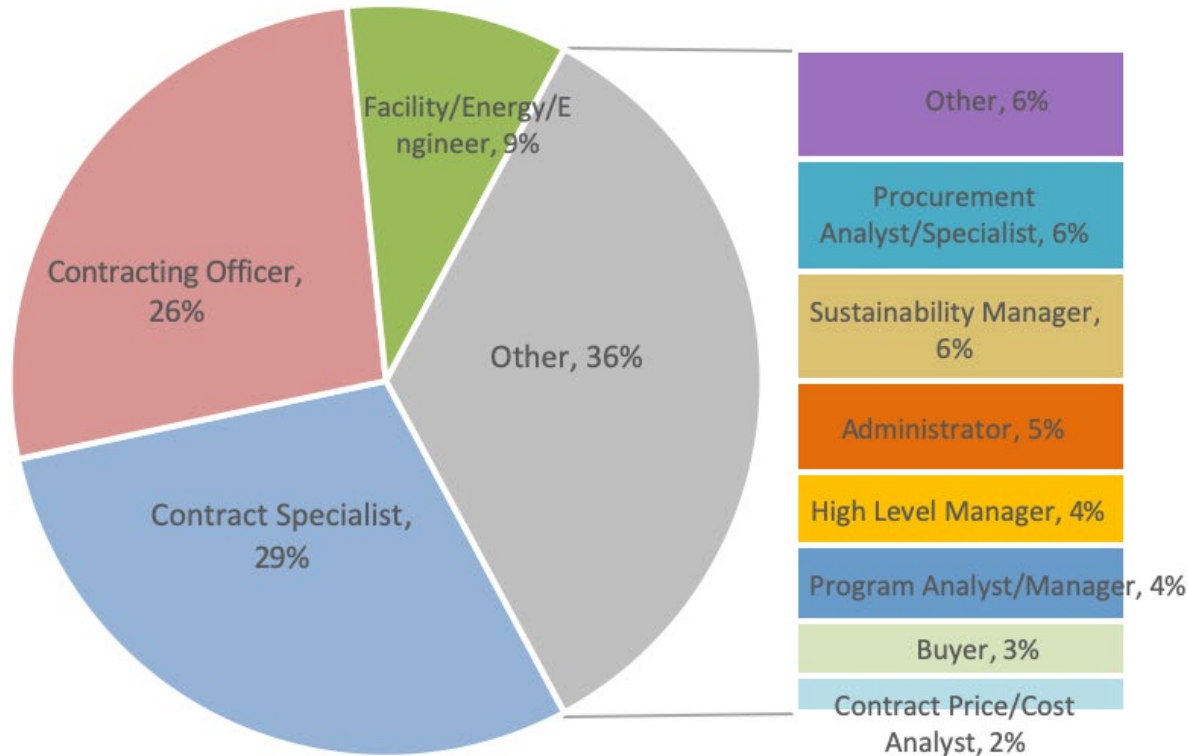
Survey respondents

We received a total of **105** responses from respondents representing **26** different agencies. Most of our respondents were from agencies outside the Department of Defense (DoD).

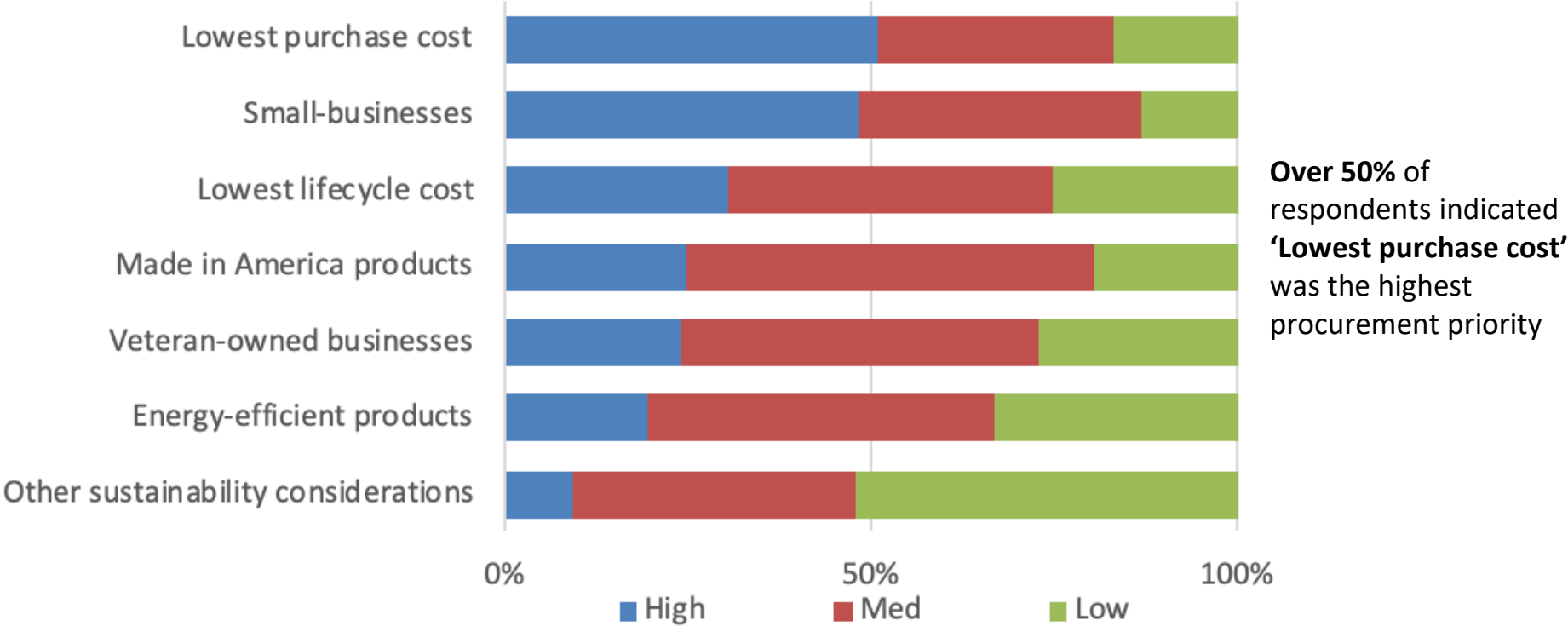


What roles do respondents have?

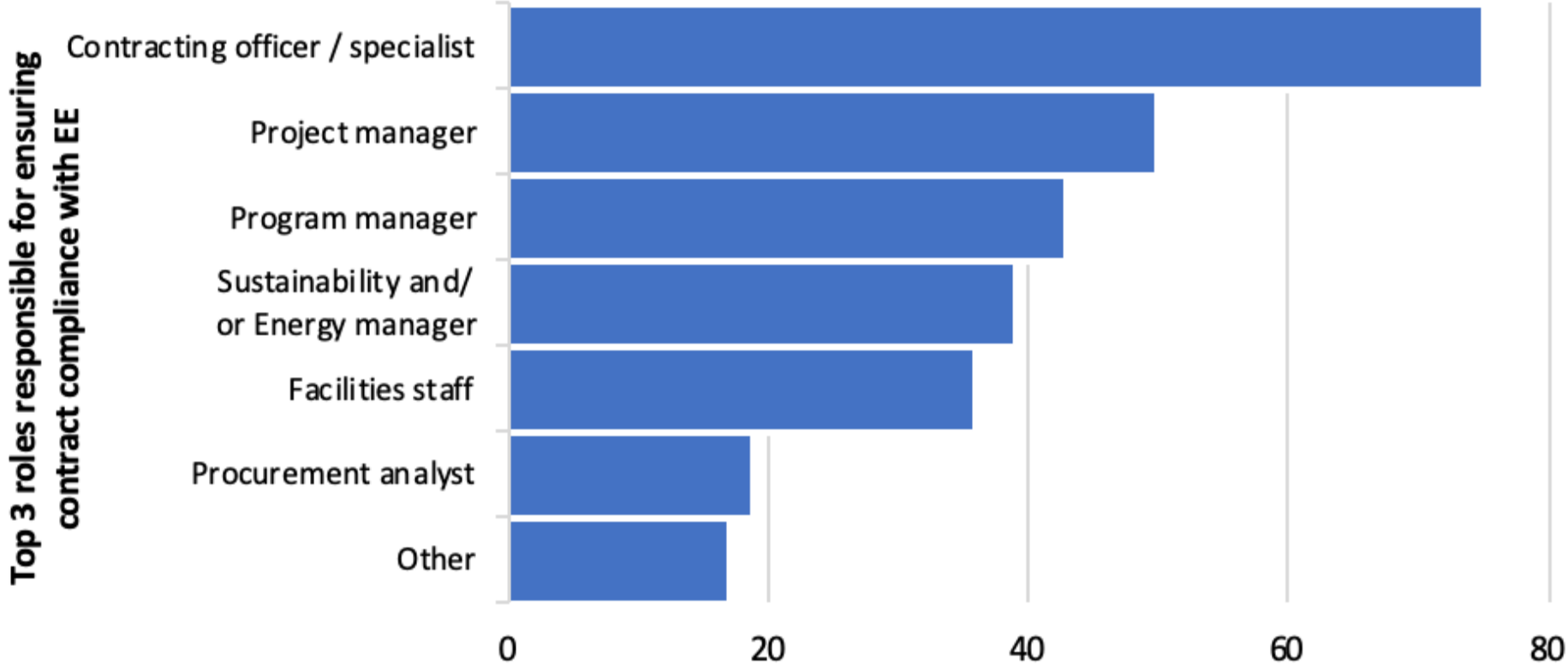
Over half of survey respondents were either **contracting officers** or **contract specialists**.



How does energy efficiency rank as a **priority** for procurement?



Who is **primarily responsible** for ensuring contract compliance with energy efficiency requirements?

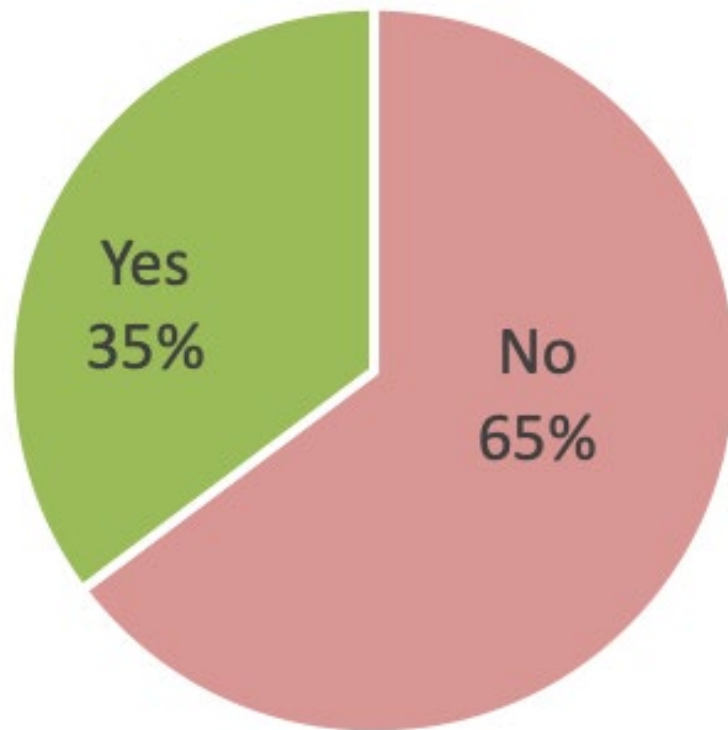


Opportunities to Increase Compliance Among Federal Agencies

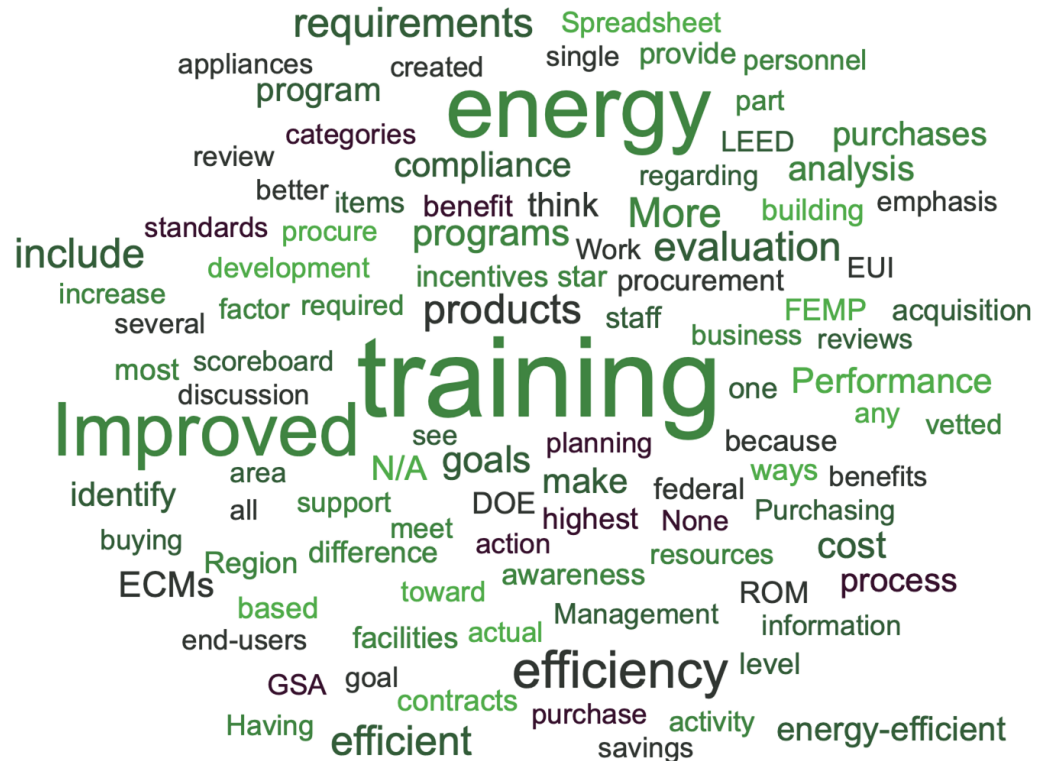


1. Improve training on how to meet energy efficiency requirements

Is guidance on how to meet energy efficiency contracting requirements **included during the training process** at your agency?



What **additional practices** would help encourage energy-efficient purchasing at your agency?



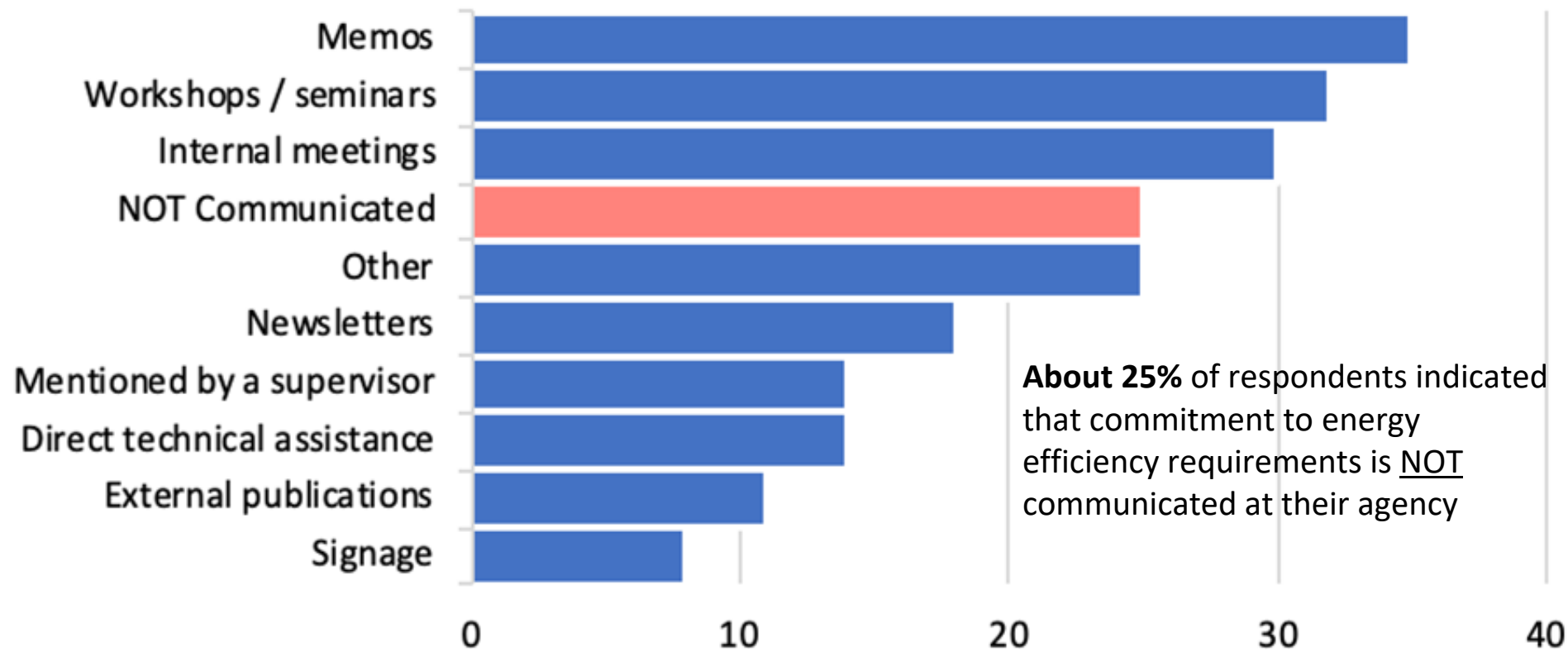
What **kind of training** do respondents want?

- Hands on
- Provide specific examples and scenarios
- Provide the 'why'
- Tailor to different procurement roles
- Include additional ways to support energy efficiency goals

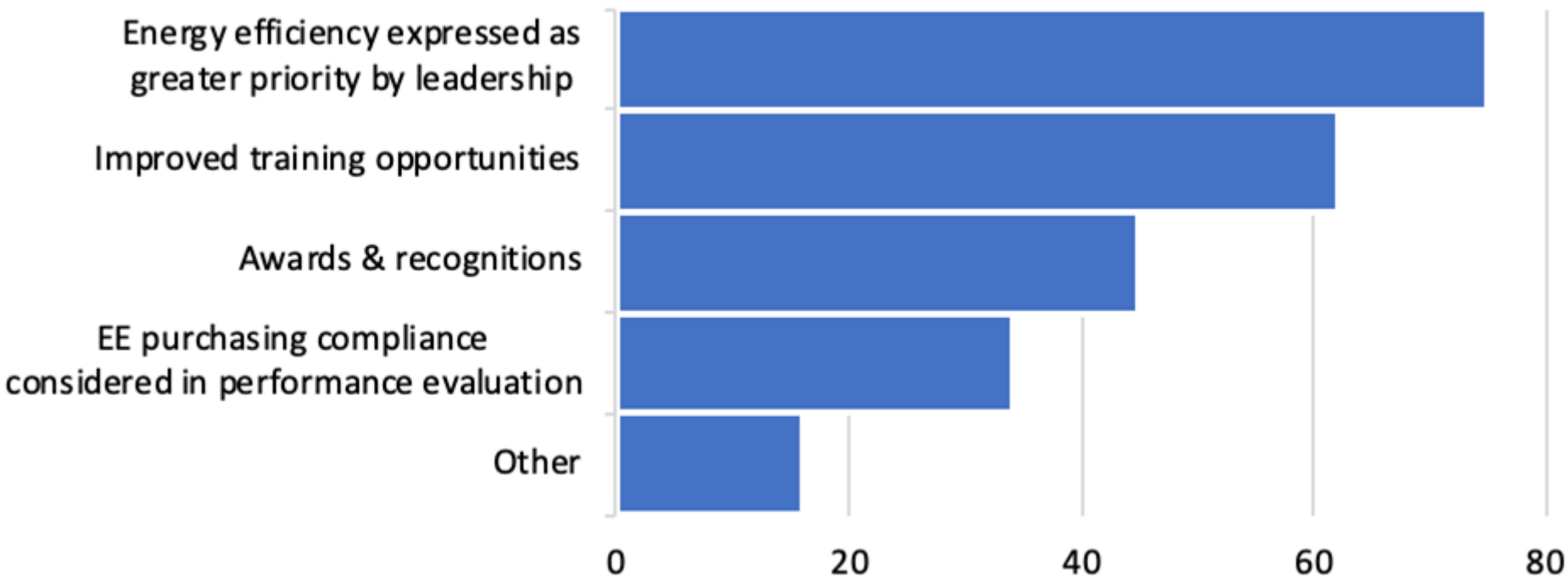


2. **Improve communication** around energy efficiency requirements

How is commitment to meeting energy efficiency requirements **communicated** at your agency?



What would make you or your colleagues **more likely** to consider energy efficiency requirements when purchasing?



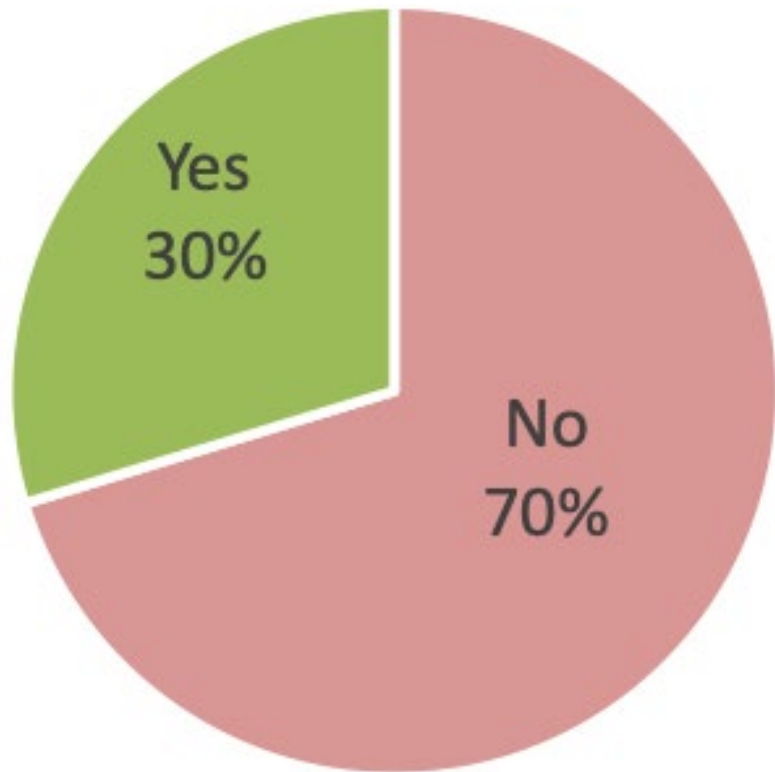
How can **communication** about energy efficiency requirements be improved?

- Establish energy efficiency commitment in early project stages
- Target efforts to engage agency leadership
- Provide more salient information about energy-efficiency
- Match messaging to procurement roles

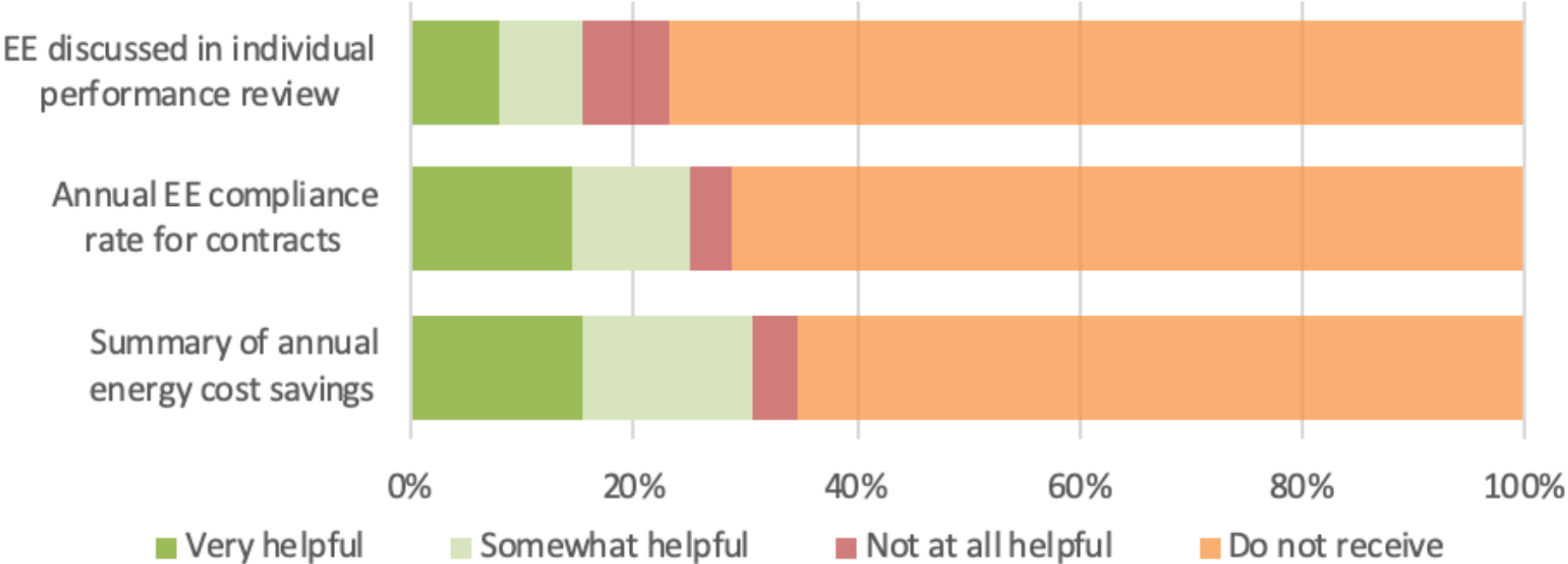


3. **Improve tools** for contracting & evaluation

Do your current tools prompt you to **include energy efficiency requirements** in contracts?

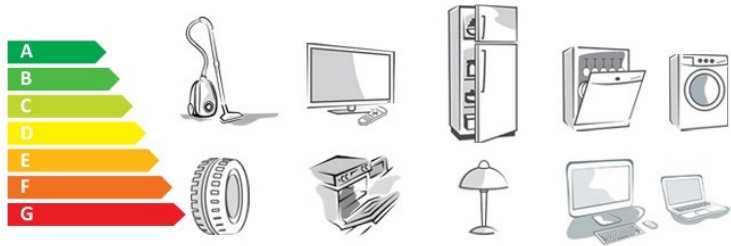


What kinds of feedback do you receive for **evaluating compliance** with energy efficiency requirements, and how **helpful** is that feedback?



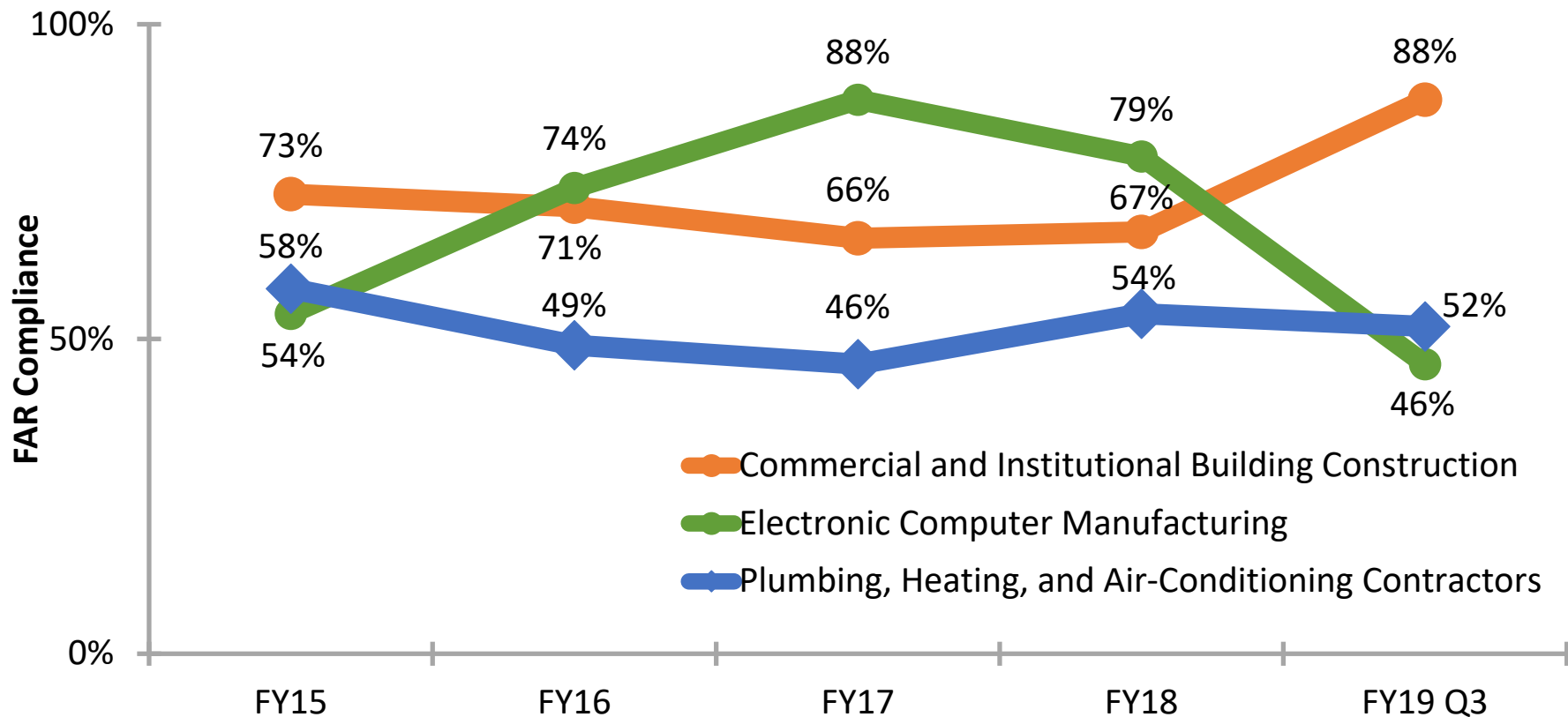
What **improvements** to existing tools would be most useful?

- Automatically include energy-efficiency requirements (contracting)
- Set energy-efficient products as the 'default' option (specifying)
- Add a feature for tracking energy-efficient contracts
- Collect data on number of annual energy-efficient products purchased

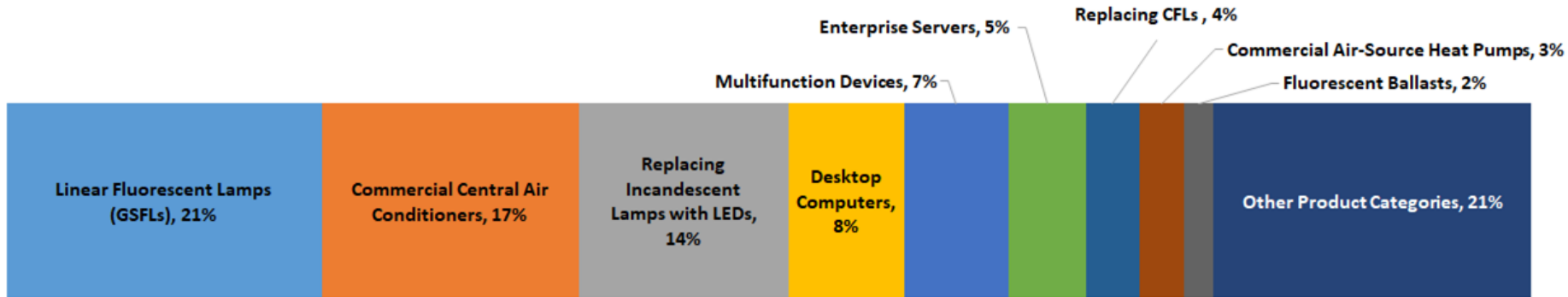


Where should agencies focus efforts to achieve the greatest savings?

Project types to prioritize ...



Product Categories to prioritize ...



Key Takeaways

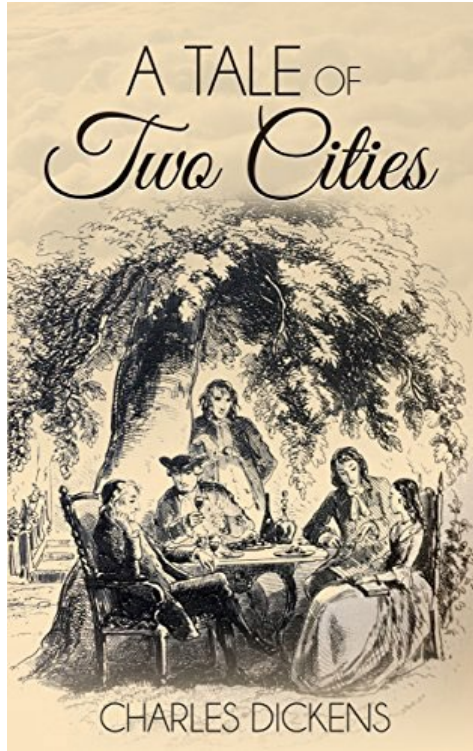
1

2

3

4

The story so far



On the one hand, we've had some real success to date

- Energy efficiency is becoming more prioritized in federal sector
- Achieving big cost and energy savings through procurement

On the other hand, there's a clear opportunity to improve

- Only **55%** compliant with energy efficiency requirements for purchasing
- Loss of **\$4.8 billion** in potential savings

We have further to go ...

Full compliance with energy efficiency requirements could save us an additional **\$300 million** in cumulative savings by 2025.

To get there, we can start with the following interventions:



Improved training



Better communication



Adopt new tools

Why does this matter?

Leveraging federal procurement to increase energy efficiency will ...

- Save up to \$500 million in taxpayer dollars
- Significantly reduce energy use and GHG emissions
- Spur the development and adoption of new technologies
- Improve national energy resiliency





Questions?



BERKELEY LAB

Bringing Science Solutions to the World

Solicitations review process → tracks compliance rates

Energy and cost savings model → quantifies potential savings

Federal procurement survey → identifies organizational barriers