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CLEAN ENERGY APPLICATION CENTERS: ANNUAL METRICS REPORT FOR FISCAL YEAR 2012

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EXECUTIVE SUMMARY

Between fiscal year (FY) 2010 and 2013, the U.S. Department of Energy (DOE) funded nine Clean Energy Application Centers (CEACs) with national coverage to promote and assist in transforming the market for Combined Heat and Power (CHP), Waste Heat to Power CHP, and district energy (DE) with CHP[1]. Prior to that, similar services were provided by eight Regional Application Centers (RACs). The key services that the CEACs provided were market assessments, education and outreach, and technical assistance. There were eight regional CEACs, each of which served a specific area of the country, and a separate center operated by the International District Energy Association (IDEA) which supported the regional centers with technical assistance, education, training, publicity, and outreach related to district energy with CHP.

Oak Ridge National Laboratory (ORNL) has performed four previous studies of CEAC activities. The first one examined what the centers had done each year from the initiation of the program through FY 2008; the second addressed center activities for FY 2009; the third one focused on what was accomplished in FY 2010; and the fourth looked at the CEACs' FY 2011 accomplishments, with a heightened emphasis on the adoption of CHP\DE technologies and the activities thought to be most closely related to CHP/DE development and use. The most recent study, documented in this report, examines CEAC activities in FY 2012.

All nine CEACs were asked to provide information on their FY 2012 activities, using a data collection spreadsheet which was similar to the one used for FY 2011. The information provided by the individual CEACs was summed to produce totals for all centers combined for each metric examined. In addition, data on CHP and DE installations were obtained from ICF International and the International District Energy Association, respectively. This study, like the four that preceded it, was designed to document center activities and existing CHP capacity but not to establish causal links between the two.

In FY 2012, the CEACs engaged in a variety of activities to support the development of policies that encourage and facilitate the use of CHP technologies. A total of 45 CHP-related policies were adopted in 21 different states during that year. Twenty of those policies were new ones, which is the same as in FY 2011. The remaining 25 were revisions to existing policies, which is about 25% less than the number of policies revised in the previous year. A complete picture of the type and number of policies enacted in FY 2012 is provided in Table ES.1.

Table ES.1 Type and number of key state policies, FY 2012

Policy type	Number new	Number revised
Incentive program	11	5
State energy plan	3	6
Portfolio standard	0	8
CHP Permitting	3	0
Public benefits fund	0	2
Other policy	3	4

The key CEAC activities undertaken to influence policy adoption were: providing states with information/advice on policy design and best practices; providing comments and participating in legislative/regulatory hearings; sharing technical expertise with state agencies; working with utilities to include CHP in their energy efficiency portfolios; and promoting the benefits of CHP to state agencies.

[1] The CEACs, which were funded through September, 2013, are now the CHP Technical Assistance Partnerships, which are more fully described at http://www1.eere.energy.gov/manufacturing/distributedenergy/chptaps.html.

Fifty-five technical site evaluations were performed in FY 2012 (40% fewer than in the previous year) and many other types of technical support were also provided to current and potential users of CHP technologies. Toward the end of FY 2012, a new technical assistance process was developed for the CEACs to streamline their efforts and focus on higher potential projects, and the initial transition to that new approach may have contributed to the downturn in the number of technical site evaluations performed.

The most common of the other technical support efforts provided by the CEACs were the following:

- design assistance;
- construction advice;
- business/financial advice;
- assistance/advice on obtaining funding;
- system/equipment advice;
- permitting/regulatory assistance;
- advice on utility issues; and
- help with identifying engineering firms and vendors.

Altogether, 76 CHP projects were under consideration, 52 were under development, and 20 went online in FY 2012 following the provision of technical assistance by the CEACs during that year or a previous one (Table ES.2). It should be noted that the date that a project goes on line often lags the initial provision of technical assistance by three to five years, so there tend to be a substantial number of projects in the pipeline at any given time.

The number of projects under consideration and under development in FY 2012 was three to four percent less than the year before, while the number of projects that went online was about 10 % greater than in the previous year. The electric generation capacity represented by those projects ranged from nine percent less (under consideration) to 47% less (under development), indicating that average electric capacity per project was lower in FY 2012 than in 2011. When the above findings are disaggregated, we find that the number of projects under development and going online following technical site evaluations was lower in FY 2012 than in 2011, while the opposite was true for projects associated with other types of technical support. The increase from FY 2011 to 2012 was especially great for projects that went online following other technical support.

The CEACs reported which of the projects associated with their technical assistance efforts had the highest impact/visibility in FY 2012 and why. The most common reasons given to explain high project impact or visibility was that they: utilized an innovative or unusual fuel source or technology; demonstrated the potential for improving energy reliability and resiliency; involved a large company, facility, or system; served an under-represented or non-traditional market sector; demonstrated potential in a targeted market sector; or involved interaction with a utility company or utility-related policy issues.

A total of 38 targeted market workshops/training sessions, 13 targeted market webinars, and 72 presentations at end-user workshops and conference events were given in FY 2012 by all CEACs combined. That represents a decline from FY 2011 in the numbers of workshops and webinars and in total attendance at those events. However, the number of presentations was greater in FY 2012 than in the previous year, as was total attendance at those presentations. In addition, the number of end-users attending *all* types of events (workshops, webinars, and presentations) was up substantially from the previous year, indicating a strategic focus on providing information to those most likely to apply it.

Table ES.2. Number of CHP projects and capacity associated with technical assistance provided, FY 2012

Project status	Number	Electric capacity (MW) [a]	Steam capacity (lbs./hr.)	Hot water capacity (MMBTU [b] /hr.)	Chilled water capacity (tons)
Project under consideration following technical site evaluation or other technical support	76	263	1,072,789	48,359	12,102
Project under development following technical site evaluation or other technical support	52	163	189,053	48,258	3,050
Project online following technical site evaluation or other technical support [c]	20	68	263,000	15	400

[a] MW stands for Megawatts

[b] MMBTU means million BTUs

[c] The number of projects shown in this table as going online in FY 2012 differs from the number of online projects listed in the installation data base kept by ICF International for a similar period. That difference is primarily due to the fact that (1) this table refers to the 2012 *fiscal* year while the ICF data base describes the 2012 *calendar* year; and (2) in some cases the ICF data base utilizes information from additional data sources.

In addition to reporting the activities in which they engaged, the CEACs were asked to identify the follow-up actions that they took after their targeted educational events. The most common follow-up actions reported were that the CEACs: educated potential users/developers on CHP opportunities; assisted government officials in developing CHP-related policies or programs; provided technical assistance to end-users on specific projects; or worked on additional education/outreach events. The most frequent explanations given for the strategic importance of the CEACs' follow-up activities were that they: increased awareness and support for CHP among stakeholders and potential users: facilitated adoption of CHP by end-users; educated government officials regarding CHP-related policies or programs; helped develop target markets; or established and maintained the CEAC's leadership role on CHP.

The CEACs were asked to describe five key accomplishments of their centers during this reporting period. The most frequently-cited accomplishment was that important education/outreach events (e.g., workshops and training sessions) were held or resources (e.g., analytical tools) were developed to support educational and outreach efforts. The next most common type of accomplishment reported by the CEACs was that state or local policies or regulations to facilitate CHP use had been developed or enacted with CEAC assistance. That was followed closely by having CHP projects under consideration or moving forward. Fairly far behind those, but still reported by multiple CEACs, was having utility policies developed to facilitate CHP usage. By far the most common reason given to explain the strategic importance of the CEACs' key accomplishments was that they provided stakeholders and end-users with information or support to facilitate CHP/DE usage. Two other frequently-cited explanations of strategic importance were that state or local government policies/regulations facilitated CHP usage and that utility policies facilitated CHP use.

CHP and DE installations were also tracked as part of this annual metrics effort. The data reported here are for all CHP and DE installations in the U.S. of all sizes, regardless of whether they received technical assistance or other support from the CEACs. While it is probable that the number and magnitude of those installations have been influenced by CEAC actions over the years, this study was not designed to establish or quantify that influence. One hundred eighty-two CHP facilities with a combined capacity of 869 MW were installed in the U.S. in calendar year (CY) 2012. This represents an increase of 67 % in the number of installations and an increase of 53% in electric generating capacity over the previous year. Unlike the CHP numbers, which were for CY 2012 only, data were collected for *all* DE systems in operation in the U.S. as of the end of 2012, regardless of when they were first installed. In total, there were 597 DE systems operating in the U.S., representing very substantial thermal and cogeneration capacity. With the exception of chilled water capacity, which is up slightly, those numbers are the same as those reported in last year's metrics report, which were current as of August, 2012.

The FY 2012 CEAC metrics exercise, like the ones that preceded it, was designed to quantify center activities and existing CHP/DE capacity but *not* to establish causal links between the two. Accordingly, we cannot say with any certainty how specific activities affect the adoption of CHP technologies and are thereby limited in our ability to recommend changes or refinements in CEAC operations. As in previous metrics reports, we do recommend that each center solicit feedback from its stakeholders concerning the usefulness of the services provided and make operational decisions based on that input.

As in previous years, we note that additional studies to explore possible relationships between CEAC activities and key outcomes could be helpful in informing management decisions about the nature and delivery of the services that the centers provide. One study that is likely to provide important findings is a direct examination of how the CEACs' technical assistance activities affect the adoption of CHP technologies. A study to examine the relationship between follow-up actions taken by the CEACs after their education and outreach events and CHP adoption in the targeted sectors could also be informative. Finally, studies looking at how the CEACs' policy-related activities influence the enactment of state policies and how those policies in turn affect CHP installations are worth considering. The findings generated by such research efforts would help quantify the effects of center-sponsored activities, which should help policy-makers and center managers decide what types of services to provide in the future.

1. INTRODUCTION

1.1. BACKGROUND

Between fiscal year (FY) 2010 and 2013, the U.S. Department of Energy (DOE) funded nine Clean Energy Application Centers (CEACs) with national coverage to promote and assist in transforming the market for Combined Heat and Power (CHP), Waste Heat to Power CHP, and district energy (DE) with CHP[1] (U.S. Department of Energy 2012). Prior to that, similar services were provided by eight Regional Application Centers (RACs).

During FY 2012, the year described in this report, there were eight regional CEACs providing market assessments, education and outreach, and technical assistance for specific areas of the country, as shown in Figure 1.1. A ninth CEAC, operated by the International District Energy Association (IDEA), supported the regional centers with technical assistance related to district energy and provided education, training, publicity, and outreach about that technology.

Figure 1.1. Geographic areas served by regional Clean Energy Application Centers

The RACs which, as noted above, were the precursors to the CEACs, began with a pilot program in the Midwest in 2001 and grew to include eight regional centers covering the entire country by 2005. Each center concentrated on providing services that fit the specific needs and market conditions of its particular geographic region (Bronson and Orlando 2009). In FY 2010, the scope of the centers expanded from CHP alone to include district energy systems and waste heat to power. At that time, consistent with language in the *Energy Independence and Security Act of 2007*, the official name of the centers was

[1] The CEACs, which were funded through September, 2013, are now the CHP Technical Assistance Partnerships, which are more fully described at http://www1.eere.energy.gov/manufacturing/distributedenergy/chptaps.html.

changed to Clean Energy Application Centers. Shortly thereafter, their number was expanded from eight to nine to include the International District Energy Association.

In 2007, Oak Ridge National Laboratory (ORNL) led an effort, involving DOE and CHP industry stakeholders, to establish metrics for quantifying center accomplishments. A logic model was developed to provide an in-depth description of the program's purpose and processes, which led to a deeper understanding of center operations and provided a basis for determining which specific activities and accomplishments should be examined (Schweitzer 2010).

ORNL has performed five metrics studies (including this one) to quantify center activities and accomplishments, fine-tuning the measures used with each subsequent assessment. The first study (Schweitzer 2009) focused on what the centers had done each year from the initiation of the program through FY 2008. The second study (Schweitzer 2010) examined center activities for FY 2009. The third study (Schweitzer 2011) documented what had been accomplished in FY 2010, the year in which the centers expanded their focus from CHP alone to include district energy and waste heat to power and changed their name to Clean Energy Application Centers. The fourth study focused on CEAC accomplishments in FY 2011, with a heightened emphasis on the adoption of CHP/DE technologies and on the activities thought to be most closely related to CHP/DE development and use (Schweitzer 2013). The fifth study, described in this report, examines what was accomplished in FY 2012.

In addition to documenting the centers' key activities, all five reports contain information on regional CHP installations from a state-by-state database maintained for DOE by ICF International. Starting with FY 2010, these reports also have presented key information on DE facilities throughout the U.S. from a database maintained by the International District Energy Association. None of the five studies conducted to date were designed to examine possible causal relationships between center activities and CHP/DE installations.

1.2. SCOPE OF REPORT

The remaining chapters of this report will address how the FY 2012 CEAC metrics study was performed and the key findings that it generated. **Chapter 2** discusses the research methods used in this study, and **Chapter 3** describes the policies enacted by various states in FY 2012. **Chapter 4** presents information on the number and capacity of CHP projects associated with the technical assistance services provided by the CEACs. It also discusses those projects identified by the CEACs as having the highest impact and visibility. **Chapter 5** addresses the key market development and end-user education activities provided by the centers with an emphasis on the follow-up actions taken and the strategic importance of those actions. In **Chapter 6**, we discuss the CEACs' most important accomplishments and their strategic significance. **Chapter 7** describes the CHP installations made during 2012 and also characterizes the state of existing DE facilities. Finally, **Chapter 8** synopsizes the key findings from this study and presents some recommendations for additional research to quantify the effects of CEAC-sponsored activities and achievements and help inform future policies.

2. METHODS

As in past years, ORNL staff developed a data collection spreadsheet to elicit all needed information from the Clean Energy Application Centers for FY 2012. This spreadsheet was similar to the one used for FY 2011 in its emphasis on the adoption of CHP technologies and those activities thought to be most closely related to CHP development and use. However, some refinements were made to the previous year's data collection spreadsheet, most notably:

- The addition of a new item asking for the influence of CEAC activities on policy adoption;
- The use of new categories for the types of projects performed, emphasizing the importance of CHP even in projects utilizing waste heat and district energy[2];
- The addition of open-ended questions asking about the prime mover technology, thermal technology/end use, and primary fuel type for each project associated with CEAC technical assistance;
- The use of a new drop-down list of possible market sectors served, providing more detail than in the past and distinguishing among a variety of industrial and institutional applications;
- The addition of an item asking for a brief description of the types of technical support other than Technical Site Evaluations that the CEACs provided; and
- The insertion of an item eliciting information on the number of state or local policy-makers in attendance at the CEACs' educational events.

In addition, the data collection spreadsheet was pre-populated with information on projects moving forward following CEAC technical assistance, based on information collected during previous interactions between the CEACs and a DOE contractor. The CEACs were asked to confirm those data and make any necessary changes. The new arrangement did not relieve the CEACs of their responsibility to ensure the accuracy of the final entries, but it did eliminate the need for them to duplicate past efforts by utilizing information that they had already provided.

In early May, 2013, the FY 2012 data collection spreadsheet was sent to each of the nine Clean Energy Application Centers with a request to fill it in with all relevant information and return it to ORNL. All nine centers returned the completed spreadsheets by mid-June, 2013. ORNL staff reviewed each completed spreadsheet and sent the CEACs requests for additional information or clarifications, as needed. All the requested follow-up information was provided to ORNL by mid-July, 2013, and a final database, containing all information provided by the centers, was completed a few days later. That database summed the information provided by each individual CEAC to yield totals for all the centers combined for each activity. The descriptive information contained in the final ORNL database served as the basis for the portions of this report that document CEAC activities and accomplishments.

Data were also collected on all CHP installations made during calendar year (CY) 2012 and on all existing DE facilities nationwide. While this study was not designed to establish a causal link between CEAC activities and CHP/DE installations, it is still considered important to document the current state of CHP/DE facilities nationwide.

[2] The three types of projects that are reported throughout this study are Traditional CHP, Waste Heat to Power CHP, and DE with CHP.

Data on CHP installations made during CY 2012 were provided to ORNL by ICF International in mid-July, 2013, from a state-by-state database that the company maintains for DOE[3]. The data provided by ICF included the number of installations made during 2012, the capacity of those installations, and estimates of the capital investment, energy savings, and carbon emissions reductions associated with them. At approximately the same time that ICF provided those CHP installation data, the International District Energy Association sent ORNL an update to the comprehensive data set containing information on all U.S. DE systems that it had prepared in August, 2012. That update showed the relatively minor capacity changes that had occurred during the final months of the 2012 calendar year.

[3] The ICF installation data base utilizes input provided on a regular basis by the CEACs as well as information from a wide variety of other sources including the U.S. Energy Information Administration (EIA), the Environmental Protection Agency (EPA) CHP Partnership, CHP system developers, equipment manufacturers, and utilities.

3. POLICY-RELATED ACTIVITIES AND RESULTS

In FY 2012, the Clean Energy Application Centers engaged in a variety of activities to support the development or revision of laws, regulations, and other policies that help facilitate CHP adoption and use. The major types of CEAC activities undertaken during FY 2012 and the specific state policies adopted during that same period are discussed in separate sections below.

3.1. CEAC ACTIVITIES

Seven of the nine CEACs reported that policies were established or revised in their states in FY 2012. For each those policies, the CEACs described the actions that they took in FY 2012 to influence policy adoption and the impact achieved by those efforts. The key activities mentioned explicitly by the CEACs are shown in Table 3.1.

Table 3.1. Key CEAC activities to influence policy adoption in FY 2012

CEAC activity	Number of CEACs explicitly reporting activity[a]
Provide state with information/advice on policy design and best practices	4
Provide comments and participate in legislative/regulatory hearings	3
Share technical expertise with state agencies	3
Work with utilities to include CHP in energy efficiency portfolio	3
Promote benefits of CHP to state agencies	2

[a] The total number of CEAC activities listed in this table exceed nine because several CEACs reported engaging in more than one type of policy-related activity.

3.2. POLICY RESULTS

Figure 3.1 shows the number of CHP-related rules, standards, and other policies adopted by the various states in FY 2012. The figure shows both “new” policies that were established for the first time in FY 2012 as well as “revised” ones that refined or adjusted previous policies addressing the same topic. Altogether, 45 state policies were passed in FY 2012, 20 new ones and 25 revisions to existing policies. The number of new policies adopted in FY 2012 was the same as in FY 2011, while the number of revised policies was about 25% less than the year before.

Incentive programs were put in place more frequently than any other policy-related instrument in FY 2012, with 11 new incentives for the adoption of CHP technologies and five revised ones. State energy plans were next most popular, with three new ones and six revisions to earlier plans. This was followed by eight revised portfolio standards, three new policies addressing CHP permitting, and two revised policies related to public benefit funds. Outside of these five major categories, there were a number of other policies enacted as well. As shown in Table 3.2, those three new and four revised policies cover a wide variety of topics including guidelines to evaluate CHP feasibility in critical government facilities, net metering, standby rates, and energy standards for public buildings.

Readers interested in obtaining more information on CHP-related policies should note that the State and Local Energy Efficiency Action Network (SEEAction) recently published a *Guide to the Successful Implementation of State Combined Heat and Power Policies* (2013) describing a variety of CHP-related policy options and implementation approaches.

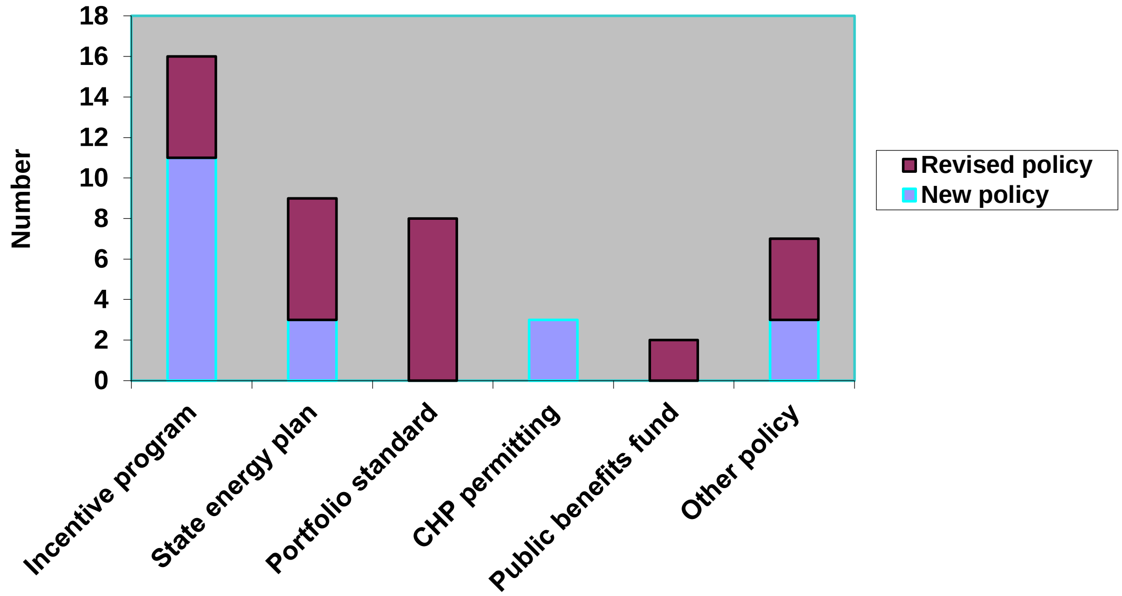

Figure 3.1. Number and type of policies enacted, FY 2012

Table 3.2. Other CHP-related policies enacted in FY 2012[a]

- Guidelines to evaluate CHP feasibility in critical government facilities (Louisiana)
- Net metering (Minnesota)
- Standby rates (New Jersey)
- Energy standards for public buildings (Ohio)
- Add thermal energy to utilities' voluntary green power programs (Washington)
- Extend air quality compliance period for biogas projects (Washington)
- Identify potential for cost-effective distributed generation for Investor Owned Utilities (Washington)

[a] The state enacting each policy is listed in parentheses after the policy description.

Table 3.3 shows the specific states that enacted new CHP-related policies in FY 2012. Those 20 new policies were distributed among 13 different states from the east coast to the west and from Alaska to Louisiana. The greatest amount of new policy activity in FY 2012 was in Washington State and New Jersey, which enacted four and three new policies respectively.

Table 3.4 lists the 14 states that revised their CHP policies in FY 2012 and shows the specific policies associated with each one. As with new policies, the states in question span the nation from east to west. Ohio and Washington revised the greatest number of policies in FY 2012 (four each), followed by Illinois with three.

Table 3.3. New policies enacted in FY 2012, by state

State	Number of: Incentive program	State energy plan	CHP permitting	Other policy
AK	1			
CT	2			
DE	1			
ID		1		
LA				1
NJ	2			1
NM	1			
NY	1			
OH	1			
TX	1		1	
UT		1		
WA		1	2	1
WI	1			

Table 3.4. Revised policies enacted in FY 2012, by state

State	Number of: Incentive program	State energy plan	Portfolio standard	Public benefit fund	Other policy
AK	1				
AZ	1				
IL	1	1		1	
IN			1		
MA			2		
MD		1			
MN		1			1
NJ		1			
NY	1				
OH			2	1	1
PA		1			
SD			1		
WA			2		2
WI	1	1			

4. TECHNICAL ASSISTANCE AND RESULTS

All nine Clean Energy Application Centers provided project-specific technical assistance to current and prospective users of CHP technologies in FY 2012. This assistance falls into two broad categories: (1) technical site evaluations and (2) other technical support contacts such as information on government/utility funding and financial/business advice. The assistance provided in those general areas, along with the various actions that followed that assistance, are discussed below.

4.1. TECHNICAL SITE EVALUATIONS AND ASSOCIATED PROJECTS

4.1.1. Technical Site Evaluations Performed

Table 4.1 shows the number of technical site evaluations of all kinds performed in FY 2012. It also displays the number and capacity[4] of all CHP projects that were recommended, under consideration, under development, or went on-line in FY 2012 following technical site evaluations performed during that year or a previous one. It is important to note that there can be a substantial time lag from when a technical site evaluation is performed until a project finally goes online because the project development life cycle for CHP installations is often three to five years.

Table 4.1. Technical site evaluations and associated projects and capacity, FY 2012

Project status	Number	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBTU /hr.)	Chilled water capacity (tons)
Technical site evaluation performed	55	-	-	-	-
Project recommended following technical site evaluation	32	96	433,953	48,168	3,212
Project under consideration following technical site evaluation	49	99	495,258	48,183	2,902
Project under development following technical site evaluation	23	66	189,053	48,006	3,050
Project online following technical site evaluation [a]	5	7	8,000	6	400

[a] The number of projects shown in this table as going online in FY 2012 differs from the number of online projects listed in the installation data base kept by ICF International for a similar period. That difference is due primarily to the following factors: (1) this table only includes projects associated with technical site evaluations as opposed to *all* technical support as in the ICF data base; (2) this table refers to the 2012 *fiscal* year while the ICF data base describes the 2012 *calendar* year; and (3) in some cases the ICF data base utilizes information from additional data sources.

In FY 2012, 55 technical site evaluations were performed by all the CEACs combined. Nearly two-thirds of them (35 evaluations) were feasibility analyses and the remainder consisted of site qualification studies. Almost 90% of the evaluations were for traditional CHP facilities alone, 7% were for DE with CHP, and the remaining evaluations were for Waste Heat to Power CHP. The most common market sectors addressed were pulp and paper, food processing, chemical plants, multi-family residential, forest

[4] Throughout this document, MW stands for megawatts and MMBTU means million BTUs.

products, colleges/universities, and health care facilities. The total number of technical site evaluations performed in FY 2012 was about 40% less than the number performed in the previous year[5].

4.1.2. Projects Recommended Following Technical Site Evaluations

Thirty-two CHP projects were recommended by the CEACs in FY 2012 following site evaluations performed then or in a previous year. Eighty-eight percent of those projects were traditional CHP, nine percent were Waste Heat to Power CHP, and the remaining three percent were DE with CHP. Between them, the 32 recommended projects provided electric generation capacity of 96 MW, thermal steam capacity of 433,953 pounds per hour, hot water capacity of over 48 billion BTUs per hour, and chilled water capacity of 3,212 tons.

The most common market sectors addressed were chemical plants, forest products, health care facilities, and multi-family residential. Gas turbines, reciprocating engines, and steam turbines were the most widely used prime mover technologies. The most common thermal technologies and uses were process heat and heat recovery steam generators (HRSG). Natural gas and biomass/biogas were used much more frequently than any other fuels.

The total number of projects recommended in FY 2012 following technical site evaluations and their electric generating capacity were about half of what was recommended in the previous year. Steam and chilled water capacity were also considerably lower (62% and 81% respectively), but the hot water capacity of the recommended projects was many times greater in FY 2012 than in FY 2011.

4.1.3. Projects under Consideration Following Technical Site Evaluations

In FY 2012, 49 CHP projects were under consideration by end-users following site evaluations performed in that year or a previous one. Seventy-eight percent of those projects were traditional CHP, 14% were Waste Heat to Power CHP, and the rest were DE with CHP. Combined, those projects accounted for electric generation capacity of 99 MW, thermal steam capacity of 495,258 pounds per hour, hot water capacity of slightly more than 48 billion BTUs per hour, and chilled water capacity of 2,902 tons.

The most common market sectors addressed were food processing, hotels, forest products, and chemical plants. Reciprocating engines and steam turbines were the most widely used prime mover technologies. The most common thermal technologies and uses were process heat, domestic hot water, and cooling. Natural gas and was by far the most frequently used fuel, with a substantial number of projects also utilizing biomass/biogas.

The total number of projects under consideration in FY 2012 following technical site evaluations was exactly the same as in FY 2011, but electric and steam capacity were 38% and 7% larger, respectively. Chilled water capacity in FY 2012 was nearly four times greater in FY 2012 than in the previous year and the increase in hot water capacity was substantially larger than that.

4.1.4. Projects under Development Following Technical Site Evaluations

Twenty-three CHP projects were under development in FY 2012 following site evaluations performed in that year or previously. This includes projects undergoing design at investment grade level, final finance

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[5] Toward the end of FY 2012, a new technical assistance process was developed for the CEACs to streamline their efforts and focus on higher potential projects, and the initial transition to the new approach may have contributed to the downturn in the number of technical site evaluations performed.

development, permitting, or construction. Sixty-five percent of the projects under development were traditional CHP, 30% were DE with CHP, and the remainder was Waste Heat to Power CHP. Altogether, those projects provided electric generation capacity of 66 MW, thermal steam capacity of nearly 190,000 pounds per hour, hot water capacity of 48 billion BTUs per hour, and chilled water capacity of just over 3,000 tons.

Rural villages and health care facilities were the most common market sectors addressed. Reciprocating engines and gas turbines were the most widely used prime mover technologies. The most common thermal technologies and uses were district energy, process heat, and HRSG. Natural gas, diesel, and biomass/biogas were the most frequently used fuels.

The number of projects under development in FY 2012 following technical site evaluations was about 15% lower than in the previous year. However, all types of capacity under development in FY 2012 far exceeded the amounts reported in FY 2011. Electric capacity associated with FY 2012 projects was more than 80% greater than in FY 2011; steam capacity was 550% greater than the year before; and the increases in hot water and chilled water capacities were larger still.

4.1.5. Projects Going On Line Following Technical Site Evaluations

Five CHP projects went online in FY 2012 following site evaluations performed then or in a previous year. Four of those projects were traditional CHP and one was DE with CHP. Those projects provided electric generation capacity of 7 MW, thermal steam capacity of 8,000 pounds per hour, and hot water capacity of only 6 million BTUs per hour.

The above projects represented a wide variety of market sectors, representing health care facilities, a hotel, a rural village, manufacturing, and the movie industry. Reciprocating engines were the prime mover technology used in four of the five projects. Heating and cooling were the most common thermal technologies and uses. Natural gas was the most frequently used fuel.

Both the total number of projects that went online in FY 2012 and the electric capacity associated with those projects were about half the amount reported in the prior year, and the amount of new steam and hot water capacity were both about 90% less than the year before. However, substantially more chilled water capacity went online in FY 2012 following technical site evaluations than in FY 2011.

4.1.6. Highest Impact/Highest Visibility Projects following Technical Site Evaluations

As was the case last year, the CEACs were asked to identify the highest impact/highest visibility projects with which they were involved during the fiscal year under study. All of the eight regional CEACs provided data in response to this query and, between them, listed a total of 28 projects for FY 2012. Of those, 24 were traditional CHP and four were Waste Heat to Power CHP. The most common thermal system reported was steam, followed by hot water and chilled water. Table 4.2 describes the projects reported by the CEACs as being their highest in terms of impact and visibility. For each one, the table shows the type of project along with its market sector and electric capacity and explains its impact/visibility as reported by the CEACs. Six of the 28 listed projects involved health care facilities and another four were in the food processing sector. Other market areas in which multiple projects took place were forest products, chemical plants, pulp and paper, other manufacturing, and waste water treatment facilities.

As shown in Table 4.2, there were many reasons that the listed projects were judged by the CEACs to have high impact and visibility. However, there were several explanations that recurred over multiple

Table 4.2. Description of highest impact/highest visibility projects following technical site evaluations, FY 2012

State	Type of project	Market sector	Electric capacity (MW)	Explanation of project's high visibility or impact
Arizona	Traditional CHP	Hotel	0.1	Project is installed and operational in an under-represented sector in this region and received CHP incentive from gas utility
Arizona	Traditional CHP	Healthcare facilities	0.9	Example of ongoing regulatory/utility barriers largely stemming from lack of interconnection standard
Arizona	Traditional CHP	Nursing home	1.2	Use of CHP in multi-family residential setting, which has not been successful in this region in the past
California	Traditional CHP	Food processing	1.6	Innovative use of technology: turbine driven chiller
California	Traditional CHP	Movie industry	1.0	High profile installation and use of innovative system: absorption chiller driven from waste heat
Colorado	Waste Heat to Power CHP	Manufacturing	0.75	Use of Waste Heat to Power CHP at a large industrial facility
Colorado	Waste Heat to Power CHP	Food processing	1.5	Potential use of CHP for Boiler MACT compliance with good payback
Georgia	Traditional CHP	Colleges/universities	17.4	Project is at state university that has experienced nearly 100% growth in energy costs over the past 10 years and presents an ideal case for CHP replacing 1940s coal boilers
Hawaii	Traditional CHP	Waste water treatment facility	0.78	Significant biogas/renewable project in Hawaii with high profile
Hawaii	Traditional CHP	Waste water treatment facility	0.6	Significant biogas/renewable project in Hawaii with high profile
Idaho	Waste Heat to Power CHP	Chemical plant	1.1	CHP screening and education/outreach efforts have encouraged other potential CHP/Waste Heat to Power projects by same company in four states and is helping move the food processing industry forward in this region

Louisiana	Traditional CHP	Healthcare facilities	0.4	Serves hospitals and medical centers, which is non-traditional for this region, and demonstrates feasibility of CHP for this sector and potential for improving resilience during natural disasters
Louisiana	Traditional CHP	Healthcare facilities	0.3	Serves hospitals and medical centers, which is non-traditional for this region, and demonstrates feasibility of CHP for this sector and potential for improving resilience during natural disasters
Massachusetts	Traditional CHP	Manufacturing	1.8	Project praised for retaining jobs in the area and received incentives from electric utility for installation
Mississippi	Traditional CHP	Food processing	--	Food processing is a growing CHP target market for this region and a successful project here could serve as an example for other sector leaders
Montana	Traditional CHP	Forest products	2.5	This biomass CHP project has had high visibility for state government and utility company related to interconnection and has encouraged other forest products mills to pursue CHP and highlighted state-level CHP barriers
Montana	Traditional CHP	Forest products	16.5	This biomass CHP project was submitted as a community renewable energy project to the state's largest electric utility and helped prove viability of relevant state law
North Carolina	Traditional CHP	Pulp and paper	4.7	This project is representative of the potential in the pulp and paper sector to increase CHP usage, made more attractive due to state policies and incentives
North Carolina	Traditional CHP	Pulp and paper	10	This project is driven by both energy cost savings and reliability; the site experiences 20-30 power interruptions per year and this project provides a high degree of protection from those grid failures
North Carolina	Traditional CHP	Beverage manufacturing	0.4	This project is at a greenfield CHP site and is seen as an economic development win for the state and a regional leader in clean energy
Ohio	Traditional CHP	Food processing	2	Largest food processing plant in the world, with interest in CHP for energy resiliency
Ohio	Traditional CHP	Chemical plant	2.5	Large company with significant name recognition; contact established as part of Boiler MACT Technical Assistance Outreach
Ohio	Traditional CHP	Brewery	--	One of top two beer companies in the U.S.

Pennsylvania	Traditional CHP	Data center	--	If project moves ahead it will be a significant element of the Philadelphia Navy Yard Energy Master Plan
Texas	Traditional CHP	Healthcare facilities	5	Serves hospitals and medical centers, which is non-traditional for this region, and demonstrates feasibility of CHP for this sector and potential for improving resilience during natural disasters
Texas	Traditional CHP	Healthcare facilities	15	Serves hospitals and medical centers, which is non-traditional for this region, and demonstrates feasibility of CHP for this sector and potential for improving resilience during natural disasters
Washington	Waste Heat to Power CHP	Correctional facility	0.2	This project was included in the long-term capital budget master plan and has benefited from a combination of market development and end-user education efforts
Wisconsin	Traditional CHP	Healthcare facilities	1.1	A leading healthcare facility in terms of sustainability and renewable energy with a goal of 100% energy independence by 2014

Note: Names of projects are not listed due to confidentiality concerns for projects in the planning stage. “**--**“ means the CEAC left this item blank.

projects. For seven of the projects, their high impact/visibility was attributed to their demonstration of the potential for improving energy reliability and resiliency. In six cases, the project served an under-represented or non-traditional market sector, and five projects involved interactions with a utility company or utility-related policy issues. Other commonly-reported reasons for projects' high impact and visibility were the involvement of a large company or well-known facility, use of an innovative technology, and the demonstration of CHP feasibility for a targeted market sector.

4.2. TECHNICAL SUPPORT CONTACTS AND ASSOCIATED PROJECTS

4.2.1. Technical Support Other Than Site Evaluations

Many different types of technical support, in addition to technical site evaluations, were provided by the CEACs in FY 2012. The most common kinds were: design assistance; construction advice; business/financial advice; assistance and advice on obtaining funding; system/equipment advice; permitting/regulatory assistance; advice on utility issues; and help with identifying engineering firms and vendors. Altogether, the CEACs provided technical assistance other than site evaluations for 120 prospective projects. Sixty-four percent of the projects receiving this technical support utilized CHP alone, another 28% used DE with CHP, and the remaining 8% were Waste Heat to Power CHP. The most common market sectors addressed were rural villages, colleges and universities, agriculture, forest products, and government buildings, in that order.

4.2.2. Projects under Consideration Following Technical Support Contacts

In FY 2012, 29 CHP projects were under consideration by end-users following technical support provided by the CEACs during that year or a previous one. Sixty-six percent of those projects were traditional CHP, 28% were DE with CHP, and the rest were Waste Heat to Power CHP. Combined, those projects accounted for electric generation capacity of 171 MW, thermal steam capacity of 577,531 pounds per hour, hot water capacity of 199 million BTUs per hour, and chilled water capacity of 9,200 tons (Table 4.3).

Table 4.3. Projects and capacity associated with technical support contacts, FY 2012

Project status	Number	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBTU /hr.)	Chilled water capacity (tons)
Project received technical support	115	-	-	-	-
Project under consideration following technical support	29	171	577,531	199	9,200
Project under development following technical support	30	100	0	253	0
Project online following technical support [a]	17	65	255,000	13	0

[a] The number of projects shown in this table as going online in FY 2012 differs from the number of online projects listed in the installation data base kept by ICF International for a similar period. That difference is due primarily to the following factors: (1) this table only includes projects associated with technical support other than technical site evaluations as opposed to *all* technical support as in the ICF data base; (2) this table refers to the 2012 *fiscal* year while the ICF data base describes the 2012 *calendar* year; and (3) in some cases the ICF data base utilizes information from additional data sources.

The most common market sectors addressed were forest products, colleges and universities, county government facilities, solid waste plants, and agriculture. Reciprocating engines, steam turbines, and gas turbines were the most widely used prime mover technologies. The most common thermal technologies and uses were process heat, heating for buildings, domestic hot water, and district energy. Biomass/biogas was the most frequently used fuel, followed by natural gas.

The total number of projects under consideration in FY 2012 following technical support contacts other than site evaluations was exactly the same as in the previous year. However, the electric capacity represented by those projects was 22% less than the year before. In contrast, the capacities for steam and hot water associated with those projects exceeded the numbers for 2011 by 54% and 155%, respectively. Cold water capacity was also much greater than in the previous year, but a percentage increase could not be calculated because no chilled water capacity was reported for projects under consideration in FY 2011.

4.2.3. Projects under Development Following Technical Support Contacts

Thirty CHP projects were under development in FY 2012 following technical support provided by the CEACs in that year or a previous one. Fifty-three percent of the projects under development were traditional CHP, 40% were DE with CHP, and the remaining 7% were Waste Heat to Power CHP. Altogether, those projects provided electric generation capacity of 100 MW and thermal hot water capacity of 253 million BTUs per hour.

The projects noted above served rural villages far more than any other market sector, and reciprocating engines were utilized much more than any other prime mover technology. The most common thermal technology and use was district energy, with process heat a distant second. Diesel, biomass/biogas, and natural gas were the most frequently used fuels.

Eleven percent more projects were under development in FY 2012 following technical support contacts other than site evaluations than the year before. However, all capacities associated with those projects were substantially lower than in FY 2011. Electric and hot water capacities were 63% and 73% lower, respectively, than the year before. The steam and chilled water capacities associated with those projects were both reported as being zero, which is substantially less than in 2011.

4.2.4. Projects Going On Line Following Technical Support Contacts

Seventeen CHP projects went on line in FY 2012 following technical support other than site evaluations provided by the CEACs in that year or a previous one. Seventy-one percent of the projects under development were traditional CHP and the other 29% were DE with CHP. In combination, those projects provided electric generation capacity of 65 MW, steam capacity of 255,000 pounds per hour, and hot water capacity of 13 million BTUs per hour.

The most common market sectors addressed were rural villages, colleges and universities, solid waste treatment plants, and agriculture. Reciprocating engines and steam turbines were the most widely used prime mover technologies. The most common thermal technologies and uses were district energy, process heat, and heat for building. Biomass/biogas, natural gas, and diesel were the most frequently used fuels.

Nearly 150% more projects went on line in FY 2012 following technical support contacts other than site evaluations than the year before. The steam capacity associated with those projects was almost 250%

greater than in FY 2011, but electric and hot water capacities were 36% and 71% lower, respectively, than in the previous year.

4.2.5. Highest Impact/Highest Visibility Projects following Technical Support Contacts

Six of the eight regional CEACs identified projects associated with their technical support efforts that they considered to be the highest impact and highest visibility for FY 2012. Altogether, the CEACs listed a total of 24 projects. Eighteen of them were traditional CHP, four were Waste Heat to Power CHP, and two were DE with CHP. The most common thermal systems reported were steam and hot water. Table 4.4 describes the projects reported by the CEACs as having the greatest impact and visibility.

Four of the 24 projects described in Table 4.4 took place in the agricultural sector. Three projects each involved colleges/universities, food processing plants, and health care facilities. Another two projects involved the forest products sector.

While a wide variety of reasons were given to explain why the listed projects were classified as having high impact and visibility, several explanations were applicable in a number of different cases. For seven projects, their high impact/visibility was due to the utilization of an innovative or unusual fuel source or prime mover technology. In five instances, the projects in question involved an exceptionally large system or facility. Other commonly-cited reasons for high impact/visibility were that a project demonstrated potential in a targeted sector, involved successful third party development, involved issues of CHP eligibility under energy efficiency and renewable energy portfolio standards, or provided an example of the use of CHP to improve energy security and independence.

4.3. TOTAL FOR ALL TECHNICAL ASSISTANCE COMBINED

Altogether, 76 CHP projects were under consideration in FY 2012 following the provision of technical site evaluations or other technical support by the CEACs during that year or a previous one. In combination, those 76 projects provided electric generation capacity of 263 MW, thermal steam capacity of 1,072,789 pounds per hour, hot water capacity of 48,359 million BTUs per hour, and chilled water capacity of 12,102 tons. The number of projects under consideration was three percent lower than in the previous year and the associated electric generation capacity was nine percent less. In contrast, steam capacity was 28% larger and the hot water and chilled water capacities were many times greater than in FY 2011. It should be noted that the total number of projects described here and in the following paragraphs is slightly less than the sum of the numbers given in Sections 4.1 and Section 4.2, because a few projects received both a Technical Site Evaluation and other types of technical support.

Fifty-two CHP projects were under development in FY 2012 following CEAC technical assistance of all kinds. Those projects accounted for 163 MW of electric generation capacity, 189,053 pounds of thermal steam capacity, 48,258 million BTUs per hour of hot water capacity, and 3,050 tons of chilled water capacity. The number of projects under development in FY 2012 was four percent lower than in 2011 and the associated electric and steam capacities were 47% and 79% lower, respectively. In contrast, the chilled water capacity for FY 2012 projects exceeded the number for 2011 by over 150% and the increase in hot water capacity was many times greater than that.

Table 4.4. Description of highest impact/highest visibility projects following technical support contacts, FY 2012

State	Type of project	Market sector	Electric capacity (MW)	Explanation of project's high visibility or impact
Alaska	Waste Heat to Power CHP	Rural village	0.25 additional, for TOTAL of 4.05	This project has all three types of systems (Traditional CHP, Waste Heat to Power CHP, and DE with CHP) and is a test site for further potential Waste Heat to Power Organic Rankine Cycle systems in rural Alaskan villages
Arizona	Traditional CHP	Waste water treatment facility	0.9	Continuation of long-standing support for CHP, and proof of viability of build-own-operate model for waste water treatment plants
Arizona	Waste Heat to Power CHP	Mining	--	Very good economics and a very large project, using 35-40 MW gas turbine
Arizona	Traditional CHP	Food processing	--	Very large thermal load, with 100% utilization of waste heat
Arizona	Waste Heat to Power CHP	City water pumping	--	Site is considering a relatively small Waste Heat to Power Organic Rankine Cycle system, which is still uncommon in this region
California	Traditional CHP	Forest products	20	Potentially major system re-powering if Power Purchase Agreement and thermal host can be identified
California	Traditional CHP	Colleges/universities	0.8	Significant college campus system
California	Traditional CHP	Colleges/universities	1.3	Significant college campus system
Illinois	Traditional CHP	Ethanol plant	3	Project funded through ARRA
Illinois	Traditional CHP	Food processing	0.5	This facility demonstrates the concept of indoor vertical farming in a renovated meat factory in Chicago and uses biogas through anaerobic digesters
Illinois	Traditional CHP	Food processing	1	Urban farm located in Chicago, presenting opportunity for economic growth and use of CHP with anaerobic digestion

Illinois	Traditional CHP	Agriculture	0.8	Project includes a number of state agencies, electric cooperatives, and the federal government
Montana	Traditional CHP	Forest products	2.5	This is the first CHP project for this state in the targeted forest products market and represents the resolution of a difficult situation regarding utility interconnection
North Carolina	DE with CHP	Colleges/universities	11	This large CHP system at a university was motivated by rising electric rates and lower natural gas prices and delivered using performance contracting; other universities are interested in this model for CHP project delivery
North Carolina	Traditional CHP	Agriculture	0.5	This project represents a successful third-party development scenario, in which an industrial host is able to procure steam from a boiler fueled by renewable biomass for a lower cost than self-generation of steam
North Carolina	Traditional CHP	Agriculture	0.4	This project represents a successful third-party development scenario, in which an industrial host is able to procure steam from a boiler fueled by renewable biomass for a lower cost than self-generation of steam
North Carolina	Traditional CHP	Pharmaceuticals	0.75	This project serves as a test case for the eligibility of CHP projects for the state's Renewable Energy and Energy Efficiency Portfolio Standard and is being watched by several other companies with an interest in CHP development
New Mexico	Traditional CHP	Casino	1-3	Potential of a decent payback; casinos are currently under-represented in CHP adoption compared to their potential and applicability
Ohio	DE with CHP	Healthcare facilities	20	High profile project in light of substantial recent state legislation and Boiler MACT opportunities

Oregon	Traditional CHP	Agriculture	4.8	This is the largest dairy digester in the U.S. and is an important step in getting large dairies in this region to adopt CHP
Texas	Traditional CHP	Healthcare facilities	4.2	Example of use of CHP in critical infrastructure for energy security reasons following catastrophic event
Washington	Traditional CHP	Pulp and paper	20	This biomass CHP project has had many environmental, permitting, and funding challenges, resulting in high visibility in state government and strong support by the Governor and Commissioner of Public Lands
Washington	Waste Heat to Power CHP	Steel manufacturing	2.8	Set precedent for use of high efficiency CHP as an efficiency portfolio measure.
Wisconsin	Traditional CHP	Healthcare facilities	0.5	A leading healthcare facility in terms of sustainability and renewable energy, with goal of 100% energy independence by 2014

Note: Names of projects are not listed due to confidentiality concerns for projects in the planning stage. “NA” means the CEAC reported this as Not Applicable. “DK” means the CEAC reported this as Don’t Know. “-“ means the CEAC left this item blank.

In FY 2012, 20 projects went on line following the provision of technical assistance by the CEACs then or in a previous year. In combination, those 20 projects provided electric generation capacity of 68 MW, thermal steam capacity of 263,000 pounds per hour, hot water capacity of 15 million BTUs per hour, and chilled water capacity of 400 tons. The number of projects that went online in FY 2012 was about 10% greater and the associated steam capacity was about 90% higher than in the preceding year. In contrast, electric, hot water, and chilled water capacities were all less than the year before by between 40 and 99%.

5. MARKET DEVELOPMENT AND END-USER EDUCATION

The Clean Energy Application Centers perform a wide variety of education and outreach activities. As was the case last year, the FY 2012 metrics effort focused on the CEACs' educational activities that directly targeted potential end-users of CHP technologies and on the centers' web-based outreach efforts. The information provided by the CEACs in those key areas is discussed in more detail below.

5.1. CEAC-HOSTED TARGETED MARKET WORKSHOPS

In FY 2012, the CEACs held a total of 38 targeted market workshops and training sessions, which attracted 3,487 attendees (Table 5.1). This represents about a 20% decline in the number of events compared to the previous year but only a five percent drop in the total number of attendees. Nineteen hundred twenty-four workshop participants (55 % of the total number) were end-users, which is more than 70% greater than the number of end-users attending workshops and training sessions in the previous year. Three hundred thirty-six participants (10% of the total) were state or local policy-makers. These numbers should be viewed in the context of the CEACs' shift during FY 2012 to a more strategic approach with an emphasis on end-user education and follow-up actions.

Table 5.1 CEAC workshops, webinars, and presentations, FY 2012

Type of event	Number held	Number end-user attendees (and % of total)	Number policy-maker attendees (and % of total)	Total number attendees
Targeted market workshops/training sessions	38	1,924 (55%)	336 (10%)	3,487
Targeted market webinars	13	392 (31%)	28 (2%)	1,247
Presentations at end-user workshops and conference events	72	1,527 (29%)	588 (11%)	5,270

The types of projects addressed by the CEACs' targeted market workshops and training sessions are shown in Figure 5.1. Sixty percent of the targeted market workshops and training sessions held in FY 2012 focused on traditional CHP; 29% addressed DE with CHP, and the remaining 11% dealt with Waste Heat to Power CHP. The market sectors most frequently addressed were colleges and universities, manufacturing, government buildings, and food processing. Other commonly addressed sectors were agriculture, waste water treatment facilities, forest products, rural villages, and commercial office buildings.

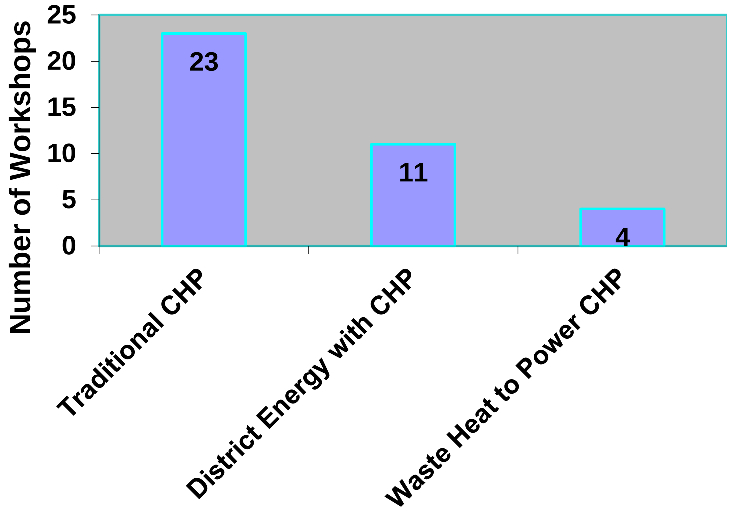

Figure 5.1. Type of project addressed by CEAC workshops, FY 2012

The CEACs were asked to identify the follow-up actions that they took after their FY 2012 education and outreach activities and to describe the strategic importance of those activities. Table 5.2 lists all the follow-up actions that the CEACs reported. As shown, the actions reported by the largest numbers of CEACs involved assisting government officials in developing CHP-related policies or programs, educating potential users/developers on CHP opportunities, providing technical assistance to end-users on specific projects, or working with utilities on CHP-related policies or programs.

Table 5.2 Follow-up actions taken by CEACs after workshops, webinars, and presentations, FY 2012

	Number of CEACs taking follow-up action after:		
CEAC follow-up action	**Workshops**	**Webinars**	**Presentations**
Assist government officials in developing CHP-related policies or programs	5	1	5
Educate potential users/developers on CHP opportunities	4	3	6
Provide technical assistance to end-users on specific projects	4	1	5
Work with utilities on CHP-related policies or programs	3	0	1
Work on additional education/outreach events	2	3	3
Solicit information from attendees regarding their CHP information needs	1	0	1
Help develop energy plan that addresses CHP	1	0	0
Provide attendees with requested information	0	1	0

The strategic importance of the CEACs' post-workshop activities, as reported by the centers themselves, is described in Table 5.3. The largest numbers of CEACs explained that their follow-up actions were important because they increased awareness and support for CHP among stakeholders and potential users or they educated government officials regarding CHP-related policies or programs. Other common answers were that CEAC follow-up actions were important because they facilitated adoption of CHP by end-users, educated utilities regarding CHP-related policies or programs, helped develop target markets, or helped identify and remove barriers to CHP use.

Table 5.3 Strategic importance of follow-up actions taken by CEACs after workshops, webinars, and presentations, FY 2012

	CEACs reporting strategic importance following:		
Strategic importance of follow-up action	**Workshops**	**Webinars**	**Presentations**
Increase awareness and support for CHP among stakeholders and potential users	5	2	4
Educate government officials regarding CHP-related policies or programs	5	1	4
Facilitate adoption of CHP by end-users	4	2	5
Educate utilities regarding CHP-related policies or programs	4	0	0
Help develop target markets	3	3	4
Help identify and remove barriers to CHP use	3	1	1
Establish and maintain CEAC leadership role on CHP	2	1	4
Support inclusion of CHP in state energy plan	2	0	0

5.2. CEAC-HOSTED TARGETED MARKET WEBINARS

The CEACs hosted 13 targeted market webinars in FY 2012. Those events were attended by 1,247 participants, 392 of whom (31% of the total) were end-users (Table 5.1). Compared to the previous year, that represents a decline of almost 63% in the number of events and 25 % in the total number of attendees. However, the number of end-user attendees was up by 15% over FY 2011. Twenty-eight participants (about 2% of the total) were state or local policy-makers. As noted in Section 5.1, these numbers can be seen as reflective of the CEACs' shift during FY 2012 to a more strategic approach with an emphasis on end-user education and follow-up actions.

Figure 5.2 illustrates the distribution of project types addressed by CEAC targeted market webinars in FY 2012. Sixty-nine percent of those webinars focused on traditional CHP and the remaining 31% addressed DE with CHP. The market sectors most frequently addressed were colleges and universities, health care facilities; manufacturing, chemical plants; and government buildings.

As shown in Table 5.2, the follow-up actions reported by the largest numbers of CEACs involved educating potential users and developers on CHP opportunities or working on additional education/outreach events.

Table 5.3 shows that the largest numbers of CEACs explained that their follow-up actions were strategically important because they helped develop target markets, increased awareness and support for CHP among stakeholders and potential users, or facilitated adoption of CHP by end-users.

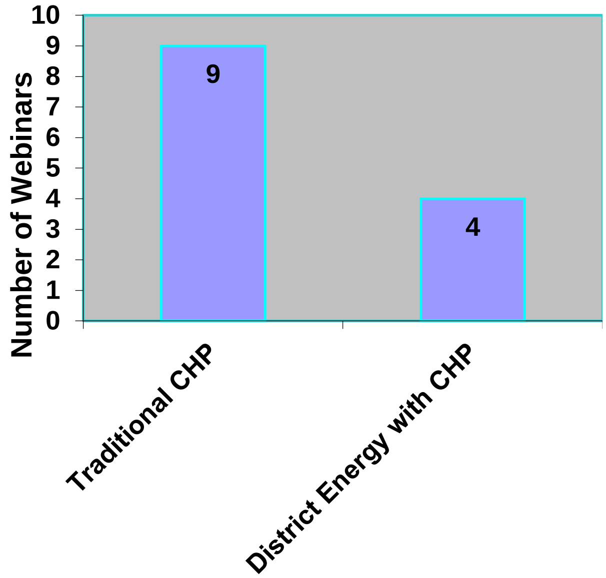

Figure 5.2. Type of project addressed by CEAC webinars, FY 2012

5.3. PRESENTATIONS AT END-USER WORKSHOPS AND CONFERENCE EVENTS

The CEACs made 72 presentations at end-user workshops and conference events in FY 2012 (Table 5.1). A total of 5,270 people attended those events, 1,527 of whom (29% of the total) were energy end-users. That represents an increase over the previous year of 29% in the number of presentations, 20% in the total number of attendees, and 33% in the number of attendees who were end-users. Five hundred eighty-eight participants (11% of the total) were state or local policy-makers.

Figure 5.3 shows the distribution of project types addressed by CEAC presentations at end-user workshops and conference events in FY 2012. Seventy-six percent of those presentations focused on traditional CHP, 19% addressed DE with CHP, and the remainder dealt with Waste Heat to Power CHP. The market sectors most frequently addressed were colleges and universities, manufacturing, health care facilities, government buildings, food processing, and waste water treatment plants.

As shown in Table 5.2, the most common follow-ups to presentations at end-user workshops and conference events were to educate potential users and developers on CHP opportunities, assist government officials in developing CHP-related policies or programs, provide technical assistance to end-users on specific projects, or work on additional education/outreach events.

Table 5.3 shows that the most frequent explanations for a post-presentation activity's strategic importance were that the action facilitated adoption of CHP by end-users, increased awareness and support for CHP among stakeholders and potential users, educated government officials regarding CHP-related policies or programs, helped develop target markets, or established and maintained the CEAC's leadership role on CHP.

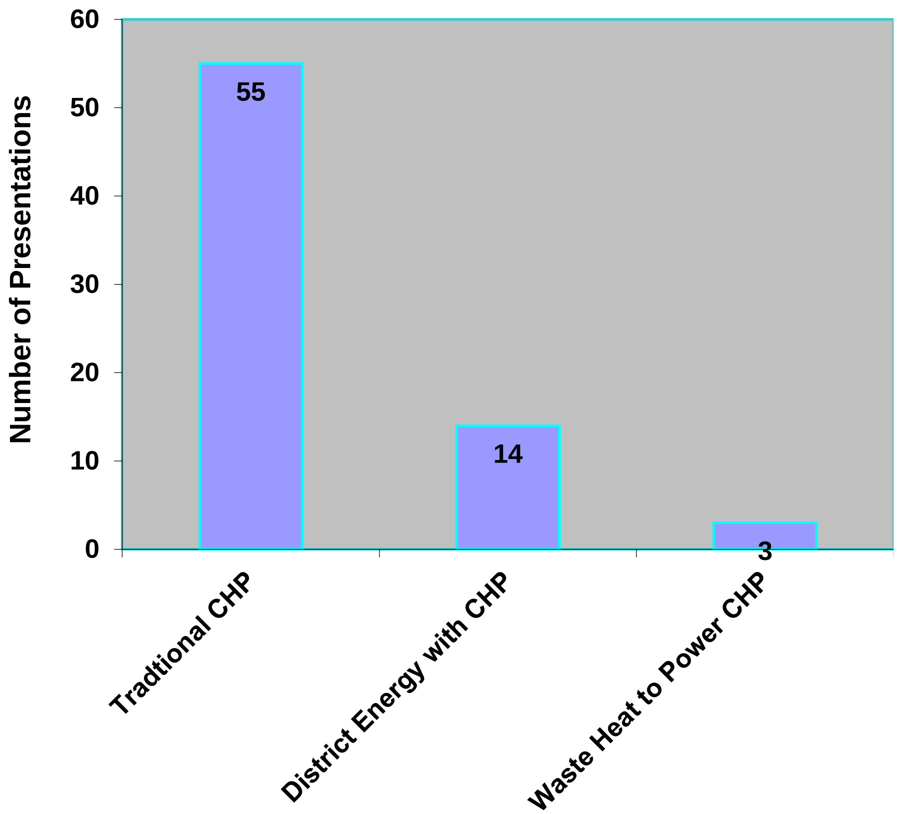

Figure 5.3. Type of project addressed by CEAC conference presentations, FY 2012

5.4. WEBSITE HITS AND DOWNLOADS

All nine CEACs reported the number of views and unique visitors to their websites for FY 2012. As shown in Figure 5.4, the totals reported for all the centers combined were 232,622 page views and 194,708 unique visitors. The number of page views in FY 2012 was about two-thirds of what it was in 2011, but the number of unique visitors was almost three times larger than it was the year before.

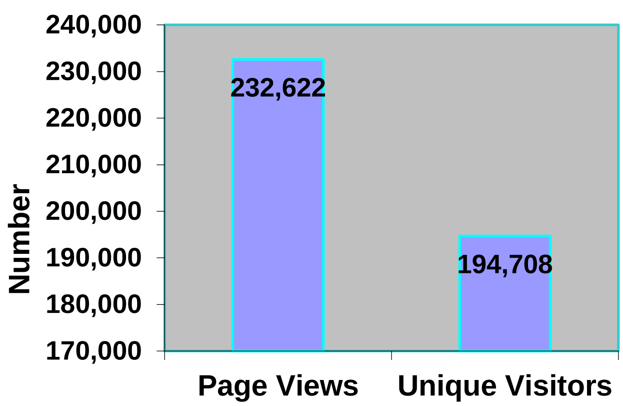

Figure 5.4. Number of Clean Energy Application Center website page views and unique visitors, FY 2012

In addition to total page views and visitors, each CEAC was also asked to identify and describe the three individual items viewed or downloaded most frequently from their website. For all nine CEACs combined, their most popular items had a total of 40,528 views or downloads in FY 2012, which is about half the number from FY 2011. The key types of most popular materials reported by the CEACs and the number viewed or downloaded in each category are shown in Figure 5.5. A little more than half of the most popular views or downloads involved materials that either profiled a specific project or provided a general overview of CHP/DE. Another one-fifth of those views/downloads provided information on International District Energy Association conferences. The next most popular views/downloads consisted of conference presentations or lists of IDEA resources. Forty-six percent of the most frequently viewed or downloaded materials addressed traditional CHP and another 38 % dealt with DE with CHP. The remaining 16% focused on Waste Heat to Power CHP.

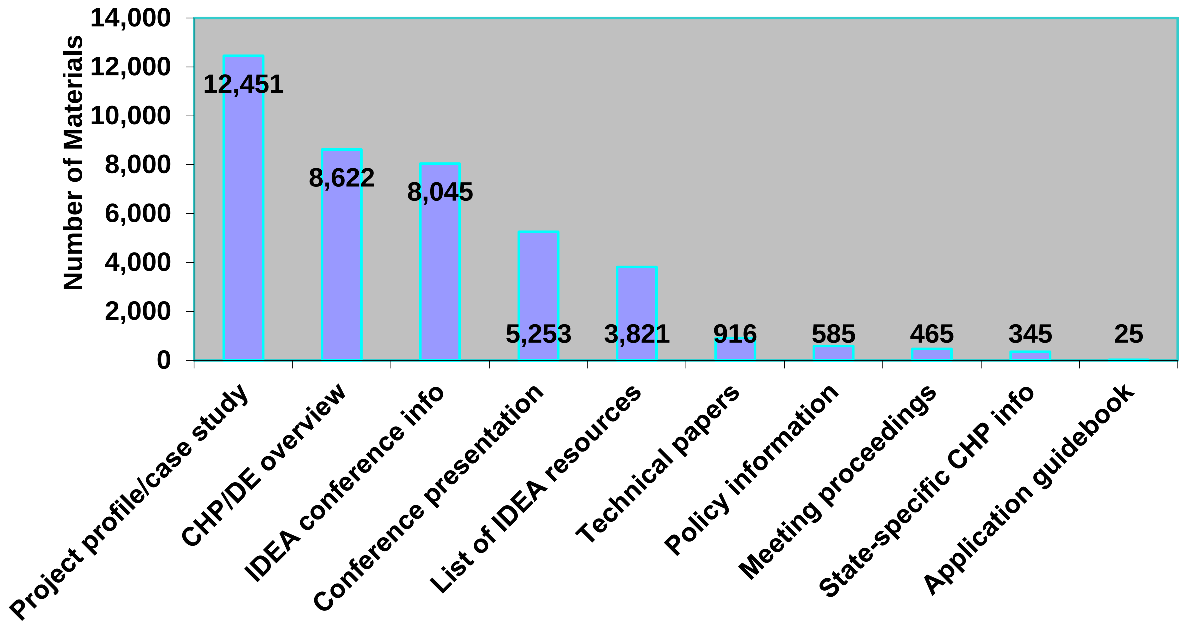

Figure 5.5. Key types of materials viewed/downloaded, FY 2012

6. MOST IMPORTANT ACCOMPLISHMENTS

In an effort to focus the CEAC metrics effort on those activities having the greatest impact on CHP development, each center was asked to identify its five most important accomplishments for FY 2012 and explain the strategic importance of each one. The information reported by the centers on those topics is provided below.

6.1. OVERVIEW OF CEAC ACCOMPLISHMENTS

Each of the nine CEACs described five key accomplishments of their center during the 2012 fiscal year. As shown in Table 6.1, the CEACs' major accomplishments fall into a small number of general categories. The most common type of accomplishment reported by the CEACs was that important education/outreach events were held or resources were developed to support educational and outreach efforts. The next most frequently reported accomplishment was the development or enactment, with CEAC input and assistance, of state or local policies or regulations to facilitate CHP usage. This was followed by having CHP projects under consideration or moving forward with help from the CEACs. The final major type of accomplishment reported was the development of utility policies to facilitate CHP usage.

Table 6.1. Overview of most important CEAC accomplishments in FY 2012

General type of accomplishment reported by CEAC	Number of times reported by CEAC
Important education/outreach events held or resources developed	17
State or local policies/regulations to facilitate CHP use developed or enacted with CEAC input and assistance	12
CHP projects under consideration or moving forward with CEAC assistance	11
Utility policies developed to facilitate CHP usage	5

For each accomplishment reported, the CEACs also explained its strategic importance. Those explanations can be put into three general categories, as shown in Table 6.2. The majority of the most important CEAC accomplishments were judged to be strategically important because they provided stakeholders and end-users (current or potential) with information or support to facilitate CHP/DE usage. In the remaining cases, CEAC activities were strategically important because they involved policies by state/local governments or utilities that facilitated the adoption and use of CHP.

Table 6.2. Overview of CEAC-reported strategic importance of accomplishments in FY 2012

Strategic importance reported by CEAC	Number of times reported by CEAC
Provide stakeholders and end-users with information/support to facilitate CHP/DE use	26
State or local government policies/regulations facilitate CHP usage	10
Utility policies facilitate CHP use	9

6.2. MOST IMPORTANT ACCOMPLISHMENTS FOR EACH CEAC

This section provides a description of the accomplishments reported by all nine CEACs as their most important, along with a detailed explanation of each accomplishment's strategic significance as seen by the CEAC. In many cases, the explanations have been edited for length and stylistic consistency, but every attempt has been made to retain the essential information provided by the CEACs. The information for each CEAC is reported in its own table (6.3 – 6.11) with the regional centers arranged in alphabetical order, followed by the International District Energy Association.

Table 6.3. Gulf Coast CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Texas Commission on Environmental Quality approved a CHP permit-by-rule (PBR) following the passage of HB 3268 in FY 2011.	The PBR is expected to reduce regulatory delays and eliminate some equipment costs associated with CHP systems. With specified controls, systems up to 15 MW are allowed. The rules can apply to a single unit or group of units.
2. CHP 2011 Tradeshow and Conference was held in the first month of the 2012 fiscal year with CEAC assistance.	This was the only nationwide conference and trade show in FY 2012 dedicated solely to cogeneration, tri-generation, and waste heat to power. It provided education, business development, and networking for individuals and organizations considering CHP. The event drew approximately 285 attendees from across the country and world, representing roughly 150 organizations, 31 exhibitors, and 14 sponsors.
3. Following educational support and the cultivation of industry allies by the CEAC, Louisiana passed a resolution calling for the Department of Natural Resources and Public Services Commission to establish guidelines to evaluate CHP feasibility in critical government facilities.	The resolution passed by the Louisiana Legislature supports the consideration of CHP usage in critical government facilities. A similar resolution is expected to be introduced by the New Orleans City Council in FY 2013.
4. Stakeholder base and network were significantly expanded through presentations by CEAC personnel at numerous events and the addition of many new subscribers to the CEAC distribution list.	The Center's distribution list increased by 15% in FY 2012, to over 6,400 subscribers.
5. Following CEAC education and outreach, the Louisiana Department of Natural Resources approved the development of a report on the status and potential of CHP in the state.	The report will document the current status of CHP usage in Louisiana and the potential for additional development.

Table 6.4. Intermountain CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Following CEAC education and outreach, CHP is now included as an eligible custom measure in a regional utility's DSM plan, allowing that technology to qualify for incentives.	When CHP is included in utility efficiency programs, it can be recognized for its efficiency benefits and viewed favorably by utilities because it can help meet their efficiency goals. This policy change by the regional utility company offers a model and precedent for other utilities to follow.
2. Following analysis, education, and outreach by the CEAC, the Arizona Corporation Commission voted to continue its incentive program which provides assistance for CHP projects.	Given the intermountain region's electric and gas prices, it is difficult for CHP projects to succeed without special circumstances and/or incentives. A regional utility's CHP program currently offers the intermountain region's best CHP incentives and is helping projects move forward that otherwise would not.
3. The CEAC succeeded in arranging one-on-one meetings with two Colorado Public Utilities commissioners and, separately, with two Colorado PUC staff to share important information on market conditions and regulatory issues affecting CHP in Colorado.	Interaction with Commissioners and staff is very important for building awareness of key CHP issues and spurring regulatory improvements. Through the meetings that were held, the CEAC was able to highlight the importance of CHP policy issues, discussing regulatory options to address existing problems and sharing important fact-based resources.
4. The CEAC organized and hosted a CHP Stakeholder Workshop and Tour in Tempe, Arizona. The outcomes of this workshop included: highlighting successful local CHP systems for policymakers and end-users; educating potential end-users about how to pursue a project; expanding the CEAC's network of active project developers; and increasing awareness of the CEAC among outreach partners, policymakers, and potential end-users.	The main strategic importance of workshops such as this one is to help encourage CHP project consideration and adoption by giving end-users necessary information, resources, examples, and contacts. Other strategic reasons for holding such workshops are to educate policymakers about the importance of CHP adoption to their local economy and communities and to build a network of CHP stakeholders for future project and policy support.
5. The CEAC formed an informal partnership with a network of 30 large industrial firms in Colorado working to reduce their energy intensity. Through this ad-hoc partnership, the CEAC was able to provide more education, feasibility screenings, and direct technical assistance to high-profile Colorado industrial companies.	Education and technical assistance are two valuable CEAC tools for helping to encourage CHP project consideration and adoption, especially when directed toward appropriate market sectors such as those represented by members of the industrial firms network.

Table 6.5. Mid-Atlantic CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. CHP incentives were included in Maryland's new Energy Master Plan following technical support by the CEAC to the Maryland Energy Administration and the Public Service Commission. As required by the plan, each utility subsequently issued requests for proposals for CHP projects.	Technical support, in an advisory capacity, to state policy makers is a key part of the CEAC's Strategic Plan. The goal of this strategic initiative is to highlight the advantages and importance of CHP in the State of Maryland.
2. New Jersey established two CHP incentive programs, one for systems under one MW and one for systems over one MW, following technical support to the New Jersey Bureau of Public Utilities by the CEAC.	As noted above, technical support to state policy makers is a key part of the CEAC's Strategic Plan. The goal of this strategic initiative is to highlight the advantages and importance of CHP in the State of New Jersey.
3. Phase II Energy Efficiency and Conservation Plan was adopted in Pennsylvania following technical support to the Pennsylvania Public Utilities Commission by the CEAC. Plan adoption resulted in extension of Pennsylvania Act 129, and utilities are including CHP incentives to help meet program efficiency goals that the Act established.	Technical support to state policy makers is a key part of the CEAC's Strategic Plan. The goal of this strategic initiative is to highlight the advantages and importance of CHP in the Commonwealth of Pennsylvania.
4. CEAC provided technical support to the Delaware Department of Natural Resources and Environmental Control to establish CHP-specific incentives as part of their program portfolios.	Technical support to state policy makers is a key part of the CEAC's Strategic Plan. The goal of this strategic initiative is to highlight the advantages and importance of CHP in the State of Delaware.
5. An area food processing company has finalized plans and a detailed design for CHP usage following the receipt of technical support from the CEAC. A Pennsylvania Commonwealth Financing Authority grant was also awarded for this project.	This is the first CHP program to move towards execution following CEAC workshop and technical assistance.

Table 6.6. Midwest CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Following CEAC education and outreach, Ohio enacted energy legislation (SB 315) which includes CHP and Waste Energy Recovery (WER, also known as Waste Heat to Power) as recognized technologies for the State Energy Efficiency Portfolio Standard (EEPS). WER is also included as a recognized technology under the State Renewable Portfolio Standard (RPS).	SB 315 puts in place the mechanism by which CHP/WER can become integral parts of the utilities' EEPS and RPS plans. This is expected to enhance the development of CHP in Ohio.
2. Boiler MACT Technical Assistance Pilot Program implemented in Ohio following efforts by the CEAC in cooperation with state and federal agencies and Ohio industrial firms. Several facilities have subsequently moved to the next step in evaluating the use of CHP within their plants.	The EPA Boiler MACT rules provide an opportunity for CHP to be utilized by industrial firms as part of their compliance strategy, and the experience gained through the pilot program will allow technical assistance to be provided nationwide in the future.
3. The CEAC worked with the Iowa Environmental Council and the Environmental Law and Policy Center to show that existing standby rate structures pose a barrier to CHP adoption and use. This analysis has been used as a basis for discussions between utilities and the environmental stakeholders and one utility has unofficially agreed to re-evaluate their standby rates prior to the scheduled rate case set for 2013.	Unfavorable standby rates are one of the largest obstacles to the implementation of CHP in many states. Making progress in Iowa will be very helpful in promoting similar standby rate reform in other states in the Midwest and nationwide.
4. Five biogas-fueled CHP projects with total generating capacity of 1.3 MW are underway in Illinois following educational, policy, and technical assistance efforts by the CEAC in cooperation with the Illinois State Energy Office and the Association of Illinois Energy Cooperatives.	The partnership of the utility coops, the State Energy Office, and the EPA sends a positive message to potential end-users (e.g., food processing plants, waste water treatment plants, livestock facilities) that utility and state support is available for them.
5. Increasing CEAC activities and accomplishments related to the adoption of favorable state policies in multiple states (Ohio, Iowa, Minnesota, Indiana, and Illinois) are establishing the Midwest CEAC as a valuable resource as states consider distributed generation policies.	Recent activities and accomplishments are establishing the Midwest CEAC as a valuable resource in the policy arena, which is the strategic position that the CEAC seeks.

Table 6.7. Northeast CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. CEAC co-chaired New York City Mayor's Distributed Generation Collaborative, which drafted regulatory improvements to facilitate CHP deployment in New York City.	The strategic regulatory improvements developed by the Collaborative are expected to help the City achieve the PlaNYC goal of 800 MW of new CHP by 2030.
2. CEAC served as a strategic resource in the Connecticut Microgrid Pilot and provided information to communities and other decision-makers regarding CHP use as a centerpiece in their pilot submissions.	The CEAC emphasized the importance of high efficiency CHP in microgrid projects through its discussions with communities and other decision-makers.
3. CEAC helped develop a District Energy Tool and use it in several high profile evaluations, including the 57 MW Nassau County District Energy System.	CEAC efforts helped advance the development of a District Energy analytical tool and supported its use in several high profile situations.
4. CEAC established itself across the region as an influential and trusted resource on the issues of critical infrastructure, resiliency, business continuity, emergency preparedness, and CHP/DE. Its efforts substantially increased the visibility of CHP as an important tool for addressing those issues among legislators, governors, policy-makers, emergency responders, and end-users at critical infrastructure facilities	CEAC staff became identified across the region as non-partisan experts on the role of CHP, microgrids, and District Energy systems with CHP.
5. CEAC worked with utilities and the New York State Energy Research and Development Authority (NYSERDA) to show the benefits of the use of strategically-sited CHP through incentive mechanisms and utility pilot programs.	CEAC has played a central role in highlighting the value of strategically-sited CHP as a substitute for distribution system capital. The "Non-Wires Alternatives" work that the CEAC has engaged in as part of activities with utilities in New York and New England represents a nationally innovative initiative.

Table 6.8. Northwest CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Policies and programs were developed to address target markets (agriculture, forest products, pulp and paper) in Oregon in conjunction with mentoring, discussions, examples, and technical support from the CEAC.	Oregon has a strong CHP policy framework and substantial support from the State Energy Office, putting it in a good position to move forward with CHP and help move other Northwest states forward by example.
2. Several policy changes were enacted in Washington State, following technical support from the CEAC. Those policy changes included: expansion of the biomass feedstock options allowed in the Renewable Portfolio Standard (RPS); formal establishment of a work group to resolve technical questions with the state's RPS and Efficiency Portfolio Standard (EPS).; and inclusion of a chapter on distributed energy in the 2012 State Energy Strategy.	These changes in Washington's CHP policy have strengthened target markets in pulp and paper, forest products, and food processing; clarified qualifications for renewable energy credits; enabled Waste Heat to Power projects to qualify under the EPS for utility grants as high efficiency CHP; removed the risk of after-the-fact negative audit findings; and developed a pathway for other needed CHP policy framework improvements.
3. The national Biomass Target Market Business Plan was developed by the Northwest CEAC. It represents a major effort to identify the status of nine target markets, establish education needs, determine market potential, and identify key stakeholders and establish next steps.	The biomass plan assembled a wide range of information on CHP technologies and feedstocks and has been followed by a number of interactions on this topic among various CEACs around the country.
4. CHP projects have moved forward in several key target markets (pulp and paper; forest products; food processing; dairies) following the provision of technical expertise, market development, end-user education, and policy assistance by the CEAC.	A number of CHP projects are now under consideration, under development, or online, helping move target markets forward from action by early adopters to a broader acceptance of CHP.
5. In Washington State, a large steel manufacturing company undertook a 2.8 MW Waste Heat to Power CHP project following a policy change that was supported by the CEAC's technical analysis.	Long-running education, outreach, and policy efforts by the CEAC have provided support for Waste Heat to Power CHP systems in the Northwest. Two sectors showing long-term potential are metal smelting and remote village systems, and both are moving forward with projects.

Table 6.9. Pacific CEAC's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. CHP project at Honouliuli, Hawaii waste water treatment plant moved forward following assessment by CHP.	CEAC assessment provided important support for project development.
2. CHP project at Sand Island, Honolulu, Hawaii waste water treatment plant moved forward following assessment by CHP.	CEAC assessment supported project development.
3. Cold vegetable storage CHP project in Monterey, California moved forward following assessment by CHP.	CEAC assessment provided support for project development
4. CHP system was commissioned at a major Hollywood studio following project screening by CEAC.	CEAC performed project screening several years ago, which helped initiate CHP project.
5. CEAC developed target market plan for Waste Heat to Power CHP.	Strategic market development plan provides inter-CEAC coordination of Waste Heat to Power CHP market development activities.

Table 6.10. Southeast CEAC's five most important accomplishments for FY 2012

Description of Accomplishment	CEAC's Explanation of Strategic Importance
1. CEAC held meetings with National Association of State Energy Officials (NASEO) Southeast regional coordinator and many State Energy Office (SEO) directors to present information on using CHP as a Boiler MACT compliance strategy. Follow-up discussions ensued with nearly all the SEOs and additional CHP-related education and outreach activities were carried out in a number of states.	These meetings and presentations helped increase awareness among SEO directors of CHP's potential for increasing energy efficiency and reducing emissions and of ways for the states to work with industry to support CHP development. These interactions also helped establish support for DOE's Boiler MACT Technical Assistance Program that launched early the following year.
2. Major state university is moving forward with a 17 MW CHP project based on CEAC's feasibility analysis recommendations.	The university in question has experienced nearly 100% growth in energy costs over the past 10 years and presents an ideal case, from which other universities can learn, for replacing old coal boilers with CHP.
3. CEAC continued to work with a large regional utility on developing a utility energy efficiency CHP incentive. This included discussions of several potential pilot sites at big industrial facilities and a local water authority.	Expanding discussions with the utility to focus on specific end-users illustrated the tangible demand for CHP that a utility incentive could help realize.
4. CEAC facilitated early meetings of the North Carolina CHP Initiative, which has organized to represent the CHP industry and end-users. The industry-led Initiative provides a forum for exchanging technical and best practice knowledge and for engaging with policymakers and regulators on CHP-related policy issues.	The Initiative provides a peer-to-peer exchange and an industry voice for CHP in North Carolina to inform policymakers of the importance of policies that support CHP development.
5. CEAC co-hosted a workshop in Nashville with the Industrial Energy Efficiency Network on industrial energy efficiency, CHP programs, and incentives. This event involved an exchange of experiences and ideas on successful approaches to partnership between utilities and industry.	This event started a corporate level dialogue between industry and utilities on potential programs and incentives needed to facilitate CHP development.

Table 6.11. International District Energy Association's five most important accomplishments for FY 2012

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. IDEA published multiple columns by CEACs in District Energy Magazine, which is distributed to 3,500 print subscribers and 3,000 digital visitors.	The columns have provided CEACs with an avenue to report on their regional activities and build relationships with IDEA members and other stakeholders who access the magazine. The columns help position the CEACs as unbiased experts able to serve as resources to industry participants. IDEA leverages District Energy magazine as a key outreach tool and distributes printed copies of the magazine at many events, presentations, and workshops.
2. IDEA created a DE system information data base.	The data base provides interested parties with definitive information on the geographic distribution, size and scale, type of end use, and fuel use attributes of U.S. DE/CHP systems.
3. IDEA sponsored an Annual Conference and Trade Show, a Campus Energy Conference, and workshops that present information on tools, best practices, lessons learned, and policy initiatives relevant to the adoption of CHP/DE.	IDEA conferences and workshops provide technical and business development content to over 1,000 attendees each year and facilitate interaction between end-users and solution providers.
4. IDEA supported regional and targeted presentations to policy makers and end-users at its own events and also at events sponsored by other organizations.	IDEA's presentations, briefings, and webinars have provided valuable information and support for end-users and policy makers.
5. IDEA continued to support and further develop a CHP/DE Screening Tool	This first order screening tool helps evaluate CHP/DE projects for CEACs. The tool models reference data for loads by climate region and calculates net present value for various options based on user inputs.

7. CHP AND DISTRICT ENERGY INSTALLATIONS

This chapter provides a description of CHP and DE installations nationwide without attempting to link them to the previously-described activities and accomplishments of the nine Clean Energy Application Centers. The data reported here are for *all* CHP and DE installations in the U.S., regardless of whether they received technical assistance or other support from the CEACs. Although it is probable that actions taken by the CEACs over the years have influenced CHP and DE installations, this study was not designed to establish or quantify that influence. Even without such a causal link, however, the information presented below is significant because it helps document the nation's progress toward achieving the goal established in a recent executive order of deploying 40 gigawatts of new, cost-effective CHP in the U.S. by the end of 2020 (Executive Order 13624, 2012).

A national database of CHP facilities, which provides an inventory of CHP installations in each state, is maintained for DOE by ICF International (2013). That database contains basic information on each facility, including location, operational capacity, system type, application, and fuel. The database tracks installations by calendar year (January through December) as opposed to the federal fiscal year (October through September) used by the CEACs to report their activities. ICF has also developed estimates of the dollar investment, energy savings, carbon emissions reductions, and job creation associated with each CHP installation.

Similarly, a database of district energy facilities throughout the U.S. has been developed by the International District Energy Association (IDEA 2012) and its contents are periodically updated (IDEA 2013). This database includes all operating district energy systems that IDEA has been able to identify, regardless of how small (or large) the system is. In addition to specifying the type of system in place (CHP, district heating, district cooling), the database describes each installation's location, thermal capacity (in terms of steam, hot water, and chilled water), cogeneration capacity, fuel type, and application (e.g., university, health care facility, downtown area).

Descriptions of CHP and DE installations taken from the above-mentioned databases are discussed in separate sections below.

7.1. CHP INSTALLATIONS

As shown in Table 7.1, 182 CHP facilities with a combined capacity of 869 MW were installed in the U.S. in CY 2012. These are facilities that have been completed and are operational, and do not include projects that are currently under development. The numbers of new CHP installations and electric generation capacity in 2012 were 67% and 53 % greater, respectively, than in 2011.

Table 7.1 Description of CHP installations in U.S., CY 2012

Number of installations	Electric capacity installed (MW)	Investment in CHP installations (million $)	Annual energy savings (million source BTUs)	Annual carbon reduction (metric tons)
182	869	1,304	18,083,494	2,651,706

The facilities described in Table 7.1 are located in 33 different states within the geographic area served by all eight regional CEACs.

Based on an average capital cost for mid-sized CHP systems of $1,500 per kilowatt (ICF International 2008), the estimated investment associated with the 182 CHP systems installed in CY 2012 is $1.3 billion. A recent ORNL report (Shipley et al. 2008) noted that four jobs are created for every $1 million of capital investment in CHP facilities. Using that formula as a multiplier, we can estimate that a little more than 5,200 new jobs have been created by the above-described investment in CHP facilities.

Substantial amounts of energy can be saved by CHP systems compared to more traditional technologies because CHP uses the thermal energy that is normally wasted when electricity is produced at central generating stations. In addition, electric transmission and distribution losses are substantially reduced by locating CHP facilities at or near the point of consumption (Shipley et al. 2008). It is estimated that the 182 CHP facilities installed in the U.S. in CY 2012 resulted in savings of over 18 trillion source BTUs. That number was calculated using typical hours of operation, power-to-heat ratio, and heat rate for each new installation, based on its system type and application (ICF International 2008).

The energy savings described above result in lower carbon emissions. Based on average CO_2 emission rates for the displaced fuels in each state (ICF International 2008), the *CHP Installation Database* (ICF International 2013) calculated that the 2012 CHP installations resulted in an annual carbon emissions reduction of 2.65 million metric tons.

7.2. DISTRICT ENERGY FACILITIES

This section describes *all* district energy systems in operation in the U.S. at the end of the 2012 calendar year, rather than just those that began operations in 2012. This approach is being used because system start-up dates are not available for many of the cases and very few of the DE systems for which we *do* have data came online in 2012. As shown in Table 7.2, there were 597 DE systems operating in the U.S. as of late 2012, with very substantial thermal and cogeneration capacity. The number of facilities listed below and their capacity are the same as was documented in last year's report except for chilled water capacity, which has increased slightly.

Table 7.2 Description of all district energy facilities in U.S. at the end of 2012

Number of facilities	Thermal capacity – steam (lbs./hr.)	Thermal capacity – hot water (million Btu/hr.)	Thermal capacity – chilled water (tons)	Cogeneration capacity (MW)
597	178,061,000	5,586	4,275,034	6,644

District energy systems are present in 49 states and the District of Columbia. Of the 597 systems cited in Table 7.2, about 55% were DE alone while the remainder was some combination of CHP, district heating, and district cooling. District energy systems that do not currently involve electric generation are strong near-term candidates for the adoption of CHP due to the magnitude of their aggregated thermal load.

8. SUMMARY AND RECOMMENDATIONS

8.1. KEY FINDINGS

In FY 2012, the Clean Energy Application Centers engaged in a variety of activities to support the development of policies that encourage and facilitate the use of CHP technologies. During that year, a total of 45 CHP-related policies were passed in 21 different states. Twenty of the FY 2012 policies (in 13 states) were new ones, which is the same number as in FY 2011. The remaining 25 (in 14 states) were revisions to existing policies, which is about 25% less than the number of policies revised in the previous year. The most common types of policies put in place in FY 2012 were incentive programs, state energy plans, and portfolio standards. The key CEAC activities undertaken to influence policy adoption were: providing states with information/advice on policy design and best practices; providing comments and participating in legislative/regulatory hearings; sharing technical expertise with state agencies; working with utilities to include CHP in their energy efficiency portfolios; and promoting the benefits of CHP to state agencies.

Fifty-five technical site evaluations were performed in FY 2012 (40% fewer than in the previous year) and many other types of technical support were also provided to current and potential users of CHP technologies. Toward the end of FY 2012, a new technical assistance process was developed for the CEACs to streamline their efforts and focus on higher potential projects, and the initial transition to that new approach may have contributed to the downturn in the number of technical site evaluations performed. The most common of the other technical support efforts were design assistance, construction advice, business/financial advice, assistance/advice on obtaining funding, system/equipment advice, permitting/regulatory assistance, advice on utility issues, and help with identifying engineering firms and vendors. Altogether, 76 CHP projects were under consideration, 52 were under development, and 20 went online in FY 2012 following the provision of technical assistance by the CEACs during that year or a previous one. The number of projects under consideration and under development in FY 2012 was three to four percent less than the year before, while the number of projects that went online was about 10 % greater than in the previous year. The electric generation capacity represented by those projects ranged from nine percent less (under consideration) to 47% less (under development), indicating that average electric capacity per project was lower in FY 2012 than in 2011. When the above findings are disaggregated, we find that the number of projects under development and going online following technical site evaluations was lower in FY 2012 than in 2011, while the opposite was true for projects associated with other types of technical support. The increase from FY 2011 to 2012 was especially great for projects that went online following other technical support.

The CEACs reported which of the projects associated with their technical assistance efforts had the highest impact/visibility in FY 2012 and why. The most common reasons given to explain high project impact or visibility was that they: utilized an innovative or unusual fuel source or technology; demonstrated the potential for improving energy reliability and resiliency; involved a large company, facility, or system; served an under-represented or non-traditional market sector; demonstrated potential in a targeted market sector; or involved interaction with a utility company or utility-related policy issues.

In the area of education and outreach, the FY 2012 CEAC metrics focused largely on workshops, webinars, and presentations that targeted potential end-users of CHP technologies in specific market sectors. A total of 38 targeted market workshops/training sessions, 13 targeted market webinars, and 72 presentations at end-user workshops and conference events were given in FY 2012 by all CEACs combined. That represents a decline from FY 2011 in the numbers of workshops and webinars and in total attendance at those events. However, the number of presentations was greater in FY 2012 than in the previous year, as was total attendance at those presentations. In addition, the number of end-users attending *all* types of events (workshops, webinars, and presentations) was up substantially from the previous year, indicating a strategic focus on providing information to those most likely to apply it.

In addition to reporting the activities in which they engaged, the CEACs were asked to identify the follow-up actions that they took after their targeted educational events. The most common follow-up actions reported were that the CEACs: educated potential users/developers on CHP opportunities; assisted government officials in developing CHP-related policies or programs; provided technical assistance to end-users on specific projects; or worked on additional education/outreach events. The most frequent explanations given for the strategic importance of the CEACs' follow-up activities were that they: increased awareness and support for CHP among stakeholders and potential users: facilitated adoption of CHP by end-users; educated government officials regarding CHP-related policies or programs; helped develop target markets; or established and maintained the CEAC's leadership role on CHP.

The CEACs were asked to describe five key accomplishments of their centers during this reporting period. The most frequently-cited accomplishment was that important education/outreach events (e.g., workshops and training sessions) were held or resources (e.g., analytical tools) were developed to support educational and outreach efforts. The next most common type of accomplishment reported by the CEACs was that state or local policies or regulations to facilitate CHP use had been developed or enacted with CEAC assistance. That was followed closely by having CHP projects under consideration or moving forward. Fairly far behind those, but still reported by multiple CEACs, was having utility policies developed to facilitate CHP usage. By far the most common reason given to explain the strategic importance of the CEACs' key accomplishments was that they provided stakeholders and end-users with information or support to facilitate CHP/DE usage. Two other frequently-cited explanations of strategic importance were that state or local government policies/regulations facilitated CHP usage and that utility policies facilitated CHP use.

As part of this annual metrics effort, CHP and DE installations were documented. While it is probable that the number and magnitude of those installations have been influenced by CEAC actions over the years, this study was not designed to establish or quantify that influence. One hundred eighty-two CHP facilities with a combined capacity of 869 MW were installed in the U.S. in CY 2012. This represents an increase of 67 % in the number of installations and an increase of 53% in electric generating capacity over the previous year. Unlike the CHP numbers, which were for CY 2012 only, data were collected for *all* DE systems in operation in the U.S. as of the end of 2012, regardless of when they were first installed. In total, there were 597 DE systems operating in the U.S., representing very substantial thermal and cogeneration capacity. With the exception of chilled water capacity, which is up slightly, those numbers are the same as those reported in last year's metrics report, which were current as of August, 2012.

8.2. RECOMMENDATIONS

The FY 2012 CEAC metrics exercise, like the ones that preceded it, was designed to quantify center activities and existing CHP/DE capacity but *not* to establish causal links between the two. Accordingly, we cannot say with any certainty how specific activities affect the adoption of CHP technologies and are thereby limited in our ability to recommend changes or refinements in CEAC operations. As in previous metrics reports, we do recommend that each center solicit feedback from its stakeholders concerning the usefulness of the services provided and make operational decisions based on that input.

As in previous years, we note that additional studies to explore possible relationships between CEAC activities and key outcomes could be helpful in informing management decisions about the nature and delivery of the services that the centers provide. One study that is likely to provide important findings is a direct examination of how the CEACs' technical assistance activities affect the adoption of CHP technologies. A study to examine the relationship between follow-up actions taken by the CEACs after their education and outreach events and CHP adoption in the targeted sectors could also be informative. Finally, studies looking at how the CEACs' policy-related activities influence the enactment of state policies and how those policies in turn affect CHP installations are worth considering. The findings generated by such research efforts would help quantify the effects of center-sponsored activities, which should help policy-makers and center managers decide what types of services to provide in the future.

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