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KEY PERFORMANCE METRICS FOR CLEAN ENERGY APPLICATION CENTERS: FISCAL YEAR 2011

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) funds nine Clean Energy Application Centers (CEACs) that promote and assist in transforming the market for Combined Heat and Power (CHP), waste heat to power, and district energy (DE) technologies and concepts throughout the United States. The key services provided by the CEACs are market assessments, education and outreach, and technical assistance. There are eight regional centers that serve specific areas of the country and a separate center operated by the International District Energy Association (IDEA) which supports the regional centers with technical assistance related to district energy and provides education, training, publicity, and outreach about that technology.

Oak Ridge National Laboratory (ORNL) has performed three previous studies of center activities. The first one examined what the centers had done each year from the initiation of the program through fiscal year (FY) 2008; the second one examined center activities for FY 2009; and the third one focused on what was accomplished in FY 2010. The most recent study, documented in this report, examines CEAC activities during FY 2011.

All nine regional Clean Energy Application Centers were asked to provide information on the full range of their FY 2011 activities, using a data collection spreadsheet prepared by ORNL for that purpose. This spreadsheet differed from the data collection instruments used in previous efforts in that it put more emphasis on the adoption of clean energy technologies and those activities thought to be most closely related to that, and did not ask about every action taken by the CEACs. Critical additions to past metrics efforts included: asking the CEACS to describe the highest impact/highest visibility projects associated with their technical assistance efforts; collecting information on the CEACs' follow-up actions to their market development and end-user education activities; and asking the CEACs to identify their most important accomplishments and explain their strategic significance. 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 databases created and maintained by ICF International and the International District Energy Association, respectively. This study, like the three that preceded it, was designed to catalogue center activities and existing clean energy capacity but not to establish causal links between the two.

In FY 2011, the CEACs engaged in a variety of activities to support the development of policies that encourage and facilitate the use of clean energy technologies. During that year, a total of 53 clean energy-related policies were passed in 23 different states, which is nearly the same number enacted during the previous year. Twenty of the FY 2011 policies were new ones and 33 were revisions to existing policies. A complete picture of the type and number of policies enacted in FY 2011 is provided in Table ES.1.

Table ES.1 Type and number of key state policies, FY 2011

Policy type	Number new	Number revised
Incentive program	12	9
Portfolio standard	4	9
State energy plan	0	4
Strategic siting	0	3
Net metering	0	2
Other policy	4	6

Ninety-one technical site evaluations were performed in FY 2011 (10% more than in the previous year) and many other types of technical support were also provided to current and potential users of clean energy technologies. Altogether, 78 clean energy projects were under consideration, 54 were under development, and 18 went online in FY 2011 following the provision of technical assistance by the CEACs during that year or a previous one (Table ES.2). The number of projects under consideration and going online in FY 2011 was greater than the year before, but fewer projects were under development than in the previous year. The electric generation capacity represented by those projects, in comparison to the year before, was greater for projects under consideration but less for those under development and going online.

Table ES.2. Number of clean energy projects and capacity associated with technical assistance provided, FY 2011

Project status	Number	CHP 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	78	290	840,317	133	612
Project under development following technical site evaluation or other technical support	54	305	888,000	1,010	1,200
Project online following technical site evaluation or other technical support	18	115	137,500	104	120,000

[a] MW stands for Megawatts
[b] MMBTU means million BTUs

In the area of education and outreach, the FY 2011 CEAC metrics focused largely on workshops, webinars, and presentations that targeted potential end-users of clean energy technologies in specific market sectors. A total of 48 targeted market workshops/training sessions, 35 targeted market webinars, and 56 presentations at end-user workshops and conference events were given in FY 2011 by all CEACs combined. The number of events and total attendees was substantially greater than during the previous year.

For the first time in FY 2011, 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 provided technical assistance on specific projects and worked on additional education and outreach efforts. Other frequenly-mentioned follow-ups were: educating state and local policy makers on clean energy use; working with stakeholders and government agencies on new opportunities and strategies; evaluating incentives for clean energy use; providing requested information to attendees; putting clean energy technologies in an energy plan; and having follow-up conversations with specific attendees.

The most frequent explanations given for the strategic importance of the CEACs' follow-up activities were that they increased awareness and support for clean energy among stakeholders and potential users, they helped promote clean energy technologies through work with key stakeholders, or they helped educate state and local policy makers about clean energy.

For the first time, the CEACs were asked to describe five key accomplishments of their centers during this reporting period. The most common type of accomplishment reported by the CEACs was that important education/outreach events were held or education/outreach resources were developed. The next most frequently reported accomplishment was having clean energy projects under consideration or moving forward with CEAC assistance. This was followed by state or local policies to facilitate clean energy use being developed or revised with CEAC input and assistance. The most common reasons given to explain the strategic importance of the CEACs' key accomplishments were that they facilitated development and completion of clean energy projects or they provided information/educational materials related to the development or revision of state or local clean energy policies. A substantial number of CEAC accomplishments were also said to be strategically important because they increased general awareness and support for clean energy or they targeted potential end-users with information to facilitate clean energy 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., 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. During calendar year (CY) 2011, 109 CHP facilities with a combined capacity of 569 MW were installed in the U.S. The number of new CHP installations and their combined capacity were both slightly greater than in the previous year. For DE, data were collected for *all* systems in operation in the U.S. as of August 2012. At that time, 597 DE systems were operating in the U.S., possessing very substantial thermal and cogeneration capacity. The number of facilities and their cogeneration and thermal capacities (with the exception of chilled water) are lower than what was reported last year but those differences are due to refinements to the data base that have been made over the past year and do *not* indicate a real reduction in DE capacity. It should be noted that existing DE systems that do not currently involve electric generation (currently numbering 328 throughout the U.S.) are strong near-term candidates for the adoption of CHP due to the magnitude of their aggregated thermal load.

Like previous CEAC metrics efforts, this study was designed to catalogue center activities and existing clean energy capacity but not to establish causal links between the two. Accordingly, we are limited in our ability to recommend changes or refinements in program operations because we do not know how specific activities affect the adoption of clean energy technologies. We do suggest, as in previous metrics reports, that each CEAC consider feedback from its stakeholders concerning the services provided and make operational decisions based on that input. That endeavor could be aided by a coordinated effort to solicit input from stakeholder groups.

Additional studies to explore possible relationships between CEAC activities and key outcomes of interest could be helpful in informing management decisions about center operations. Specifically, we recommend that studies be undertaken to test for possible relationships between: (1) the CEACs' technical assistance activities and the adoption of clean energy technologies; (2) lessons learned by the CEACs during their technical assistance efforts and subsequent policy-related activities; (3) follow-up actions taken by the CEACs after education and outreach events and clean energy adoption by end-users in the targeted sectors; (4) CEAC policy-related activities and state policies enacted; and (5) state policies enacted and the implementation of clean energy projects in the states. The findings generated by such studies would help quantify the effects of center-sponsored activities and achievements, which should help policy-makers and center managers decide what types of efforts to support and services to provide in the future.

1. INTRODUCTION

1.1. BACKGROUND

Nine Clean Energy Application Centers (CEACs) are currently in operation across the United States. These centers, which are funded by the U.S. Department of Energy (DOE), promote and assist in transforming the market for Combined Heat and Power (CHP), waste heat to power, and district energy (DE) technologies and concepts throughout the United States. The key services provided by the CEACs are market assessments, education and outreach, and technical assistance. There are eight regional centers that provide assistance for specific areas of the country, as shown in Figure 1.1. In addition, a separate center operated by the International District Energy Association (IDEA) supports the regional centers with technical assistance related to district energy and provides education, training, publicity, and outreach about that technology (U.S. Department of Energy 2012).

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

Beginning with a pilot program in the Midwest in 2001, this effort 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). The original focus of the centers was on CHP technologies and they were called CHP Regional Application Centers, or RACs, to reflect that orientation. However, with the beginning of fiscal year (FY) 2010, which started on October 1, 2009, the scope of the centers expanded to include district energy systems and waste heat recovery (WHR). At that time, consistent with language in the *Energy Independence and Security Act of 2007*, the official name of the centers was changed to Clean Energy Application Centers and their number was expanded from eight to nine to include the International District Energy Association.

Oak Ridge National Laboratory (ORNL) began providing support for the CHP Regional Application Centers when they were first established and that support has continued to the present. In 2007, ORNL led an effort, involving DOE and CHP industry stakeholders, to establish metrics for quantifying center accomplishments. The metrics effort began with the development of a logic model that provided a detailed description of how the program operated. That model, and the in-depth understanding of regional center operations that it engendered, provided a basis for determining which specific activities and accomplishments should be examined over the life of the program (Schweitzer 2010).

ORNL has performed four studies of center activities, starting with the metrics identified through the previously-mentioned effort and refining them over time. 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 DE and WHR and changed their name to Clean Energy Application Centers. The fourth study, described in this report, examines what was accomplished in FY 2011. In addition to documenting the centers' key activities, all four reports contain information on regional CHP installations from a state-by-state database maintained for DOE by ICF International. The FY 2010 report and the current one also present key information on DE facilities throughout the U.S. from a database maintained by the International District Energy Association. None of the four studies conducted to date were designed to examine possible causal relationships between center activities and clean energy installations.

1.2. SCOPE OF REPORT

The remaining chapters of this report will address how the study of FY 2011 Clean Energy Application Center activities was performed and the key findings resulting from that effort. **Chapter 2** presents a brief discussion of the research methods used in this study. **Chapter 3** describes the policies enacted by various states during the study period. **Chapter 4** focuses on the number and capacity of clean energy projects associated with the technical assistance services provided by the CEACs and discusses those projects identified by the centers as having the highest impact and visibility. **Chapter 5** addresses the key market development and end-user education activities provided by the CEACs with an emphasis on follow-up actions taken by the centers and the strategic importance of those actions. **Chapter 6** discusses the CEACs' most important accomplishments and their strategic significance. In **Chapter 7**, we describe the CHP installations made during 2011 and also characterize 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 center policies and programs going forward.

2. METHODS

At the outset of this year's CEAC metrics study, ORNL staff developed a data collection spreadsheet to elicit all needed information from the Clean Energy Application Centers for FY 2011. This spreadsheet differed from the data collection instruments used in previous efforts in that it put more emphasis on the adoption of clean energy technologies and those activities thought to be most closely related to that, and did not ask about every action taken by the CEACs. Key departures from the spreadsheets used in past years are that the FY 2011 spreadsheet: looked only at key policies enacted rather than policy-related activities; did not ask for descriptions of the types of technical assistance provided other than technical site evaluations; asked the CEACs to identify the highest impact/highest visibility projects associated with their technical assistance efforts; solicited information on the CEACs' follow-up actions to their end-user education and outreach efforts and the strategic importance of those actions; and collected information on each CEAC's most important accomplishments and their strategic significance.

In late July, 2012, the FY 2011 data collection spreadsheet was sent to the nine Clean Energy Application Centers with a request to fill it in with all relevant information and return to ORNL. All nine centers returned the completed spreadsheets by early September, 2012. 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-September, 2012, and a final database, containing all information provided by the centers, was completed by the end of the month. 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) 2011 and on all existing DE facilities nationwide. While this study was not designed to establish a causal link between the centers' activities and the clean energy installations made, it is still considered important to document the current state of CHP and DE facilities in the U.S.

Data on CHP installations made during CY 2011 were provided to ORNL by ICF International in mid-August, 2012, from a state-by-state database that the company maintains for DOE. The data provided by ICF included the number of installations made during 2011, 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 a comprehensive data set containing information on all U.S. DE systems. That data set identified each installation's location, type (heating, cooling, CHP), 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).

3. POLICY RESULTS

In FY 2011, 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 the use of clean energy technologies. Figure 3.1 shows the number of clean energy-related rules, standards, and other policy instruments enacted by the various states in FY 2011. The figure shows both "new" policies that were established for the first time in FY 2011 as well as "revised" ones that refined or adjusted previous policies addressing the same topic. Altogether, 53 state policies were passed in FY 2011, 20 new ones and 33 revisions to existing policies. This is nearly the same total number of policies that were put in place in FY 2010.

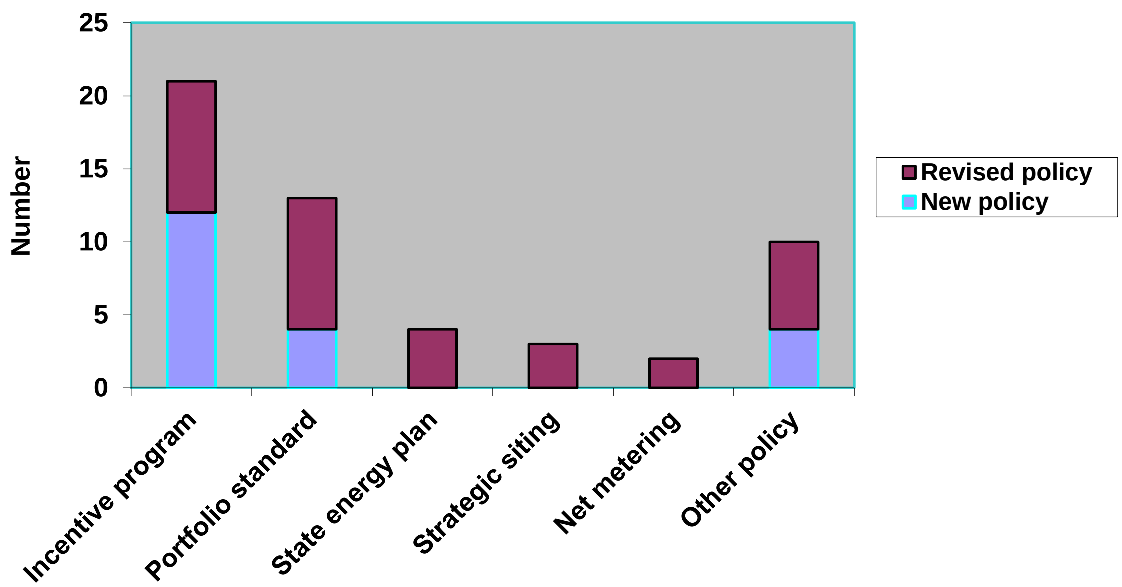

Figure 3.1. Number and type of policies enacted, FY 2011

As shown above, incentive programs were put in place more frequently than any other policy-related instrument in FY 2011, with 12 new incentives for the adoption of clean energy technologies and nine revised ones. Portfolio standards were next most popular, with four new ones and nine revisions to earlier standards. This was followed by four revised state energy plans, three revised policies to encourage strategically-sited CHP, and two revised net metering policies. Outside of these five major categories, there were a number of other policies enacted as well. As shown in Table 3.1, those four new and six revised policies cover a wide variety of topics including energy standards for public buildings, interconnection rules, emissions rules, and various state- and region-specific concerns.

Readers interested in obtaining more information on clean energy-related policies should note that the State and Local Energy Efficiency Action Network (SEEAction)[1] Industrial Energy Efficiency and Combined Heat and Power Working Group is currently developing a guidebook that will describe model

[1] More information on SEEAction and its working groups is available online at www.seeaction.energy.gov.

programs and give examples of successful CHP policies. That document is expected to be published in early 2013.

Table 3.1. Other clean energy-related policies enacted in FY 2011

- Energy standards for public buildings
- Interconnection rule
- Output-based emissions rule
- Solar thermal licensing requirement
- Streamline CHP permitting process
- Shale gas utilization policy plan
- Promote better understanding of portfolio standard
- Resolution to implement industrial energy efficiency projects
- Encourage role of CHP in NYC energy-substitution rule
- Clean energy leadership council recommendations

Table 3.2 shows the specific states that enacted new clean energy-related policies in FY 2011. Those 20 new policies were distributed among 12 different states from the east coast to the west and from Alaska to Louisiana. The greatest amount of activity in FY 2011 was in Alaska and Wisconsin, which each enacted three new policies.

Table 3.2. New policies enacted in FY 2011, by state

	Number of:		
State	**Incentive program**	**Portfolio standard**	**Other policy**
AK		2	1
IL	1		
IN	1	1	
LA		1	
MO	2		
NE	1		
NJ	1		
OR	2		
PA			1
TX	1		1
WA			1
WI	3		

Table 3.3 lists the 18 states that revised their clean energy policies in FY 2011 and shows the specific policies associated with each one. As with new policies, the states in question span the nation from east to west. Massachusetts and New York revised the greatest number of policies in FY 2011 (four each) while Iowa and Wisconsin each had three.

Table 3.3. Revised policies enacted in FY 2011, by state

State	Number of: Incentive program	Portfolio standard	State energy plan	Strategic siting	Net metering	Other policy
CA	1					
CT			1	1		
IA	2					1
IL		1			1	
IN					1	
KS		1				
MA		1		1		2
MI	2					
MN						2
MO			1			
MT			1			
NC		2				
NE	1					
NJ			1			
NY	1	1		1		1
OR		1				
RI	1					
WI	1	2				

4. TECHNICAL ASSISTANCE AND RESULTS

All nine Clean Energy Application Centers provided project-specific technical assistance to current and prospective users of clean energy technologies in FY 2011. This assistance falls into two broad categories: (1) technical site evaluations and (2) other technical support contacts such as government/utility funding information and financial/business advice. The assistance provided in each of 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 2011. It also displays the number and capacity[2] of all clean energy projects that were recommended, under consideration, under development, or went on-line in FY 2011 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 clean energy installations is often three to five years.

Table 4.1. Technical site evaluations and associated projects and capacity, FY 2011

Project status	Number	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBTU /hr.)	Chilled water capacity (tons)
Technical site evaluation performed	91	-	-	-	-
Project recommended following technical site evaluation	67	187	1,136,063	70	16,755
Project under consideration following technical site evaluation	49	72	464,763	55	612
Project under development following technical site evaluation	27	36	29,000	77	0
Project online following technical site evaluation	11	14	64,500	59	0

In FY 2011, 91 technical site evaluations were performed by all the CEACs combined. This is about 10% greater than the number performed in the previous year. Sixty percent of those evaluations were for CHP facilities alone, 16% were for WHR, and 7% were for DE projects. Another 11% were for projects that involved both CHP and DE. The remaining few projects involved CHP in conjunction with some other clean energy technology. The most common market sectors addressed were industrial, institutional, and commercial, in that order. The remaining projects involved the residential sector and rural village utilities in Alaska.

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

4.1.2. Projects Recommended Following Technical Site Evaluations

Sixty-seven clean energy projects were recommended by the CEACs in FY 2011 following site evaluations performed then or in any previous year since the centers' inception. Between them, those projects provided electric generation capacity of 187 MW, thermal steam capacity of 1,136,063 pounds per hour, hot water capacity of 70 million BTUs per hour, and chilled water capacity of 16,755 tons. Sixty-three percent of those projects were CHP alone, 19% were WHR, and 3% were DE alone. Another 9% were CHP and DE combined, while the remainder was CHP in conjunction with some other clean energy technology. More projects addressed the industrial and institutional market sectors than any others. These were followed, in numerical order, by projects targeting the commercial and residential sectors. There were also some projects (about 12% of the total) that involved rural village utilities. The total number of projects recommended in FY 2011 following technical site evaluations was almost 85% greater than the number recommended during the previous year. However, the electric capacity represented by those projects was about 15% less than the year before. Comparisons of thermal capacity cannot be made because FY 2011 is the first year for which those data were collected.

4.1.3. Projects under Consideration Following Technical Site Evaluations

In FY 2011, 49 clean energy projects were under consideration by end-users following site evaluations performed in that year or a previous one. Combined, those projects accounted for electric generation capacity of 72 MW, thermal steam capacity of 464,763 pounds per hour, hot water capacity of 55 million BTUs per hour, and chilled water capacity of 612 tons. Sixty-seven percent of those projects were CHP alone, 20% were WHR, and 2% were DE alone. Another 2% were CHP and DE combined, with the remainder being CHP together with another clean energy technology. The most common market sectors addressed were commercial, industrial and institutional, in that order. Almost none of the projects under consideration were in the residential sector, but about 12% of them involved Alaskan rural village utilities. The total number of projects under consideration in FY 2011 following technical site evaluations was 75% greater than in the previous year. The electric capacity represented by those projects, however, was 60% less than the year before.

4.1.4. Projects under Development Following Technical Site Evaluations

Twenty-seven clean energy projects were under development in FY 2011 following site evaluations performed in that year or previously. This includes projects undergoing design at investment grade level, final finance development, permitting, or construction. Altogether, those projects provided electric generation capacity of 36 MW, thermal steam capacity of 29,000 pounds per hour, and hot water capacity of 77 million BTUs per hour. Forty-eight percent of those projects were CHP alone and another 48% were WHR. The remaining project involved CHP and DE combined. Two-thirds of the projects under development in FY 2011 involved rural village utilities. Most of the rest were in the institutional sector, with a couple of industrial projects completing the roster. The total number of projects under development in FY 2011 following technical site evaluations was 8% greater than in the previous year, but the electric capacity provided by those projects was 8% less.

4.1.5. Projects Going On Line Following Technical Site Evaluations

Eleven clean energy projects went online in FY 2011 following site evaluations performed then or in a previous year. Those projects provided electric generation capacity of 14 MW, thermal steam capacity of 64,500 pounds per hour, and hot water capacity of 59 million BTUs per hour. Twenty-seven percent of those projects were WHR, 27% were DE alone, and 27% were CHP and DE combined. The remaining

18% of the projects were CHP alone. The most common market sector addressed was institutional, followed by industrial and rural village utilities. A single project took place in the agricultural sector. The total number of projects that went online in FY 2011 following technical site evaluations exceeded the number that went on line the previous year by more than 80%. Even more dramatically, the electric capacity provided by the projects that went online in FY 2011 was more than 380% greater than the year before.

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

For the first time since metrics data have been collected, the CEACs were asked to identify the highest impact/highest visibility projects with which they were involved during the fiscal year under study. Seven of the eight regional CEACs provided data in response to this query and, between them, listed a total of 28 projects for FY 2011. Of those, 22 were CHP alone, four were WHR, one was CHP and DE combined, and one was CHP and WHR together. Table 4.2 lists all the projects reported by the CEACs as having the greatest impact and visibility. For each one, the table shows the type of project along with its electric and thermal capacity and explains its impact/visibility as reported by the CEACs.

While there were many reasons that the listed projects were judged by the CEACs to have high impact and visibility, as Table 4.2 shows, there were several explanations that recurred over multiple projects. For four of the projects, their impact/visibility was attributed to their being a good example of a clean energy project for the market sector involved. For another four, the project was judged to be important because it involved interactions with a utility company or utility-related policies. Two of the projects listed were undertaken by large and prominent hospital or health care systems, and two more involved large, high visibility hotels in a famous tourist area.

4.2. TECHNICAL SUPPORT CONTACTS AND ASSOCIATED PROJECTS

Many different types of technical support, in addition to technical site evaluations, were provided by the CEACs in FY 2011. In an effort to reduce the CEACs' reporting requirements, information was not solicited on this topic for FY 2011 but, in past years, the most common types of assistance provided have included telephone or email advice, government or utility funding information, regulatory advice, financial or business advice, system and equipment advice, meetings with key parties, design assistance, vendor information, and power calculation assistance.

4.2.1. Projects under Consideration Following Technical Support Contacts

In FY 2011, 29 clean energy projects were under consideration by end-users following technical support provided by the CEACs during that year or a previous one. Combined, those projects accounted for electric generation capacity of 218 MW, thermal steam capacity of 375,554 pounds per hour, and hot water capacity of 78 million BTUs per hour (Table 4.3). Seventy-three percent of those projects were CHP alone, 17% were CHP and DE combined, and 10% were WHR. By far the most common market sectors addressed was institutional, followed by industrial and commercial. A single project involved the agricultural sector. The total number of projects under consideration in FY 2011 following technical site evaluations was exactly the same as in the previous year, but the electric capacity represented by those projects was 162% greater than the year before.

Table 4.2. Description of highest impact/highest visibility projects following technical site evaluations, FY 2011

State	Type of clean energy project	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBtu/hr.)	Chilled water capacity (tons)	Explanation of project's high visibility or impact
Alaska	WHR	3.8	-	TBD	0	Attempting to prove financial viability of Organic Rankine Cycle using waste heat from diesel generator
Alaska	CHP/WHR	2.3	-	7.8	0	Large heat recovery system selling waste heat to community buildings
Arizona	CHP	TBD	TBD	TBD	TBD	Example of small commercial project using microturbines
Arizona	CHP	0.6	4,000	0	0	Prominent local hospital with utility opposition
California	CHP	2.1	7,781	DK	0	Large San Francisco office building with good CHP potential
California	CHP	1.2	DK	DK	0	Potentially significant project in emerging food processing sector
Colorado	WHR	6.5	300,000	0	0	Project interacts with rural co-op and illustrates lack of eligibility of waste pressure in state Renewable Portfolio Standard (RPS)
Colorado	WHR	0.4	18,000	0	0	Illustration of effects of standby rates on project economics
Colorado	WHR	1.5	46,600	0	0	Good payback
Hawaii	CHP	0.3	DK	DK	0	Interesting potential biogas project for Hawaii

Hawaii	CHP	0.5	DK	DK	0	Large and very high-visibility hotel on the Waikiki strip
Hawaii	CHP	0.5	DK	DK	0	Another large and very high-visibility hotel on the Waikiki strip
Idaho	CHP	45	250,000	0	0	Large CHP project
Kentucky	CHP	0.2	900	0	0	Provides good example of low cost implementation
Massachusetts	CHP	0.8	-	3.3	0	Facility committed to CHP
Massachusetts	CHP	1	5,500	0	0	CEAC assistance allowed project to proceed
Massachusetts	CHP	1.9	-	0	0	New system helped plant stay in business
Montana	CHP	TBD	TBD	TBD	TBD	First project in target market to move forward, highlighting opportunity for biomass CHP
New York	CHP	0.4	1,000	0	0	Negotiating terms with electric utility before making decision to proceed
New York	CHP	0.7	3,500	0	0	Example of partnership with NYSERDA on the project
North Carolina	CHP	5	25,000	0	0	Allows firm to sell electric and thermal Renewable Energy Credits
North Carolina	CHP	7.4	26,000	0	0	Solves existing power quality problems and reduces energy costs

Ohio	CHP/DE	1.2	8,900	0	0	CHP being reconsidered due to lower natural gas rates
Pennsylvania	CHP	TBD	TBD	TBD	TBD	Good example for chocolate processing sector
Pennsylvania	CHP	4.5	24,000	0	0	Good example of food processing project
Tennessee	CHP	3.5	17,500	0	0	CHP can be easily added with boiler modifications
Washington	CHP	0.2	DK	DK	DK	First serious CHP analysis in state's government facilities in 25 years
Wisconsin	CHP	1.1	-	4	0	Helps large health care network achieve its energy independence goal

Note: Names of projects are not listed due to confidentiality concerns for projects in the planning stage.

Table 4.3. Projects and capacity associated with technical support contacts, FY 2011

Project status	Number	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBTU /hr.)	Chilled water capacity (tons)
Project under consideration following technical support	29	218	375,554	78	0
Project under development following technical support	27	269	859,000	934	1,200
Project online following technical support	7	101	73,000	45	120,000

4.2.2 Projects under Development Following Technical Support Contacts

Twenty-seven clean energy projects were under development in FY 2011 following technical support provided by the CEACs in that year or previously. Altogether, those projects provided electric generation capacity of 269 MW, thermal steam capacity of 859,000 pounds per hour, hot water capacity of 934 million BTUs per hour, and chilled water capacity of 1,200 tons. Seventy-four percent of those projects were CHP alone and another 15% were WHR. Most of the remaining project involved CHP in combination with DE or WHR. The total number of projects under development in FY 2011 following technical site evaluations was 44% less than in the previous year, and the electric capacity provided by those projects was lower than the year before by almost the exact same percentage.

4.2.3. Projects Going On Line Following Technical Support Contacts

Seven clean energy projects went online in FY 2011 following technical support provided by the CEACs during that year or a previous one. Those projects provided electric generation capacity of 101 MW, thermal steam capacity of 73,000 pounds per hour, hot water capacity of 45 million BTUs per hour, and chilled water capacity of 120,000 tons. Seventy-one percent of those projects were CHP, with the remainder split equally between DE and WHR. The most common market sectors addressed were institutional and industrial, with a single agricultural project. The total number of projects that went online in FY 2011 following technical site evaluations was 30% less than the year before, and the electric capacity provided by those projects was 74% lower than the year before.

4.2.4. 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 2011. Altogether, the CEACs listed a total of 22 projects. Seventeen of them were CHP alone, two were WHR, one was DE, one was CHP and DE combined, and one was CHP in conjunction with WHR. Table 4.4 lists and describes all the projects reported by the CEACs as having the greatest impact and visibility.

Table 4.4. Description of highest impact/highest visibility projects following technical support contacts, FY 2011

State	Type of clean energy project	Electric capacity (MW)	Steam capacity (lbs./hr.)	Hot water capacity (MMBtu/hr.)	Chilled water capacity (tons)	Explanation of project's high visibility or impact
Alaska	DE	TBD	TBD	TBD	TBD	Project located at state capitol
Colorado	CHP	1	-	0	-	At major zoo, using innovative fuel source
Colorado	CHP	1.2	-	0.5	-	Uses forest waste in urban-interface zone, with community buy-in
Colorado	CHP	TBD	TBD	TBD	TBD	Prominent example of economic development in state
Colorado	CHP	1	-	0.4	-	Uses forest waste in urban-interface zone, with utility support
Illinois	CHP	0.1	-	0.3	-	First biogas CHP system funded by state grant program
Illinois	CHP	2.5	85,000	0	-	Helps ethanol plant lower its energy consumption and carbon footprint
Illinois	CHP	0.5	-	2.1	-	First of its kind CHP system installed at vertical indoor farm in Chicago
North Carolina	CHP/DE	11	100,000	0	-	Located at large university and used performance contracting
North Carolina	CHP	0.8	DK	0	-	Excellent case study of CHP from landfill gas.

North Carolina	CHP	0.4	40,000	0	-	Third-party development of CHP at industrial site.
North Carolina	WHR	0.8	DK	0	-	Organic Rankine Cycle waste heat recovery system at large paper plant
Texas	CHP	4.6	-	0	-	Highest-profile hospital in largest medical center in the world
Texas	CHP	45	-	0	-	One of the largest universities in U.S.
Texas	CHP	48	33,000	0	120,000	Largest medical center in the world
Utah	CHP	6	60,000	0	-	CHP integrated into new construction in mining sector
Washington	CHP	20	225,000	420	-	Project overcame multiple appeals on permit issues
Washington	WHR	2.8	-	170	-	Highlighted need for Portfolio Standard legislation; will make steel mill greenest in the world
Washington	CHP	25	250,000	250	-	Project overcame multiple appeals on permit issues
Washington	CHP	1.3	DK	18	-	Used new engineering technology for demo project and overcame difficult permitting issues

Washington, DC	CHP/WHR	7.5	80,000	0	-	Power plant for U.S. Capitol Building
Wisconsin	CHP	0.5	19,000	0	-	Helps large health care network achieve its energy independence goal

Note: Names of projects are not listed due to confidentiality concerns for projects in the planning stage

While a wide variety of reasons were given for why the listed projects were judged to have high impact and visibility, several explanations applied to multiple projects. In five cases, the high impact/high visibility projects involved innovative or unusual fuel sources, including animal waste, trash from zoo visitors, and landfill gas. In three instances, the projects in question involved difficult permitting issues. Two other projects involved large and prominent hospitals or health care systems, two were located at large universities, and two were at state or federal capitol buildings.

4.3. TOTAL FOR ALL TECHNICAL ASSISTANCE COMBINED

Altogether, 78 clean energy projects were under consideration in FY 2011 following the provision of technical site evaluations or other technical support by the CEACs during that year or a previous one. In combination, those 78 projects provided electric generation capacity of 290 MW, thermal steam capacity of 840,317 pounds per hour, hot water capacity of 133 million BTUs per hour, and chilled water capacity of 612 tons. The number of projects under consideration was 37% greater than in the previous year, and the electric generation capacity was 10% more than the year before.

Fifty-four clean energy projects were under development in FY 2011 following CEAC technical assistance of all kinds. Those projects accounted for 305 MW of electric generation capacity, 888,000 pounds of thermal steam capacity, 1,010 million BTUs per hour of hot water capacity, and 1,200 tons of chilled water capacity. The number of projects under development was 26% less and the electric generation capacity was 40% lower than the year before.

In FY 2011, 18 projects went on line following the provision of technical assistance by the CEACs then or in a previous year. In combination, those 18 projects provided electric generation capacity of 200 MW, thermal steam capacity of 137,500 pounds per hour, hot water capacity of 104 million BTUs per hour, and chilled water capacity of 120,000 tons. The number of projects that went online in FY 2011 was 13% greater than in the previous year, but the electric generation capacity represented by those undertakings was 48% less than the year before.

5. MARKET DEVELOPMENT AND END-USER EDUCATION

The Clean Energy Application Centers perform a wide variety of education and outreach activities. For FY 2011, we focused on the CEACs' educational activities that directly targeted potential end-users of clean energy 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 2011, the CEACs held a total of 48 targeted market workshops and training sessions, which attracted 3.688 attendees (Table 5.1). This represents a 4% increase over the previous year in the number of events and a 65% jump in the total number of attendees. Eleven hundred twenty-one workshop participants (30 % of the total number) were end-users, which is 12% less than the number of end users in the previous year.

Table 5.1 CEAC workshops, webinars, and presentations, FY 2011

Type of event	Number held	Number end-user attendees	Total number attendees	End-users as % of total attendees
Targeted market workshops/training sessions	48	1,121	3,688	30%
Targeted market webinars	35	341	1,654	21%
Presentations at end-user workshops and conference events	56	1,149	4,404	26%

The types of clean energy addressed by the CEACs' targeted market workshops and training sessions are shown in Figure 5.1. Forty percent of the FY 2011 events focused on CHP alone; 29% addressed CHP,

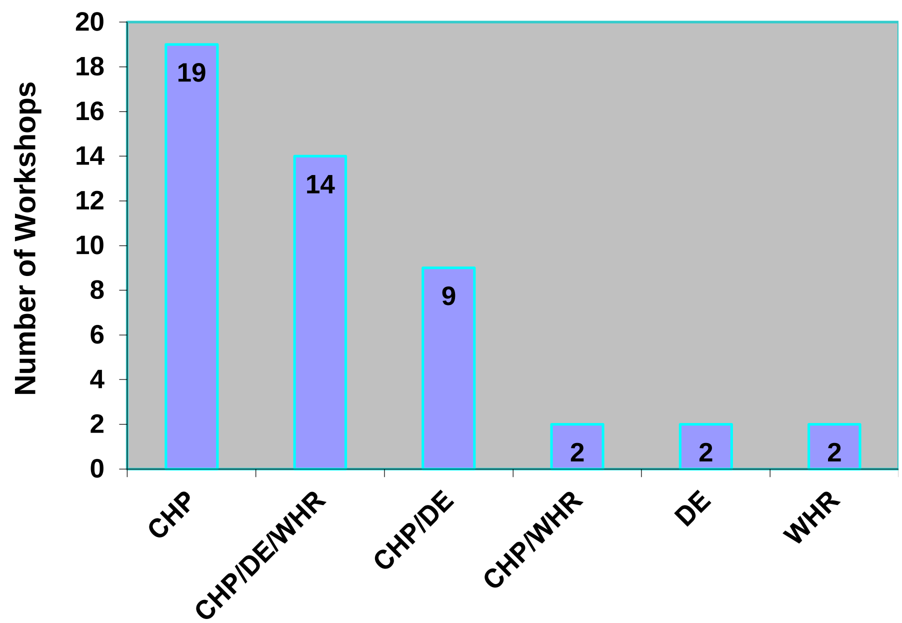

Figure 5.1. Type of clean energy addressed by CEAC workshops, FY 2011

DE, and WHR combined; and 19% dealt with CHP and DE together. Another 4% focused on CHP and WHR together while the remainder looked at either DE or WHR alone. Most of the workshops and training sessions were targeted at multiple end-use sectors. By far the most commonly-addressed of those sectors were industrial, institutional, and commercial.

FY 2011 was the first year for which the CEACs were asked to identify the follow-up actions that they took after their education and outreach activities. Table 5.2 lists all the follow-up actions that the CEACs reported. As shown, the most common follow-ups to workshops and training sessions were to provide end-users with technical assistance on specific projects and to work on additional education and outreach efforts. Educating policy makers on clean energy use, working with stakeholders and government agencies on new opportunities and strategies, and evaluating incentives for clean energy use were also frequently-reported workshop follow-ups.

Table 5.2 Follow-up actions taken by CEACs after workshops, webinars, and presentations, FY 2011

	Number of CEACs taking follow-up action after:		
CEAC follow-up action	**Workshops**	**Webinars**	**Presentations**
Provide technical assistance on specific projects	4	1	3
Work on additional education/outreach efforts	4	1	3
Educate state and local policy makers on clean energy use	3	0	2
Work with stakeholders and gov't. agencies on new clean energy opportunities and strategies	3	0	2
Evaluate incentives for clean energy use	3	0	1
Provide attendees with requested information	2	0	2
Put clean energy technologies in energy plan	2	0	2
Assist in formation of stakeholder group	2	0	0
Have follow-up conversations with specific attendees	1	1	2
Solicit information from attendees	1	0	2
Modify outreach materials based on attendee feedback	0	1	1
Coordinate with utility industrial energy efficiency programs	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 most frequent explanation of a follow-up activity's strategic importance was that it increased awareness and support for clean energy among stakeholders and potential users. Other common answers to the question of a follow-up action's strategic importance was that it helped promote clean energy technologies through work with key stakeholders, it helped educate state and local policy makers about clean energy, and it identified potential projects.

Table 5.3 Strategic importance of follow-up actions taken by CEACs after workshops, webinars, and presentations, FY 2011

	Number of CEACs reporting strategic importance following:		
Strategic importance of follow-up action	**Workshops**	**Webinars**	**Presentations**
Increase awareness and support for clean energy among stakeholders and potential users	5	4	3
Work with key stakeholders to promote clean energy technologies	4	3	2
Educate state and local policy makers about clean energy	4	1	3
Identify potential projects and help increase use of clean energy technologies	3	0	1
Help remove barriers to clean energy use	2	0	1
Establish and maintain CEAC leadership role on clean energy	2	0	1
Work with utility to increase clean energy use	1	1	0
Help develop target markets	1	0	1
Demonstrate benefits of clean energy technologies	1	0	0
Help improve operations at specific clean energy facility	1	0	0
Help CEAC stay current with end user needs	1	0	0
Increase effectiveness of CEAC tools and services	0	1	0
Help reduce costs and increase power quality	0	0	1
Improve regional industrial energy efficiency	0	0	1
Advance local economic goals	0	0	1

5.2. CEAC-HOSTED TARGETED MARKET WEBINARS

The CEACs hosted 35 targeted market webinars in FY 2011. Those events were attended by 1,654 participants, 341 of whom (21% of the total) were end-users (Table 5.1). That is an increase over the previous year of 67% in the number of events, 76 % in the total number of attendees, and over 1300% in the number of end-user attendees reported.

Figure 5.2 illustrates the distribution of clean energy types addressed by CEAC targeted market webinars in FY 2011. Fifty-one percent of those webinars focused on CHP alone; 23% addressed CHP and WHR combined; and 11% dealt with DE by itself. Another 9% focused on CHP, DE, and WHR together. Three percent of webinars looked at CHP and DE together and the same number addressed WHR alone. As with workshops and training sessions, most of the webinars were targeted at multiple end-use sectors. By far the most commonly-addressed of those sectors were institutional, industrial, and commercial.

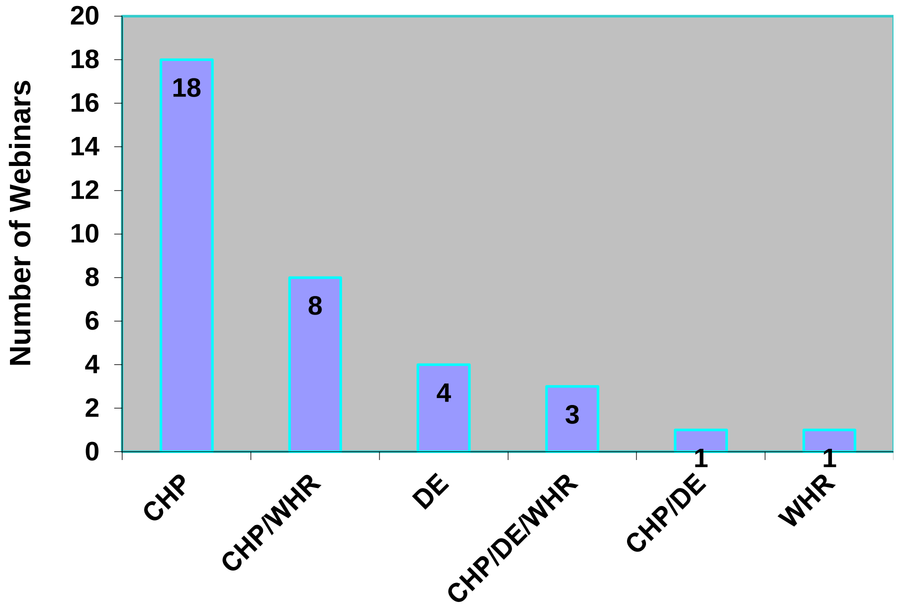

Figure 5.2. Type of clean energy addressed by CEAC webinars, FY 2011

Table 5.2 shows the actions taken by CEACs in FY 2011 as follow-ups to their webinars. The CEACs reported substantially fewer follow-up activities to their webinars than to their other types of education and outreach activities. Those activities included providing technical assistance on specific projects, working on additonal education and outreach efforts, and coordinating with utiltiy industrial energy efficiency programs.

As shown in Table 5.3, the most frequent explanation of a post-webinar activity's strategic importance was that it increased awareness and support for clean energy among stakeholders and potential users. The next most common answer was that a follow-up activity helped promote clean energy technologies through work with key stakeholders.

5.3. PRESENTATIONS AT END-USER WORKSHOPS AND CONFERENCE EVENTS

The CEACs made 56 presentations at end-user workshops and conference events in FY 2011 (Table 5.1). A total of 4,404 people attended those events, 1,149 of whom (26% of the total) were energy end-users. That represents an increase over the previous year of 70% in the number of presentations and 34 % in the total number of attendees. Attendees at presentations who were end-users were not identified in last year's metrics, so that comparison cannot be made.

Thirty-four percent of the CEAC presentations focused on CHP alone; 28% addressed CHP and WHR combined; 20% dealt with CHP, DE, and WHR together, and 18% looked at CHP and DE combined (Figure 5.3). Most of the presentations were targeted at multiple end-use sectors, with institutional, industrial, and commercial being by far the most commonly addressed.

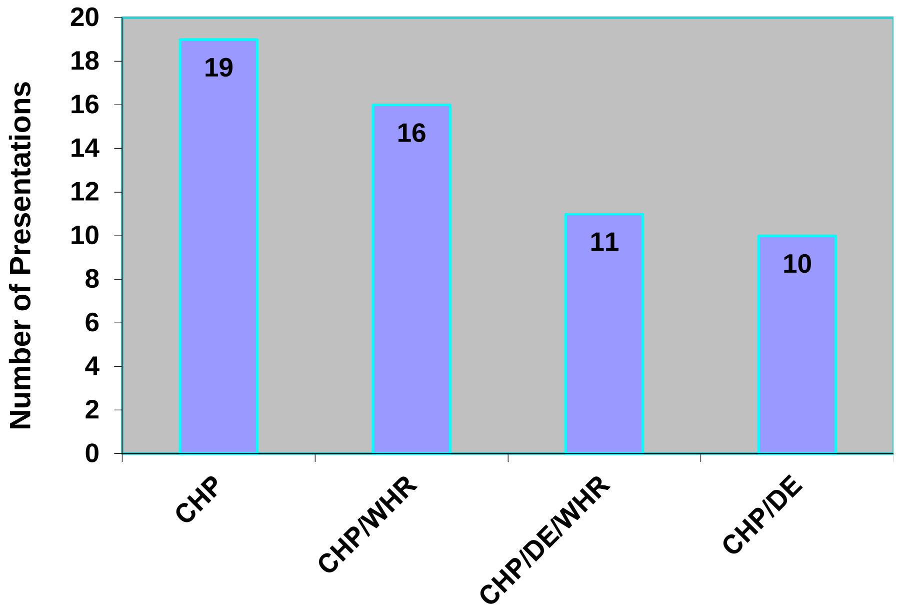

Figure 5.3. Type of clean energy addressed by CEAC conference presentations, FY 2011

As shown in Table 5.2, the most common follow-ups to presentations at end-user workshops and conference events were to provide technical assistance on specific projects and to work on additional education and outreach efforts. Other follow-up actions taken by multiple CEACs were: educating policy makers on clean energy use; working with stakeholders and government agencies on new opportunities and strategies; providing attendees with requested information; putting clean energy technologies in an energy plan; having follow-up conversations with specific attendees; and soliciting information from attendees.

Table 5.3 shows that the most frequent explanations for a post-webinar activity's strategic importance were that the action increased awareness and support for clean energy among stakeholders and potential users and that it educated government policy makers on clean energy. The next most common answer was that a follow-up activity helped promote clean energy technologies through work with key stakeholders.

5.4. WEBSITE HITS AND DOWNLOADS

All nine CEACs reported the number of views and unique visitors to their websites for FY 2011. As shown in Figure 5.4, the totals reported for all the centers combined were 354,825 page views and 50,737 unique visitors. Those numbers are substantially lower than what was reported for the previous year.

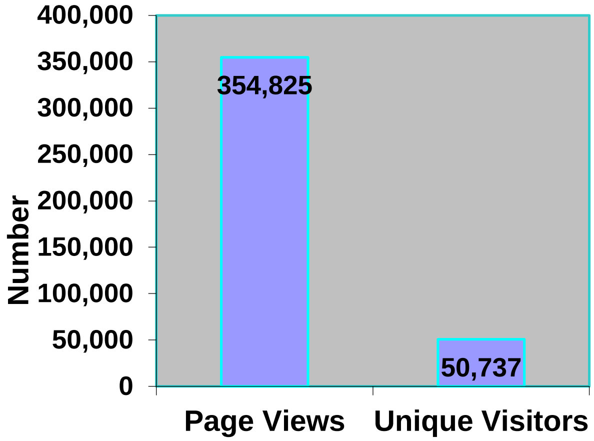

Figure 5.4. Number of Clean Energy Application Center website page views and unique visitors, FY 2011

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 85,527 views or downloads in 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. Nearly four-fifths of the views/downloads were conference presentations and application guidebooks, with just over half of the remaining views/downloads accounted for by project profiles and case studies. Seventy-two percent of the most frequently viewed or downloaded materials addressed CHP alone and another 11% dealt with CHP, DE, and WHR combined. Nine percent involved CHP and waste heat recovery together, 7% addressed CHP and DE, and less than 1 % dealt with waste heat recovery by itself.

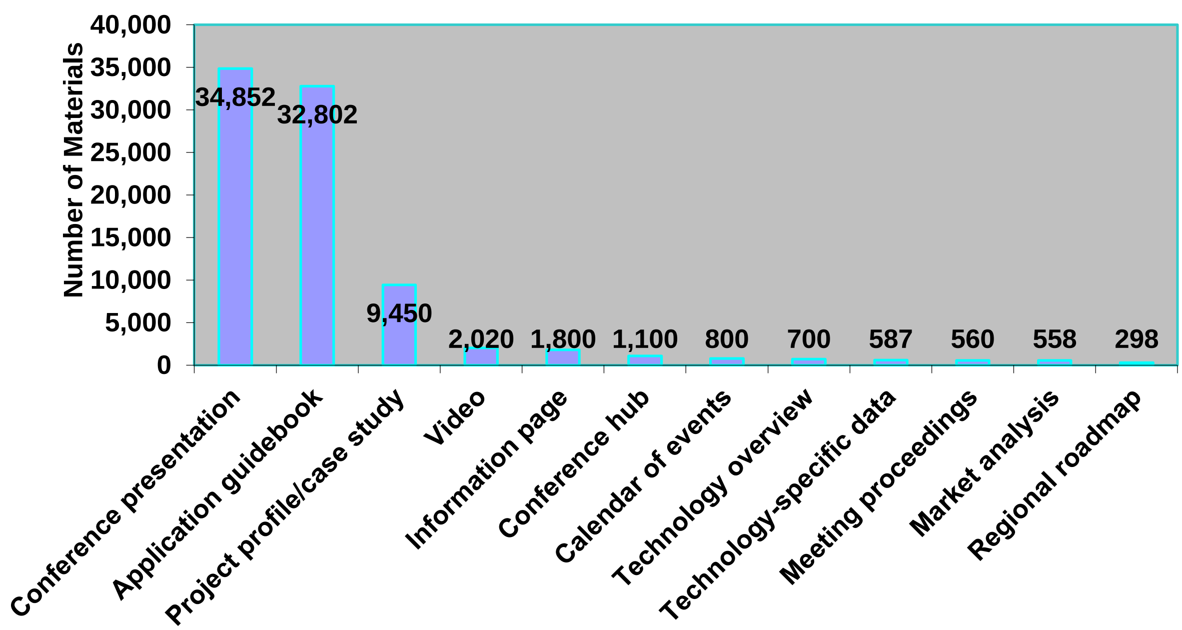

Figure 5.5. Key types of materials viewed/downloaded, FY 2011

6. MOST IMPORTANT ACCOMPLISHMENTS

In an effort to focus the CEAC metrics effort on those activities having the greatest impact on clean energy development, each center was asked to identify its five most important accomplishments for FY 2011 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 2011 fiscal year. As shown in Table 6.1, the CEACs' major accomplishments fall into a relatively small number of general categories. The most common type of accomplishment reported by the CEACs was that important education/outreach events were held or education/outreach resources were developed. The next most frequently reported accomplishment was having clean energy projects under consideration or moving forward with CEAC assistance. This was followed by state or local policies to facilitate clean energy use being developed or revised with CEAC input and assistance. The remaining types of accomplishments reported by the CEACs are included in the table below.

Table 6.1. Overview of most important CEAC accomplishments in FY 2011

General type of accomplishment reported by CEAC	Number of times reported by CEAC
Important education/outreach events held or resources developed	16
Clean energy projects under consideration or moving forward with CEAC assistance	11
State or local policies to facilitate clean energy use developed or revised with CEAC input and assistance	8
CHP partnerships or working groups formed with CEAC assistance	4
Information and education provided to utilities on the benefits of CHP	3
Incorporation of CHP into state energy plans	3

For each important accomplishment reported, the CEACs also explained its strategic importance. These explanations can be put into a limited number of general categories that capture the significance of key CEAC activities. A large number of accomplishments were judged to be strategically important by the CEACs for one of two reasons: they either were thought to have facilitated development and completion of clean energy projects or they provided information/educational materials related to the development or revision of state or local clean energy policies. A substantial number of CEAC accomplishments were also said to be strategically important because they were thought to have increased general awareness and support for clean energy or they targeted potential end-users with information to facilitate clean energy use. The full set of reasons that key accomplishments were seen as important by the CEACs is listed in Table 6.2, below.

Table 6.2. Overview of CEAC-reported strategic importance of accomplishments in FY 2011

Strategic importance reported by CEAC	Number of times reported by CEAC
Facilitate development and completion of clean energy projects	11
Provide information/educational materials related to development or revision of state or local clean energy policies	9
Increase general awareness and support for clean energy	7
Target potential end-users with information to facilitate clean energy use	7
CHP partnerships/working groups support adoption of clean energy technology	5
Educate utilities on benefits of clean energy projects	3
Provide information/assistance to state planning for clean energy use	3

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), arranged in alphabetical order.

Table 6.3. Gulf Coast CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. CHP Policy Forum and Trade Show was held, co-organized by the Gulf Coast CEAC.	The first regional CHP conference and trade show, co-organized by the Gulf Coast CEAC and the Texas CHP Initiative, drew over 300 attendees and 26 sponsors and exhibitors. The meeting increased awareness of CHP among Texas stakeholders and helped stimulate support for CHP, waste heat to power, and district energy in advance of the 2011 Texas legislative session. The CEAC had lead responsibility for the content and logistics associated with this conference.
2. Substantial gains were made in Gulf Coast CHP adoption in the institutional and industrial sectors with CEAC assistance.	Several large-scale, high-profile projects were completed in all three states of the Gulf Coast region. Noteworthy projects involved large university, hospital, municipal, and industrial facilities. The CEAC's role in providing assistance for those projects included: conducting qualification screenings and feasibility analyses; providing stakeholder education on CHP technologies and applications, permitting, and regulatory barriers; and identifying possible funding sources or funding mechanisms.
3. Texas Legislature passed a law (HB 3268), with CEAC input, allowing Permit-by-Rule (PBR) for CHP plants smaller than 15 MW; the Texas Commission on Environmental Quality (TCEQ) developed rules to implement the new law.	The CEAC provided information and educational materials related to the development and passage of HB 3268 during the 2011 Texas Legislature. Permits by Rule (PCRs) are less complex than standard permits and can facilitate CHP adoption. During the subsequent rule-making process, the CEAC provided feedback to TCEQ via comments and participation in a stakeholder meeting. During this stakeholder meeting, the CEAC answered specific system configuration and technology questions raised by TCEQ.
4. Waste heat to power and biomass CHP were included in Louisiana Pilot Renewable Portfolio Standard, following the provision of information by the CEAC.	The Louisiana Public Service Commission (PSC) created the state's first energy portfolio standards, a pilot RPS that would include waste heat to power and biomass CHP as eligible applications. The CEAC had previously submitted comments and testified before the PSC, providing information related to the inclusion of waste heat to power and CHP in the pilot program.
5. Gulf Coast CEAC produced a White Paper on the benefits of advancing gas-fired CHP in Texas	The CEAC issued a white paper on the impacts of increasing the usage of natural gas fueled CHP at the request of the Texas Lieutenant Governor's office. The report supported the policy efforts of the Texas CHP Initiative during the 2011 legislative session.

Table 6.4. Intermountain CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. State-by-state stakeholder workshops and tours were launched by the Intermountain CEAC.	These events, called "Recycled Energy in Action" were held in Utah (July 2011) and New Mexico (Sept. 2011). They highlighted a number of successful CHP systems in the region; reinforced the CEAC's relationships with the Utah and New Mexico State Energy Offices; expanded the CEAC's network of active project developers; increased awareness of the CEAC among possible outreach partners; and led to requests for policy information and technical assistance from state regulators, policy makers, and potential end-users.
2. Intermountain CEAC conducted research and held discussions with utilities on incorporating CHP into utility demand-side management and energy efficiency programs.	These activities led to the inclusion of CHP as an eligible measure in a regional utility company's DSM plan; improved awareness of CHP as a valuable efficiency measure among utilities and Public Utility Commissions in Arizona, New Mexico, and Colorado; and educated utilities to the benefits of CHP, thereby increasing the likelihood of reduced barriers and increased installations
3. Technical assistance and project feasibility screenings for potential projects in the Intermountain region were provided by the CEAC.	These services helped: get potential adopters to "the next step" in project evaluation or implementation; optimize systems for efficiency, maintenance requirements, costs, and other considerations; and identify projects that might not be financially or technically viable
4. Intermountain CEAC redesigned and upgraded its website, facilitating the dissemination of useful information to a wide range of interested parties.	These improvements and additions to the website's various pages and features reinforced the notion that CHP is a modern and advanced energy solution and increased the accessibility of information and examples of project successes that highlight the financial and technical viability of CHP in the Intermountain region
5. Training and outreach for State Energy Offices and related organizations throughout the Intermountain Region were provided by the CEAC.	Training was provided for 20 rural energy coordinators and 25 metro area energy coordinators for the Colorado Governor's Energy Office and for six State Energy Office Staff members in the Utah Office of Energy Development. In addition, joint outreach was conducted with the New Mexico Energy, Minerals, and Natural Resources Department. These training and outreach efforts had the effect of: drawing attention to the importance of CHP in state and community energy plans; boosting the overall level of CHP knowledge and technical competence among state and local officials; illustrating the importance of policies that effectively support CHP; and eliciting technical assistance and feasibility screening requests that can help potential projects move forward.

Table 6.5. Mid-Atlantic CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. The State of New Jersey established a goal in the New Jersey Energy Master Plan of installing 1500 MW of CHP over the next ten years, following technical support provided by the Mid-Atlantic CEAC to state policy makers. That support consisted of preparing a CHP market assessment report, offering public comments, and participating in stakeholder meetings.	Technical support to state policy makers is a key part of the CEAC's strategic plan. The goal of this strategic initiative was to highlight the advantages and importance of CHP to the State of New Jersey and provide information, analysis, assistance, and the sharing of best practice during the plan development process.
2. The Marcellus Shale Gas Utilization Policy Plan, issued in July 2011, specified that Pennsylvania should promote the use of CHP through the employment of Permit-by-Rule, standardized utility power grid interconnection rules, and direct financial incentives. This followed a presentation by the CEAC to the PA Marcellus Shale Advisory Commission on the benefits of CHP	Technical support of the type provided here is a key part of the CEAC's Strategic Plan. The goal of this particular CEAC activity was to highlight the advantages and importance of CHP to the Commonwealth of Pennsylvania as it developed its Marcellus Shale policies.
3. The Commonwealth Recycled Energy and Economic Development Alliance (CREEDA) was formed following a workshop sponsored by the CEAC and Penn State University focusing on the potential utilization of Marcellus Shale Gas. CREEDA is an industry trade group focusing on developing strategies to impact state policy as it relates to CHP. Following creation of the CREEDA, the CEAC provide it with technical support in the form of a CHP market assessment report	Technical support is a key part of the CEAC Strategic Plan. The goal of this strategic initiative was to highlight the advantages and importance of CHP to Pennsylvania and to help the Commonwealth develop policies through the State Energy Plan and the Marcellus Shale Gas Utilization Plan that encourage the use of CHP.
4. Maryland's Energy Master Plan was rewritten by the responsible state agencies, with technical support from the CEAC. This technical support included preparing a CHP market assessment report, providing comments at stakeholder meetings, and giving presentations on the benefits of CHP.	Technical support to state policy makers is a key part of the CEAC's Strategic Plan. The goal of this strategic initiative was to highlight the advantages and importance of CHP to the State of Maryland as it seeks to achieve its energy-related goals.
5. Mid-Atlantic CEAC provided robust technical assistance in the form of on-site visits and a site technical evaluation in support of future CHP usage by a major regional food processing company.	The CHP project in question is the first one to move towards execution in association with a Mid-Atlantic CEAC workshop and technical assistance.

Table 6.6. Midwest CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. The Ohio CHP Coalition was formed, with technical and educational support provided by the Midwest CEAC. The Coalition brings together both the industrial manufacturing community and the environmental community to address opportunities and barriers facing CHP and waste energy recovery (also known as waste heat to power) in Ohio. The technical support provided by the CEAC included participating in numerous meetings and conference calls, preparing educational material, organizing workshops and webinars, and being available to answer questions on CHP and waste energy recovery in general and on how other states were addressing similar issues. .	The formation of the Ohio CHP Coalition was the mechanism used to affect state policy regarding CHP and waste energy recovery. A united partnership between the industrial and environmental communities got the attention of state regulators and legislators which in turn got the attention of the utilities.
2. Midwest CEAC achieved recognition as a key participant in state policy reform: The CEAC participated in policy activities in Illinois, Indiana, Iowa, Minnesota, Missouri, and Ohio. The CEAC's involvement varied from state to state and included initiating discussions, providing comments, participating in symposia, serving on panels and working groups, and reviewing proposed rules. The CEAC also served as the Midwest Governor's Association Industrial Committee spokesman for CHP and waste energy recovery.	The recognition of the Midwest CEAC in the state policy arena positions it as a reliable technical resource on CHP and waste energy recovery in policy matters. Since the CEAC's strategic thrust is focused on policy reform, this recognition is very important.
3. A partnership was formed by the CEAC with the Association of Illinois Electric Cooperatives (AIEC) to educate electric utilities and end-users on the benefits of Biogas CHP. Workshops were jointly held, biogas feedstock analysis for Illinois was conducted by the CEAC, and technical and educational support was provided to coop utilities, municipalities, and end users. This is an ongoing relationship that has resulted in projects being identified and supported by utilities, the State Energy Office, regional and state EPA, and end-user investors.	This partnership with the IAEC assists in bringing local electric utilities to the table and addressing potential barriers early in the project development process.
4. A wide range of technical studies and site analyses were completed by the CEAC in FY 2011. Specifically, the CEAC participated in more than six CHP site analyses in Wisconsin, Michigan, Ohio, and Indiana and provided other technical support to seven sites in Illinois and Wisconsin. The CEAC also helped develop CHP input for the *Michigan Digester Operations Handbook* and provided technical assistance to the Illinois Biogas CHP program.	It is strategically important for the Midwest CEAC to be recognized as the experts to contact in the Midwest for unbiased technical information on CHP concepts, technologies, and installation information. The above activities provided that strategic positioning for the CEAC.
5. Midwest CEAC served as spokesman for CHP during the development of the *SEEAction Industrial Energy Efficiency and CHP Working Group Blueprint*, which was published in 2011. The CEAC participated in the working group and was very active in ensuring that CHP information was considered and that the technology was adequately addressed in the ensuing Blueprint.	The SEEAction Network activities have become a focal point of industry, utility, and state government interaction and cooperation in pursuing policy reform. CHP inclusion in the SEEAction activities put these technologies at the forefront of state policy discussions.

Table 6.7. Northeast CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Continued funding was secured for CHP in New York's System Benefit Charge (SBC IV) five year expenditure plan following extensive education and outreach efforts by the Northeast CEAC. Major CEAC activities consisted of: organizing and convening meetings with important stakeholders and high-level state policymakers; preparing briefing materials; and speaking on the benefits of CHP and the importance of continuing to provide support for market development.	CEAC worked with other interested parties to educate state policymakers on the benefits of retaining CHP in the SBC IV program.
2. Northeast CEAC worked in close collaboration with utilities and industry to heighten the visibility of "strategically sited CHP" (projects that are built in a congested area or where transmission and distribution expenditures are imminent) as a means of lowering distribution system capital costs. Specific actions included: helping prepare a report on this topic; distributing that document to key stakeholder organizations for review and comment; and engaging in planning meetings with utility personnel to identify sites for a pilot project.	This pursuit of strategically-sited CHP in collaboration with utilities and other interested parties is an innovative strategy that led to a special bonus incentive from the State of New York for this type of installation.
3. Specific actions were identified to achieve PlaNYC's original goal of achieving 800 MW of clean energy capacity in New York City by 2030, with technical assistance from the CEAC. The CEAC helped convene an all-parties meeting that led to the formation of three separate working groups on various CHP issues, and the CEAC went on to play an active role in all three groups.	CEAC staff was involved in all three working groups and chaired one of them, toward the end of creating a policy environment more conducive to the development of CHP projects.
4. Northeast CEAC provided education to the hospital sector on the benefits of CHP and the financing of such systems. Specific services provided by the CEAC included: gathering data on how capital financing decisions are made in hospitals; designing and convening conferences and other meetings on CHP in hospitals; providing information on CHP to health care groups and other key stakeholders; heading a working group on hospital markets; and helping create a work plan to address financing challenges.	The education and assistance provided by the CEAC was designed to address the issue of financing, which has emerged as a critical barrier to the installation of CHP systems by hospitals.
5. Fifteen technical assistance efforts were completed by the CEAC, from which seven projects went on to be considered for development by facility owners.	The CEAC's technical assistance efforts led to serious consideration of seven new clean energy projects. In some cases, facility owners began working with a developer and started exploring financing options for those projects.

Table 6.8. Northwest CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Northwest CEAC worked to improve the CHP policy framework in Washington State through participation in four key coordinated efforts: (1) Utility commission study of distributed generation; (2) Anaerobic Digestion Work Group; (3) Efficient Energy Work Group; and (4) an informal Portfolio Standard Work Group to resolve technical questions.	Prior to 2011, the CHP policy framework in Washington State was mostly ignored. Through these efforts, CHP was established as having a legitimate role in Washington energy policy and steps were being taken to more fully enable the use of CHP.
2. Technical assistance was provided by the CEAC for five large CHP projects moving forward in two states with a total capacity of nearly 175 MW. The technical assistance provided by the CEAC included help with a technical site evaluation, preparation of a corrective action plan, and help with permitting issues.	Large and visible projects helped focus attention on CHP policy improvements and contributed to national goal of deploying 40 gigawatts of new CHP in the U.S. by 2020.
3. Northwest CEAC helped develop the Montana forest products target market by: establishing the structure of whole mill energy audits including CHP to enable project financing; developing Requests for Proposals (RFPs); obtaining funding for the actual audits from outside sources; and providing quality review of the CHP portions of those third party audits.	These efforts helped establish baseload biomass CHP as a viable option for meeting Renewable Portfolio Standard requirements in Montana.
4. Technical and analytical assistance for a variety of clean energy projects in Alaska was provided by the CEAC. That assistance included funding staff at the Alaska Energy Authority to perform engineering design for a rural village biomass CHP project and providing technical advice on incorporating power generation into a biomass district energy project.	The support provided by the CEAC ensured that biomass CHP was considered in Alaska energy planning.
5. Oregon's Business Energy Tax Credit was extensively revised and the new policy includes CHP as both an energy efficiency and renewable energy resource, depending on feedstock. The CEAC provided technical expertise on biomass CHP to the Oregon Department of Energy in the development of the new tax credit.	The CEAC's assistance efforts helped ensure the survival of this key financial incentive for CHP.

Table 6.9. Pacific CEAC's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. California Bill AB 1150 was passed, following completion of economic analysis by the Pacific CEAC. The bill extended Self Generation Incentive Program (SGIP) funds to CHP and waste heat to power technologies. This bill provided an additional $249 million in state funds through 2016.	The CEAC analysis showed the prospective benefits to state entities and the California economy from the extension of this incentive program to distributed generation/CHP in the state.
2. "Field Performance Report" on CHP in California was completed by the CEAC.	That report identified key operational issues and lessons learned as well as "success stories" from assessing the performance of CHP in California
3. Site assessment report for landmark skyscraper in San Francisco's financial district was completed by the Pacific CEAC. The report recommended installation of a 2 MW CHP system with an estimated three to four year payback period.	This project represents a high-profile CHP opportunity in San Francisco.
4. Project profile of California state government "Central Plant" district energy project was completed by the CEAC.	This project profile describes a large district energy plant in Sacramento, CA, that provides energy and HVAC to 23 state buildings
5. Project profile of a California municipal waste water treatment plant was completed by the CEAC.	This profile provides a good example of the power project potential at waste water treatment plants in the Pacific region.

Table 6.10. Southeast CEAC's five most important accomplishments for FY 2011

Description of Accomplishment	CEAC's Explanation of Strategic Importance
1. CHP workshop was held by the Southeast CEAC and the North Carolina CHP Initiative was established to represent end-users, developers, and advocates of CHP in North Carolina.	This activity established the foundation for future policy work, technical cooperation, and outreach designed to improve the market for CHP in North Carolina.
2. Development of a Utility CHP Energy Efficiency Incentive Program was begun by the CEAC and a large regional utility, which led to the creation of a working group involving one additional utility, clean energy developers, and a non-profit advocacy group.	The support and participation of utilities in CHP development is important in the Southeast, which has vertically integrated utilities.
3. Two Level I assessments were performed by the Southeast CEAC at North Carolina paper plants representing total capacity of over 12 MW.	These projects represent good potential successes that follow on smaller projects that have established precedents for tax credit use and eligibility in the North Carolina Renewables and Efficiency Portfolio Standard.
4. A Biomass CHP workshop was held by the CEAC in Mississippi and follow-up activities were conducted in the Southeast including: a conference presentation; a webinar; participation in a briefing for Congress on bioenergy; and the inclusion of biomass CHP in fact sheets issued by a regional public policy think tank.	Biomass CHP is a strategic market sector for the Southeast and other regions. This workshop and follow-up actions have helped the CEAC raise its profile among the renewable biomass community and has led to several technical assistance requests for viable projects.
5. A waste water treatment plant in Kentucky is considering installation of a CHP system following technical assessments and a recommendation from the CEAC in a previous fiscal year. Also, two case studies were completed for similar CHP systems at wastewater treatment plants in Florida and Arkansas.	The interest exhibited by the Kentucky facility shows that the wastewater treatment plant market is receptive to CHP implementation. The case studies can be cited in future conversations with wastewater plants to illustrate the applicability of CHP to such facilities, particularly those that have anaerobic digesters.

Table 6.11. International District Energy Association's five most important accomplishments for FY 2011

Description of CEAC Accomplishment	CEAC's Explanation of Strategic Importance
1. Multiple columns by CEACs were published in IDEA's *District Energy* magazine.	The magazine is distributed to 3,500 print subscribers and 3,000 digital visitors and has provided the CEACs with a mechanism for reporting on their regional activities and building relationships with IDEA members and other stakeholders who read the magazine. IDEA uses *District Energy* magazine as a key outreach tool and distributes printed copies of the magazine at many events, presentations and workshops, providing significant visibility to CEAC column content and authors.
2. A comprehensive district energy system information data base was created by IDEA.	The information gathered through this effort documents the geographic distribution, size and scale, type of end use, and fuel use attributes for all DE/CHP systems.
3. Several conferences and workshops were held by IDEA, including its Annual Conference and Trade Show, Annual Campus Energy Conference and Distribution Workshop, and International District Cooling Conference and Trade Show.	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. The conferences present tools, best practices, lessons learned, and policy initiatives relevant to the promotion of CHP/DE.
4. IDEA made several presentations and conducted webinars for policy makers and end users. These included presentations to the Connecticut Association of Architects and various U.S. military agencies.	IDEA's presentations and webinars provided important information on district energy systems to end-users and policy makers and led to follow-up invitations to provide information on the value of CHP and district energy in ensuring power reliability and resiliency during major storm events.
5. A robust CHP/DE Screening Tool was developed by IDEA to help evaluate CHP/DE projects for the other CEACs.	The tool models reference data for loads by climate region and provides a calculation of 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. 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). About 45% of the systems contained in that database have a CHP component in addition to a DE element. The other 55% are either district heating or district cooling alone or, most commonly, the two types of systems operating together. In addition to identifying 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 installations and DE facilities taken from the above-mentioned databases are discussed in separate sections below.

7.1. CHP INSTALLATIONS

As shown in Table 7.1, 109 CHP facilities with a combined capacity of 569 MW were installed in the U.S. in CY 2011. These are facilities that have been completed and are operational, and do not include projects that are currently under development. The number of new CHP installations in 2011 is about 4% greater than in the previous year and the generation capacity is about 1% greater than the year before. Three of the CHP systems that went online in 2011 were developed in conjunction with DE systems. These CHP/DE systems accounted for 64 MW, or about 11%, of the total CHP capacity installed in 2011.

Table 7.1 Description of CHP installations in U.S., CY 2011

Number of installations	CHP capacity installed (MW)	Investment in CHP installations (million $)	Annual energy savings (million source BTUs)	Annual carbon reduction (metric tons)
109	569	853	15,102,064	2,200,594

The facilities described in Table 7.1 are located in 24 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 109 CHP systems installed in CY 2011 is $853 million. 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 just over 3,400 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 109 CHP facilities installed in the U.S. in CY 2011 resulted in savings of over 15 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 2012) calculated that the 2011 CHP installations resulted in an annual carbon emissions reduction of 2.2 million metric tons.

7.2. DISTRICT ENERGY FACILITIES

This section describes *all* district energy systems in operation in the U.S. as of August 2012 rather than just those that began operations in 2011. 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 2011. As shown in Table 7.2, 597 DE systems are currently operating in the U.S., possessing very substantial thermal and cogeneration capacity. The number of facilities listed below and all the capacities (with the exception of chilled water) are lower than what was reported last year. This does *not* indicate a genuine reduction in U.S. district energy system cogeneration and thermal capacity. Rather, those differences are due to refinements to the data base that have been made over the past year, most notably the removal of duplicate entries, the disaggregation of several large downtown DE systems, the elimination of double-counting the same CHP system as both supplier and purchaser, the removal of systems that were CHP-only with no DE component, and the correction of previous data entry errors.

Table 7.2 Description of all district energy facilities in U.S. as of August, 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	4,250,681	6,644

District energy systems are present in 49 states and the District of Columbia. Of the 597 systems currently in operation, 269 are some combination of CHP, district heating, and district cooling. The other 328 systems are DE alone, with no electric generation component. The precise mix of system types is shown in Figure 7.1. It should be noted that district heating and district cooling capabilities are often present in the same system. It is also fairly common for DE systems to provide heating only, but cooling-only systems are found less frequently.

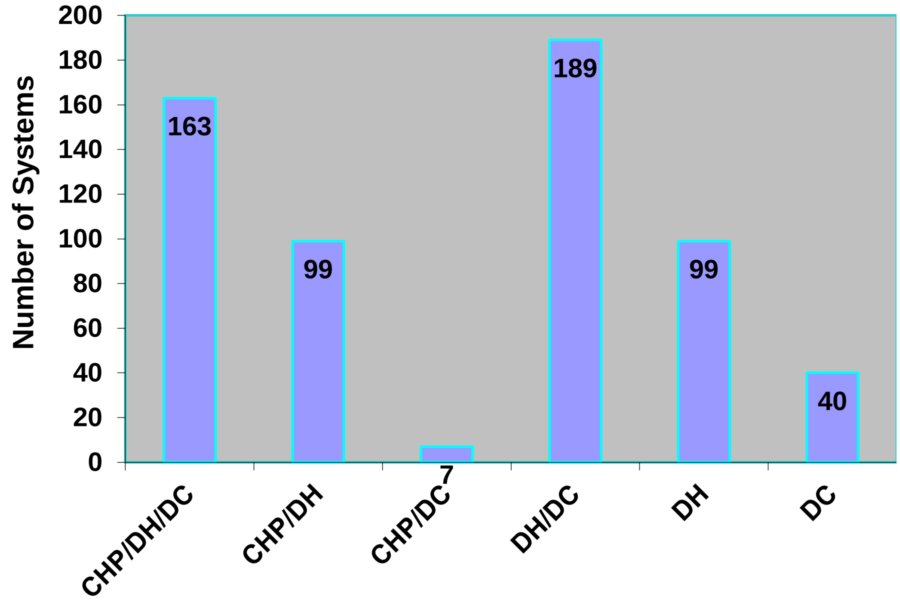

Figure 7.1. Types of district energy systems operating in U.S., 2011

Existing 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. Currently there are 328 such thermal-only DE systems operating in 47 states plus the District of Columbia. Two hundred twenty-seven of them are located at colleges and universities, 60 are characterized as "downtown/utility" systems, and most of the remainder serve airports and health care facilities. Between them, these 328 DE systems have a thermal capacity of nearly 57 million pounds per hour of steam, 2.8 billion BTUs per hour of hot water, and over 2 million tons of chilled water. A recent example of thermal-only DE systems that evolved into a large CHP system is a 50 MW system that was deployed in 2011 at a Texas university with a well-established district heating and cooling system.

8. SUMMARY AND RECOMMENDATIONS

8.1. KEY FINDINGS

In FY 2011, the Clean Energy Application Centers engaged in a variety of activities to support the development of policies that encourage and facilitate the use of clean energy technologies. During that year, a total of 53 clean energy-related policies were passed in 23 different states. This is nearly the same total number of state policies that were enacted during the previous year. Twenty of the FY 2011 policies (in 12 states) were new ones and 33 (in 18 states) were revisions to existing policies. The two most common types of policies put in place that year were incentive programs and portfolio standards.

Ninety-one technical site evaluations were performed in FY 2011 (10% more than in the previous year) and many other types of technical support were also provided to current and potential users of clean energy technologies. Altogether, 78 clean energy projects were under consideration, 54 were under development, and 18 went online in FY 2011 following the provision of technical assistance by the CEACs during that year or a previous one. The number of projects under consideration and going online in FY 2011 was greater than the year before, but fewer projects were under development than in the previous year. The electric generation capacity represented by those projects, in comparison to the year before, was greater for projects under consideration but less for those under development and going online.

The CEACs were asked to identify the highest impact/highest visibility projects in FY 2011 that were associated with their technical assistance efforts. The most common reasons given to explain the high impact or visibility of the reported projects was that they: involved innovative or unusual fuel sources; provided a good example of a clean energy project for the market sector involved; involved interactions with a utility company or utility-related policies; took place at a large and prominent hospital or health care systems; or involved difficult permitting issues.

In the area of education and outreach, the FY 2011 CEAC metrics focused largely on workshops, webinars, and presentations that targeted potential end-users of clean energy technologies in specific market sectors. For the first time, 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 provided technical assistance on specific projects and worked on additional education and outreach efforts. Other frequenly-mentioned follow-ups were: educating state and local policy makers on clean energy use; working with stakeholders and government agencies on new clean energy opportunities and strategies; evaluating incentives for clean energy use; providing requested information to attendees; putting clean energy technologies in an energy plan; and having follow-up conversations with specific attendees.

The most frequent explanations given for the strategic importance of the CEACs' follow-up activities were that they increased awareness and support for clean energy among stakeholders and potential users, they helped promote clean energy technologies through work with key stakeholders, or they helped educate state and local policy makers about clean energy.

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 were held or education/outreach resources were developed. Having clean energy projects under consideration or moving forward with CEAC assistance was also reported quite frequently. This was followed by state or local policies to facilitate clean energy use being developed or revised with CEAC input and assistance. The most common reasons given to explain the strategic importance of the CEACs' key accomplishments were that they facilitated development and completion of clean energy projects or they provided information/educational materials related to the development or revision of state or local clean energy policies. In addition, many CEAC accomplishments were said to be strategically important because they increased general awareness and support for clean energy or they targeted potential end-users with information to facilitate clean energy use.

As part of this annual metrics effort, we also tracked CHP and DE installations. While it is probable that actions taken by the CEACs over the years have influenced the number and magnitude of those installations, this study was not designed to establish or quantify that influence. One hundred nine CHP facilities with a combined capacity of 569 MW were installed in the U.S. in CY 2011. Both the number of installations and their overall capacity were slightly larger than the numbers from the preceding year. Unlike the CHP numbers, which were for CY 2011 only, data were collected for *all* DE systems in operation in the U.S. as of August 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, the number of facilities and their cogeneration and thermal capacities are lower than what was reported last year. However, rather than indicating a genuine reduction in DE capacity, those differences are just due to refinements to the data base that have been made over the past year.

8.2. RECOMMENDATIONS

Like previous CEAC metrics efforts, this study was designed to catalogue center activities and existing clean energy capacity but not to establish causal links between the two. Accordingly, we are limited in our ability to recommend changes or refinements in program operations because we do not know how specific activities affect the adoption of clean energy technologies. We do suggest, as in previous metrics reports, that each CEAC consider feedback from its stakeholders concerning the services provided and make operational decisions based on that input. That endeavor could be aided by a coordinated effort to solicit input from stakeholder groups.

Additional studies to explore possible relationships between CEAC activities and key outcomes of interest could be helpful in informing management decisions about center operations. Specifically, we recommend that studies be undertaken to test for possible relationships between: (1) the CEACs' technical assistance activities and the adoption of clean energy technologies; (2) lessons learned by the CEACs during their technical assistance efforts and subsequent policy-related activities; (3) follow-up actions taken by the CEACs after education and outreach events and clean energy adoption by end-users in the targeted sectors; (4) CEAC policy-related activities and state policies enacted; and (5) state policies enacted and the implementation of clean energy projects in the states. The findings generated by such studies would help quantify the effects of center-sponsored activities and achievements, which should help policy-makers and center managers decide what types of efforts to support and services to provide in the future.

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