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CHP REGIONAL APPLICATION CENTERS: ACTIVITIES AND SELECTED RESULTS FOR FISCAL YEAR 2009

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EXECUTIVE SUMMARY

Between 2001 and 2005, the U.S. Department of Energy (DOE) created a set of eight Regional Application Centers (RACs) to facilitate the development and deployment of Combined Heat and Power (CHP) technologies. By utilizing the thermal energy that is normally wasted when electricity is produced at central generating stations, Combined Heat and Power installations can save substantial amounts of energy compared to more traditional technologies. In addition, the location of CHP facilities at or near the point of consumption greatly reduces or eliminates electric transmission and distribution losses. The regional nature of the RACs allows each one to design and provide services that are most relevant to the specific economic and market conditions in its particular geographic area. Between them, the eight RACs provide services to all 50 states and the District of Columbia.

Through the end of the federal 2009 fiscal year (FY 2009), the primary focus of the RACs was on providing CHP-related information to targeted markets, encouraging the creation and adoption of public policies and incentives favorable to CHP, and providing CHP users and prospective users with technical assistance and support on specific projects. Beginning with the 2010 fiscal year, the focus of the regional centers broadened to include district energy and waste heat recovery and these entities became formally known as Clean Energy Application Centers, as required by the Energy Independence and Security Act (EISA) of 2007.

In 2007, ORNL led a cooperative effort to establish metrics to quantify the RACs' accomplishments. That effort began with the development of a detailed logic model describing RAC operations and outcomes, which provided a basis for identifying important activities and accomplishments to track. A data collection spreadsheet soliciting information on those activities for FY 2008 and all previous years of RAC operations was developed and sent to the RACs in the summer of 2008. This represents the first systematic attempt at RAC program measurement in a manner consistent with approaches used for other efforts funded by DOE's Industrial Technologies Program (ITP). In addition, data on CHP installations and associated effects were collected for the same years from a state-by-state database maintained for DOE by ICF international. A report documenting the findings of that study was produced in September, 2009.

The purpose of the current report is to present the findings from a new study of RAC activities and accomplishments which examined what the Centers did in FY 2009, the last year in which they concentrated exclusively on CHP technologies. This study focused on identifying and describing RAC activities and was *not* designed to measure how those efforts influenced CHP installations or other outcomes.

Representatives of all eight RACs were contacted in late September 2009 and asked to provide information describing the full range of their FY 2009 activities and selected results, using a data collection spreadsheet prepared for that purpose. The information provided on the individual RACs was summed to yield totals for all the Centers combined for each relevant item. In addition, data on CHP installations and related outcomes were obtained from the previously-mentioned database. It is likely that some additional 2009 capacity will be added to the CHP installation database in the coming months, but any such additions are likely to be relatively small.

The RACs' undertakings and accomplishments can be grouped into the following major categories: education and outreach activities; outreach materials produced; policy-related activities and results; and technical assistance and results. Brief highlights from each of these broad areas are presented below.

A huge variety of education and outreach activities have been performed by the RACs with the goal of educating potential end-users, policy-makers, and other stakeholders about the benefits and applications of CHP technologies. These activities include: presenting targeted workshops and webinars; leading, planning or taking some other active role in conferences; organizing partnership meetings; sponsoring training sessions; teaching college courses; taking part in media interviews; contacting relevant parties via e-mail; developing websites containing pertinent information for target audiences and educational materials for downloading; and assisting in specific State Energy Office (SEO) activities. Among other things, the RACs hosted 45 workshops and webinars in FY 2009 with over 1,500 targeted attendees and more than 3,400 attendees in total. The RACs also helped plan 13 conferences involving over 2,100 participants, led five conferences, and made nearly 30 conference presentations for almost 2,000 attendees. Targeted sectors included: college campuses; industrial and manufacturing facilities; agriculture; government buildings; hospitals and health care facilities; and forest products. In addition, RAC websites received nearly 2.4 million hits and had over 220,000 documents downloaded from them in FY 2009. The most frequently downloaded materials were conference presentations, application guidebooks, market analyses, project profiles, and technical papers.

In FY 2009, the RACs also produced substantial amounts of outreach materials in pursuit of their mission to facilitate the development and deployment of CHP technologies. Those outreach materials included nearly 20 CHP project profiles, 10 market analyses, 9 technical papers, 8 fact sheets, and a variety of other products.

In addition to the targeted workshops and webinars mentioned above, the RACs held 65 policy-related workshops and meetings in FY 2009 with nearly 2,500 attendees, including almost 500 key public officials. The RACs also engaged in a wide variety of policy-related communications such as e-mails, conference calls, and the issuing of comments and recommendations. During this same period, a number of CHP-related rules, standards, and other policy instruments were implemented by various states. Many of those policies were implemented in states where RACs engaged in policy-related workshops, meetings, and communications on the same topics. This suggests the possibility that the RACs' activities influenced the reported policy outcomes, but this study was not designed to establish and quantify such a relationship. As shown in Table ES.1, the most common CHP-related policies implemented in FY 2009 were interconnection rules, other utility policies, state energy plans, and incentive programs.

Table ES.1. Type and number of state policies established, FY 2009

Policy type	Number
Interconnection rules	4
Other utility policies	4
State energy plans	4
Incentive programs	4
Utility rates	3
Loan/grant program	2
Renewable portfolio standard	1
Other	8

In FY 2009, the RACs reported performing 63 technical site evaluations and making nearly 3,300 other technical support contacts of various types. Altogether, there were 22 projects with 291 MW of capacity under consideration and 49 projects with 385 MW of capacity under development in FY 2009 in association with the RACs' technical assistance efforts (Table ES.2).

Table ES.2 Number of projects and CHP capacity associated with technical assistance provided, FY 2009

Project status	Number	Installed capacity (in MW)
Project under consideration following technical site evaluation or other technical support	22	291
Project under development following technical site evaluation or other technical support	49	385

Data have been compiled on CHP installations and associated outcomes in all states during the 2009 calendar year. During that period, 92 installations were made with almost 530 MW of total capacity. Nearly $800 million of investment was made in those CHP units. Altogether, those installations resulted in estimated annual energy savings of more than 24 trillion source BTUs and carbon emissions reductions of over 3.1 million metric tons. The above-noted capital investment created an estimated 3,178 jobs. While it is likely that RAC activities have influenced those outcomes, this study was not designed to establish and quantify a causal relationship between RAC activities and CHP installations.

This study, like the previous one, was designed to catalogue RAC activities and not to establish how they influenced CHP installations. Accordingly, our ability to make recommendations about future program operations is limited. As in the last report, we do suggest that each RAC consider the feedback it has received from its region's stakeholders concerning the services provided and make near-term decisions based on that input. The establishment of a nationally-coordinated mechanism to solicit input from stakeholder groups regarding desired services could facilitate the collection of important information on the needs of the Centers' constituents.

To improve our ability to document and understand RAC accomplishments, we recommend that the collection of data be enhanced by (1) identifying new metrics related to the expanded focus of the revamped Clean Energy Application Centers; and (2) creating a mechanism for collecting the needed information online. Because the Centers have recently broadened their focus to include district energy and waste heat recovery in addition to CHP, it will be important to consider the addition of new metrics to capture any important new activities and emphases. Also, collecting information online could be less burdensome for the RACs and could be set up to allow each RAC to see what the other RACs have accomplished during the same time period.

To help inform subsequent decisions about Center operations, we recommend that future studies be designed to explore possible relationships between RAC activities and key outcomes, most notably those between: (1) the RACs' policy-related activities and state policies enacted; (2) state policies enacted and the implementation of CHP, district energy, and waste heat recovery projects; and (3) the RACs' targeted education/outreach activities and the adoption of the above-mentioned technologies.

1. INTRODUCTION

1.1. BACKGROUND

Starting with a pilot program in the Midwest in 2001 and eventually expanding to cover the entire country by 2005, the U.S. Department of Energy (DOE) created a set of eight Regional Application Centers (RACs) to facilitate the development and deployment of Combined Heat and Power (CHP) technologies (U. S. Department of Energy 2008). The regional nature of the Centers allows each one to design and provide services that are most relevant to the specific economic and market conditions in its particular geographic area. The region served by each RAC is shown in Figure 1.1.

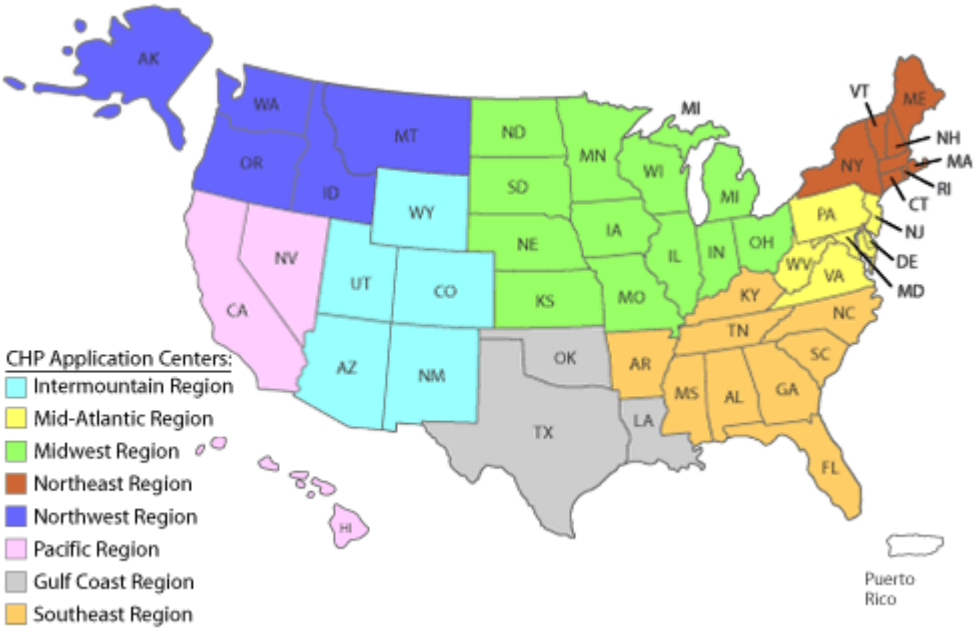

Figure 1.1. Geographic area served by each Regional Application Center

Through the end of the federal 2009 fiscal year (FY 2009), the primary focus of the RACs was on providing CHP-related information to targeted markets, encouraging the creation and adoption of public policies and incentives favorable to CHP, and providing CHP users and prospective users with technical assistance and support on specific projects (Bronson and Orlando 2009). Beginning with the 2010 fiscal year (October 1, 2009), the focus of the regional centers broadened to include district energy and waste heat recovery and these entities became formally known as Clean Energy Application Centers, as required by the Energy Independence and Security Act (EISA) of 2007.

Oak Ridge National Laboratory (ORNL) has provided support for the RAC program since the Regional Application Centers were first established. In 2007, ORNL led a cooperative effort to establish metrics to quantify the RACs' accomplishments. That effort – which involved ORNL, DOE, and CHP industry stakeholders – began with the development of a detailed logic model describing key RAC activities and outputs, the parties involved in RAC operations, and the ways in which those elements combine to produce outcomes and long-term impacts. The information on RAC structure and operations contained in

the logic model (Appendix A) provided a basis for identifying important activities and accomplishments to track.

In the summer of 2008, the RACs were sent a data collection spreadsheet soliciting information on the key metrics identified through the process described above. Information was requested for the 2008 fiscal year as well as for all previous years of RAC operations. This represents the first systematic attempt at RAC program measurement in a manner consistent with approaches used for other efforts funded by DOE's Industrial Technologies Program (ITP). Eventually, all eight RACs completed and returned their data collection spreadsheets and a report was produced documenting those findings and also presenting information on regional CHP installations from a state-by-state database maintained for DOE by ICF International (Schweitzer 2009).

The purpose of the current report is to present the findings from a new study of RAC activities and accomplishments which examined what the Centers did in FY 2009, the last year in which they concentrated exclusively on CHP technologies. This study focused on identifying and describing RAC activities and was *not* designed to measure how those efforts influenced CHP installations or other outcomes.

1.2. SCOPE OF REPORT

The remainder of this report documents how the study of the RACs' FY 2009 activities and accomplishments was carried out and the principal findings from that effort. **Chapter 2** discusses the research methods used to collect and analyze the necessary information. **Chapter 3** describes the education and outreach activities undertaken by the Regional Application Centers during the study year. In **Chapter** 4, we list the various outreach materials produced by the RACs in pursuit of their mission. **Chapter** 5 depicts the policy-related activities carried out by the RACs and the key policy results achieved. In **Chapter 6,** we discuss the RACs' technical assistance efforts and the CHP projects associated with such assistance. **Chapter** 7 presents information on the CHP capacity installed in the 2009 calendar year, the financial investment made in those installations, and the resulting energy savings and carbon emissions reductions. Finally, **Chapter 8** summarizes the major findings of this study and makes recommendations for future efforts to quantify the accomplishments of the Clean Energy Application Centers.

2. METHODS

A data collection spreadsheet specifying all of the information needed on the RACs' FY 2009 activities was prepared and sent to the designated contact person at each Regional Application Center in late September, 2009. This spreadsheet asked for much of the same information requested in the previous study, but there were a few additions and the format was modified extensively to make it easier to complete. The information requested covered the full range of RAC activities and accomplishments.

The RACs were asked to provide all the requested information by late November, 2009. Five of the eight RACs met this deadline and all of the others reported the necessary information by mid January 2010. As each completed spreadsheet was received, its contents were reviewed and follow-up interviews were conducted with the RACs to seek clarification of the answers given and request additional information, as needed. All of the follow-up interviews were completed by late January and a final database, containing all the information provided by the RACs, was prepared in February. In that database, the information provided by the individual RACs was summed to yield totals for all the Centers combined for each relevant item.

In addition to the above-described information on RAC activities, data on the number and capacity of regional RAC installations and the associated capital investment, energy savings, and carbon emissions reductions were also collected. As noted above, those data came from a state-by-state database maintained by ICF International. ICF sent ORNL the requested information for the 2009 calendar year in early February 2010 and provided additional information, collected subsequent to the initial submittal, in June 2010. It is likely that some additional 2009 capacity will be added to the database in the coming months, but any such additions are likely to be relatively small.

3. EDUCATION AND OUTREACH

The Regional Application Centers perform a wide variety of education and outreach activities to help build market awareness of CHP technology and application. These activities include: presenting targeted workshops and webinars; leading, planning or taking some other active role in conferences; organizing partnership meetings; sponsoring training sessions; teaching college courses; taking part in media interviews; contacting relevant parties via e-mail; developing websites containing pertinent information for target audiences and educational materials for downloading; and assisting in specific State Energy Office (SEO) activities. Each of these topics is discussed separately below.

3.1. TARGETED WORKSHOPS AND WEBINARS

Table 3.1 presents key information on the workshops and webinars presented by all the RACs combined in FY 2009. More than 30 workshops and a dozen webinars were held on CHP topics during this period. The RACs reported that these events attracted over 1,500 targeted attendees and more than 3,400 attendees of all types. It should be noted that the actual number of webinar attendees is certain to be higher than reported in Table 3.1 because a few RACs were not able to provide data on total attendance. More than 300 workshop and webinar attendees requested follow-up information, and over 20,000 presentations from those events were downloaded from the RACs' websites.

Table 3.1. Key information on RAC-supported workshops and webinars, FY 2009

Type of event	Number held	Number targeted attendees	Total number attendees	Number attendees requesting information	Number presentations downloaded
Workshops	33	1,452	3,141	313	20,263
Webinars	12	109	265	14	142

The specific end-use sectors targeted by those workshops and webinars most often mentioned were: college campuses; agriculture; government buildings; industrial and manufacturing facilities; hospitals and health care facilities; and forest products. Other targeted sectors included utilities; their regulators; developers; the commercial sector; food services; and state government.

Topics addressed by workshops and webinars in FY 2009 included: campus sustainability; renewable energy sources including biofuels; utility issues; CHP for hospitals and health care facilities; general introduction to CHP; environmental regulations; financial incentives; schools; industry; CHP policies; and development opportunities.

3.2. CONFERENCES

Table 3.2 describes the full range of conference-related activities reported by the RACs for FY 2009. The RACs reported leading five conferences, serving on planning committees for 13 conferences, and leading eight conference sessions. They also made 28 conference presentations and sponsored eight booths. The attendance numbers shown below are not cumulative because there is some overlap in the conferences involved (e.g., a RAC might have planned a conference and also led specific sessions or made a

presentation at the same event). However, the total number of people at RAC-planned conferences alone was more than 2,100.

Table 3.2. Conference participation and attendance, FY 2009

Event	Number of events	Number of attendees
Conferences led	5	1,194
Conferences planned	13	2,105
CHP sessions led	8	1,428
Presentations given	28	1,956
Conference booths sponsored	8	730

The topics addressed by the above conferences included: clean technology; innovation and sustainability; biofuels; industrial applications; agricultural opportunities; hospitals; environmental issues; jobs; and assessment tools.

3.3. PARTNERSHIP MEETINGS

The number of partnership meetings reported by the RACs for FY 2009 is shown in Figure 3.1. More than 50 such meetings were held in FY 2009, drawing over 400 attendees. The topics addressed included: future goals and projects; legislative agenda and status; barriers to CHP; educational opportunities; funding sources; feed stocks; and market issues.

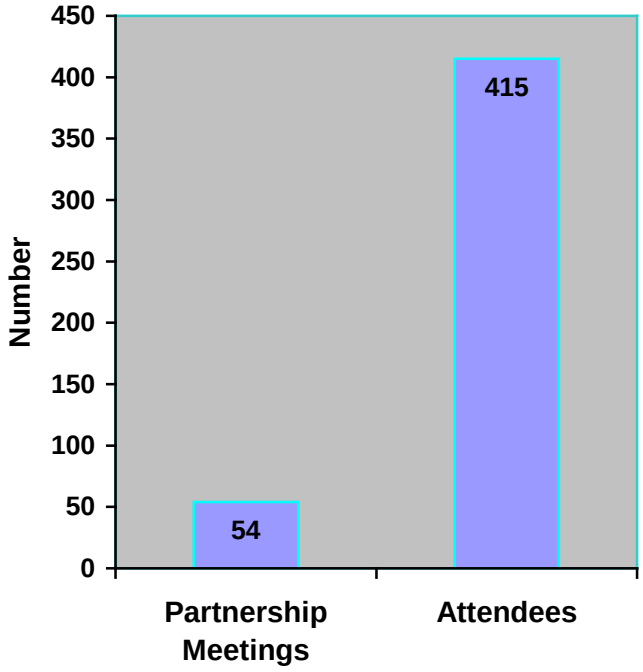

Figure 3.1. Number of partnership meetings and attendees, FY 2009

3.4. TRAINING

The number of training sessions reported by the RACs for FY 2009 and the number of people attending those sessions are show in Figure 3.2. Nearly all of the RACs reported sponsoring training, with a total of 16 sessions and over 400 attendees. Topics included: introduction to CHP; incentives; industrial applications; green building law; biofuels: funding opportunities; and software tools.

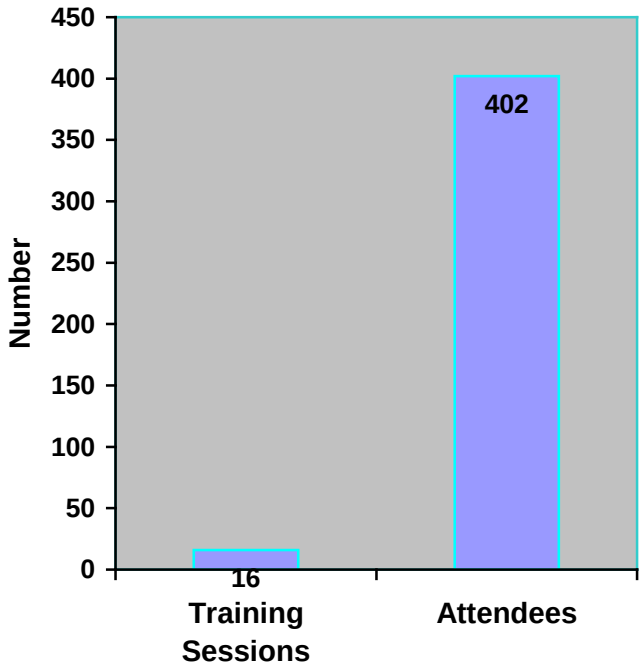

Figure 3.2. Number of RAC-supported training sessions and attendees, FY 2009

3.5. COLLEGE COURSES

Two RACs reported that they taught CHP-related college courses during FY 2009. As shown in Figure 3.3, three such courses were reported, with a total of 70 students. The courses in question covered the fundamentals of CHP and energy systems.

3.6. MEDIA INTERVIEWS

Only two RACs reported being interviewed by the media in FY 2009 on CHP-related topics. Two of those were radio interviews and one was shown on television.

3.7. E-MAIL BLASTS

E-mail blasts typically are announcements or news bulletins relating to CHP that are sent to a RACs' stakeholders. In FY 2009, 13 such blasts were sent out, reaching 11,750 recipients. The topics covered

included: emission standards; funding opportunities; upcoming workshops and meetings; and various technical topics.

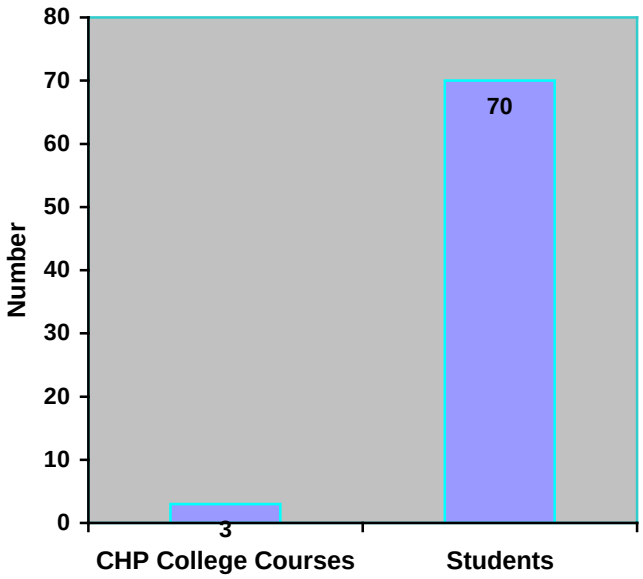

Figure 3.3. Number of CHP college courses taught and students attending, FY 2009

3.8. WEBSITE ACTIVITY

Figure 3.4 shows the number of hits and unique visitors for all RAC-operated websites in FY 2009. In that year, the websites received nearly 2.4 million hits, representing over 220 thousand unique visitors.

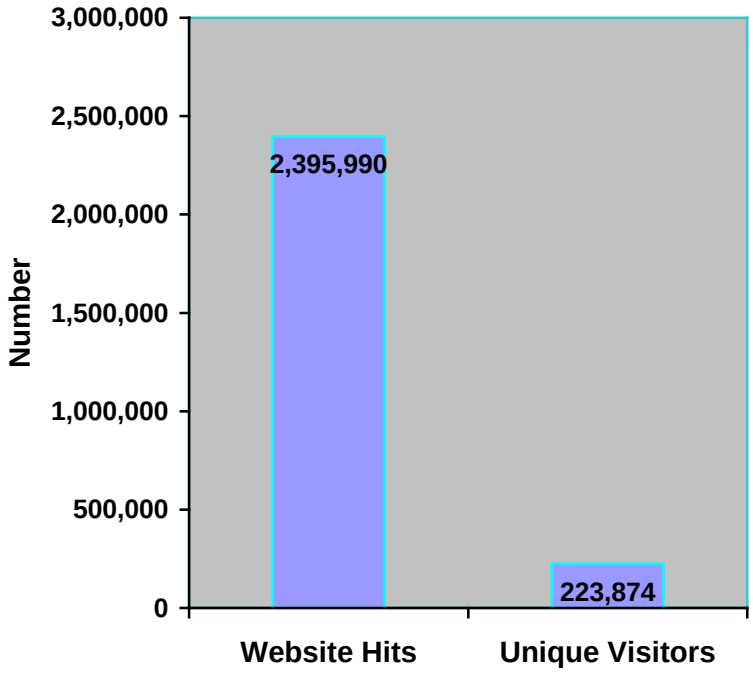

Figure 3.4. Number of RAC website hits and unique visitors

The number and type of materials downloaded from RAC websites in FY 2009 are shown in Table 3.3. Conference presentations were accessed most frequently, but application guidebooks, market analyses, project profiles, and technical papers were all downloaded in substantial numbers.

Table 3.3. Downloads from RAC websites, FY 2009

Type of material	Number of downloads
Conference presentations	129,216
Application guidebooks	76,918
Market analyses	66,012
Project profiles	55,566
Technical papers	47,026
Tools	13,317
Regional roadmaps	856
Other documents	136
Total	389,047

3.9. INVOLVEMENT IN SPECIFIC SEO ACTIVITIES

In FY 2009, RACs reported being involved with nine specific CHP-related State Energy Office activities. These included helping manage a biofuels program, assisting in the development of a state energy plan, and assisting with policy issues.

4. OUTREACH MATERIALS PRODUCED

A number of different types of informational materials were produced by the Regional Application Centers in FY 2009 to help encourage and facilitate the use of Combined Heat and Power. These materials include: project profiles; market analyses; regional roadmaps and state action plans; application guidebooks; fact sheets; newsletters; and technical papers. Table 4.1 shows the number of materials produced, and each type is discussed briefly in its own separate section, below.

Table 4.1. Outreach materials produced by RACs, FY 2009

Type of material	Number produced
Project profiles	18
Market analyses	10
Technical papers	9
Fact sheets	8
Newsletters	6
Regional roadmaps/State action plans	3
Application guidebooks	3

4.1. PROJECT PROFILES

In total, the RACs reported developing 18 project profiles in FY 2009. The most common topics covered included CHP projects in industry of various kinds, dairies, universities, and wastewater treatment facilities. Other profiles addressed CHP applications at banks, hospitals, the agricultural sector, and military bases.

4.2. MARKET ANALYSES

Another common RAC activity is to perform market analyses examining the potential demand for Combined Heat and Power in the region and the conditions and participants affecting CHP development. In FY 2009, ten such analyses were performed. End use sectors addressed included: lumber, pulp, and paper; agriculture; mining; the chemical industry; other manufacturing; and wastewater treatment.

4.3. TECHNICAL PAPERS

A total of nine technical papers or articles on CHP topics were prepared by the RACs in FY 2009. The topics covered included: policy options; biogas-fueled CHP; applications for pulp and paper facilities; other CHP applications; financing tools; community profiles; and electric reliability.

4.4. FACT SHEETS

Eight fact sheets were written and distributed by the RACs in FY 2009. The topics addressed included: a general description of CHP; industrial waste heat recovery technologies; CHP-driven dehumidification and air conditioning; the use of CHP in hospitals; anaerobic digestion; CHP in critical infrastructure; and the use of CHP on brown fields sites.

4.5. NEWSLETTERS

Newsletters can be used by RACs to communicate key information about CHP, RAC activities, upcoming events, and other topics that are important to stakeholders. A total of six newsletters were produced by two different RACs in FY 2009.

4.6. REGIONAL ROADMAPS/STATE ACTION PLANS

Over the years, regional roadmaps and state action plans have been developed by most of the RACs, often in conjunction with regional stakeholders, to help guide CHP development in their region. In FY 2009, three such efforts were undertaken.

4.7. APPLICATION GUIDEBOOKS

A total of three application guidebooks were produced by two different RACs in FY 2009. Two of the guidebooks addressed the use of biomass and one dealt with environmental regulations.

5. POLICY-RELATED ACTIVITIES AND RESULTS

The Regional Application Centers engage in a number of policy-related activities designed to lead to the enactment of regulations and statutes that facilitate the use of Combined Heat and Power. The most common activities are holding policy workshops and meetings and performing a wide variety of other policy-related communications. These activities are described below, as are the key policy results achieved.

5.1. WORKSHOPS/MEETINGS

In FY 2009, three RACs held a total of eight workshops on a variety of policy-related topics. As shown in Table 5.1, two of the workshops addressed emission rules, one dealt with incentives, and one covered tax credits. The other eight were concerned with a variety of other topics, including: permitting and barrier removal for specific CHP technologies (two workshops); funding opportunities; biopower feedstock supply; geothermal energy; and public purpose bond financing for industrial projects. In total, over 1,500 individuals attended those sessions.

Table 5.1. Number of policy-related RAC workshops and attendees, FY 2009

Workshop topic	Number of workshops	Number of attendees
Emission rules	2	150
Incentives	1	10
Tax credits	1	10
Other	8	1,334
All topics combined	12	1,504

The RACs were asked to report the number and type of key public officials in attendance at their policy-related workshops. Table 5.2 shows that those attendees included 41 state environmental officials, 31 state energy office directors or staff, 17 Public Utility Commission (PUC) commissioners or staff, and 12 state legislators or staff. The highest ranking officials who attended those events were a state Governor and a state Department of Commerce director.

Table 5.2. Type and number of key public officials attending RACs' policy-related workshops, FY 2009

Type of attendee	Number
State environmental official	41
State energy office director or staff	31
PUC commissioner or staff	17
State legislator or staff	12
Other key official	6
Regional EPA staff	2
Governor, lieutenant governor, or staff	1
Total	110

The RACs reported holding substantially more policy-related meetings than workshops, but with fewer total attendees. There were 53 RAC-sponsored meeting in FY 2009, with a total of nearly 1,000 attendees. The most common topics covered were utility rates and emissions rules, but a large variety of other subjects were addressed as shown in Table 5.3, below The "other" category includes meetings on: CHP policy and strategy; CHP in critical government facilities; barriers to CHP; renewable energy sources, including biofuels and geothermal; relevant legislation; project funding; and green house gases.

Table 5.3. Number of policy-related RAC meetings and attendees, FY 2009

Meeting topic	Number of meetings	Number of attendees
Utility rates	5	68
Emission rules	4	8
Incentives	2	20
State energy plan	2	9
Interconnection rules	2	8
Wheeling rules	1	60
Tax credits	1	4
Other	36	801
All topics combined	53	978

Table 5.4 shows the number and type of key public officials in attendance at the RACs' policy-related meetings. They included 160 state environmental officials, 38 Public Utility Commissioners or staff, 32 state energy office directors or staff, and 24 state legislators or staff. The highest ranking officials who attended those events were three PUC commissioners, two Chief Energy Advisors to a state Governor, the executive director of a PUC staff, the Deputy Speaker of a state Legislature, a commissioner for a state Department of Human Services, a city's Chief Sustainability Officer, and a County Judge.

Table 5.4. Type and number of key public officials attending RACs' policy-related meetings, FY 2009

Type of attendee	Number
State environmental official	160
PUC commissioner or staff	38
State energy office director or staff	32
State legislator or staff	24
Governor, lieutenant governor, or staff	5
Regional EPA staff	4
U.S. senator, representative, or staff	2
Other key official	108
Total	373

5.2. POLICY-RELATED COMMUNICATIONS

In addition to holding workshops and meetings, RACs address policy-related issues through a number of other channels. These include: communicating via e-mail and conference call; making comments and recommendations; preparing white papers; and delivering testimony. Table 5.5 shows the number of policy-related communications of each type reported by the RACs for FY 2009.

Table 5.5. Type and number of policy-related communications, FY 2009

Type of communication	Number
E-mail	475
Conference call	36
Comments	18
Recommendations	14
White paper	9
Testimony	8
Other	5
Total	565

5.3. POLICY RESULTS

Figure 5.1 shows the number and type of CHP-related rules, standards, and other policy instruments implemented in FY 2009. Interconnection rules, other utility policy, state energy plans, and incentives were all adopted with the same frequency, while fewer states addressed utility rates, loan and grant programs, and renewable portfolio standards. "Other Utility Policies" generally involved net metering. The broad "Other" category covered a wide range of topics such as CHP in critical government buildings, renewable energy credits, financing mechanisms, and permit requirements. Altogether, 30 policy results were achieved in FY 2009. Many of those policies were implemented in states where RACs engaged in policy-related workshops, meetings, and communications on the same topics. This suggests the possibility that the RACs' activities influenced the reported policy outcomes, but this study was not designed to establish and quantify such a relationship.

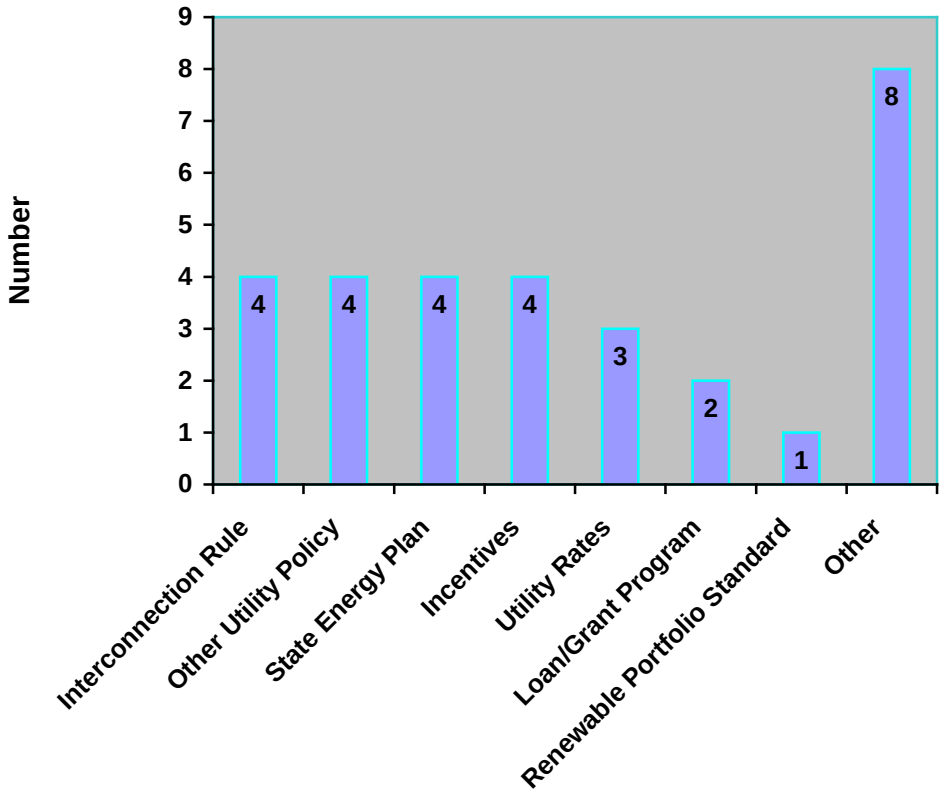

Figure 5.1. Number and type of policy results achieved, FY 2009

6. TECHNICAL ASSISTANCE AND RESULTS

In addition to all of the other activities detailed in previous chapters, the RACs provide project-specific technical assistance to CHP users and prospective users. This assistance can be grouped into two broad categories: technical site evaluations and other technical support contacts (e.g., financial and regulatory advice, design assistance, site visits). The assistance provided in each of these general areas is discussed separately below.

6.1. TECHNICAL SITE EVALUATIONS AND ASSOCIATED PROJECTS

Table 6.1 shows the number of technical site evaluations performed in FY 2009 as well as the number and size of CHP projects recommended, considered, and developed in FY 2009 following evaluations done in that year or a previous year. It is important to note that the project life cycle for CHP installations is often three to five years, meaning that there can be a substantial lag from the time a technical site evaluation is performed until development is completed. In FY 2009, 63 technical site evaluations were performed and 24 CHP projects were recommended with a combined capacity of 162 MW. Twelve projects with 119 MW of capacity were under consideration by potential developers in FY 2009 and 31 projects with 101 MW of capacity were under development in the same year. There were more projects under development in FY 2009 than were recommended in that year because many of the projects being developed were recommended by technical site evaluations performed in previous years.

Table 6.1. Technical site evaluations and associated projects and capacity, FY 2009

Project status	Number	CHP capacity (in MW)
Technical site evaluation performed	63	---
Project recommended following technical site evaluation	24	162
Project under consideration following technical site evaluation	12	119
Project under development following technical site evaluation	31	101

Of the technical site evaluations performed in FY 2009, 29 were Level 1 (screening analysis), 19 were Level 2 (conceptual/financial analysis), 9 were Level 3 (investment-grade engineering analysis), and 6 were of some other type. All of the "other" evaluations were reported by a single RAC and were described primarily as on-site meetings and reviews to discuss CHP options or help refine a project.

6.2. TECHNICAL SUPPORT CONTACTS AND ASSOCIATED PROJECTS

Technical support can be delivered in many different ways and at various stages throughout the project design and development process. The number and type of technical support contacts made by the RACs in FY 2009 is shown in Figure 6.1. This illustrates that the most frequent types of support provided were financial and regulatory advice, design assistance, and "other" help. The latter category includes many different types of support including: providing vendor information; performing studies; evaluating development proposals; making system and equipment recommendations; discussing available technologies; performing literature reviews; and doing power calculations.

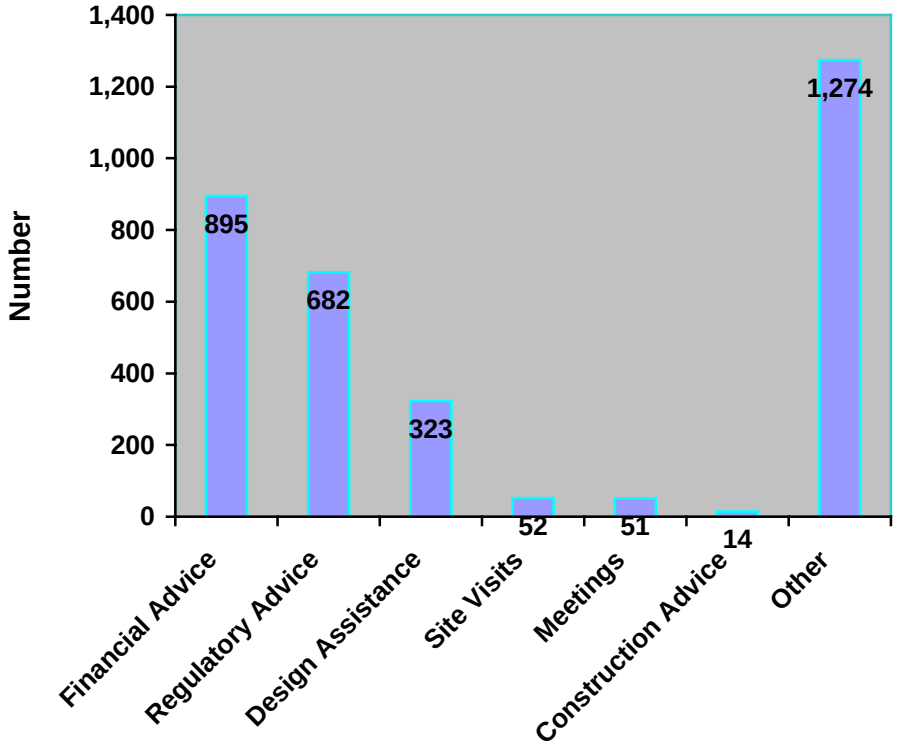

Figure 6.1. Number and type of technical support contacts, FY 2009

Table 6.2 shows the number and capacity of CHP projects being considered and under development following technical support provided in FY 2009 or a previous year. A total of 10 CHP projects with 172 MW of capacity were under consideration in FY 2009. Nearly all of that was in the industrial, institutional, government, and agricultural sectors. Another 18 projects with 284 MW of capacity were under development in the same year, primarily in the Industrial, Institutional, Commercial, and Agricultural sectors.

Table 6.2. Projects and capacity associated with technical support contacts, FY 2009

Project status	Number	CHP capacity (in MW)
Project under consideration following technical support	10	172
Project under development following technical support	18	284

Summing the numbers for technical site evaluations and other technical support shows that there were 22 projects with 291 MW of capacity under consideration and 49 projects with 385 MW of capacity under development in FY 2009 in association with the RACs' technical assistance efforts.

7. CHP INSTALLATIONS AND ASSOCIATED OUTCOMES

Information on CHP installations and the associated outcomes was taken from a national database maintained by ICF International for the U.S. Department of Energy (ICF International 2010). That database provides an inventory of CHP installations of all sizes in every state, containing basic facility information such as location, operational capacity, system type (e.g., steam turbine, combined cycle, fuel cell), application (e.g., industrial, agricultural, commercial buildings), and fuel. It is likely that some additional 2009 capacity will be added to the database in the coming months, but any such additions are likely to be relatively small. Accordingly, the information presented below can be considered an accurate and largely complete depiction of CHP installations for 2009.

The CHP installation database tracks activity by calendar year (January through December) so that is the convention that is used in this chapter as well. In contrast, the RAC activities discussed in the preceding chapters were reported for the federal government's fiscal year (October through September) because the funds that support those activities are provided on a fiscal year basis.

The following sections provide information on the number and capacity of CHP facilities installed in the U.S. in 2009, the amount of investment made in those facilities, the resulting energy savings, the amount of carbon emissions reductions associated with those savings, and the number of jobs created. While it is probable that the RACs were responsible for influencing or expediting some of the CHP installations described here, this study was not designed to establish and quantify a causal relationship between RAC activities and CHP installations.

7.1. CAPACITY INSTALLED

As shown in Table 7.1, 92 CHP facilities were installed in the U.S. in 2009. The total capacity associated with those units was nearly 530 MW.

Table 7.1 Description of CHP installations in U.S., Calendar Year 2009

Number of installations	CHP capacity installed (in MW)	Investment in CHP installations (in million $)	Annual energy savings (in million source BTUs)	Carbon reduction (in metric tons)	Number of jobs created
92	529.7	794.56	24,442,785	3,108,340	3,178

7.2. INVESTMENT IN CHP INSTALLATIONS

Altogether, nearly $800 million dollars was invested in the 92 CHP installations described above. That figure was taken from ICF International's CHP database, which calculated it from installed capacity using an assumed cost of $1,500 per kW, the average capital cost for mid-sized CHP systems (ICF International 2008). The investment reported here is only for CHP projects that have been completed and are operational. At any given time, there are likely to be a number of projects under development, and the capital investment associated with those undertakings can be substantial. However, the investment made in those pre-operational projects is not reported in Table 7.1.

7.3. ENERGY SAVINGS

By utilizing the thermal energy that is normally wasted when electricity is produced at central generating stations, Combined Heat and Power installations can save substantial amounts of energy compared to more traditional technologies. In addition, the location of CHP facilities at or near the point of consumption greatly reduces or eliminates electric transmission and distribution losses (Shipley et al 2008). Table 7.1 shows that, in total, it is estimated that over 24 trillion source BTUs were saved by the CHP facilities installed in the U.S. in 2009. That savings number, taken from the current CHP installation database, was calculated based on typical hours of operation, power-to-heat ratio, and heat rate for each relevant system type and application (ICF International 2008). It is important to note that the number given here represents *annual* savings, which are expected to occur each year that the CHP facilities are in operation.

7.4. CARBON EMISSIONS REDUCTIONS

The energy savings described in the previous section result in a reduction in carbon emissions. The magnitude of that reduction was calculated in the CHP installation database for the displaced fuels in each state, using average CO2 emissions rates (ICF International 2008). As shown in Table 7.1, it is estimated that annual carbon emissions were reduced by more than 3.1 million metric tons as a result of the CHP facilities installed in 2009.

7.5. NUMBER OF JOBS CREATED

A recent ORNL report (Shipley 2008) noted that every $1 million of capital investment in CHP facilities results in the creation of four jobs. Based on that multiplier, the $794.56 million dollars invested in CHP in 2009 can be expected to create approximately 3,178 jobs.

8. SUMMARY AND RECOMMENDATIONS

8.1. SUMMARY OF FINDINGS

The information presented in the preceding chapters addressed the following key elements of the Regional Application Centers' undertakings and accomplishments in FY 2009: education and outreach activities; outreach materials produced; policy-related activities and results; and technical assistance and results. In addition, we described CHP installations and associated outcomes for the 2009 calendar year, although this study was not designed to establish and quantify a causal relationship between RAC activities and CHP installations. Brief highlights from each of the broad areas covered in this report are presented below.

A huge variety of education and outreach activities were performed by the RACs to inform potential end-users, policy-makers, and other stakeholders about the benefits and applications of CHP technologies. These include: targeted workshops and webinars; conferences; partnership meetings; training sessions; college courses; media interviews; e-mail blasts; website activity; and involvement in State Energy Office activities. Among other things, the RACs hosted 45 workshops and webinars in FY 2009 with over 1,500 targeted attendees and more than 3,400 attendees in total. The RACs also helped plan 13 conferences involving over 2,100 participants, led five conferences, and made nearly 30 conference presentations for almost 2,000 attendees. Targeted sectors included: college campuses; industrial and manufacturing facilities; agriculture; government buildings; hospitals and health care facilities; and forest products. In addition, RAC websites received nearly 2.4 million hits and had over 220,000 documents downloaded from them in FY 2009. The most frequently downloaded materials were conference presentations, application guidebooks, market analyses, project profiles, and technical papers.

In FY 2009, the RACs also produced substantial amounts of outreach materials in pursuit of their mission to facilitate the development and deployment of CHP technologies. Those outreach materials included nearly 20 CHP project profiles, 10 market analyses, 9 technical papers, 8 fact sheets, and a variety of other products.

In addition to the targeted workshops and webinars mentioned above, the RACs held 65 policy-related workshops and meetings in FY 2009 with nearly 2,500 attendees, including almost 500 key public officials. The RACs also engaged in a wide variety of policy-related communications such as e-mails, conference calls, and the issuing of comments and recommendations. During this same period, a number of CHP-related rules, standards, and other policy instruments were implemented by various states. Many of those policies were implemented in states where RACs engaged in policy-related workshops, meetings, and communications on the same topics. This suggests the possibility that the RACs' activities influenced the reported policy outcomes, but this study was not designed to establish and quantify such a relationship. The most common CHP-related policies implemented in FY 2009 were interconnection rules, other utility policies, state energy plans, and incentive programs.

In FY 2009, the RACs reported performing 63 technical site evaluations and making nearly 3,300 other technical support contacts of various types. Altogether, there were 22 projects with 291 MW of capacity under consideration and 49 projects with 385 MW of capacity under development in FY 2009 in association with the RACs' technical assistance efforts.

Data have been compiled on CHP installations and associated outcomes in all states during the 2009 calendar year. During that period, 92 installations were made with almost 530 MW of total capacity. Nearly $ of investment was made in those CHP units. Altogether, those installations resulted in estimated annual energy savings of more than 24 trillion source BTUs and carbon emissions reductions of over 3.1

million metric tons. The above-noted capital investment created an estimated 3,178 jobs. While it is likely that RAC activities have influenced those outcomes, this study was not designed to establish and quantify a causal relationship between RAC activities and CHP installations.

8.2. RECOMMENDATIONS

Because this study, like the previous one, was designed to catalogue RAC activities and not to establish how they influenced CHP installations, our ability to make recommendations about future program operations is limited. As in the last report, we do suggest that each RAC consider the feedback it has received from its region's stakeholders concerning the services provided and make near-term decisions based on that input. The establishment of a nationally-coordinated mechanism to solicit input from stakeholder groups regarding desired services could facilitate the collection of important information on the needs of the Centers' constituents.

To improve our ability to document and understand RAC accomplishments, we recommend that the collection of data be enhanced by (1) identifying new metrics related to the expanded focus of the revamped Clean Energy Application Centers; and (2) creating a mechanism for collecting the needed information online. Because the Centers have recently broadened their focus to include district energy and waste heat recovery in addition to CHP, it will be important to consider the addition of new metrics to capture any important new activities and emphases. Also, collecting information online could be less burdensome for the RACs and could be set up to allow each RAC to see what the other RACs have accomplished during the same time period.

To help inform subsequent decisions about Center operations, we recommend that future studies be designed to explore possible relationships between RAC activities and key outcomes, most notably those between: (1) the RACs' policy-related activities and state policies enacted; (2) state policies enacted and the implementation of CHP, district energy, and waste heat recovery projects; and (3) the RACs' targeted education/outreach activities and the adoption of the above-mentioned technologies.

9. REFERENCES

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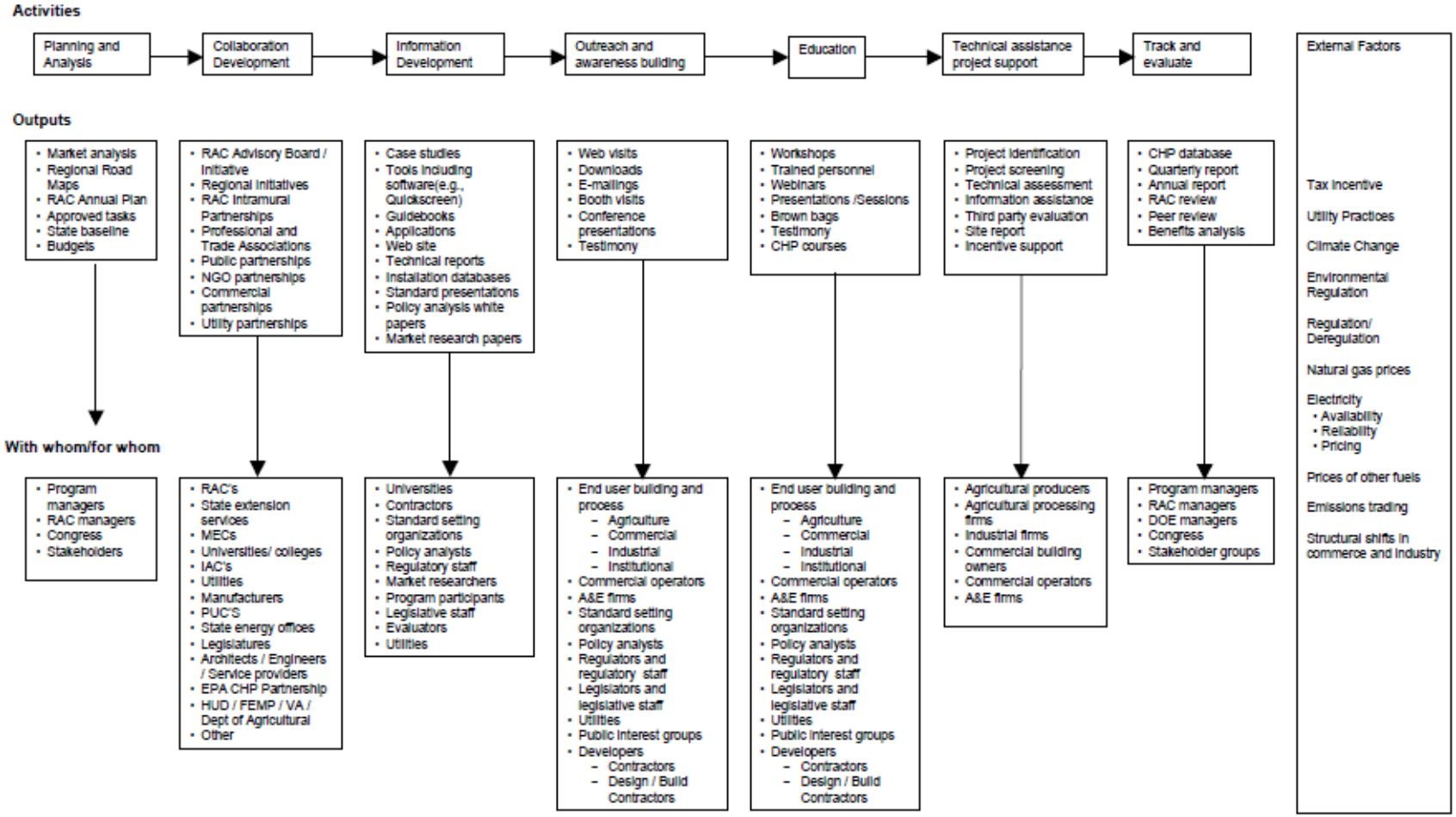
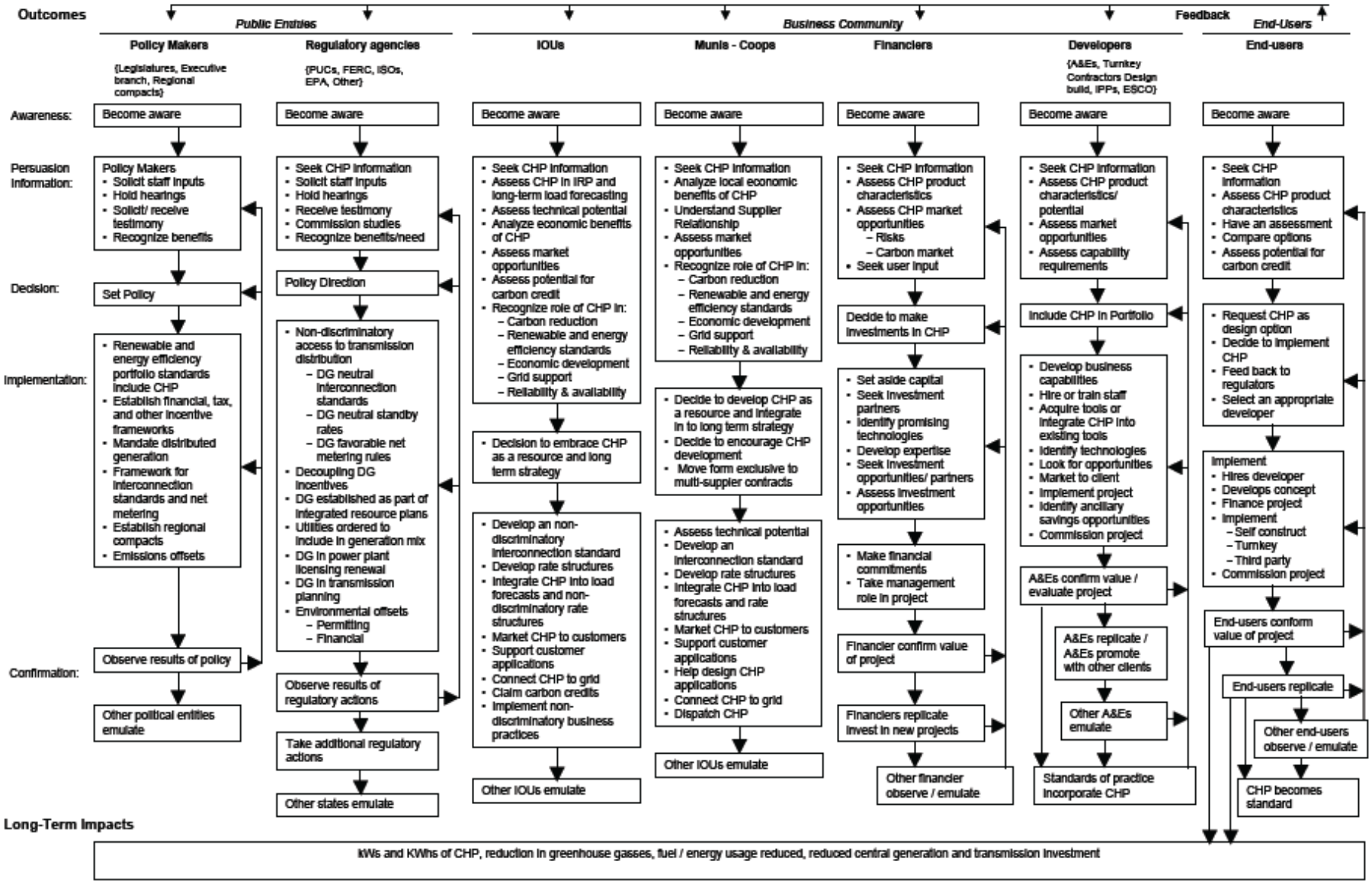
APPENDIX A. RAC LOGIC MODEL





Logic Model developed by John Reed, with input from Michaela Martin, Ted Bronson, John Cuttica, Joe Orlando, Bruce Hedman, Patti Garland, Bob Gemmer, and Merrill Smith. Final Version: October 30, 2007.