CALIFORNIA
ENERGY
COMMISSION

Annual Report

California Biomass Collaborative

CONSULTANT REPORT

JUNE 2004
Contract 500-01-016

Arnold Schwarzenegger, *Governor*

CALIFORNIA ENERGY COMMISSION

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Contract No. 500-01-016

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LEGAL NOTICE

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Acknowledgements

The California Biomass Collaborative gratefully acknowledges the financial support and assistance of the California Energy Commission and the PIER Renewables Program. In addition, we appreciate the assistance provided from the California Integrated Waste Management Board, the California Environmental Protection Agency, the California Department of Forestry and Fire Prevention, the California Department of Food and Agriculture, the California Air Resources Board, and the many other organizations and industry participants who have contributed to the mission of the Collaborative.

EXECUTIVE SUMMARY

The California Biomass Collaborative was established on February 5, 2003 by contract between the California Energy Commission and the University of California, Davis. The Collaborative was created to provide stakeholders and interested parties a forum in which to join together in the consideration of major issues and to provide statewide coordination of biomass research, policy, and communication activities. The Collaborative includes representatives from the California biomass industry, state and local government agencies, the environmental community, the University of California, federal agencies and national laboratories, and other related academic and public organizations.

The Collaborative has over the first year of operations developed a membership of over 300 from all major biomass-related sectors in the state. A sixteen member Executive Board provides direction, guidance, and oversight. The Collaborative reviewed and updated state biomass inventory data and compiled these data into spreadsheet and geographic information system (GIS) database formats aggregated by biomass resource type at the county level. From the resource assessments, estimates were made of current gross and technical electrical generation potential from biomass. Projections to 2017 have also been made for the purposes of evaluating potential contributions biomass can make to the state's Renewable Portfolio Standard or RPS. Results from the assessment are contained in the Collabortive's California Biomass Resources Assessment Report. The GIS resource database is imbedded in the web-based Biomass Facilities Reporting system also developed by the Collaborative. This reporting system includes performance information on biomass facilities throughout the state and provides a perspective on the current and planned status of the industry.

The Collaborative hosted an open Forum in January 2004 at which preliminary findings of the Collaborative's research were presented for review and comment and which policy and other issues of interest to the membership were addressed. The forum was well attended and included a variety of speakers including Commissioner James Boyd of the Energy Commission, Secretary of the California Environmental Protection Agency Terry Tamminen, and Secretary of the Department of Food and Agriculture A.G. Kawamura.

The forum provided an opportunity to hear about the current activities of the Collaborative and to provide recommendations for future directions and actions. Close to 200 attended the forum including representatives from industry, government, academia, environmental organizations, and other sectors. Forum recommendations are discussed in more detail later in the report. Surveys on policy and research conducted at the Forum give a good overview of principal concerns and interests among the membership.

Executive Board meetings and deliberations resulted in the formation of subcommittees on policy, research, and education and outreach. Committee reports have been developed on policy issues and research needs. The board has recommended that the Collaborative undertake educational workshops and other meetings to inform the public, concerned agencies, and the legislature on problems, perspectives, and potentials of biomass management and development.

The Collaborative is continuing with investigations of economical resource utilization, power generation potentials, and fuels and product manufacturing leading to sustainable biomass development. Results and information are disseminated through a quarterly newsletter, the Collaborative's web site, and mailings, including email, to the membership. Future activities and directions of the Collaborative are outlined in the Report on the Future of the California Biomass Collabortive: Recommendations for Continuing Activity and Support.

Annual Report for the
California Biomass Collaborative
California Energy Commission Interagency Agreement 500-01-016
Reporting Period: February 2003 to March 2004

Contractor Project Manager: Bryan Jenkins, University of California
Commission Project Manager: Valentino Tiangco

INTRODUCTION

Purpose of the Collaborative

The California Biomass Collaborative was established on February 5, 2003 by contract between the California Energy Commission and the University of California at Davis. The Collaborative was created to provide stakeholders and interested parties a forum in which to join together in the consideration of major issues and to provide statewide coordination of biomass research, policy, and communication activities. The Collaborative includes representatives from the California biomass industry, state and local government agencies, the environmental community, the University of California, federal agencies and laboratories, and other related academic and public organizations.

Highlights of the first year of the Collaborative:

- The California Biomass Collaborative was established on 5 February 2003.
- The website for the California Biomass Collaborative was operating in late April, 2003.
- The Executive Board of the California Biomass Collaborative was formally constituted as of July, 2003.
- Executive Board meetings were conducted on 4 August 2003 and 9 January 2004.
- The California Biomass Collaboration conducted its First Annual Forum on 8 January 2004 with close to 200 in attendance.
- Policy and Research Committees of the Executive Board were active in developing future plans for the Collaborative and addressing critical needs of the industry and State.
- The Collaborative completed an assessment of biomass resources in the state.
- Surveys of California and European biomass power facilities are underway through Collaborative subcontracts.
- The Collaborative has 350 members and continues to attract membership.

Vision: *Biomass resources are sustainably developed, managed, and used for the effective production of renewable energy, materials, and products.*

Mission Statement

The mission of the California Biomass Collaborative is to enhance the sustainable and effective use of biomass in the state of California.

To fulfill this mission, the Collaborative administers a comprehensive statewide program in scientific research and innovation; technology development, demonstration and deployment; economic analysis; policy formulation; and education, training, and outreach. The Collaborative supports and integrates efforts of the State in advancing the state-of-knowledge and state-of-the-art in efficient, safe, reliable, affordable, and environmentally sound bioenergy, bioproducts, and other biomass systems. The Collaborative relies on close cooperation of representatives of the State of California, its universities and academic institutions, the state's biomass and energy industries, environmental organizations, agencies and laboratories of the federal government, and other organizations and institutions.

Scope of First Year Effort

The initial undertaking was the establishment of the organizational structure of the Collaborative and recruitment of members. Upon formation of the Executive Board, staff engaged in a series of information gathering efforts. In its first year, the Collaborative reviewed and updated biomass inventory data within the state. It has compiled these data into a spreadsheet format which aggregates biomass resource by type at the county level. The assessment also estimates gross and technical electrical generation potential from the resource and makes projections for biomass quantities in the future. Results from the assessment are contained in the draft California Biomass Resources Assessment Report. The Collaborative has developed a GIS (geographic information system) database that links to the resource database and the current and planned biomass facilities database. A survey of existing biomass facilities has recently been completed which is intended to improve our understanding of the current state of the industry. The Collaborative has reviewed power facilities in California utilizing biomass materials and is conducting a review of biomass utilization in Europe. Results from these studies will be published as part of the Collaborative's power generation assessment.

The Collaborative hosted an open Forum in January 2004 at which the preliminary findings were presented for review and comment. The forum was well attended and included a variety of speakers including Commissioner James Boyd of the Energy Commission, Secretary of the California Environmental Protection Agency Terry Tamminen, and Secretary of the Department of Food and Agriculture A.G. Kawamura.

The forum provided an opportunity to hear about the current activities of the Collaborative and to provide recommendations for future directions and actions. Close to 200 attended the forum including representatives from industry, government, academia, environmental organizations, and other sectors. Forum recommendations are discussed in more detail later in the report.

COLLABORATIVE ORGANIZATION

The California Biomass Collaborative Administrative Structure

- Collaborative Membership (over 300 members)
- Executive Board (16 members)
  - University of California
  - California Energy Commission
  - Biomass Industry
  - Environmental Community
  - USDOE and National Laboratories
- Technical Staff (8 full and part-time staff)
  - UC Executive Director
  - Assistant Director
  - Development Engineers and Researchers
  - Faculty, students, visiting researchers

Membership

- California Biomass Industry
- California Energy Commission and Other State Agencies
- University of California
- California Energy Suppliers
- Environmental Groups
- US Federal Agencies and Programs
- Industry Research and Other Groups/Consultants
- Commodity Commissions and Boards
- University of California Cooperative Extension
- Other Universities and Programs
- National Laboratories
- Technology Providers
- International Programs
- Professional Societies and Standards Program

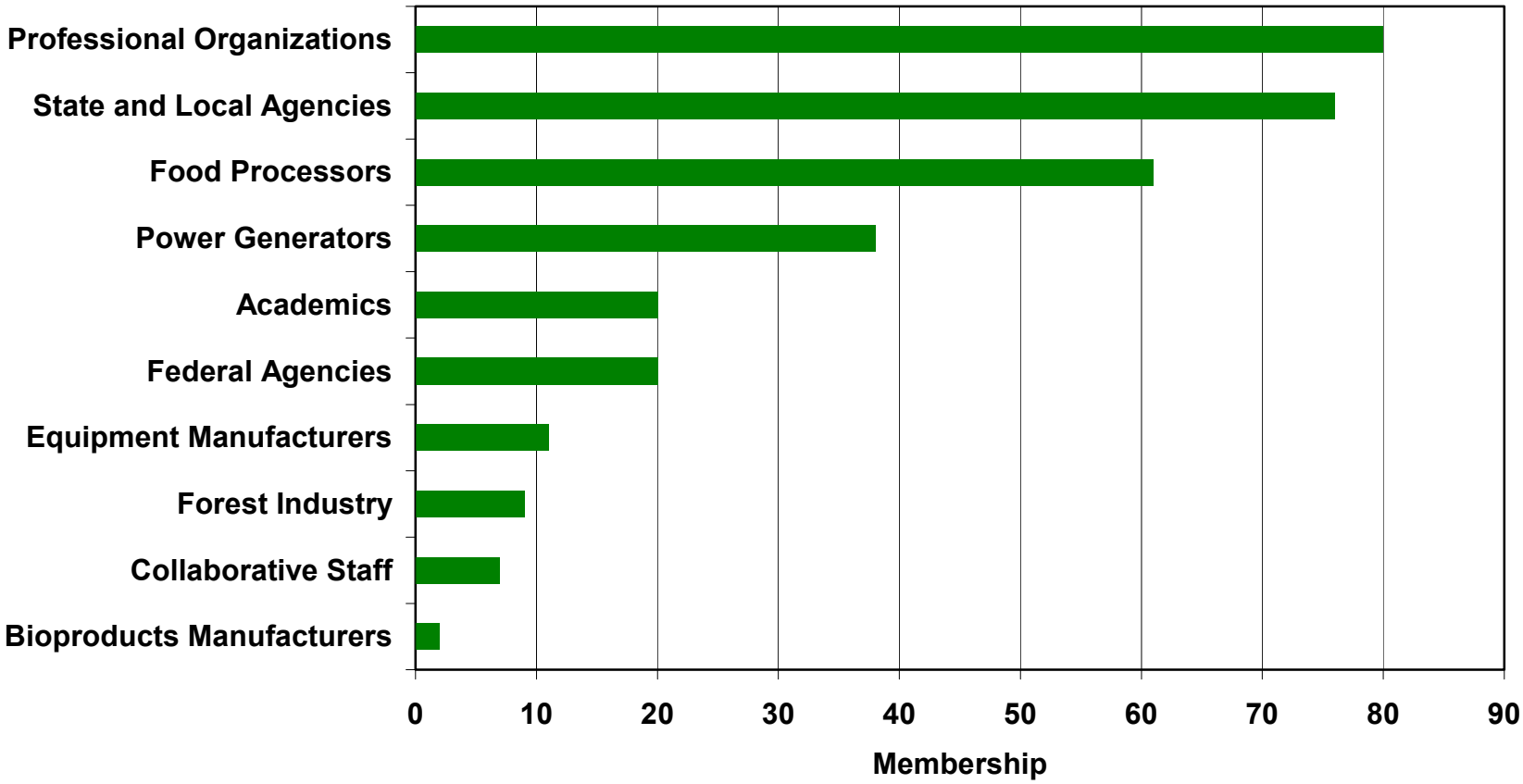

Figure 1 CBC Membership by category.

Executive Board

The Executive Board provides direction, identifies objectives, and sets priorities for the Collaborative's efforts. There are currently 16 members of the Executive Board, and recruitment of additional members is underway.

The Board has met twice, first in August 2003 and again in January 2004. In addition, three committees of the Board have been created, the Policy Committee, the Research Committee, and the Education and Outreach Committee. The sixteen members of the Executive Board during the first year were:

Linda Blevins	Sandia National Laboratories	Livermore, CA
Shannon Eddy	Sierra Club	Sacramento, CA
John Ferrell	US DOE	Washington, DC
Loyd Forrest	TSS Consultants, Inc.	Rancho Cordova, CA
Tony Goncalves	California Energy Commission	Sacramento, CA
Bryan Jenkins	University of California	Davis, CA
Mike Marsh	Western United Resource Development, Inc.	Modesto, CA
Kay Martin	Environmental & Energy Resources Dept. Ventura County	Ventura, CA
Gregory Morris	Future Resources Associates	Berkeley, CA
Ralph Overend	National Renewable Energy Laboratory	Golden, CO
Phil Reese	CBEA/Colmac Energy	Somis, CA
John R. Shelly	University of California Cooperative Extension Advisor -- Woody Biomass	Richmond, CA
Patrick Sullivan	SCS Engineers	Sacramento, CA
Necy Sumait	Arkenol	Mission Viejo, CA
Toni Symonds	Ag Works California	Sacramento, CA
Valentino Tiangco	California Energy Commission	Sacramento, CA

Collaborative Staff

The Collaborative staff operates out of the main office in Bainer Hall on the UC Davis campus.

Bryan Jenkins – Executive Director
Gary Matteson – Assistant Director
Rizaldo Aldas – Graduate Student Researcher
Hugo von Bernath – Post-graduate Researcher
Martha Gildart – Post-graduate Researcher
Rob Williams – Development Engineer
Limei Yan – Postgraduate Researcher/Programmer
Peilin Yang – Graduate Student Researcher

Collaborative Offices

UC Davis – Department of Biological and Agricultural Engineering, 3058 Bainer Hall
Sacramento – Governor's Office of Planning and Research, Feb 2003 – Oct 2003
Sacramento - Senate Office of Research, Oct 2003--

Collaborative Meetings

Executive Board Meetings

4 August 2003.
CEC and UCD staff presented a brief overview of the Collaborative's mission and structure, its work plans, projects and progress. Member presentations and discussions covered the different technologies and the hurdles or obstacles facing them; the industry needs in research on risk mitigation, testing protocols and standards; costs and benefits of the technologies; and potential financial incentives. The Board recommended establishing workgroups and committees on policy, facilities reporting and performance, resources, research, and education and outreach. Committees were directed to work on integrating regulations and permits, exploring incentives and market development measures, establishing biomass databases on facilities and resources with high-quality technical, economic, environmental data, informing the government, public, and industry about biomass, and determining research needs for biomass development.

9 January 2003.
The Board discussed the effectiveness of the January Forum including attendance, membership and survey results, labor issues relating to biomass facility operations, emissions offsets, and conflicting state agency requirements. The Board also discussed possible financing mechanisms for the Collaborative and heard reports from the research and policy committees. A discussion was held of possible Collaborative activities including identifying sites and opportunities for biomass facilities, working with the legislature and regulators to improve state regulations and policies, and reducing costs of operation and fuel transport. The Board approved the recommendation by staff to develop and distribute a Collaborative newsletter.

Committees

The Executive Board appointed members to form policy, research, and education and outreach committees. Two other committees recommended during the first board meeting were not formally established and responsibilities were incorporated into the general policy committee. The policy committee explores institutional and policy changes necessary to ensure the development and viability of biomass industries in California. The research committee investigates research needs and opportunities. The education and outreach committee is intended to foster communication between members, industry, and the public. Meetings of the policy and research committees are outlined below. The education and outreach committee is still in the planning stages.

Policy Committee :

Meeting on 24 November 2003.
Committee members discussed the proposed Forum agenda and the structure for policy and research surveys to be conducted at the forum. Members provided recommendations for topics and speakers to invite to the forum. Further discussion was held on the objectives for a biomass policy including elements of the policy, federal actions, proposed regulatory areas, regulatory reform, projects/policy

elements, integrating agency groups, facilitating cross agency permitting, and incentives for industry. The policy committee submitted recommendations in a report in January 2004.

Meeting on 11 February 2004.
The committee discussed the need for legislative committee hearings or workshops to educate legislators on biomass issues, recently adopted and draft legislation dealing with emission offsets and methane emissions reduction, financial support mechanisms such as fees on dairy products or increasing the integrated waste management fee to offset the cost of collecting and processing fuel, ownership and tradability of renewable energy credits, adopting and implementing greenhouse gas policies, understanding restrictions in net metering and interconnection, providing expert testimony at hearings dealing with the healthy forests initiative. The committee decided to develop informational hearings or workshops on issues of importance. A workshop on forest biomass is in the planning stage.

Research Committee:

The Research Committee has conducted several phone conferences and met in person on 24 November 2003. The committee developed the research survey for the January Forum. It also prepared and submitted the Research Committee Report in January. Key issues in the report are:

- Research projects should be categorized as either short (to 2007), medium (to 2017), or long-term (2017 and beyond)
- Priority feedstocks in California requiring attention are municipal solid wastes, forest thinnings, and regional agricultural residues.
- The short term effort is aimed at electricity generation. Value-added co-products such as fuels are desirable but are medium-to-long-term objectives.
- One of the guiding principles is to take advantage of mutually beneficial technologies being developed in other segments of the power generation industry and in other countries. The Collaborative may be able to learn from federal developments in gasification of other feedstocks such as coal or black liquor. One idea was to form a Technology Assessment Group that monitors the technologies being developed for other segments of the power generation industry.

Education and Outreach :

This committee is still developmental and has not yet met.

Conferences, Poster Sessions, and Other Meetings

Collaborative staff have attended or participated in several important meetings and conferences involving biomass issues, and have communicated information about the Collaborative.

1. BioCycle West Coast Conference (LA, 24-26 March 2003) – composting and organics recycling
2. Air Resources Board/Agricultural Air Quality Workgroup Meeting (Modesto, 8 April 2003)—biomass utilization and air quality
3. USDOE Ethanol Workshop (Sacramento, 15 April 2003)—ethanol from biomass
4. UC Davis College of Agriculture and Environmental Sciences Field Day (Davis, 2 May 2003)—biomass, agriculture, and the environment
5. USDA-CSREES research committee meeting on science and engineering for a bio-based industry and economy, 7-10 May 2003 Washington D.C.
6. DOE Hydrogen Program Workshop (Berkeley, 19-22 May, 2003)

7. San Bernardino Forest/UC Woody Biomass Working Group Meeting (San Bernardino, 5 June 2003 and 11 December 2003) – use of trees affected by bark beetle infestation
8. Executive Board meeting (Davis, 4 August 2003)
9. California Rice Field Day (Biggs, 28 August 2003)
10. California Institute of Food and Agricultural Research (CIFAR) executive board meeting (Davis, 14 November 2003)
11. EPRI Biomass Interest Group – (Chino, 13-14 November 2003)
12. Bioenergy and Wood Products Conference (Denver, 20-22 January 2004)
13. California Biomass Collaborative Annual Forum (Sacramento, 8 January 2004)
14. Executive Board meeting, (Davis, 9 January 2004)
15. BioCycle West Coast Conference (Portland, 28-30 March 2004) – composting and organics recycling
16. American Chemical Society National Meeting and Exposition (Anaheim, March 28 - April 1, 2004)
17. 2nd World Conference and Technology Exhibition on Biomass for Energy (Rome, May 2004)

Reporting Efforts

Terms of the CEC contract include several reporting milestones which are described below.

Monthly

Monthly reports detailing Collaborative accomplishments have been submitted to the Commission starting in February 2003 and for each month up through March 2004. The reports describe progress on contract tasks, database and report preparation, significant problems incurred or changes to tasks, and expectations of work to be completed in the next month.

Semi-annual

Semi-annual reports were submitted to the Commission in September 2003 and February 2004. The reports describe the Collaborative's goals, membership, meetings and minutes, and the task accomplishments for the prior six months.

Executive Board meetings & minutes

The Executive Board met twice during the first year of the Collaborative. Minutes of both meetings have been submitted to the Commission.

Future Direction

A draft of the "Report on the Future of the California Biomass Collaborative Recommendations for Continuing Activity and Support" was submitted to the Commission in February 2004. The report describes the formation and organization of the Collaborative, its mission and goals, lays

out the Collaborative membership's proposed next steps in policy development, research, and potential funding mechanisms, and makes recommendations on research and demonstration priorities, policy development, training and education, and standards development.

Other Deliverables and Reports

Other deliverables and supplemental reports were prepared and submitted to the Commission. These include the *Biomass Facilities Reporting System, Biomass Resources Assessment, Draft Economic Models, Power Generation Consultant Reports, Policy Committee Progress Report,* and the *Report of the Research Committee.* The first three reports are discussed in more detail below under the technical tasks, while the last two are attached as appendices. Full copies of reports are available separately.

TECHNICAL TASKS

Biomass Facilities Reporting System (BFRS)

The BFRS database contains information on biomass power plants including thermal-station power-plants, digesters, and landfill-gas systems. The system includes expansion categories for fermentation plants, bio-refineries, other biomass-energy converters, material handling and processing operations, and storage units.

The BFRS is being implemented as a web-based database that can provide selectable GIS map configurations and data tables, and has been installed on the collaborative web server (http://cbc1.engr.ucdavis.edu). The program is simple and user-friendly; the simplified program structure is shown in Figure 2. The database is divided into three major categories (facilities, resources, and technical and environmental performance) that a user can access from the main page. The user can then explore the subcategories with opportunity to look at corresponding GIS maps and data tables.

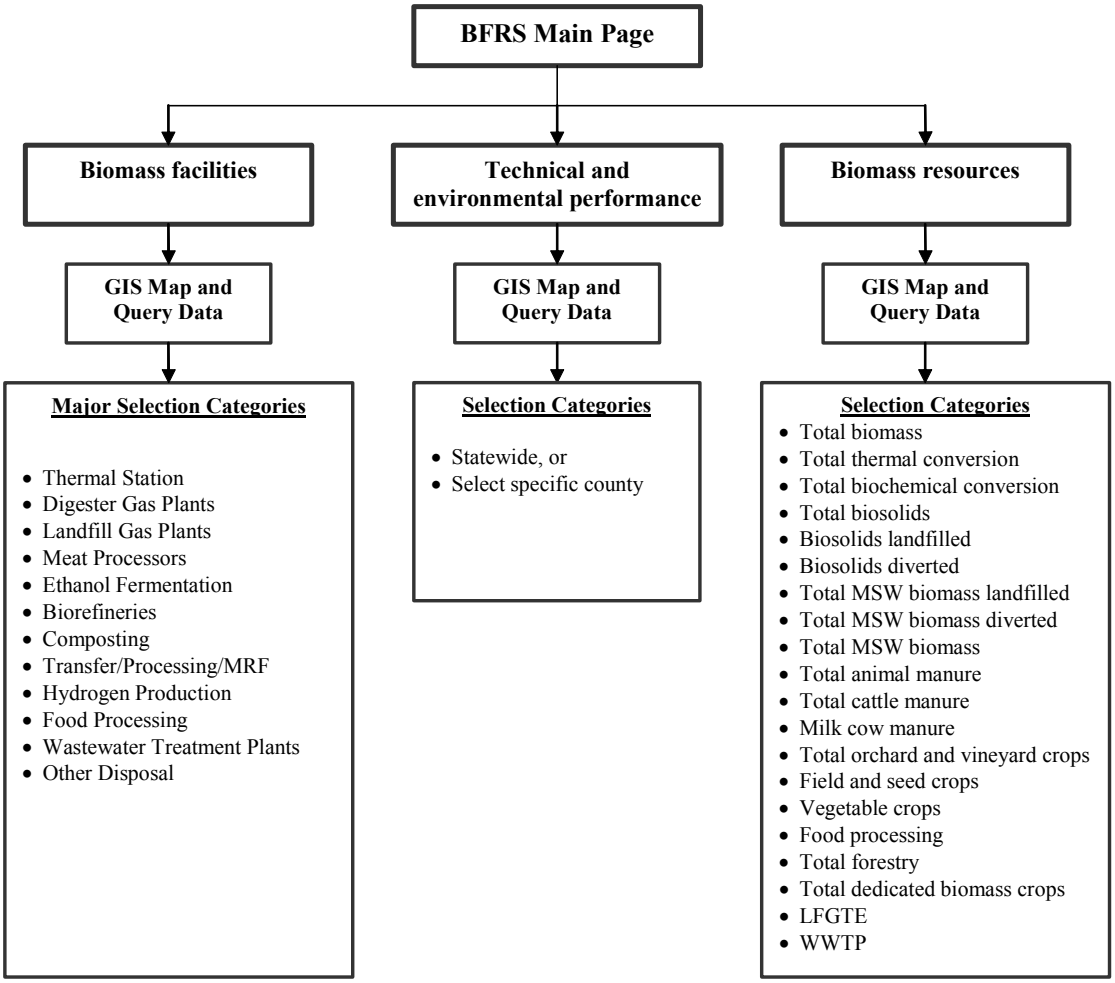

Figure 2. Simplified structure of the BFRS web-based program.

The database includes estimates of gross and technical biomass resources, estimates of electricity generation capacity and energy produced from biomass for year 2003, and projections for 2005, 2007, 2010 and 2017. Data were submitted to the California Department of Forestry and Fire Prevention (CDFFP) as input data for its GIS model used as part of a strategic value assessment of renewable energy in California being conducted by the CEC.

A sample output GIS map is shown in Figure 3. The map was generated by selecting the 'Gross resource' and year 2003 for Sacramento county in the "Technical and environmental performance" category. Corresponding tabular data including facility attributes are available on the site. Currently, the database is set up to provide the gross and technical resources, estimates of electricity capacity and energy from biomass for year 2003, 2005, 2010, and 2017.

Although the site is already in its usable form, it will continue to be maintained, updated, and improved by the Collaborative staff. The database was developed from a number of sources (including those listed

in Figure 4) and is expected to collect and append new information along with voluntarily self-reported data from facilities operators and owners.

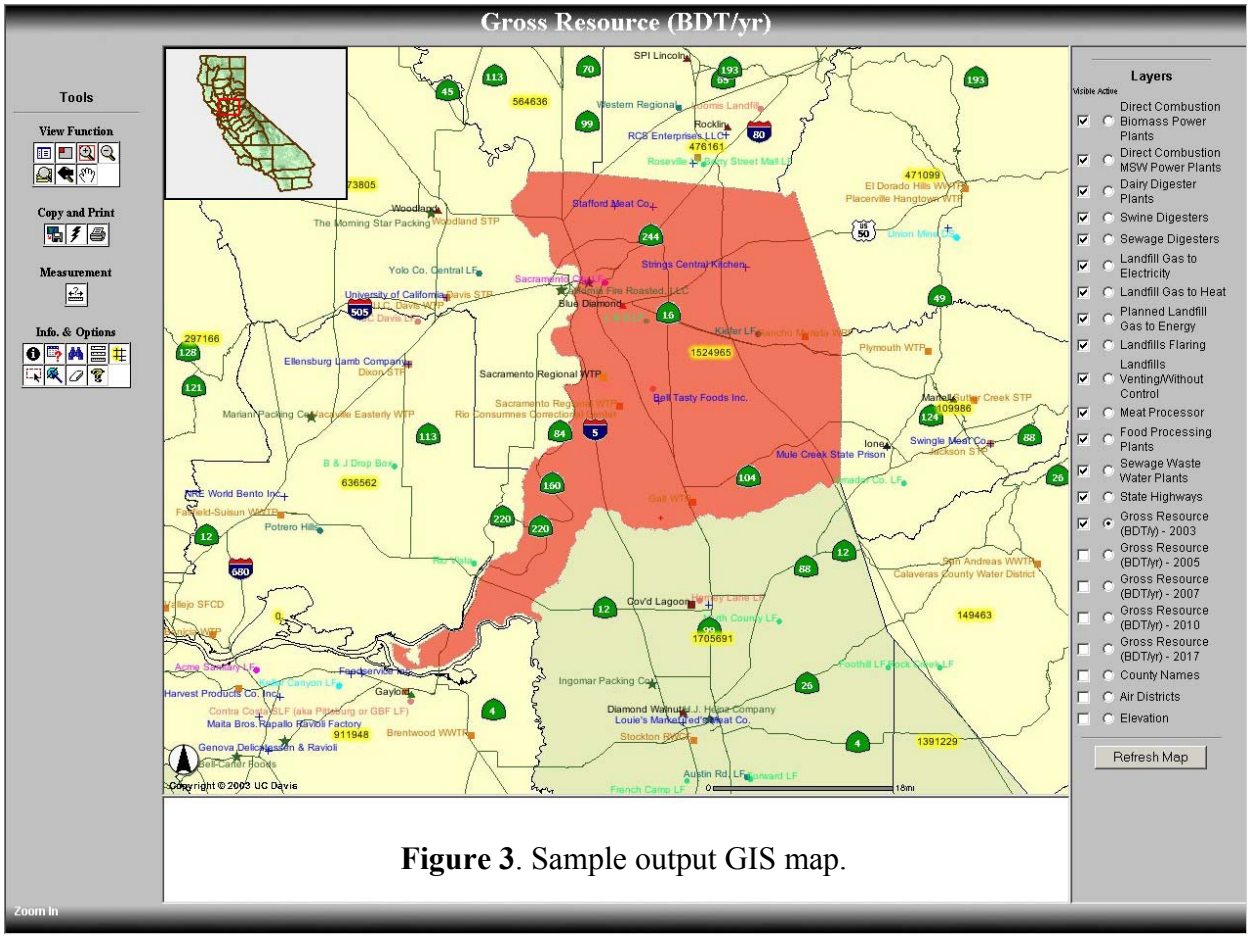

Figure 3. Sample output GIS map.

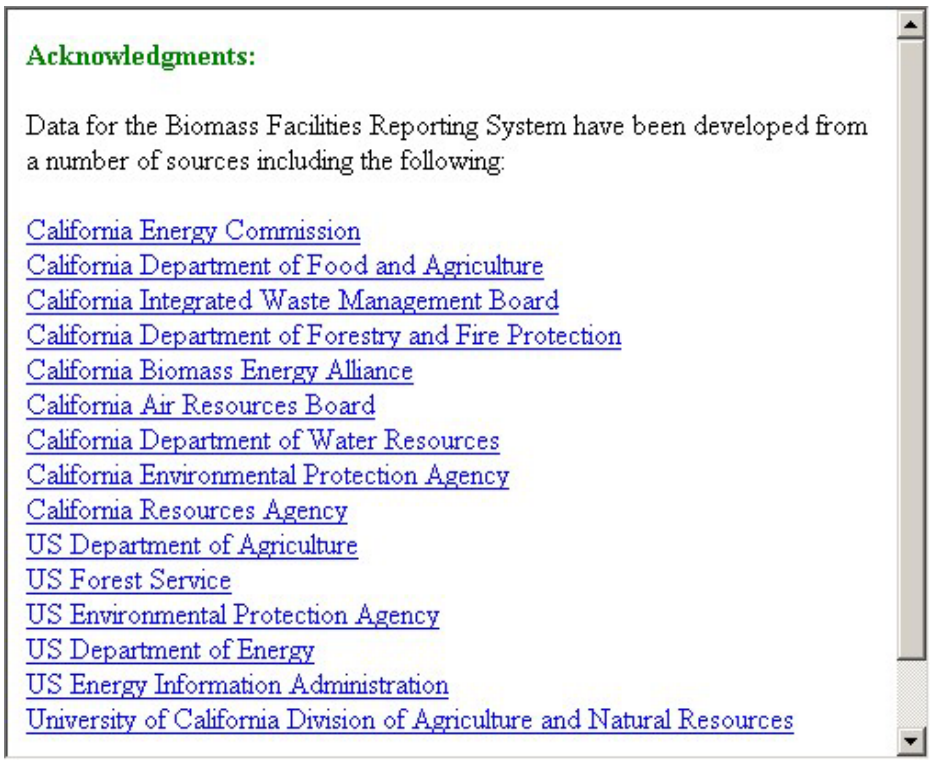

Figure 4. BFRS acknowledgement window.

Biomass Resource Assessment

The Biomass Resource Assessment contains estimates of the gross and technically available quantities of biomass resources in the state. The Collaborative assessed the potential of a variety of biomass resources for the production of energy, fuel, or other products. Principal categories of biomass included in the assessment are:

Agricultural residue biomass:	Orchard and vineyard crops
	Field and seed crops
	Vegetable crops
	Food processing residues
	Animal manures
Forest residues and thinnings:	Forest thinnings and slash
	Chaparral
	Mill residues
Municipal wastes:	Biomass fraction of municipal solid waste (MSW)
	Paper and cardboard
	Food wastes
	Green wastes including leaves, grass, prunings, stumps
	Other organics
	Biosolids from waste water treatment operations
	Landfill gas
	Sewage digester gas

Dedicated biomass crops

A detailed county-level database was compiled with estimates of the gross quantities of biomass available by county as well as the quantities that might be technically available due to various constraints of access, handling and costs. Using assumptions regarding current and future conversion paths, possible contributions from biomass toward meeting the renewable electricity goals under the state's renewable energy portfolio (RPS) were also developed. Gross and technical electrical generation potentials are calculated from the resource estimates and other assumptions on conversion technology (thermochemical or biochemical), efficiency, heating value and moisture contents. Summary data on resources and generation are presented in Table 1 and a map of statewide resources in bone dry tons per year (BDT/y) by county in Figure 5.

Biomass within these categories totals 71 million gross BDT/y at present and is projected to increase to 86 million BDT/y by 2017. Biomass considered to be technically available totals 26 million BDT/y in 2003, increasing to 34 million BDT/y in 2017. Of the gross resource in 2003, 21 million tons are from agriculture, 14 million from forestry, and 36 million tons from municipal wastes (MSW) exclusive of waste in-place in landfills and biomass in sewage. The current technical potential includes 10 million BDT/y in agriculture, 7 million BDT/y in forestry, and 9 million BDT/y as biomass in MSW.

Table 1. Current estimate for gross and available biomass in California

	Gross		Technically Available	
Resource type	(MBDT/y)	(% of state)	(MBDT/y)	(% of state)
Agriculture	21	29.6	9	35.9
Forestry	14	19.7	7	28.1
MSW	36	50.7	9	35.9
Energy Crops	0	0.0	0	0.0
Totals	**71**	**100**	**26**	**100**

Net thermal conversion efficiencies were assumed to remain constant through 2007 at an average of 20% (based on dry matter higher heating value) and then increase due to improvements in boiler operations or adoption of enhanced technologies such as integrated gasification combined cycles for new capacity additions. Average efficiency was increased to 25% in 2010 and to 30% in 2017. Bioconversion efficiencies depend on feedstock and range from about 12% to more than 20%. Overall efficiencies in combined heat and power operations were not incorporated into this analysis but economic factors will certainly influence such technology selection in the future with possible ramifications for average net electrical generation efficiency.

Gross electrical generation potential from biomass currently exceeds 8,700 MWe with more than 2,100 MWe from agriculture, 1,800 MWe from forestry, and 4,800 MWe from municipal wastes including landfill and sewage digester gas. The technical resource generation potential is close to 3,600 MWe. By 2017, technical generation potential could exceed 6,500 MWe, representing 11% of projected statewide peak power capacity. Existing and planned biomass power generation capacity in the state is currently 924 MWe including solid-fueled combustion power plants and engines, boilers, and turbines operating on landfill gas, sewage digester gas, and biogas from animal manures. Total biomass capacity is 1.8% of statewide peak power capacity (51,000 MWe).

Incremental capacity additions (exclusive of existing and planned generation) could exceed 2,600 MWe based on current resource estimates and 5,600 MWe by 2017 given resource growth and improvements in

average conversion efficiency. Electrical energy contributions in 2017 (49 TWh) could reach 15% of statewide consumption (334 TWh). Through 2017, the largest resources for development will be municipal solid waste, in-forest biomass, animal manures, landfill gas, orchard and vineyard residues, and field crop residues. State biomass resources are sufficient to supply a substantially larger amount of renewable electricity than is presently generated as well as serve as feedstock for biofuels and bioproducts.

The database incorporates CEC data for landfill gas and sewage digester gas. County-level data files were prepared for use with a statewide GIS model to assess economic generation potential.

Additional data were obtained from the California Energy Commission, California Department of Food and Agriculture, County Agricultural Commissioners, California Department of Forestry and Fire Protection, California Integrated Waste Management Board, California Biomass Energy Alliance, California Agricultural Statistical Service (CASS) and National Agricultural Statistical Service (NASS), US EPA, the National Renewable Energy Laboratory, and by direct survey with input from the California League of Food Processors and other industry organizations. Additional surveys are continuing to update the food processing, sawmill residue, and other inventories.

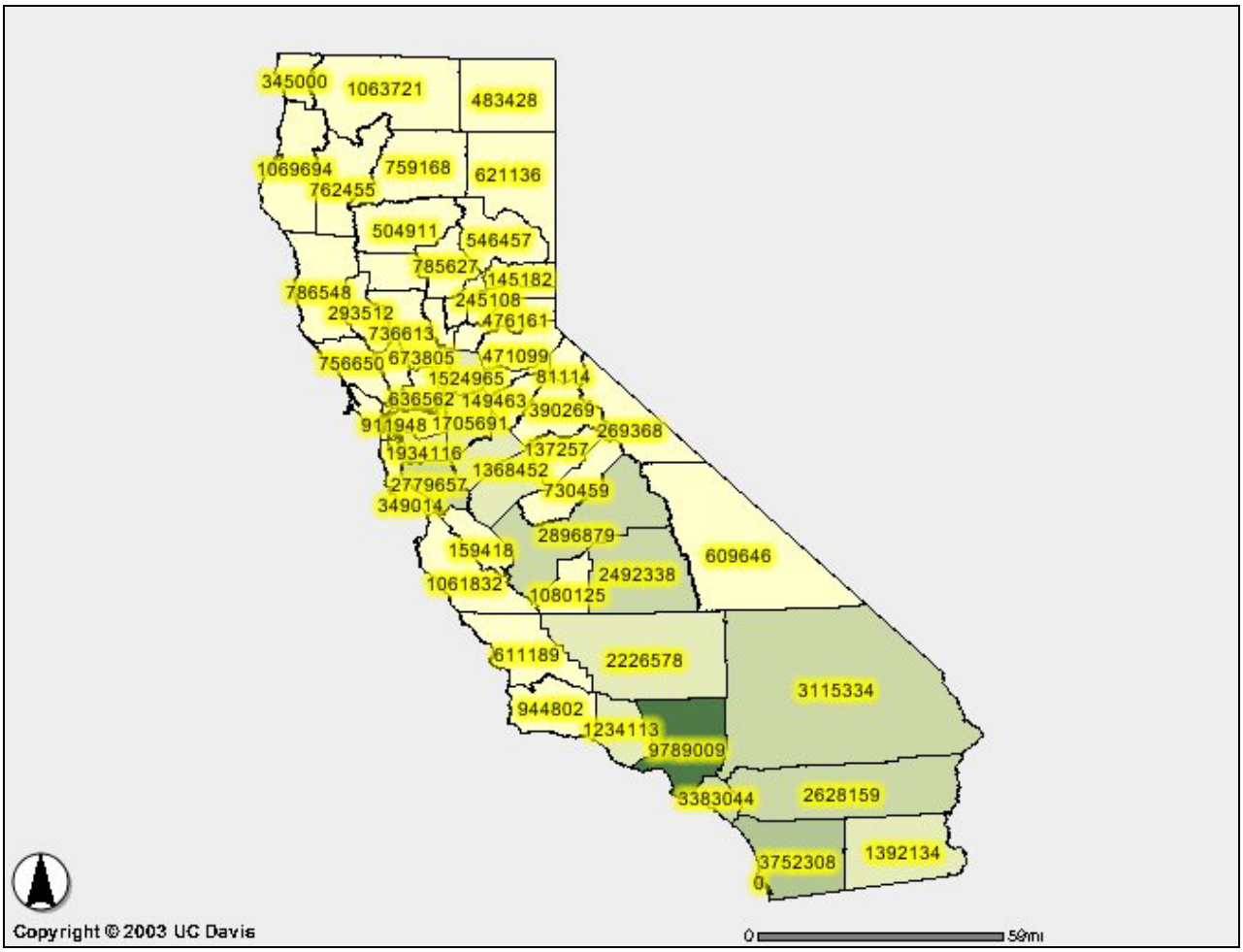

Figure 5. Total gross biomass (BDT/y) by county in California, 2003.

Power Generation Assessment

The power generation assessment comprises a database of alternative biomass-fueled generation technologies assessing their technical, economic, and environmental performance and simplified economic models for biomass-to-energy conversion systems. An interactive on-line "Cost of Energy Calculator" was developed and will be made available through the Collaborative web site following final review. This cost calculator uses a revenue requirements approach to determine the level annual costs of energy in both current and constant dollars. The calculator will be adapted to specific conversion technologies to aid developers and the public in estimating costs of energy from biomass.

The *Draft Economic Models and Biomass Power Generation* report is currently in preparation and will use results from two subcontracts to Global Greenlife Institute and Bates Consulting.

The Global Greenlife Institute contract is for a study of European and other biomass conversion technologies and governmental policies to explore their relevance for application to California. The purpose is to identify commercial or near commercial international activity with potential application to California. The Bates Consulting contract is for a survey of California biomass facilities. A ten-page survey was developed with guidance from the Collaborative to gather information from three different types of energy conversion technologies, i.e.: thermochemical, biochemical, and physicochemical technologies. Information was solicited on plant design, capacity, electrical generation, fuel quantities, environmental data, financing, economics, and social benefits. Surveys were mailed to facilities on mailing lists maintained by the CEC, CBEA, and CBC. During the time that surveys were being returned, mailing lists were refined and additional surveys sent. The compilation of received data is underway. Response rate from facilities was approximately 20% and a second survey effort is underway.

The Collaborative is also supporting an assessment of technologies as part of a Sacramento Municipal Utilities District (SMUD) regional renewable energy analysis. The objective of this project is to identify and evaluate novel and advanced technologies that could improve power generation from biomass, solid waste and landfill gas. It includes a discussion of much of the current US and California biomass-fueled installed capacity along with a preliminary assessment of biomass resources in the Sacramento region. The report also includes descriptions of biomass conversion pathways and discussions and analyses of advanced and developmental biomass systems.

Outreach

Web Site

The Collaborative has established and maintains a web site through the College of Engineering servers to provide information on biomass resources, technologies and generation which can be accessed at:

http://biomass.ucdavis.edu

In addition, the site will provide a variety of links to the web sites of related state, federal and private organizations and businesses.

Newsletters

The first CBC newsletter was published March 2004 and more than 500 copies distributed to CBC membership and others. An electronic edition is published on the CBC web site. Newsletters will be published quarterly and cover topical information on Collaborative activities.

Forum

The Collaborative hosted an open Forum in January 2004 at which preliminary findings were presented for review and comment. The forum was well attended with approximately 200 participants and included a variety of speakers including Commissioner Jim Boyd of the Energy Commission, two secretaries of the Governor's Cabinet, representatives from the industry, environmental community, the legislature., UC, and other groups.

Policy and research surveys were conducted of the participants at the Forum. Participants were asked to rank various issues and options facing the biomass industry according to their importance. The survey covered a number of issues including:

- possible impediments and opportunities facing the continued use or expansion of biomass;
- potential financial incentives for expanding the use of biomass;
- primary policy objectives for the Collaborative; and
- technical and social or economic areas that need to be researched.

Independent comments and suggestions were also solicited. Approximately 68 completed surveys were received. While largely qualitative and representative of only a select group, the results give an indication of the membership's concerns. Key issues identified by the participants were:

- the lack of state policy on bio-based fuels, power and products;
- a lack of quantifiable financial benefits to offset higher costs for biomass;
- the need to establish a platform for industry, academia, government, and others to work together on issues relating to biomass;
- the need to promote research and transfer of technologies related to bio-based fuels, power and products;

Participants ranked the top opportunities as:

(1) Fire hazard mitigation in wildlands and urban interface areas
(2) Diversion of waste from landfills, and
(3) California Renewable Portfolio Standard

Other Outreach

The Collaborative has also participated in other outreach including radio (executive director on KNCI Sacramento, 8 February 2004).

FUTURE DIRECTIONS

Committee Recommendations

The Collaborative's policy and research committees have submitted recommendations for future efforts of the Collaborative. The Collaborative staff has compiled the recommendations, along with comments from the Forum survey responses and submitted to the Commission a draft report on the Future of the California Biomass Collaborative: Recommendations for Continuing Activity and Support. The following information summarizes those reports.

The policy committee defined biomass industries to include a diverse platform of industrial operations that convert biomass materials into renewable sources of power, fuels, chemicals, and other bio-based products. The committee identified barriers to the development of biomass industries which include fragmented State environmental policies and programs, lack of a system to quantify or assess benefits from biomass industries, competition with vested utility, fuel, and waste management infrastructures, and a lack of public awareness and advocacy.

Policy changes to pursue include enhancing the biomass-power role in the RPS; prioritizing the use of biomass fuels over fossil fuels where technically feasible; quantifying and monetizing the environmental benefits of biomass; streamlining permit review and regulation; modifying regulations pertaining to fuels; establishing state and local government purchasing mandates; establishing tax or other economic incentives for growers and manufacturers; and educating the public on issues pertaining to biomass utilization.

Recommendations by the Collaborative's research committee provide suggestions for possible research efforts to be undertaken. The committee laid out its proposals for short, medium, and long-term efforts. Further detail on the policy and research committee reports are addressed above.

The Futures report addresses the goals of the Collaborative in attempting to fulfill its mission. Strategies associated with each goal were developed. Future efforts will be planned within a five year horizon updated on a biannual basis.

Five-year Plan

The Collaborative proposes to prepare a five-year plan laying out program activities to be undertaken that will advance the status of the biomass industry in California and possible funding mechanisms to pursue for support of those activities. The plan will describe the status of the industry, and specific goals, objectives, and tasks for the proposed activities during the funding period. Multiple funding sources at the federal, state and local levels will be pursued for individual projects or components of the plan. The initial two years of operation will be described in greater detail to serve as the basis for the continuation proposal for the Collaborative to the California Energy Commission. The five-year plan will be revised every two-years and include an evaluation of the Collaborative's performance in the preceding two years.

The detailed two-year plan shall describe specific research projects and informational efforts to be undertaken by the Collaborative for fiscal years 2004/05 and 2005/06. Goals and strategies within the

Collaborative mission will be addressed in detail. The plan will include, at a minimum, detailed descriptions of the following:

- Technical Assessments
- Policy Objectives
- Research Proposals
- Education and Outreach Program
- Local Decision Maker Support, and
- Financial Support Mechanisms

The report structure will include the following subject areas: state of the industry, identification of need, overall Collaborative goals and objectives, scope of work (technical task list, timeline, key name list, and staffing requirements), technical and economic performance objectives, measurement criteria, structure of the organization (including Executive Board), and a two-year budget (salaries, supplies, travel, subcontractors, equipment, and indirect costs) including cost sharing by private parties and research grant support.

CONCLUSIONS AND RECOMMENDATIONS

The California Biomass Collaborative has been established to support and motivate efforts towards the sustainable and effective use of biomass resources in the state. Within its first year of operation the Collaborative has attracted a large and diverse membership. The Collaborative provides an open forum for communicating the interests of members and for identifying critical needs throughout the state. A comprehensive needs assessment should be undertaken in all areas of potential biomass conversion and utilization with the purpose of designing a road map of future biomass development that can be used in support of RDD&D planning, project analysis, policy making, regulation, standardization, education, outreach, and training. California's biomass resources have an important role in the future economic development of the state. Biomass technologies provide significant potential for increasing renewable power generation and manufacturing of high-value products; they provide benefits derived through mitigation of adverse environmental impacts associated with many current disposal practices and non-renewable energy consumption; and they allow for expansion into new areas of production and conversion. Realizing the potential offered by the state's biomass resources will require continuing coordination and broad level discussions among concerned agencies and stakeholder groups addressing policy, financing, environmental and social impacts and benefits, and research and development needs. Members view the Collaborative as a viable and effective way of addressing these issues and supporting state efforts at sustainable development.

APPENDICES

Reports and other deliverables of the Collaborative are incorporated by reference into this annual report as the following separate appendices. Final reports will be available on the Collaborative web site or by request to the California Biomass Collaborative, Department of Biological and Agricultural Engineering, University of California, Davis, 3058 Bainer Hall, 1 Shields Avenue, Davis CA 95616.

Appendix 1: First Semi-annual report
Appendix 2: Second Semi-annual report
Appendix 3: An Assessment of Biomass Resources in California
Appendix 4: Report on Biomass Power Generation Survey
Appendix 5: Report on the Future of the California Biomass Collaborative
Appendix 6: California Biomass Collaborative Policy Committee Progress Report
Appendix 7: California Biomass Collaborative Research Committee Report
Appendix 8: California Biomass Collaborative Web Site (http://biomass.ucdavis.edu)
Appendix 9: California Biomass Collaborative Biomass Facilities Reporting System (http://cbc1.engr.ucdavis.edu)
Appendix 10: California Biomass Collaborative Economic Calculator