Annual Report 2002

IEA BIOENERGY: EXCO: 2003:01

IEA Bioenergy

IEA Bioenergy is an international collaborative agreement set up in 1978 by the International Energy Agency (IEA) to improve international co-operation and information exchange between national bioenergy RD&D programmes.
IEA Bioenergy aims to accelerate the use of environmentally sound and cost-competitive bioenergy on a sustainable basis, and thereby achieve a substantial contribution to future energy demands.

Cover Picture: Courtesy Fortum, Finland

To: IEA Headquarters, Paris

IEA BIOENERGY ANNUAL REPORT 2002

The IEA Committee on Energy Research and Technology (CERT) has recommended that an Annual Report shall be submitted for each of the IEA Implementing Agreements.

This document contains the report of the IEA Bioenergy Executive Committee.

This year, we have presented a special feature of the bioenergy activities within Task 29: Socio-economic Aspects of Bioenergy Systems.

The contributions from the Task Leaders and Operating Agents to this report are gratefully acknowledged.

Kyriakos Maniatis
Chairman

John Tustin
Secretary

Contents

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Further information on IEA Bioenergy can be obtained from the Executive Committee Secretary, see back cover of this Annual Report.

A list of country representatives in the Executive Committee is given in Appendix 6.

The opinions and conclusions expressed in this report are those of the authors.

Socio-economic Aspects of Bioenergy Systems

This overview describes some of the most important socio-economic issues concerning bioenergy systems as well as their linkage and overall impact on biomass utilisation. The article was prepared by Julije Domac and Keith Richards on behalf of the participants in Task 29 and draws on the work of the collaborating researchers in Austria, Canada, Croatia, Japan, Sweden and United Kingdom, as well as associated networks.

Introduction

Within the international community there is considerable interest in the socio-economic implications of moving society towards the more widespread use of renewable energy resources including bioenergy. Such change is seen to be very necessary but is often poorly communicated to the people and communities who need to accept it. Biomass can provide heat, electricity, transportation fuels and solid fuels, but it is frequently overshadowed by other, more glamorous 'space-age' renewable energy technologies. The environmental, economic and social benefits of bioenergy are often poorly recognised or appreciated. There are however, pockets of activity across the world exploring various approaches to understanding the multiplicity of relationships involved and several models have been developed and tested in order to examine the socio-economic aspects of bioenergy and other renewable energy projects. However, most of these models address the technical and economic aspects of projects without undertaking or seeking to analyse their social implications.

Re-emergence of the power of the local economy and local choice in the guise of a farmers' market - Gajnice, Croatia. (Courtesy J. Domac, Croatia)

Task 29 uniquely includes the exchange of results and information among the normally discrete research areas of social, economic, techno-engineering/engineering-economic and environmental issues. The Task also provides a platform for the integration of research in all of these areas (see Table 1).

Table 1: Socio-economic issues associated with biomass production and utilisation [1]

Dimension	Benefit
Social	Increased standard of living
	Environment
	Health
	Education
	Social cohesion and stability
	Migration effects (mitigating rural population)
	Regional development
	Rural diversification
Macro Level	Security of supply/risk diversification
	Regional growth
	Reduced regional trade balance
	Export potential
Supply Side	Increased productivity
	Enhanced competitiveness
	Labour and population mobility (induced effects)
	Improved infrastructure
Demand Side	Employment
	Income and wealth creation
	Induced investment
	Support of related industries
Institutional Aspects	Democratic decision processes
	Participatory problem solving
	Local problem solving

[1] *Source: Domac, J. and Richards, K. Final Results from IEA Bioenergy Task 29: Socio-economic Aspects of Bioenergy Systems, 12th European Conference on Biomass for Energy and Climate Protection, Amsterdam, 2002: 1200-1204.*

Key among the many separate aspects that need to be taken into account when analysing the socio-economic aspects of bioenergy systems are: stakeholder involvement, local income generation, public acceptance, local non-government organisation (NGO) involvement, long-term support (e.g. low interest loans), technology transfer, technology diffusion, distribution of benefits, fuel substitution aspects, policy perspective, education, capacity building, definition of collateral effects, market development in relation to timber and non-timber product markets (e.g. shift of income or changes in financial sources for sustainable development), institutional development, the nature and role of local and co-operative energy services companies (ESCOs) in propagating community actions, and other means relevant to securing long-term success, the minimisation of 'leakage' and maximising additionality of projects.

This plethora of related themes and issues confirms the importance of seeking an integrated approach when studying this topic. Typically, socio-economic implications

are measured in terms of economic indices, such as employment and monetary gains, but in effect the analysis relates to a number of other important aspects, which include social, cultural, institutional, and environmental issues. The problem lies in the fact that these latter elements are not always tractable to quantitative analysis and, therefore, have been excluded from the majority of impact assessments in the past, even though at the local level they may be very significant.

The Social Dimension of Bioenergy Systems

In many ways the social implications of local bioenergy investment represent the 'woolly' end of impact studies. Nevertheless they can be broken down into two categories: those relating to an increased standard of living or 'quality of life' and those that contribute to increased social cohesion and stability.

Social cohesion - partnership between rural and urban populations - is an important benefit which results from biomass utilisation. (Courtesy K. Richards, United Kingdom)

In economic terms the 'standard of living' refers to a household's consumption level, or its level of monetary income. However, other factors contribute to the 'standard of living' but have no immediate economic value. These include such factors as education, employment opportunities, the surrounding environment and healthcare, and accordingly, they should be given equal consideration.

Moreover, the introduction of a net employment and income-generating source, such as bioenergy production, can help to stem adverse social cohesion trends (e.g. high levels of unemployment, rural depopulation, etc). It is evident that rural areas in some countries are suffering from significant levels of outward migration, which mitigates against population stability (usually, it is the younger and artisan population that moves on resulting in aging communities). Consequently, given bioenergy's potential in rural locations, the deployment of bioenergy plants may have positive effects upon rural labour markets by, firstly, introducing direct employment and, secondly, by supporting related industries and the employment therein. For example, supporting the farming community, local/regional renewable energy technology providers, installers and service providers.

Finally, it is often possible to achieve significant and sustained development of local initiatives given genuine local involvement of key stakeholders. The emergence and cultivation of local champions is an essential area for study.

The farming community are often key stakeholders and potential champions. (Courtesy L. Park, PhotoNewZealand.com)

Macro-economic and Supply Security/Diversity Effects

There are many examples of 'urban bioenergy' projects, such as this CHP plant in Enköping, Sweden. Local people are strong supporters and beneficiaries of such schemes. (Courtesy P. Westergård, Sweden)

Bioenergy contributes to many important elements of a country or region's development including: economic growth through business expansion (earnings) and employment; import substitution (direct and indirect economic effects on GDP and trade balance); and diversification and security of energy supply. Other benefits include support of traditional industries, rural diversification, rural depopulation mitigation and community empowerment.

The increased use of bioenergy, which exhibits both a broad geographical distribution and diversity of feedstock, could secure long-run access to energy supplies at relatively constant costs for the foreseeable future. An example of the need for this is the economic 'disruption' caused by fluctuations in the price of energy products in the European market. The tripling of the price of crude oil in 1999 and its effect on the price of natural gas had a significant impact on the energy bill and economies of the European countries. This increase in the price of crude oil led to a net transfer from the European Union of an extra 22.7 billion euro between January and May 2000. This effect combined with the fall of the euro has increased the inflation rate by 1%. Economic growth is feeling the effect but growth in GDP remains around 3%. The current situation is leading to a drop in growth rate: 0.3% in 2000 and 0.5% in 2001 and loss of confidence among market operators and consumers. Current events also show that increases in fuel prices can cause serious social disruption. The strike in autumn 2000 by those particularly affected by the rise in oil prices, notably truck drivers, is an example of just how seriously this can manifest itself.

Delivery of pellets to a villa in Växjö, Sweden. (Courtesy P. Westergård, Sweden)

In addition, the use of indigenous resources implies that much of the expenditure on energy provision is not only retained locally but it is also re-circulated within the local/regional economy.

Supply Side Effects

Supply side effects are rather subjective in regional impact studies, as they are commonly deemed to be those impacts which are the result of improvements in the competitive position of the region, including its attractiveness to inward investment. These effects are likely to differ in kind and will depend upon the development, but generally such 'economies of speculation' relate to changes and improvements in regional productivity and enhanced competitiveness, as well as any investment in resources to accommodate inward migration that may result from the development.

Clog factory outside of Amsterdam. Bioenergy projects can utilise traditional skills and enhance their prospects as a 'spin-off' activity from forest management. (Courtesy J. Domac, Croatia)

Taken together, these effects may result in the establishment of complementary economic activity, where related and often local industries mushroom in response to increases in local demand. Accordingly, supply side effects have a much broader scope, and are much more speculative. Despite this caveat, some projects have been justified purely on the grounds that they may have significant long-term supply side effects, even if they are difficult to quantify with any confidence prior to the development.

Demand Side Effects

Demand side effects constitute the focal point of the majority of socio-economic impact studies, and are concentrated upon for several reasons. Most notably, they are relatively easy to define and the scale of the investment's impact can be quantified with reasonable accuracy. Moreover, it is the economic impact that is most important to regional developers and decision makers.

Demand side effects are primarily quoted in terms of employment and regional income. They can be categorised accordingly into:

- direct effects
- indirect effects
- induced effects
- displacement effects

The derivation of the above should form the basis of socio-economic analyses. However, the extent to which these effects can be totally captured at a local level will depend on the quality of the information available.

Considerable effort should be made to determine the extent and direction of capital flows both within the region under analysis and, more importantly, out of the region. If this 'leakage' element is ignored, predictions about future employment and income gains will be spurious. Furthermore, consideration should be given to the duration of the impacts, and only then can a tentative evaluation of the wider effects pertaining to some, or all, of the other factors be attempted.

Bioenergy and its Employment-creation Function

Bioenergy has provided millions of households with livelihoods (including employment and income). The essence of sustainability of bioenergy projects from a social aspect is how they are perceived by society, and how different societies benefit from this activity. Avoiding carbon emissions whilst providing environmental protection and security of energy supply on a national level are all added bonuses for local communities, but the driving forces are much more likely to be employment or job creation, contribution to the regional economy and income improvement. Such benefits will result in increased social cohesion and stability that stem from the introduction of a local employment and income-generating source. Among other renewables, bioenergy is the most labour-intensive technology and has the highest and most diverse employment-creation potential. Jobs created range from extensions to existing agricultural and forestry activities through to specialised engineering and electronic functions.

Many farmers would welcome the opportunity to sell residues or purpose-grown wood to long-term, steady consumers. Producing biomass provides a new source of revenue and helps farmers to diversify. This reduces their vulnerability to crop failures or declining crop prices, especially if the biomass is derived from tree crops – a secure standing asset that can be harvested on demand. Tree planting has additional rewards in terms of improved agricultural productivity and environmental benefits. Sometimes, participants in the forestry and bioenergy sectors learn new skills they can transfer to other profitable projects.

Briquette production in Belisce, Croatia. Many new jobs are being created in rural and city areas to service the growing interest in bioenergy. (Courtesy EIHP, Croatia)

What can bioenergy offer in terms of employment generation? In Europe, policymakers recognise that there are added economic benefits from renewables such as bioenergy, especially in terms of the potential for employment creation and the development of a

Using local sources of biofuel can provide security of energy supply in times of uncertainty, improve the national trade balance and provide new job opportunities. Ethanol production contributes some 700,000 jobs in Brazil. (Courtesy J. Domac, Croatia)

strong export industry. The renewable energy industry is one of Europe's fastest growing sectors. In this region, countries encourage the deployment of renewables as an alternative, indigenous energy source with low environmental impacts.

From the perspective of bioenergy projects, what does the term employment mean? Direct employment results from operation, construction and production. In the case of bioenergy systems, this refers to the total labour necessary for crop production, construction, operation and maintenance of conversion plants, and for the transportation of biomass. Indirect employment is jobs generated within the economy as a result of expenditures related to biomass fuel cycles. Indirect employment results from all activities connected, but not directly related, such as supporting industries, services and similar. The higher purchasing power, due to increased earnings from direct and indirect jobs may also create opportunities for new secondary jobs, which may attract people to stay or even to move in. These latter effects are referred to as induced employment. The main issue is whether the bioenergy project will provide earnings that are high enough for long enough to make it worthwhile to mobilise local resources for implementation.

This CHP plant uses waste material from forestry to produce heating and electricity for the city of Växjö. (Courtesy VEAB, Sweden)

Table 2 (see facing page) provides estimates of bioenergy sector employment in various developing countries. The figures are approximations of employment in production and distribution of bioenergy resources. Hektor[7] and Remedio[6] have provided more detailed accounts of job creation, earnings and employment in bioenergy projects (see Tables 3 and 4 on page 12). Three types of systems are demonstrated: intensive production in marginal lands; woodfuel production with intensive inter-cropping; and large-scale woodfuel production on previously forested lands. Total employment per unit of energy in person-years was derived for the activities of establishment, weeding, harvesting, chipping and administration. The information is a collation of results from studies done in several Latin American and Southeast Asian countries with particular reference to the Thailand Master Plan for Dendro Thermal Power Programme.

Table 2: Estimated employment figures for developing countries from various source documents

Country	Estimated employment in person years	Description and nature of employment	Source
Pakistan	600,000	Wholesalers and retailers in the wood fuel trade. Many are involved in production, conversion, and transportation. About three-quarters are full time, the rest part time. The ratio of traders to gatherers is 1:5	FAO-RWEDP 1998 [2]
India	3 to 4 million	The wood fuel trade is the largest source of employment in the energy sector	FAO-RWEDP 1998 [2]
Philippines	700,000 households (production) 140,000 households (trade)	Biomass energy production and trade	UNDP/WB ESMAP 1992 [3]
Brazil	800,000 200,000	Ethanol industry Charcoal industry	Hall, D. and Calle, F.R. 1998 [4]
Kenya and Cameroon	30,000	Charcoal production only	UNDP 1996 [5]
Ivory Coast	90,000	Charcoal production only	UNDP 1996 [5]

[2] Source: Anon. Images of wood and biomass energy in industries in Thailand. Regional Wood Energy Development Programme in Asia GCP/RAS/154/NET. FAO-RWEDP 1998. Field Document No. 52.
[3] Source: Anon. Philippines: Defining an Energy Strategy for the Household Sector. Results of a Joint Study by ESMAP and the Philippines Office of Energy Affairs. UNDP/WB ESMAP 1992. Vol I: Main Report.
[4] Source: Hall, D. and Calle, F.R. A New strategy for the FAO wood energy programme: The way ahead after Kyoto. 1998 Unpublished report to the Forest Products Division-Wood Energy, Food and Agriculture Organisation of the United Nations, Rome, Italy.
[5] Source: Anon. Sustainable Energy Strategies: Materials for Decision-Makers. UNDP Initiative for Sustainable Energy. United Nations Development Programme. New York. UNDP 1996.

Wood Fuel collection in central Brazil. (Courtesy J. Domac, Croatia)

Table 3: Bioenergy employment from selected studies [6]

Person years/PJ	Intensive production, farmers	Intensive inter-cropping	Large scale "energy forestry"
Establishment	112	71	34
Weeding	338	196	59
Harvesting	248	251	85
Transport	70	71	51
Chipping	13	13	13
Administration	19	19	11
Total	799	620	252

[6] Source: Remedio, E. Socio-economic aspects of bioenergy: A focus on employment. 2000 Unpublished report to the Forest Products Division - Wood Energy, Food and Agriculture Organisation of the United Nations, Rome, Italy.

Table 4: Bioenergy earnings from selected studies [6]

Earnings $ per PJ	Intensive production, farmers	Intensive inter-cropping	Large scale "energy forestry"
Establishment	82,305	54,870	17,147
Weeding	205,761	126,886	27,435
Harvesting	257,202	257,202	37,723
Transport	68,587	68,587	20,576
Chipping	13,717	13,717	13,717
Administration	68,587	68,587	34,294
Total	696,159	589,849	150,892

[6] Source: Remedio, E. Socio-economic aspects of bioenergy: A focus on employment. 2000 Unpublished report to the Forest Products Division - Wood Energy, Food and Agriculture Organisation of the United Nations, Rome, Italy.

Another analysis is shown in Table 5 (see facing page), which considers multiplier effects (indirect and induced). In previous examples, employment and earnings are held constant. In the real world, woodfuel production effectively catalyses other activities (indirect/induced) and this further translates into more earnings and more opportunities.

(Courtesy J. Domac, Croatia)

Table 5: Employment and earnings per PJ annual fuel consumption among selected European projects [7]

Biomass source/ technology	MWth	Direct jobs	Indirect jobs	Induced jobs	Total jobs	Labour earnings euro (000)	Other earnings euro (000)	Multiplier	Country
SRC, gasifier	2	51	11	36	98	1,116	1,114	1.25	UK
Miscanthus, heat	0.13	321	0	214	534	7,054	4,142	1.21	Belgium
Forest residues, CHP	40	52	33	30	115	1,566	227	1.30	France
Triticale, proc. Heat	2	134	60	28	222	3,858	-473	1.33	Germany
Artichoke, heat	1	269	19	93	380	1,745	-478	1.50	Greece
SRC, gasifier	5	36	21	23	80	1,010	400	1.29	Ireland
Ind. Residues, CHP	17	41	11	13	65	974	-263	1.46	Italy
Waste etc. CHP	5	13	2	27	42	240	2,450	1.18	Netherlands
Logging Residues, heat	10	52	2	21	76	724	1,028	1.26	Sweden

[7] Source: Hector, B. Forest fuels - rural employment and earnings. Department of Forest Management and Products, SLU, SE-750 07, Sweden, 2000.

'Would an investment in renewables lead to more jobs and economic growth?' was the question that challenged the study carried out in 1998-99 to evaluate and quantify the employment and economic benefits of renewable energy in the European Union (EU). The study funded by the European Commission through the ALTENER Programme was initiated by the European Forum for Renewable Energy Sources (EUFORES) and carried out by a consortium of organisations led by ECOTEC Research and Consulting Ltd. The study provided a complete analysis of employment impacts from renewable energy (including bioenergy) taking into account jobs created both directly and indirectly as more renewable plants are manufactured, installed and operated. It also considered jobs displaced in conventional (fossil or nuclear) energy plants, or jobs lost because of subsidies provided to renewables that could otherwise fund employment in other sectors of the economy. Highlights derived from the conclusions were that the use of renewable energy technologies will more than double by 2020 and will lead to the creation of about 900,000 jobs by 2020. Approximately 500,000 of these jobs will be in the agricultural industry in order to provide primary biomass fuels (see Table 6 over page).

Small is beautiful. Modern biomass fuelled district heating plant in Austria – a new image for an 'old-fashioned' fuel. (Courtesy H. Scheuer, Austria)

Table 6: Impact of renewable technologies on employment in the European Union (new net jobs FTE employment relative to base in 1995) [8]

Technology	2005	2010	2020
Solar thermal heat	4590	7390	14, 311
PV	479	-1769	10,231
Solar thermal electric	593	649	621
Wind onshore	8690	20,822	35,211
Wind offshore	530	-7968	-6584
Small hydro	-11,391	-995	7977
Bioenergy	449,928	642,683	838,780
TOTAL	453,418	660,812	900,546

[8] Source: ECOTEC Research and Consulting Ltd. The impact of renewables on employment and economic growth. Directorate General for Energy, European Commission, 1999. Available on the Internet: www.eufores.org/Employment.htm

Conclusions and Further Information

In developing countries bioenergy is a source of fuel for people surviving at the subsistence level. It is also a source of income of particular importance during the off-harvest season. Many of the practices currently used by these countries are, however, unsustainable due to a variety of factors. It is sometimes suggested that modernising traditional bioenergy may turn it into a more sustainable venture. This hypothesis needs further investigation. Certainly the potential for generating employment opportunities in modern bioenergy applications among developing countries is worth serious study. It is vital to understand the implications and impacts of these claims from the socio-economic point of view as they touch on fundamental aspects of the ways in which people live. The issues include gender, health, environment, poverty and rural development.

In developed countries, particularly in the EU, bioenergy (together with the other renewable energy technologies) is being promoted due to its potential contribution to energy security and environmental benefits (both local and global). Moreover, there is the realisation that deployment of bioenergy has the potential for job creation, improved industrial

Deployment of bioenergy brings major benefits in terms of job creation, energy security and greenhouse gas mitigation. (Courtesy VTT Process, Finland)

competitiveness, regional development and the development of a strong export industry. Experiences gained among EU member countries relating to employment generation in particular should be disseminated not only within the energy community but also to a much larger audience in terms of lessons learned, techniques derived, and case study experiences.

Education at all levels is seen as an important factor in the removal of non-technical barriers to bioenergy implementation. (Courtesy R. Driesson, PhotoNewZealand.com)

The 1990s have seen a substantial diffusion of many renewable energy technologies, often showing two-digit growth rates. In most cases, however, this growth is not sustained. Apart from a lack of cost competitiveness, for which policymakers try to compensate by means of subsidies or quota targets, there are numerous socio-economic and institutional barriers that need to be identified and tackled. In addition, there are a number of external net benefits that are not accounted for in the decision-making process.

Task 29 has produced a comprehensive brochure in Frequently Asked Question (FAQ) format. This is intended for non-technical audiences. For more technically oriented individuals, focused experts and scientists, there are a number of reports from participating countries, overviews of the existing tools for socio-economic modelling, reports setting out the possibilities for using management/business type approaches, minutes of Task meetings, proceedings of workshops and a large selection of papers presented during the last triennium at international workshops, conferences and seminars. These can be accessed at www.iea-bioenergy-task29.hr

Task 29 has made a good start in giving detailed consideration to the value of bioenergy when viewed in the broader context of society, environment and the economy. The boundaries of the Task have been deliberately wide in order to be as inclusive as possible without becoming unmanageable. The first working period for Task 29 finished at the end of 2002, but the Executive Committee of IEA Bioenergy has decided to prolong the Task to 31 December 2005. Country participation for this period has increased to include Ireland and Norway. Co-operation with the FAO and other international institutions, networks and projects is being developed as a major theme of future work.

For further information, readers should visit www.iea-bioenergy-task29.hr or contact the Task Leader, Julije Domac, jdomac@eihp.hr or the Associate Task Leader, Keith Richards, keith.richards@tvenergy.org.

International Energy Agency

The International Energy Agency (IEA) is an autonomous body which was established in 1974 within the framework of the Organisation for Economic Cooperation and Development (OECD) to implement an international energy programme. It carries out a comprehensive programme of energy cooperation among its Member countries.

The basic aims of the IEA are:

- To improve the world's energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use;
- To maintain and improve systems for coping with oil supply disruptions;
- To operate a permanent information system on the international oil market;
- To promote rational energy policies in a global context through cooperative relations with non-Member countries, industry and international organisations;
- To assist in the integration of environmental and energy policies.

A. Introducing IEA Bioenergy

Welcome to this Annual Report for 2002 from IEA Bioenergy!

IEA Bioenergy is the short name for the international bioenergy collaboration within the International Energy Agency - IEA. A brief description of IEA is given on the preceding page.

Bioenergy is defined as material which is directly or indirectly produced by photosynthesis and which is utilised as a feedstock in the manufacture of fuels and substitutes for petrochemical and other energy intensive products. Organic waste from forestry and agriculture, and municipal solid waste are also included in the collaborative research, as well as broader 'cross-cutting studies' on socio-economic and techno-economic aspects, environmental and economic sustainability, system studies, fuel standards, greenhouse gas balances, barriers to deployment, and management decision support systems.

The IEA Implementing Agreement on Bioenergy, which is the 'umbrella agreement' under which the collaboration takes place, was originally signed in 1978 as IEA Forestry Energy. A handful of countries took part in the collaboration from the beginning. In 1986 it broadened its scope to become IEA Bioenergy and to include non-forestry bioenergy in the scope of the work. The number of participating countries has increased during the years as a result of the steadily increasing interest in bioenergy worldwide. By the end of 2002, twenty parties participated in IEA Bioenergy: Australia, Austria, Belgium, Brazil, Canada, Croatia, Denmark, Finland, France, Ireland, Italy, Japan, The Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, United States of America and the European Commission.

IEA Bioenergy is now 25 years old and is a well established collaborative agreement. All OECD countries with significant national bioenergy programmes are now participating in IEA Bioenergy, with very few exceptions. The IEA Governing Board has decided that the Implementing Agreements within IEA may be open to non-Member Countries, i.e. for countries that are not members of the OECD. For IEA Bioenergy, this has resulted in a large number of inquiries from potential participants, and as a consequence of this, a number of new members are expected.

The work within IEA Bioenergy is structured in a number of Tasks, which have well defined objectives, budgets and time frames. The collaboration which earlier was focused on Research, Development and Demonstration is now increasingly also emphasising Deployment on a large scale and worldwide.

There were eleven ongoing Tasks during 2002:

- Task 29: Socio-economic Aspects of Bioenergy Systems
- Task 30: Short Rotation Crops for Bioenergy Systems
- Task 31: Conventional Forestry Systems for Sustainable Production of Bioenergy
- Task 32: Biomass Combustion and Co-firing
- Task 33: Thermal Gasification of Biomass
- Task 34: Pyrolysis of Biomass
- Task 35: Techno-economic Assessments for Bioenergy Applications
- Task 36: Energy from Integrated Solid Waste Management Systems
- Task 37: Energy from Biogas and Landfill Gas
- Task 38: Greenhouse Gas Balances of Biomass and Bioenergy Systems
- Task 39: Liquid Biofuels

Members of IEA Bioenergy are invited to participate in all of the Tasks, but each member is free to limit its participation to those Tasks which have a programme of special interest. The Task participation during 2002 is shown in Appendix 1.

A progress report for IEA Bioenergy for the year 2002 is given in Section B of this Annual Report.

ExCo49 study tour group at the gasification plant in Güssing, Austria

B. Progress Report

1. THE EXECUTIVE COMMITTEE

Introduction and Meetings

The IEA Bioenergy Executive Committee acts as the 'board of directors' of IEA Bioenergy. The Committee plans for the future, appoints persons to do the work, approves the budget and, through its Members, raises the money to fund the programmes and administer the Agreement. The Executive Committee (ExCo) also scrutinises and approves the programmes of work, progress reports and accounts from the various Tasks within IEA Bioenergy.

The 49th ExCo meeting took place in Vienna, Austria on 24-25 April 2002. Including observers, there were 29 participants at this meeting. The 50th ExCo meeting was held in Helsinki, Finland, on 23-24 October 2002, also with 29 participants.

During 2002, Kyriakos Maniatis from the European Commission was Chairman of the ExCo and Bjorn Telenius from Sweden was Vice Chairman. At the ExCo50 meeting, Bjorn Telenius was elected Chairman and Kai Sipilä from Finland, Vice Chairman.

The ExCo Secretariat is based in Rotorua, New Zealand under the Secretary, John Tustin. The fund administration for the ExCo Secretariat Fund and Task funds is consolidated with the Secretariat, along with production of ExCo publications, the newsletter and maintenance of the website. By decision of the ExCo, John Tustin will provide the Secretariat and Fund Administration service for the period to 31 December 2003. The contact details for the ExCo can be found in Appendix 6 and for the Secretariat on the back cover of this report.

The work in the ExCo, with some of the achievements and issues during 2002 is described below.

Supervision of Ongoing Tasks, Review and Evaluation

The progress of the work in the Tasks is reported by the Operating Agents to the Executive Committee twice per year at the ExCo meetings. The ExCo has also continued its policy to invite some of the Task Leaders to each ExCo meeting so that they can make the presentation on the progress in their Task and programme of work personally. This has improved the communication between the Tasks and the Executive Committee and has also involved the ExCo more with the Task programmes.

The work within IEA Bioenergy is regularly evaluated by the IEA Committee for Energy Research and Technology (CERT) via its Renewable Energy Working Party (REWP) and reported to the IEA Governing Board.

Approval of Task and Secretariat Budgets

The budgets for 2002 approved by the Executive Committee for the ExCo Secretariat Fund and for the Tasks are shown in Appendix 2. Total funds invoiced in 2002 were US$1,333,039; comprising US$155,600 of ExCo funds and US$1,177,439 of Task funds. Appendix 2 also shows the financial contributions made by each Member Country and the contributions to each Task. Very substantial 'in-kind' contributions are also a feature of the IEA Bioenergy collaboration but these are not shown because they are more difficult to recognise in financial terms.

Fund Administration

The International Energy Agency, Bioenergy Trust Account, at the National Bank of New Zealand is functioning smoothly. In 2002 this account was accessed electronically by Ms Jeanette Allen at the New Zealand School of Forestry, University of Canterbury on behalf of the Secretariat. The account is an interest bearing account denominated in US dollars. Details for making payments are:

Remit funds to:	Chase Manhattan Bank, New York, USA Federal Wire No: 021000021
For credit of account:	Account number: 001-1-941473 - in the name of: The National Bank of New Zealand Limited Head Office, 1 Victoria Street, Wellington, New Zealand
Quoting:	IEABRS-USD00 plus the invoice number.

The currency for the whole of IEA Bioenergy is US dollars. The main issue faced in fund administration is slow payments from some Member Countries. As at 31 December, there were US$190,841 of financial contributions for 2000, 2001 and 2002 outstanding. However a significant proportion of these were paid early in 2003.

KPMG is retained as an independent auditor. The audited accounts for the ExCo Secretariat Fund and Task Funds for the period 1 January 2001 to 31 December 2001, were approved at ExCo49. The audit provided an unqualified opinion that the financial accounts of the Trust account were a true and fair record. The audited accounts for the ExCo Secretariat Fund and Task Funds for the period ended 31 December 2002, have also been prepared and these will be presented for approval at ExCo51.

Task Administration

Task 28: This Task titled 'Solid biomass fuels standardisation and classification' was initiated in October 1998 and scheduled to end on 31 March 2001. It was decided at ExCo48 to prolong the Task, with no extra budget provision, to give the Task Leader an opportunity to seek new funding from the European Commission, which had served as Operating Agent. Time was also needed for discussions between the European Commission and USA on future participation. The goal was to continue the Task for another three years.

An application for further funding was made to the ENERGIE part of the Commission's Fifth Framework Programme for Research in February 2001, as part of a large proposal for research to support the standardisation activities of CEN (Pre-normative work on sampling and testing solid biofuels for the development of quality assurance systems – BioNorm). This approach was successful and the European Commission offered a contribution of Euro 15,000 a year, for three years for the IEA Bioenergy component.

At ExCo49 the Task Leader presented a Progress Report and requested Member Countries to provide the additional 50% of the budget. No Member Country was able to commit to additional funding, despite a high level of interest in the work on standardisation. However, it was agreed that the Task Leader would investigate the possibility of continuing the work as a Special Project, with participation from the European Commission and FAO. This would have entailed 100% cash funding from the Commission and an in-kind contribution from FAO. Following ExCo49, the Task Leader discussed a possible variation of the contract for the BioNorm Project with the European Commission. However, the Commission was not willing to increase its funding for the IEA Bioenergy element of the project from 50% to 100%. This meant that Task 28 could not continue either as a Task or as a Special Project. Accordingly this initiative ceased on 4 July 2002.

Task 29: The first triennium for this Task ended on 31 December 2002. At ExCo50 it was decided to prolong the Task to 31 December 2005 with the new title 'Socio-economic Drivers in Implementing Bioenergy Projects'. Croatia will continue as the Operating Agent, with Julije Domac the Leader and Keith Richards the Associate Task Leader. The participating countries will be Canada, Croatia, Ireland, Japan, Norway, Sweden and the United Kingdom. In addition, the European Commission may also participate. In this triennium the work will include urban/industrial scale situations and is expected to include study of 'cost savings' which in some situations can be more important than 'job creation'.

Task Participation: Please see Appendix 1 on page 66 for a summary table of Task participation in 2002.

Planning for the next Task period: The working period for most of the Tasks finishes on 31 December 2003. The Secretary undertook a survey to identify whether a tendering process may be required for Tasks in the upcoming triennium. The results indicated that this process was not required. It was therefore agreed that Task Leaders should prepare draft programmes of work and budgets for discussion at ExCo51 and formal approval at ExCo52.

Term of the Implementing Agreement

The current term of the Agreement is to 31 December 2004 and the current triennium for the Tasks ends on 31 December 2003. It is expected that the Executive Committee will approve an extension of the Implementing Agreement at ExCo51 in Sydney, Australia and request that an 'End of Term' report be prepared for the REWP/CERT.

Strategic Planning

The third Strategic Plan for IEA Bioenergy for the period 2003-2006 was approved at ExCo50 in Helsinki. Included in the process of developing this plan was an external review of the previous plan by the REWP. The new plan was published and distributed in November 2002. This document underpins a stronger emphasis on market deployment of technologies and systems for sustainable energy production from biomass. The strong technology platforms and networks will continue but in addition the ExCo has signalled a more strategic and proactive approach to bioenergy implementation and promotion.

At ExCo48 the Executive Committee decided to have a "strategic emphasis" for the April ExCo meeting each year and a "Task reporting emphasis" at the October meeting. Task reports would continue to be produced for each ExCo meeting but discussion of Task reports at the April meeting would only be by the wish of any ExCo Member or Task Leader. At the November meeting, the ExCo would receive presentations on every Task (either by a Task Leader who was present or the Operating Agent) and these would include the programme of work and budget for the following year. However, whenever a Task Leader was present at any ExCo meeting they would be asked to make a presentation.

New Participants

Interest from potential Member Countries continued to be strong in 2002. Ireland rejoined the Agreement on 20 September 2002 and appointed Mr Pearse Buckley, Sustainable Energy Ireland, as their ExCo Member. China accepted an invitation to observe ExCo50 in Helsinki and sent Professor Yuan Zhenhong of the China Biomass Development Centre, Beijing. Other countries to show interest have been South Africa and Portugal.

Peter Hall (left), Canada with Pearse Buckley, the new ExCo Member for Ireland on the study tour in Finland

Collaboration with FAO

There has been good progress with the FAO collaboration since an MoU was signed early in 2000. Mr Miguel Trossero, Senior Forestry Officer (Wood Energy) is the key contact. He participated at ExCo49 in Vienna and made a very interesting presentation titled 'FAO Woody Energy Activities'. Tasks 29, 30, 31 and 38 offer the most promising areas for collaboration. 'Terminology and definitions' and some of the IEA Bioenergy 'special projects' are other areas of substantial interest.

Trossero also participated in the Task 29 International Workshop on the 'Socio-economic Aspect of Bioenergy Systems: Issues Ahead' and delivered a paper 'Socio-economic aspects of wood energy systems in developing countries: A focus on employment'. In addition Mr Mohamed Saket, Forest Officer, Forest Resource Assessment represented

FAO at the Tasks 30/31 International Workshop on 'Sustainable Bioenergy Production Systems: Environmental, Operational and Social Implications' held in Belo Horizonte, Brazil. Two papers were provided; 'Forest Resources Assessment - The way forward' and 'WISDOM: Woodfuel Integrated Supply/Demand Overview Mapping: A geographical representation of wood fuel priority areas'. IEA Bioenergy Activities are reported in the FAO Newsletter, Forest Energy Forum. This has provided excellent exposure to the readership in developing countries and is achieved through the efforts of Trossero and his fellow compiler Tina Etherington.

Miguel Trossero (left), FAO Wood Energy programme, with Marcelo Poppe, the Member for Brazil

Overall the level of collaboration is significant and still growing. Both the Executive Committee and FAO are committed to capitalising on the opportunities provided through the MoU.

Seminars and Workshops

A large number of seminars and workshops are arranged every year by individual Tasks within IEA Bioenergy. This is a very effective way to exchange information between the participants. These meetings are described in the progress reports from the Tasks later in this Annual Report. The papers presented at some of these meetings are listed in Appendix 3. Occasionally, seminars and workshops are also arranged by the Executive Committee.

IEA Bioenergy was a co-sponsor of the 12th European Conference & Technology Exhibition on Biomass for Energy, Industry and Climate Protection, 17-21 June in Amsterdam. Members of IEA Bioenergy were heavily involved in the organisation and planning of this major event. For example, from the Executive Committee, Kees Kwant was the National Committee Chairman and Josef Spitzer was Chairman of the Programme Committee. In addition several Members chaired conference sessions and Kyriakos Maniatis provided a keynote presentation on IEA Bioenergy. The Implementing Agreement was also involved in leading four of the eight workshops, viz Gasification; Biomass Trade: Economic and Greenhouse Gas Considerations; Biofuels for Transport and The Status of Biomass/Coal Co-firing. There were also a large number of presentations and posters on the work of IEA Bioenergy Tasks. Overall the ExCo felt that the sponsorship investment provided very good value.

Promotion and Communication

The ExCo has continued to show lively interest in communication of IEA Bioenergy activities and information. The brochure on IEA Bioenergy with information targeted at audiences who are unfamiliar with this collaboration has been widely distributed both within the Member Countries and at major conferences. There is a wide range of other

promotional material available through the Secretariat. This includes Annual Reports, technical brochures, copies of IEA Bioenergy News, the new Strategic Plan and position papers. The website underpins this publishing activity.

The 2001 Annual Report with the special colour section on 'Biomass combustion and co-firing' was very well received. This coloured section was also produced as an independent booklet. Only a few copies of the Annual Report from the original print run of 1800 remain. However, this report is also available through the IEA Bioenergy website.

The newsletter IEA Bioenergy News remains popular. Two issues were published in 2002. The first issue featured bioenergy in Austria and the second issue featured bioenergy in Finland as special themes. A free subscription is offered to all interested and there is a wide distribution outside of the normal IEA Bioenergy network. The newsletter is distributed in June and December each year which follows the pattern of ExCo meetings. The contacts for the Newsletter Editor are provided on the back cover of this report.

Five contributions under the banner of 'IEA Bioenergy Update' were provided to the journal Biomass and Bioenergy in 2002. These cover news from the Executive Committee, events, overviews of progress in the Tasks and short articles about bioenergy in the Member Countries. This initiative provides excellent access to bioenergy researchers and finds a place in major libraries worldwide.

In 2002, the website was upgraded and more closely integrated with other communication activities. The main new feature is a special 'members only' section for Executive Committee documents. In the medium term, the website is viewed as a pivotal element in the IEA Bioenergy communication and marketing strategy.

The Executive Committee has continued to be proactive in providing sponsorship funds to major biomass conferences. These have included the 12th European Biomass Conference and the Bioenergy Australia 2002 Conference, 2-4 December in Sydney. The main goal in co-sponsoring these events has been to raise the profile of IEA Bioenergy.

The Executive Committee also decided to support the 20th Anniversary Windsor Workshop on Transportation – 'Towards Sustainable Transportation', June 2003 in Ontario, through an in-kind contribution of a keynote paper by Don Stevens, the Leader of Task 39. He will also lead a technical session. In addition, a copy of the 'call for papers' was circulated to all of the Task Leaders along with an invitation to present more papers and to provide ideas on 'issues' that could be relevant to the meeting.

The series of Industry Days initiated by Task 18 (now Task 31) has continued. The concept is designed to take advantage of the presence of international experts who participated in a Task workshop, by having them meet with regional persons with an interest in bioenergy to discuss issues and share ideas. Successful events with participation ranging from 40-100 have now been held in New Zealand, Canada, The Netherlands, Belgium and Brazil.

Interaction with IEA Headquarters

There is regular contact between the IEA Bioenergy Secretariat, and IEA Headquarters in Paris and active participation by ExCo representatives in relevant meetings.

During 2002 the Chairman, Secretary and key Members of Executive Committee have worked closely with the IEA Headquarters in Paris at both administrative and technical levels. Mr Johan Wide attended ExCo50 in Helsinki. This participation by IEA Headquarters is greatly appreciated by the Members of the ExCo and helps to strengthen linkages between the Implementing Agreement and relevant headquarters initiatives.

Mr Bill Gillett represented IEA Bioenergy at the April REWP Meetings in Paris and made a presentation prepared by Chairman Maniatis. This included comments on the REWP R&D Strategy. Mr Gillett also reported via the Chairman that feedback from the REWP meeting had been very positive and that the REWP was very interested in the programme of Task 29. It appears that IEA Bioenergy is the only Implementing Agreement that covers the topic of 'socio-economic aspects' although it is needed in a number of other Implementing Agreements.

The Executive Committee showed strong interest in the discussions between Headquarters and the Implementing Agreements on 'effective support' and 'future direction'. A major draft was prepared by the Secretary for discussion at ExCo50 and was finalised in time for the CERT meeting in November 2002. The ExCo asked that the final report should emphasise that the work of Implementing Agreements is entirely 'bottom up' and for this reason 'top down' initiatives are difficult to implement. They can only be achieved by negotiation and co-operation with the Implementing Agreements. Thus, while the Headquarters' role in providing a platform for the work is extremely valuable and important, it would not seem to be appropriate to expect significant deliverables from this role. To get this additional benefit the IEA Headquarters would have to invest more than provision of a platform, e.g. financial support for specific requests and project work.

During the period, Task 38 and specific ExCo Members participated in a review of the Headquarters CERT report 'Technologies for significant GHG reductions from energy'.

Information was supplied to Mr Peter Cunz, Switzerland, the Associate Chairman of the End-user Working Party (EUWP/CERT), who is charged with providing progress reports on transport related work to EUWP meetings. The Secretary completed a substantial questionnaire on behalf of IEA Bioenergy and supplemented this with the End-of-Term Report and copies of the 2001 Annual Report.

The ExCo accepts the viewpoint that cross fertilisation between Implementing Agreements can be productive in appropriate circumstances. At ExCo50 there was a positive response to a letter from Mr Tom Howes, Desk Officer for the Advanced Motor Fuels Implementing Agreement and a draft proposal for a joint project titled 'Where will the Hydrogen come from?' It was agreed that IEA Bioenergy should attend the exploratory meetings that were planned for this proposal, which may lead to a joint Annex.

As a result of a decision taken at ExCo49, Status Reports according to the template supplied by IEA Headquarters are now prepared by the Secretary and forwarded to the IEA Administrator for REWP Implementing Agreements following each ExCo meeting.

At ExCo49 it was agreed to support the Headquarters OPEN Energy Technology Bulletin initiative and four items were forwarded for inclusion in 2002. In addition, the ExCo gave a positive response to an enquiry from one of the editors of the Bulletin to support a "Special Issue" on the Bioenergy Implementing Agreement. This was seen as a good opportunity to raise the profile of IEA Bioenergy in 2003.

At ExCo46 it was decided that the Executive Committee should commission 'position papers' based on the work of the Tasks. These 'position papers' would be policy-orientated statements that promote bioenergy and focus on key issues that may arise in the near future. It is expected that they will provide valuable input to and influence policy development. The first of these titled 'Sustainable Production of Woody Biomass for Energy' was printed and circulated to all ExCo Members and Task Leaders in December. At the same time a pdf version was posted on the website. Hard copies of this useful document can be obtained from the Secretary. A second position paper titled 'Municipal Solid Waste and Its Role in Sustainability' will be published in 2003.

IEA Bioenergy Books

Three books were produced by the Tasks in 2002. Task 31 produced 'Bioenergy for Sustainable Forestry: Guiding Principles and Practice'; Task 32 the 'Handbook of Biomass Combustion and Co-firing'; and 'Fast Pyrolysis of Biomass: A handbook Volume 2' was produced by Task 34. These major publications represented significant progress in the work programme of these Tasks.

ExCo50 study tour, Finland. The Timberjack Slash Bundler manufacturing Compacted Residue Logs after final harvest

2. PROGRESS IN 2002 IN THE TASKS

Task 29: Socio-economic Aspects of Bioenergy Systems

Overview of the Task

The objective of Task 29 is to identify and quantify the socio-economic and environmental impacts of bioenergy production systems. In particular, to investigate the effects of bioenergy generation – both feedstock production and energy conversion – on the surrounding economic (financial, local industry creation, infrastructure development, regional value added, etc), social (employment, education, health, etc), and environmental climate. Thereafter, any identified and substantiated net regional gains and benefits can be used to promote the use of bioenergy to policy and decision makers in areas where the gains can be maximised to best effect.

Participating countries: Austria, Canada, Croatia, Ireland, Japan, Sweden and United Kingdom.
Task Leader: Mr Julije Domac, Energy Institute Hrvoje Pozar, Croatia
Operating Agent: Dr Branka Jelavic, Energy Institute Hrvoje Pozar, Croatia

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 29, please refer to Appendices 2-5 inclusive; the Task website www.iea-bioenergy-task29.hr and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings and Workshops

The main event of Task 29 in 2002 took place on 18-21 September in Cavtat, Croatia. This was a workshop titled 'Socio-economic aspects of bioenergy systems: issues ahead'. The programme included one day for a Task meeting, two days for presentations and one day for site visits and connected discussions. In total 35 people attended the event and 14 papers were delivered. The workshop proceedings are in preparation and will be published by the end of 2002.

The Task participated in a joint event with Task 38 and the COST E21 network. This was co-organised by Task 29 and held on 22-24 April in Graz, Austria. Climate change mitigation from bioenergy projects was seen to be important and worthy of joint collaboration both from a technical as well as a socio-economic perspective. This event was used to draw in relevant groups for the specific meeting (e.g. NGOs). Co-operation in Science and Technology is an EC Network, which has overlapping aims with Task 29 and was also a participant. The goal was to generate a paper for input to the political as well as the technical debate (so COP talks, UN etc). Work was split into two groups;

environmental issues and the socio-economic aspects. There were few presentations – most time was spent in brainstorming and debate. In the end, there was just one position paper generated. The paper titled 'Socio-economic, institutional and environmental aspects to support long-term success of LULUCF projects' was presented at the COST E21 fourth whole action meeting on 7-8 October in Valencia, Spain and is now offered for publication in a well-recognised scientific journal.

The Task held a workshop during the World Renewable Energy Congress VII on 30 June - 5 July in Cologne, Germany and the Task results were presented in an oral presentation during technical sessions at this event. Task results were also presented at the 12th European Conference & Technology Exhibition on Biomass for Energy, Industry and Climate Protection on 17-21 June in Amsterdam, The Netherlands.

Work Programme

The Task work programme in 2002 included publication of the 2nd and 3rd workshop proceedings; final work by experts on priority issues; presentation of the tools and guidelines developed by the Task; participation in major events (reported above); planning and running the workshop in Croatia; preparation of a final Task report and planning for the continuation of the Task.

The analysis and modelling work in communities (chosen case studies in each participating country), was completed and results were announced during the final workshop in Croatia. The details are:

Country	Region	What next?
Austria	Styria	Local energy agency support; need to raise Research funding for substantial research
Canada	Remote communities Aboriginal institutions	Co-management opportunities, demonstrations, community response
Croatia	Primorsko-goranska county - Gorski kotar region	Regional government lobbying. Projects launching
Sweden	Växjö REFERENCE Northern	Analysing problems and barriers. European network opportunities
UK	Thames Valley (TV) and Gwynedd (Gw)	TV: apply BIOSEM to a set of projects with social model overlay Gw: Further refinement

Through the Task activities it became very clear that the technique likely to yield the best match was highly dependent on the state of development of bioenergy/renewables in that region. For example, in Croatia or England there are very few if any reference plants for the study and so some very basic modelling is needed in order to facilitate project build (addressing both the technical and political requirements). By contrast, in Sweden and Austria there are numerous good examples of projects, which are ready for enhanced consideration. Hence, it is unlikely that one model only can be used for all countries. Basically, the models reviewed to date are seen as most appropriate for 'top-down' assessments, but emphasis should also be given to management/business type approaches with an appreciation/summary made of the differences. A report setting out the possibilities for using such approaches either alongside more conventional methods

employed for case study areas, or using hybridised methods is seen as an important contribution to the Task activities and was presented at the workshop in Canada. This report is available on the Task website.

The Task agreed to sponsor one student per participating country from the Task budget. Some countries used this opportunity and these selected students participated in data gathering, data analysis and the application of models to the regions. They also participated in the final Task 29 workshop. This initiative provided an excellent opportunity for young people from the communities under study to participate and exchange ideas. They all used the work as a part of their university activities and as a source of data for their final or MSc thesis. Three countries successfully involved students to assist with this project. Details are as follows:

- *Austria:* Ms Irmgard Herold; Master's thesis on socio-economic and geographical aspects of energy use
- *Croatia:* Ms Velimir Segon; Postgraduate. PhD in renewable systems/bioenergy
- *United Kingdom:* Ms Giorgia Franco; MSc in renewable energy (Engineering)

The Task produced a brochure in FAQ form intended for a wide audience. 'Techno-eco-socio-economic' mix is seen as an important dimension of this work. The brochure was published in September 2002 and distributed to all ExCo Members, Task Leaders and many other relevant experts, institutions and international bodies and organisations.

The Task also participated in preparation of the position paper 'Sustainable production of woody biomass for energy'. Task 31 prepared an initial draft then discussion at ExCo48 indicated that the impact of such a paper would be greatly enhanced if it reflected the activities of the other three forestry-related Tasks: Task 29: Socio-economic Aspects of Bioenergy Systems; Task 30: Short Rotation Crops for Bioenergy Systems and Task 38: Greenhouse Gas Balances of Biomass and Bioenergy Systems. It was therefore agreed at ExCo49 that the position paper 'Sustainable production of woody biomass for energy' would be substantially revised by Peter Hall, the Task 31 Operating Agent, following input at and after the ExCo meeting. Task 29 actively participated in this activity and provided input related to the socio-economic dimension.

Collaboration with Other Tasks/Networking

During 2002 the Task collaborated closely with Task 31 and Task 38. The co-operation with FAO has progressed and both organisations are now investigating more detailed collaboration based on joint reports, organisating events and launching joint projects.

The following external experts participated and made presentations at the final Task workshop in Croatia:

- Miguel Trossero, FAO, Rome 'Socio-economic aspects of wood energy systems in developing countries: A focus on employment';
- Jorn Lileng, Norway 'WOODENMAN-joint project';
- Elizabeth M. Remedio, Philippines 'Woodfuel use, production, distribution and trade among Southeast Asian countries: The case study of Cebu province, Philippines';
- Andreas Grübl, Austria 'EBEX – The European Biofuel Exhange'.

The Task is linked to a European Commission SAVE II initiative which has establised a cluster of three local energy management agencies in the United Kingdom, Spain and Bulgaria.

The Task is also linked to a European 'Biomass Cogeneration Network' which was established to examine the prospects for hybrid biomass and green waste CHP energy facilities. Again, the focus is on the community level and the socio-economic benefits. Countries (organisations) participating in this activity are: Greece (CRES), UK (TV Energy and Wycombe District Council), France (European Technical Institute for Wood Energy), Sweden (Swedish University of Agricultural Sciences), Austria (Joanneum Research Institute) and Finland (VTT Energy).

Website

The website for Task 29 (www.iea-bioenergy-task29.hr), which was created at the beginning of the Task period, has been further extended and updated.

Deliverables

The deliverables from the Task in 2002 included a Task brochure (see Fig 1), minutes of two Task meetings/business sessions, two progress reports and an annual audit report to the Executive Committee, a workshop proceedings and a large selection of papers presented during 2002 at international workshops, conferences and seminars.

The Task 29 visual identity has been constantly developed. The second in the series of Task posters has been designated and made available to Task participants and others interested. The poster contains general information about Task 29 and selected results as well as details of the work programme (see Fig 2).

Figure 1: Task 29 brochure

Figure 2: Task 29 poster

Task 30: Short Rotation Crops for Bioenergy Systems

Overview of the Task

The objective of Task 30 is to acquire, synthesise and transfer theoretical and practical knowledge of sustainable short rotation biomass production systems and thereby to enhance market development and large-scale implementation in collaboration with the various sectors involved. The Task also aims to improve the awareness of biomass production potential and to promote the use of biomass for energy in participating countries.

The Task is confined to short rotation crops that entirely or by means of residuals may provide biomass to the energy market, and comprises lignocellulosic crops in farming systems and plantation forests grown on short rotations. The latter category includes coppice systems, and also fast-growing single-stem plantations (rotation period 6-12 years). These short rotation systems usually employ willow, hybrid poplar and *Eucalyptus* species and produce large quantities of biomass suitable for energy purposes. In many instances, they form an important component of nutrient cycling and thus may play an important role in environmental management. Pest and disease problems associated with short rotation crop systems and ways to mitigate them are an integral part of the work of the Task.

A major focus is the integration of production and environmental functions of short rotation biomass production. Consequently a range of topics, from economic viability to system sustainability, are represented as high priority areas in the work programme of the Task.

Participating countries: Australia, Brazil, Canada, Croatia, Denmark, New Zealand, Sweden, United Kingdom and USA
Task Leader: Professor Theo Verwijst, Department of Short Rotation Forestry, Swedish University of Agricultural Sciences, Sweden
Operating Agent: Dr Bjorn Telenius, Swedish National Energy Administration, Sweden

The Task Leader directs and manages the work programme assisted by an international team from USA, New Zealand and Sweden. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 30, please refer to Appendices 2-5 inclusive; the Task website www.shortrotationcrops.com and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings

The first Task meeting was held in conjunction with the 'International Poplar Symposium III: Basic and Applied Willow Biology' on 26-29 August in Uppsala, Sweden - see www.conference.slu.se/ips3. Task 30 Members also took the opportunity to promote IEA

Bioenergy at this conference. The Task was responsible for part of the session on 'physiology' for the session on 'environmental applications' and for the excursion program, which focused on a municipal CHP plant in Enköping, exclusively fed by regional biofuels.

An international workshop 'Sustainable Bioenergy Production Systems: Environmental, Operational and Social Implications' was held on 28 October-1 November in Belo Horizonte, Brazil in co-operation with Task 31. This meeting focussed on short rotation forestry with *Eucalyptus spp.* and also the role and potential of the sugar cane industry for energy provision.

Work Programme

During the Task 30 meeting in Brazil, it was decided to rearrange the 'high priority areas', resulting in the following list of topics:

- Sustainable SRC-Systems: Biomass production and technical aspects
- Sustainable SRC-Systems: Environmental and economic externalities
- Full-scale implementation of SRC-systems: Assessment of technical and non-technical barriers
- The use of Policy instruments - incentives, regulations, legislation to boost bioenergy, and assessment of their effectiveness
- Systematic SRC-knowledge transfer: development of web-based communication, compilation and dispersal of SRC-knowledge

The above list is compatible with the original working plan and in agreement with the viewpoints as expressed during the 2001 Task meeting in Denmark.

As seen from the high priority areas above, political issues and integration of several production functions comprise a major focus of the Task. Also integration of production functions with environmental ones is being investigated in several studies.

Newsletter

The first Task 30 Newsletter (see www.shortrotationcrops.com) was published in April 2002.

Website

Activities were undertaken to obtain wider Task 30 exposure by means of web-based activities. For ongoing updates see www.shortrotationcrops.com

Collaboration with Other Tasks/Networking

The co-operation between Task 30 and Task 31, initiated in August 2001, has been intensified and resulted in the international workshop 'Sustainable Bioenergy Production Systems: Environmental, Operational and Social implications', Belo Horizonte, Brazil.

Working contacts have been established between Task 30 and the IUFRO-Groups 'Short Rotation Forestry' (1.09.00) and 'Poplars and Willows' (2.08.04). The co-operation

between Task 30 and the IUFRO 'Poplars and Willows' has led to a substantial IEA-impact on the 'International Poplar Symposium III, on Basic and Applied Willow Biology', 26-29 August, Uppsala, Sweden, (www-conference.slu.se/ips3).

Contacts with the International Poplar Commission (FAO) and FAO Wood Energy Programme have been exploited together with Task 31. This lead to an FAO-contribution at the Belo Horizonte workshop. The Leaders of Tasks 30 and 31 have had preliminary discussions with FAO representatives in Rome on the possibility for including bioenergy statistics in the framework of FAO's Global Forest Resources Assessment.

Task 30, in co-operation with Task 31, also organised a meeting on 19 December in Thurles, Ireland to promote IEA Bioenergy in general and to obtain an overview of biomass production activities in Ireland.

Further co-operation between Task 30, the above-mentioned organisations, and some other organisations will be exploited wherever possible.

Task 31: Conventional Forestry Systems for Sustainable Production of Bioenergy

Overview of the Task

The objective of Task 31 is to synthesize and transfer to stakeholders important knowledge and new technical information concerning conventional forestry systems for sustainable production of bioenergy.

The Task encompasses natural forestry systems and single-stem plantation systems, which can provide a source of biomass for energy. The scope is worldwide, including boreal, temperate, sub-tropical and tropical forest regions. The work includes sharing of research results, stimulation of new research directions in national programs of participating countries and technology transfer from science to resource managers, planners and industry. The emphasis is on an integrated approach to biological, economic, environmental and social components of forestry systems. Multidisciplinary partnerships of key stakeholders in forest biomass production research, planning and operations are fostered.

The primary end users of Task outputs are forest managers, researchers and bioenergy planners, but these outputs will also be useful to policy makers, NGOs and the interested public.

Participating countries: Australia, Belgium, Canada, Denmark, Finland, New Zealand, Norway, Sweden, United Kingdom and USA
Task Leader: Mr Jim Richardson, J Richardson Consulting, Canada
Operating Agent: Dr Peter Hall, Canadian Forest Service, Canada

The Task Leader directs and manages the work programme assisted by an international team from Canada, New Zealand, Sweden and the United States. A National Team Leader from each country is responsible for coordinating the national participation in the Task. The national teams comprise an extensive group of scientific and technical collaborators.

For further details on Task 31, please refer to Appendices 2-5 inclusive and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Workshops

The second annual workshop was held jointly with Task 30 on 28 October-1 November in Belo Horizonte, Brazil. The Brazilian Society for Forest Research (SIF) provided the local organization for this event. The theme of the workshop was 'Sustainable Bioenergy Production Systems: Environmental, Operational and Social Implications' which was considered over five technical program sessions to which a total of 37 invited and volunteer papers and posters were contributed. The overall workshop program included pre- and post-workshop study tours in São Paulo State (sugar cane and ethanol production) and Espirito Santo State (*Eucalyptus* plantations). During the workshop week, a field tour was offered to visit *Eucalyptus* plantations, charcoal and tar production at the V&M company near Belo Horizonte. A day-long Bioenergy Seminar complemented the workshop activities. In all, there were 110 participants from 15 different countries. The local organizers were successful in attracting considerable support from sponsors and six Brazilian companies and organizations involved in energy, forestry, nature conservation and science and technology mounted exhibit booths at the workshop.

The overall outcome was a very successful workshop and an enhanced profile for IEA Bioenergy in Brazil. Agreement in principle has been reached to publish the proceedings of the workshop in Brazil in a special issue of the journal Biomass and Bioenergy. About half of the papers presented are under review for that publication.

Communications and Promotion

Communication of the goals, activities and outputs of the Task is a vital element of the promotional work of the Task. A strong presence for the Task has been established on the Internet, through the IEA Bioenergy website, and is being actively maintained. Most Task informational materials are available through this site, including workshop announcements. Plans have been made to greatly enhance the extent and depth of Task information available on the Internet, including a much more complete coverage of publications of the present Task and related Tasks and activities.

This is the first step towards the development of an electronic information system (EIS) to which will be added other Task resources such as photos, data and presentations, and links to other web-based information sources. The system will be gradually developed further, and will eventually draw on the considerable volume of valuable scientific and technical information synthesized in the printed medium of the Task's recently-published

book, as well as incorporating practical illustrations and examples from participating countries in interactive form. It will provide an innovative tool for education, training and improved technology transfer to interested stakeholders. The electronic information system will be established as a separate website.

The development of an EIS was advanced considerably through a planning workshop held in June in Växjö, Sweden. The Task Leadership team met with several National Team Leaders, information technology experts, and potential clients of the EIS to reach consensus on the objectives, scope and organization of the project. A schedule was developed which will see the delivery of a prototype system on the Internet by the end of the present Task, but the full realization of the vision for the EIS will take longer to achieve and will require resources beyond the normal budget of IEA Bioenergy Tasks. Other potential sources of funding are being explored. Interest in the EIS has been expressed by several other biomass-production-oriented Tasks with whom close collaboration is expected.

The series of Industry Days initiated under Task 18, is being continued. The concept is designed to take advantage of the presence of international experts who have participated in a Task workshop, by having them meet with regional persons with an interest in bioenergy to share issues and ideas. A successful event was held in June in Gembloux, Belgium. About 40 participants mainly from industry and government in the Wallonia region of Belgium took part in the presentations and discussion of this bioenergy seminar. Within the context of the joint Task 30/31 workshop in Belo Horizonte, Brazil, a very successful Bioenergy Seminar with over 100 participants was held aimed at information sharing and technology transfer between Brazilian and international participants. A total of 14 oral presentations were made, including an opening address given by the ExCo Member for Brazil on behalf of the Secretary of the Brazilian Ministry of Mines and Energy.

In an effort to determine the level of interest in Ireland in biomass production for energy and to share information about IEA Bioenergy and its production-oriented Tasks, a one-day seminar was arranged jointly by Task 30 and Task 31 at the Tipperary Institute in December in Thurles, Ireland. There were 12 invited participants, including the Leaders of both Tasks. Considerable interest in IEA Bioenergy was expressed. A similar number of participants was involved in a half-day seminar on biomass production for energy given by the same two Task Leaders at FAO Headquarters in Rome in September.

Collaboration with Other Tasks

Several other current IEA Bioenergy Tasks (e.g. Task 30) have objectives and interests that are complementary to those of Task 31. Strong links are maintained with these Tasks through sharing of information and, where possible, joint workshops.

A representative of Task 38 'Greenhouse Gas Balances of Bioenergy Systems' participated in the workshop held on June in Sweden to develop plans for an electronic information system. The 'Country Report' system of Task 38 may be linked to the planned Task 31 system. The Leaders of both Task 29 'Socio-economic Aspects of Bioenergy Systems' and Task 30 have expressed interest in collaborating on development of an electronic information system. The leader of Task 29 also participated actively in the joint Task 30/31 workshop in Brazil. An Associate Task Leader of Task 31 participated in a

workshop of Task 29 in Croatia in September and presented a paper.

Opportunities for collaboration and co-operation with other international researchers, organizations and activities, including IUFRO and FAO, are also pursued, particularly those involved in issues of sustainability of forest ecosystems.

Deliverables/Synthesis Publication

The proceedings of the first annual workshop of Task 31, which was held in September 2001 in Garderen, The Netherlands are being published as a special issue of the journal Biomass and Bioenergy. The publication includes 17 invited and volunteer papers on the theme of 'Principles and practice of forestry and bioenergy in densely-populated regions'. It is expected to appear in the spring of 2003.

The second and third issues of the Task 31 News series were published and have been distributed with the help of National Team Leaders. This technical newsletter series is intended as a communication vehicle for National Team Leaders to use to help market the Task and its technical output. The first issue was produced in colour with a design inspired by that of the IEA Bioenergy Newsletter.

One of the primary Task outputs is a publication that synthesizes available ecological, physical, operational, social and economic information, and identifies gaps in knowledge related to sustainable biomass production and harvesting systems. The book is organized around the criteria for sustainable forest management: productivity, environment, social, economic, and legal and institutional framework. It emphasizes guiding principles and state-of-the-art knowledge in a concise and distilled form, rather than trying to provide a detailed ‘how-to’ handbook covering every possible situation. The scale of resolution for the information is primarily at the ‘forest region’ level. The basic philosophy is to provide information or interpretations on generalisable principles that span forest regions, such as effects of management on soil carbon. The primary audience for the publication is forest resource managers and planners to enable them to evaluate the ability of specific forest regions to sustainably meet bioenergy production demands.

This book, titled 'Bioenergy from Sustainable Forestry: Guiding Principles and Practices', was published by Kluwer Academic Publishers in The Netherlands in June 2002. With a team of more than 25 authors and contributors who prepared individual sections of the eight chapters of the book, and 17 peer reviewers, the publication process has been complex, taking more than three years to complete. The Task has purchased 400 copies of the book, which are being distributed primarily through its National Team Leaders. Order forms for the book were distributed at the European Biomass Conference in Amsterdam in June and the World Renewable Energy Congress in Cologne in July, as well as at other related meetings and events.

Task 32: Biomass Combustion and Co-firing

Overview of the Task

The objective of Task 32 is to stimulate the expansion of the use of biomass combustion and co-firing for the production of heat and power on a wider scale. There is special emphasis on small and medium-scale CHP plants and co-firing biomass with coal in traditional coal-fired boilers. The objective will be reached by generating and disseminating information on technical and non-technical barriers and solutions.

Technical issues to be addressed in Task 32 include:

- *co-firing:* ash deposition, ash utilisation, NO_x, corrosion, char combustion, pre-processing of biomass, resource assessment;
- *combustion:* ash utilisation, aerosol formation, NO_x.

Non-technical issues to be addressed include the keys to successful projects, logistics and contracting, environmental constraints and legislation, acceptance by the public and financial incentives.

Significant factors in Task 32 are industrial participation, the interaction with other IEA activities (such as IEA Clean Combustion Sciences) and the interaction with the European Union. Enhancement of industrial participation is achieved by formulating joint projects between participating Members and industry.

The emphasis of the activities in the Task is therefore on 'market introduction' for expanding the use of biomass combustion in the short term and 'optimisation of biomass combustion technology' to remain competitive in the longer term.

Worldwide, combustion already provides over 90% of the energy generated from biomass. The main benefits of combustion compared to other thermochemical conversion technologies (i.e. gasification, pyrolysis, liquefaction) is that combustion technologies are commercially available and can be integrated with existing infrastructure on both large and small-scale levels. For further implementation of biomass combustion, combustion technology should nevertheless be optimised to keep it competitive as gasification and pyrolysis develop. Co-firing biomass with coal in traditional coal-fired boilers represents one combination of renewable and fossil energy utilisation that derives the greatest benefit from both fuel types.

Participating countries: Australia, Austria, Belgium, Canada, Denmark, Finland, The Netherlands, Norway, New Zealand, Sweden, Switzerland, United Kingdom, USA and the European Commission.
Task Leader: Mr Sjaak van Loo, TNO-MEP, The Netherlands.
Operating Agent: Mr Erik Wissema, Ministry of Economic Affairs, The Netherlands

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 32, please refer to Appendices 2-5 inclusive; the Task website www.ieabioenergy-task32.com and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Task Meetings and Workshops

The first Task meeting in 2002 was held on 19-20 June in Amsterdam, The Netherlands. This coincided with the 12th European Conference & Technology Exhibition on Biomass for Energy, Industry and Climate Protection. Main topics at this meeting were the publication and follow-up of the handbook on combustion and co-firing, progress in other Task activities and country presentations. Task 32 also organised a seminar on co-firing biomass in coal power plants, as part of the main conference. This was in conjunction with Task 33 (biomass gasification) and the European Bioenergy Networks (EUBIONET). The report of this well attended seminar was distributed widely.

The second Task meeting, planned to be held in New Zealand in autumn 2002 was cancelled by the hosts due to financial constraints. During the Amsterdam Task meeting, it was concluded that the current time span between meetings (six months on average) was relatively short, and resulted in relatively little progress to discuss and high costs of participation for Member Countries. It was therefore agreed to hold the next meeting early in 2003.

Work Programme

The work programme of Task 32 is based on a prioritisation of national activities. This is agreed at the start of the triennium. Task participants identified small and medium-scale CHP systems as well as co-firing coal with biomass and related wastes as the most important topics.

- *Small and medium-scale CHP*
  In most Member Countries the potential market for small-scale biomass fuelled co-generation systems is large because of the local availability of biomass and a substantial application potential in buildings, small industries and horticulture. The advantages of small-scale systems over large-scale systems are the lower costs for fuel transport and the potentially better overall efficiencies because of the local use of heat generated. Task 32 focuses on: economic performance; environmental acceptability; alternative and difficult-to-burn feedstock and innovative combustion technologies.

  In this topic area most of the Task work involves collation and dissemination of information. An important means of disseminating information is through the publication of a handbook on combustion and co-firing. Other specific activities that were initiated and partially funded by Task 32 are:
  - a seminar on aerosol emissions from biomass combustion (already implemented by Switzerland);
  - an internet database on biomass fuel and ash composition from installations in practice (already implemented, by Austria and The Netherlands);
  - an international overview of current CHP installations (ongoing, by Austria);
  - an energetic assessment of energy systems with biomass combustion (ongoing, by Switzerland);
  - determination of efficiency for automatic biomass combustion plants and comparison of efficiency and emissions for different operation modes (ongoing, by Switzerland and Belgium).

- *Co-firing coal with biomass and related wastes*
  Co-firing biomass with coal is attracting rapidly increasing attention as it capitalises on the large investment and infrastructure associated with existing fossil fuel-based power systems. It requires only a relatively modest investment to include a fraction of biomass in the fuel. When proper choices of biomass, coal, boiler design, and boiler operation are made, traditional pollutants (SO_x, NO_x, etc.) and net greenhouse gas (CO_2, CH_4, etc.) emissions decrease. Ancillary benefits include increased use of local resources for power, decreased demand for disposal of residues and more effective use of resources. These advantages can be realised in the very near future with very low technical risk. However, improper choices of fuels, boiler design, or operating conditions can minimise or even negate many of the advantages of burning biomass with coal and may, in some cases, lead to significant damage to equipment.

  Stimulation of large-scale implementation of biomass combustion and co-firing can only be efficient if relevant knowledge is available. The focus of the activities is therefore on gathering and dissemination of relevant expertise.

  The following items have been selected in Task 32 to be of importance in research, development and demonstration in this field: fuel characteristics and resource assessment; fuel preparation and handling; pollutant emissions; ash deposition; carbon conversion; chlorine-based corrosion and fly ash utilisation.

  Task 32 restricts its activities to co-combustion of biomass or biomass derived products such as producer gas, pyrolysis oil or charcoal in existing coal-fired boilers. Non-technical issues that also receive attention are related to emissions, emission guidelines, economics, financial incentives, logistics and public acceptance.

  With respect to smaller dedicated biomass combustion systems, participants have initiated specific activities on co-firing issues, often with financial support from the Task Leader. These include:
  - global overview of co-firing initiatives (ongoing, coordinated by The Netherlands);
  - a joint seminar on co-firing with Task 33 and EUBIONET (June 2002, by The Netherlands);
  - a seminar on waste wood combustion (autumn 2003, by Sweden);
  - formation of striated flows during biomass/coal co-firing (ongoing, by USA);
  - biomass Impacts on SCR catalyst performance (ongoing, by USA).

In 2002 the following progress was achieved with the Task work programme:

- *Ash related problems during combustion (USA)*
  At the second Task meeting of Task 32, new insights in the effects on corrosion of striated gas flows through a coal utility boiler were shared and discussed amongst the Member Countries.

- *Ash handling and disposal (Austria)*
  The database with composition data of fuel and ash from actual biomass combustion installations has been updated with additional data.

- *Modelling (The Netherlands)*
  A project has been initiated on modeling striated flows in coal utility boilers.
  A physical model calculating the combustion conditions of a given fuel was prepared by Norway and published on the Task's website.

- *Aerosol emissions (Switzerland)*
  In 2001 a dedicated international seminar was already organised on this topic by Switzerland. The report of this seminar was distributed widely. In addition, a statement has been made and distributed on the need for reduction of aerosol emissions from biomass combustion installations.

- *CHP (Austria)*
  An overview of the performance and experiences with CHP systems is currently under preparation by Austria. The progress of this activity was presented at the second Task meeting in Amsterdam.

- *Co-firing (USA)*
  A seminar was organised on co-firing biomass with coal by Task 32 with inputs from Task 33 and EUBIONET. Three projects were initiated on co-firing:
  - an international overview of installations (by TNO);
  - formation of striated flows during biomass/coal co-firing (by USA);
  - biomass impacts on SCR catalyst performance (by USA).

Collaboration with Other Tasks/Networking

The programme of Task 32 is closely related to those of other IEA Bioenergy Tasks, especially to activities in the field of biomass gasification (Task 33) and techno-economic analysis (Task 35). In the area of biomass co-combustion, interaction between IEA Bioenergy and IEA Coal Research is further intensified by collaboration with the Coal Combustion Science group of IEA Coal Research. The exchange of minutes of meetings, reports and mutual meetings stimulate coordination of the activities and information exchange.

Deliverables

A major output from the Task was the 'Handbook of Biomass Combustion and Co-firing'. This was published in time to be distributed at the 12th European Conferences & Technology Exhibition on Biomass for Energy, Industry and Climate Protection in June. The book has received very positive comments and it is expected that the first edition will be sold out by spring 2003.

Other deliverables in 2002 included: organisation and minuting of one Task meeting; organisation and reporting on a seminar on biomass co-firing with coal; reporting to the ExCo; facilitating of seven projects and maintenance of Task internet site with biomass fuel and ash database.

The meeting reports are available on the Task's website www.ieabioenergy-task32.com.

Task 33: Thermal Gasification of Biomass

Overview of the Task

The objectives of Task 33 are to review and exchange information on biomass gasification research, development, and demonstration (RD&D), seek continuing involvement with bioenergy industries and to promote co-operation among the participating countries to eliminate technological impediments to commercialisation of thermal gasification of biomass. The ultimate objective is to promote commercialisation of efficient, economical, and environmentally preferable biomass gasification processes, for the production of electricity, heat, and steam, for the production of synthesis gas for subsequent conversion to chemicals, fertilisers, hydrogen and transportation fuels, and also for co-production of these products.

Participating countries: Austria, Denmark, Finland, Italy, The Netherlands, Sweden, Switzerland, United Kingdom, USA and the European Commission
Task Leader: Dr Suresh P. Babu, Gas Technology Institute, USA
Operating Agent: Dr Raymond Costello, US Department of Energy, USA

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 33, please refer to Appendices 2-5 inclusive and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings and Workshops

The first Task meeting for 2002 was held on 19 June, during the 12th European Biomass Conference in Amsterdam, The Netherlands. During this conference, workshops on three important biomass gasification related topics, namely, Tar Measurement Protocol, Community/Modular Biomass Gasification Systems for On-site Power, and Synthesis Gas and Hydrogen from Biomass, were organised and presented. The Task also assisted Task 32: Biomass Combustion and Co-firing, to organise and conduct a workshop on Biomass Co-firing.

The second Task Meeting was conducted jointly with European GasNet, on 2-3 October in Strasbourg, France.

Work Scope, Approach and Industrial Involvement

The scope of work in Task 33 for the current triennium is built upon the progress made in the past. In previous years, information exchange, selected subtask studies, coordinated RD&D among participating countries, selected plant visits, and industrial involvement at Task meetings have been very effective in:

- evaluating the state-of-the-art of biomass gasification RD&D and to understand the technical and non-technical hurdles to technology commercialisation

- forming strategic partnerships with participating Member Countries and industries to initiate new RD&D projects
- advising government agencies on matters pertinent to national bioenergy initiatives
- undertaking appropriate joint efforts with other IEA Bioenergy Tasks to investigate technologies and technical issues of mutual interest

Consequently, these remain as the basic foundations on which to develop and implement the work programme for the current triennium.

The Task activities for the current triennium continue to focus on identifying and evaluating both gasification technologies and related unit operations and processes that are ready for commercial applications. The Task meetings provide a forum to discuss the technological advances and issues critical to process scale-up, demonstration, and commercial implementation of biomass gasification processes. Generally, these discussions provide the basis for selection of subtask studies and assignment of responsibilities to participating national experts. The selected subtask studies for the current triennium (2001-2003) and coordinators are listed below:

- *Moving-bed Gasification, Gas Cleanup, and Power Generation Systems - H. Knoef, BTG, The Netherlands*
- *Circulating Fluidized Bed (CFB) and Fluidized Bed (FB) Gasification, Gas Cleaning, and Fuel Gas Utilization Systems - E. Kurkela and P. Simell, VTT, Finland*
- *Process Waste Water, Ash, Emissions Regulations, Permitting, Toxicology and Environmental Issues - H. Christiansen, DEA and M. Fock, DK Technik, Denmark*
- *Biomass Gasification to produce H_2 and H_2-rich gas - R.L. Bain, NREL, USA*
- *Biomass Gasification to produce Synthesis Gas for Fuel Cells, Liquid Fuels and Chemicals - R. Rauch, TUV, Austria*
- *Tar Measurement Protocol - J. Neeft, ECN, The Netherlands*
- *Review and Update the Status of Energy Conversion Devices Fuelled Biomass Gasification Products - E. Scoditti, ENEA, Italy*
- *Fuel Gas Co-firing - R. Meijer, KEMA, The Netherlands*
- *Energy from Integrated Solid Waste Management Systems - N. Barker, AEAT, UK*
- *Legislation on Technical Issues, Emission and Effluent Limits, and Safety - R. Buehler, Energy und Umwelt, Switzerland*
- *Country Reports - K. Kwant, NOVEM, The Netherlands*

In the past, the practice of conducting subtask studies and submitting final reports have put undue pressure on the subtask coordinators to complete the reports on time. Therefore, it was decided at the Spring 2001 Task meeting in Dresden, to prepare and maintain the proposed subtask studies in the form of a Technology Brief, which would be about two to four pages long. Given the fact that the Participating National Experts have been working as a cohesive group for several years with fairly extensive knowledge and expertise in biomass gasification, it should be possible to prepare and maintain these Technology Briefs, fully updated within the available time and resources. The Technology Briefs are posted on the IEA Bioenergy, Task 33, Thermal Gasification of Biomass website http://www.gastechnology.org/pub/iea/

The Task has continued the practice of inviting industrial experts to the Task meetings to introduce their technologies related to biomass gasification, and to provide an opportunity for the participants to discuss and identify possible refinements that should be made to these technologies and to advance the state-of-the-art of biomass

gasification technology. In addition to conducting the semi-annual Task meetings, other Task deliverables include conducting focused seminars, workshops, and round table discussions on critical technical topics, involving industrial experts and representatives from universities, and the preparation and distribution of topical reports resulting from selected subtask studies.

Collaboration with Other Tasks/Networking

The programme of Task 33 is closely related to other IEA Bioenergy Tasks, especially Tasks 32 and 36. The Task is also actively collaborating with other Implementing Agreements and organisations. The subtask studies on Moving-bed Gasification, Gas Cleanup and Power Generation Systems and Legislation on Technical Issues are conducted jointly with European GasNet; the subtask studies on Biomass Gasification to produce H_2 and H_2-rich gas and Biomass Gasification to produce Synthesis Gas for Fuel Cells, Liquid Fuels and Chemicals are joint with the Implementing Agreement on Hydrogen Production and Utilisation (Task 16: Hydrogen from Carbon-Containing Materials); the subtask on Fuel Gas Co-firing is joint with Task 32; and the subtask on Energy from Integrated Solid Waste Management Systems is joint with Task 36.

Deliverables

The deliverables for the Task in 2002 included: two progress reports to the ExCo; audited financial reports as required by the ExCo; technology briefs and technical reports as detailed in Appendix 3. These deliverables are posted on the Task website at: http://www.gastechnology.org/pub/iea/, which includes other pertinent recent publications, and selected past activity reports.

Task 34: Pyrolysis of Biomass

Overview of the Task

The objective of Task 34 is to resolve technical issues and barriers which impede commercial implementation of fast Pyrolysis. The focus is on:

- dedicated and focused regular meetings centered on Technical Subject Groups that will advance the state-of-the-art through critical review of each Technical Topic and commissioning of specialist material;
- collation and dissemination of relevant information through the regular PyNe newsletter, the PyNe website and direct contact between Task Members and invited guests through a planned programme of meetings, workshops and conferences.

The main difference in this Task compared to the previous Task 21 is that greater attention is paid to market developments of the technology and resolutions of issues that inhibit this development. This Task started in January 2001 and will finish in December 2003.

By agreement between the European Commission (EC) and IEA Bioenergy, the Task is integrated with a EC Pyrolysis Network that started in June 2001 and will finish in May 2004. These two networks together form PyNe. The different starting dates of the networks meant that no official work could be started until the EC contract was let on 1 June 2001. This particular collaboration was established in 1998 and has proved to be very successful in integrating the EC and IEA Bioenergy activities and providing more extensive opportunities for interaction between Europe and the USA.

The EC-sponsored Thematic Network that forms the contribution of the EC to the Task is itself made up of two complementary Networks – PyNe that covers Pyrolysis and GasNet that covers Gasification – and together these are known as ThermoNet. One important feature of this combined Network is the opportunities to create joint activities that can benefit from the knowledge and expertise in both networks, particularly where norms and standards and common methodologies are concerned. In addition to the PyNe specific topics, there will also be a contribution to Joint Topics, all of which were defined and agreed at the kick-off meeting in Helsinki in June 2001.

In addition to the EC-sponsored ThermoNet, a further contract has also been recently agreed from the Altener programme in which all the EC PyNe members will contribute to an economic and market assessment of the opportunities for pyrolysis liquid.

The relationship between all these networks is shown in Figure 1 below.

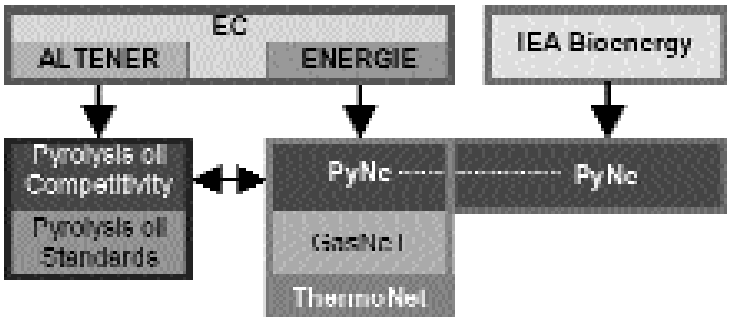

Figure 1: Relationship between IEA Bioenergy and EC Tasks, Networks and Contracts

Participating countries: Norway, USA and the European Commission
Task Leader: Professor Tony Bridgwater, Aston University, United Kingdom
Operating Agent: Dr Kyriakos Maniatis, European Commission, Belgium

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 34, please refer to Appendices 2-5 inclusive; the Task website www.pyne.co.uk and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Task Meetings and Workshops

The second Task meeting was held on 29 June-2 July in Graz, Austria as a joint meeting between PyNe and its European gasification counterpart, GasNet.

The third Task meeting was held in September in Haguenot, France, immediately before the Strasbourg workshop. Details of this expert meeting are provided below.

A major international workshop titled 'The future for biomass pyrolysis and gasification: status, opportunities and policies for Europe' was held on 29 September-1 October in Strasbourg, France. The purpose of the meeting was to review the achievements to date in the fields of biomass pyrolysis and gasification and to explore the ways in which the European Commission could encourage the implementation and penetration of these technologies. The meeting provided a timely and authoritative review of the status of the technologies and particularly addressed the concerns over the rate and extent of implementation and penetration of the thermal biomass conversion processes of pyrolysis and gasification.

There were formal presentations by invited speakers as well as experts in the field, workshops and discussions. The workshops were arranged to address topical problems under the chairmanship of an expert in the area, with a particular focus on definition of policies for encouragement, implementation and penetration of these important technologies. The workshop topics were: Technical Barriers – Gasification; Technical Barriers – Pyrolysis; Technical Barriers – Waste; Syngas for Synfuels; Power production by engines, turbines and fuel cells and Economics.

In total over 150 people attended this expert meeting representing 24 countries. These included participation from most of Europe as well as North America, Japan, Australia and Malaysia. A proceedings including recommendations for policies is currently in preparation and will be published as a book which will be available for purchase to disseminate information and results as widely as possible.

Work Programme

The technical contributions of the Task were agreed at the kick-off meeting in 2001 and developed since then to form the structure shown in Figure 2 on next page. Groups have been established under the leadership of a Topic Leader drawn from the participating countries.

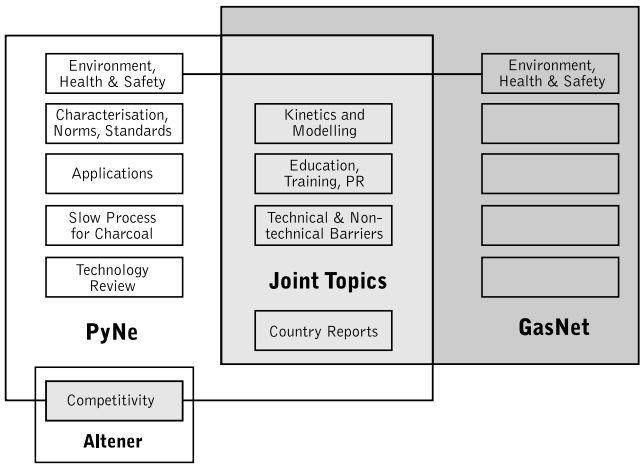

Figure 2: Structure of the Task 34 Work Programme

The objectives of each Topic Area include:

- a comprehensive review of the specialist area;
- identification of technical and non-technical barriers;
- provision of expert overviews for publication as required;
- recommendations for norms and standards, procedures and protocols;
- production of at least one report for distribution and publication.

Details on each Topic Area are shown below.

- *Applications for bio-oil, Leader: S. Czernik*
  The objectives are to review current applications for fast pyrolysis liquids and to define research needs to enhance and develop the use of bio-oil. The scope includes the application of bio-oil as liquid fuel for boilers, engines and turbines, e.g. performance, emissions; the potential of bio-oil as a transport fuel, e.g. upgrading, blending; and bio-oil as a source of chemicals, e.g. liquid smoke, adhesives, fertilizers, bio-lime, fine chemicals.

- *Characterisation, analysis, norms and standards, Leaders: D. Meier and A. Oasmaa*
  This Topic follows on from the concurrent Altener project which finished at the end of 2002. The objectives are to review and update physical and chemical methods; review and update properties of oils from demonstration plants and to formulate recommendations for specifications and classification of bio-oils. The scope includes methods for testing and analysis.

- *Environment, health and safety aspects of bio-oil, Leader: P. Girard*
  The objectives are to improve knowledge on environment, health and safety concerns at three levels: regulations; process emissions; and bio-oil toxicity. The scope includes collecting and reviewing data and information and carrying out toxicity tests.

- *Slow pyrolysis for charcoal, Leader: M. Gronli*
  The objectives are to provide industry, researchers and decision makers a state-of-the-art review of technologies for slow pyrolysis; and to identify the need for technology development and new exploitation of charcoal. The scope includes feedstock – native wood, agro residues and solid-recovered biofuels.

- *Joint Topic – Technical and non-technical barriers, Leader: W. Prins*
  The objectives are to identify and monitor barriers; assess routes for solution; and to remove the barriers, where possible. The scope includes technical barriers, such as: pyrolysis plant and environment interaction; phase stability; solids in oil – application related; water, mineral content; acidity; odour; noise and emissions; and non-technical barriers, such as: capitalization; requirement for standards; requirement for EHS data; alternatives: wind, solar, ethanol, fossil; feedstock cost and scarcity; public perception and national/local legislation.

- *Joint Topic – Education, training, information and public relations, Leader: J. Arauzo*
  The objectives are to promote the use of thermochemical processes, pyrolysis and gasification as a source of energy; to deliver clear and comprehensive information about processes and installations and to promote courses and exchange of students.

- *Joint Topic – Kinetics and modelling, Leader: C. Di Blasi*
  This is a relatively new Topic and details are not yet finalised.

- *Joint Topic – Environment, health and safety – general aspects, Leader: P. Girard (PyNe)*
  This is a relatively new Topic and details are not yet finalised.

Collaboration with Other Tasks

As the emphasis moves more towards commercial exploitation and implementation, greater interaction with other Tasks has occurred and will continue, particularly with Task 35 'Techno-Economic Assessments for Bioenergy Applications' and Task 39 'Liquid Biofuels'.

Newsletter

The PyNe newsletter, published at six monthly intervals, continues to be an important vehicle for dissemination and is widely distributed within Member Countries. Items are gathered from the Task participants and their contacts as well as the extensive links maintained by the Task Leader including pyrolysis contracts with the European Commission. Two thousand copies of each issue are printed. Much of the information is available on the PyNe website. The 13th issue was published in March 2002 and the 14th issue in September 2002.

Website

The PyNe Website (www.pyne.co.uk) is more easily updated in its new format and forms a basis for more readily advertising meetings and activities.

Deliverables

Progress Reports to the Executive Committee were produced in May for ExCo49 in Vienna, Austria, and August for ExCo50 in Helsinki, Finland.

The minutes from the two Task meetings held during 2002 have been published and distributed.

The Final Report of Task 21 'Fast Pyrolysis of Biomass – A Handbook Volume 2', was produced as the second in the series of hardbound books. It was published in early summer 2002. Copies have been sent to all Members of the Executive Committee and are available for sale from CPL Scientific Press (http://www.cplbookshop.com).

Task 35: Techno-economic Assessments for Bioenergy Applications

Overview of the Task

The objectives of Task 35 are:

- to carry out techno-economic studies on selected bioenergy utilisation routes. These include local, regional and intercontinental schemes, where bio-products are transported over extended distances;
- to identify opportunities for biomass conversion processes, if bioenergy is used as a commodity in international trade in reducing the CO_2 emissions.

The Task has two major parts. The feasibility of international bioenergy trade is being studied through practical examples. Both solid and liquid biofuels can be traded internationally, although today this is only done on a limited scale. Production, transport and utilization of biomass as solid wood, wood chips, pellets or liquid fuels are being compared. A carbon impact analysis is being carried out for selected alternatives in collaboration with Task 38.

Participating countries: Austria, Canada, Finland, The Netherlands, Sweden and USA
Task Leader: Dr Yrjö Solantausta, VTT Processes, Finland
Operating Agent: Professor Kai Sipilä, VTT Processes, Finland

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task. Details of these 'working group members' for the Task are provided in Appendix 4.

For further details on Task 35, please refer to Appendices 2-5 inclusive; the Task website www.vtt.fi/ene/bioenergy and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings and Workshops

The Task was very active in 2002. The second Task meeting was held on 18-19 March at NREL, Golden, USA. Participants in the meeting were Eric Podesser (Austria), David Beckman (Canada), Martijn Wagener, Rob Remmels and Andre Faiij (The Netherlands), Kevin Craig (USA), Yrjö Solantausta (Finland) and Björn Kjellström (Sweden). The detailed work plan for the study of biofuel trade was finalised. Also related activities at NREL were presented to the participants. Details of these presentations are provided in Appendix 3.

The third Task meeting was arranged in connection with the '12th European Conference on Biomass for Energy, Industry and Climate Protection' on 14-17 June at Utrecht, and at the RAI Conference Centre in Amsterdam, The Netherlands. Participants in the meeting were Henrike Bayer (Austria), David Beckman (Canada), Martijn Wagener, Rob Remmels, and Andre Faiij (The Netherlands), Yrjö Solantausta and Paterson McKeough (Finland), and Björn Kjellström (Sweden).

The project meeting was connected to two workshops organised jointly with Task 38. In the first workshop, both Tasks were presented and collaboration was discussed and agreed. Then another workshop 'Biomass Trade: economic and greenhouse gas considerations (biotrade)' was held in conjunction with the conference. The primary objective was to present and analyse GHG aspects of bioenergy trade. Details of these presentations are provided in Appendix 3.

The fourth Task meeting took place on 11-13 December in Espoo, Finland. Participants in the meeting were Henrike Bayer (Austria), Martijn Wagener, Rob Remmels, Carlo Hamelinck, and Andre Faiij (The Netherlands), Yrjö Solantausta and Paterson McKeough (Finland), and Björn Kjellström (Sweden). The spreadsheet model used in bioenergy chain analysis within the project was presented and reviewed. A study tour in connection to the meeting vested a pyrolysis pilot-plant at the Fortum refinery. In addition, the working group visited a forestry residue collecting site. Both of these items were relevant to the bioenergy chains being studied.

Work Programme – 'bioenergy trade'

Biomass may be used locally, regionally or it may even be transported intercontinentally. Currently, nearly all use is local, and transportation distances for bioenergy are typically restricted to around 100 km. However, in some cases biomass is transported longer distances (up to 500 km) in systems, which may be considered regional. For test purposes biomass has also been transported overseas.

If bioenergy is used as a commodity in international trade for reducing the CO_2 emissions, there will be opportunities to apply biomass conversion methods. Solid biomass is relatively expensive to transport due to its low bulk density. Biomass will also decay during the time required for transport and storage. Both solid wood and wood chips have this drawback. Pellets, ethanol, methanol, Fischer-Tropsch liquids and fast pyrolysis oils are examples of bio-products that may be better suited for long distance transport.

The objective is to evaluate the most economical options in transferring biomass from its source locations to users at the regional, intracontinental and intercontinental locations. A systems analysis (mainly within Task 35) will initially screen several potential utilization schemes, with the objective of more detailed techno-economic evaluations of a few options. This will be followed by a life cycle analysis and carbon impact assessment (primarily within Task 38) for the most economic options.

Input data for a carbon impact assessment for a number of alternatives is being collected. The chains are schematically shown in Figure 1 on next page.

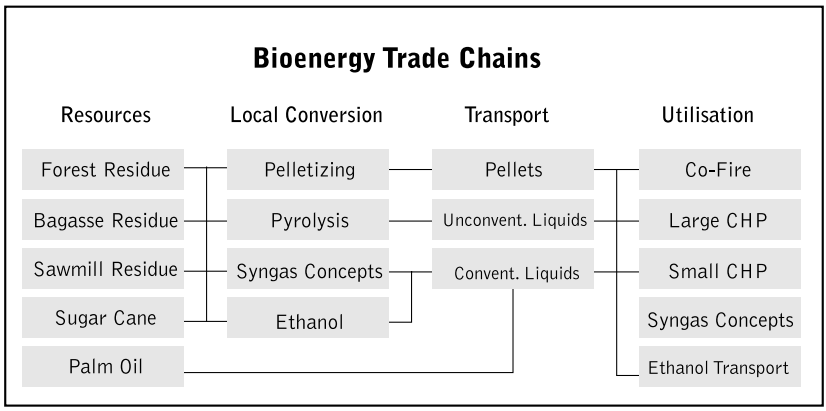

Figure 1: Bioenergy trade chains for analysis.

Several of these bioenergy trade chains will be analysed. The following will be included in the work programme for 2003.

- *Forestry or sawmill residues in Quebec* - truck transport to central site, storage, chipping of forestry residues, crushing of forestry residues, drying, pelletization or pyrolysis at central site (non-integrated production), storage, truck transport to a sea port, storage, ship transport to The Netherlands, storage, utilization either as co-firing at a PC-boiler or at a CHP-plant.

- *Forestry residues in Western Russia* - truck transport to a CHP-plant at lake site, storage, chipping, crushing, drying, pelletization or pyrolysis (production integrated to a CHP-plant), storage, transport by sea-worthy barge to The Netherlands, storage, utilization either as co-firing at a PC-boiler or at a CHP-plant.

- *Forestry residues in Sweden or Finland* - truck transport to a CHP-plant, storage, chipping, crushing, drying, pelletization or pyrolysis (production integrated to a CHP-plant), storage, transport to a sea port, storage, ship transport to The Netherlands, barge transport to utilization site, storage, utilization either as co-firing at a PC-boiler or at a CHP-plant.

- *Forestry residues in Sweden* - truck transport to central site, storage, chipping, ethanol production, storage, transport to a sea port, storage, ship transport to The Netherlands, utilization in the transportation sector.

- *Forestry residues in Austria* - truck transport to a CHP-plant, storage, chipping, crushing, drying, pelletization (production integrated to a CHP-plant), storage, truck transport to a river port, transport by barge to The Netherlands, storage, utilization either as co-firing at a PC-boiler or at a CHP-plant.

- *Sugar cane residues in Brazil* - truck transport to central site, storage, crushing, drying, pelletization (non-integrated production), storage, truck transport to a sea port, storage, ship transport to The Netherlands, barge transport to utilization site, storage, utilization either as co-firing at a PC-boiler or at a CHP-plant.

- *Ethanol production in Brazil (existing plant, GHG-impact of sugar cane feedstock taken into account)* - transport to a sea port, storage, transport to The Netherlands, utilization in the transportation sector.

- *Palm oil production in Asia (existing small plants, GHG-impacts of feedstock taken into account)* - truck transport to a sea port, storage, ship transport to The Netherlands, barge transport to utilization site, storage, utilization as co-firing at a NG-boiler.

- *Palm oil residues in Asia (existing small plants, GHG-impacts of feedstock taken into account)* - truck transport to a sea port, storage, ship transport to The Netherlands, barge transport to utilization site, storage, utilization as co-firing at a PC-boiler or at a CHP-plant.

As an example, the first of the chains listed is presented in Figure 2. Forestry residues from conventional logging is used as feedstock for pellet or pyrolysis oil production in Eastern Canada. The bio-product is transported from a site in Quebec by truck to the port of Montreal. The product is transported by ship to The Netherlands. An intermediate loading may be necessary before transportation to an existing coal-fired power plant located at a waterway to be co-fired.

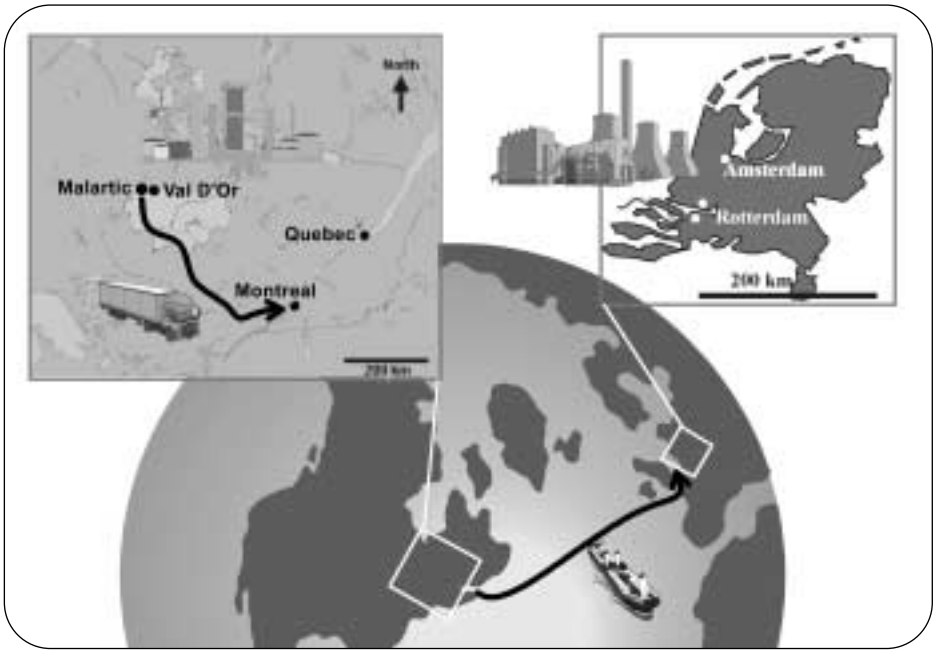

Figure 2: Example of a bioenergy trade chain: forest residues in Quebec.

Collaboration with Other Tasks

Several bioenergy technologies are assessed in the Task so interaction with the appropriate Tasks has been sought.

The two workshops (one within Tasks 35 and 38, and one for a conference audience) with Task 38 have been detailed above. Further collaboration on Life Cycle Analysis has been agreed with Task 38.

Bioenergy trade chains under evaluation in Task 35 have been sent for comment to Task 38: Greenhouse gas balances of biomass and bioenergy systems, Task 33: Thermal gasification of biomass, Task 34: Pyrolysis of biomass and Task 39: Liquid biofuels.

Website

The Task 35 website www.vtt.fi/ene/bioenergy has been active since 2001. It is currently being modified and improved.

Deliverables

The deliverables from the Task will include: a techno-economic comparison of several bioenergy systems, including local, regional and intracontinental utilization schemes as a final report. The established web pages (www.vtt.fi/ene/bioenergy) will be updated. Final reports of previous activities - Task XIII and Task 22 - are available through this website. The joint Task 35/Task 38 workshop presentations are available at www.joanneum.ac.at/iea-bioenergy-task38. Progress and audit reports to the ExCo have also been provided.

Task 36: Energy from Integrated Solid Waste Management Systems

Overview of the Task

The objective of Task 36 is to maintain a network of participating countries as a forum for information exchange and dissemination. The waste and energy sector world-wide is currently undergoing a period of intense legislative and institutional change. Keeping abreast of both policy and technology developments is a prime aim of the Task. The sharing of good practice and/or new technology and techniques is also a major goal. The Task participants have chosen a number of important Topic Areas, which include the application of life-cycle based analysis for determining environmental impacts of waste management and case studies of advanced thermal conversion systems.

Participating countries: Australia, Canada, Finland, France, Japan, The Netherlands, Norway, Sweden, United Kingdom and the European Commission
Task Leader: Dr Niranjan Patel, AEA Technology Environment, United Kingdom
Operating Agent: Mr Gary Shanahan, Department of Trade and Industry, United Kingdom

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task. For further details on Task 36, please refer to Appendices 2-5 inclusive and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Task Meetings and Workshops

Task 36 held two meetings in 2002. The first meeting took place on 7 April in Espoo in Finland alongside a joint VTT/EC DG Tren/IEA Bioenergy/Novem/Tekes/KTM 'Expert Meeting on Power Production from Waste and Biomass IV'. Speakers at the seminar from Task 36 included Kai Sipilä who presented the Finnish Waste to Energy R&D Programme; the Task Leader, Niranjan Patel who made a presentation on the best practicable environmental option (BPEO); Åsa Hagelin spoke on dioxins in Sweden; and an observer to Task 36, Juergen Vehlow from Germany spoke on Bottom Ash and APC Residue Management. The programme for the seminar included site visits to the 50 MWth Circulating Fluidised Bed plant in Lahti (one of the case studies for the waste gasification in fluidised bed systems topic) and a 100 MWth fluidised bed boiler.

The second meeting took place on 4-6 December, in Manly, Australia, alongside the third annual Bioenergy Australia Conference. The theme of the conference was 'Sustainable Energy for Society, the Economy and the Environment'. Task 36 speakers at the conference included the Task Leader, Niranjan Patel who gave a keynote address entitled 'Global Developments in Energy from Waste'; Wilfrid Hesseling from TNO, who gave a review of conversion technologies for wastes; Carl Wilen from VTT who presented on experiences of co-firing waste and biomass. David Granatstein from Canmet in Canada spoke on gasification vs combustion of waste/biomass in fluidised bed combustors and Paul Wootton from Brightstar Environmental gave a presentation on the SWERF Technology. Site visits included Sydney Water Corporation's 497 kW Cronulla Sewage Treatment anaerobic digestor, Energy Development's Lucas Heights 11 MW landfill gas power plant and Brightstar Environmental's SWERF gasification plant near Wollongong.

Work Programme

The Work Programme for Task 36 consists of eight Topics as follows:

- best practicable environmental options for solid waste management;
- waste gasification with ash melting;
- waste gasification in fluidised bed systems;
- small-scale waste conversion systems;
- public perception and acceptance of energy from waste;
- mass balance of heavy metals in waste incinerators and dioxin emissions from incineration – status and effect of the new EU regulations;
- review of waste processing technologies for RDF;
- high efficiency conversion in conventional grate fired systems.

Progress on each Topic is summarised below.

- *Best practicable environmental options for solid waste management*
  Emissions inventory or life-cycle (LCA) based analysis is increasingly applied to decision making on waste management planning. The US Environmental Protection Agency and the UK Environment Agency have invested much effort in developing analytical tools for use by waste management planners. In the latter case, the UK National Strategy for solid waste management includes explicit instructions to local municipalities in the use of LCA analysis in waste planning and in the determination of

the best environmental option (BEO) for waste. The work done so far on this Topic has been to validate the UK model and to analyse the WISARD model by waste stream using the same parameters for each waste stream. The Best Environmental Option for each waste stream can then be identified – results to date have been presented to the Task and work on sensitivity analysis (e.g. transport distances) is currently in progress.

- *Waste gasification with ash melting*
  The aim of this Topic is to review candidate waste gasification systems (at scales up to 100,000 t/y throughput) and produce a status report of their technical and economic performance. An initial survey of technologies has been undertaken identifying in particular those that perform at high efficiency. The next stage is to prepare a questionnaire seeking technical data on pilot and commercial scale developments. Two types of system have been identified as being of interest – those relying on conversion utilising steam turbine and those relying on gas engines. The development of pilot scale systems in Japan (Ebara technology) has also been reviewed.

- *Waste gasification in fluidised bed systems*
  Gasification of solid waste provides a means for cleaner and more efficient electrical generation than conventional waste-to-energy methods. In plants where the produced fuel gas is routed to an existing fossil fuel-fired unit, it allows 'co-firing' without contamination of the marketable ash, while reducing CO_2, NO_x and SO_2 emissions. Three case studies are to be undertaken under this topic, and two of these have been completed: the Lahden Lampovoima Gasification Project, Kymijarvi Power Station in Lahti Finland, and the Biococomb Biomass Gasification Project, Zeltweg Power Station in Austria. Final reports on both case studies have been circulated to Task Members and also to Task 33 Thermal Gasification of Biomass members. The Lahti plant was visited as part of the site visit programme at the meeting of Task 36 in Finland in April 2002. A third case study is to be undertaken on the Greve-in-Chianti plant in Italy.

- *Small-scale Waste Conversion Systems*
  The conventional grate fired mass burn systems for MSW have tended to be built as large as possible in order to benefit from the inherent economies of scale. In urban locations, which is where most of the waste is, this has been seen as an appropriate strategy for conversion of MSW. In rural or semi-rural locations the generally lower waste tonnage combined with high transportation costs have ruled out the deployment of large-scale systems. In these cases the interest has been in the application of small-scale (typically less than 50,000 t/y throughput) systems capable of competing with low-cost landfill disposal.

  The aim of this Topic is to review the technology and economics of small-scale energy conversion systems and report on their potential applicability in Member Countries. A short-list of candidate facilities is in preparation and an initial overview of a gasification process for MSW has been made – including the Brightstar technology now commissioning in Australia. This facility was visited as part of the site visit programme of the Task 36 meeting in Australia in December 2002.

- *Public Perception and Acceptance of Energy from Waste*
  A key task for the energy from waste (EfW) industry is to get the recognition for EfW as renewable energy or at least as a valuable non-fossil energy source. This is necessary to improve the utilisation of MSW for the production of energy and to stimulate innovation towards high efficiency conversion systems. During 2001 pertinent data was acquired from recent and on-going work in the field particularly from the UK and The Netherlands. A presentation on this project was given by R. Ross, NIPO, The Netherlands at the 'Expert Meeting on Power Production from Waste and Biomass – IV' in Finland in April 2002.

- *Mass balance of heavy metals in waste incinerators, and dioxin emissions from incineration – status and effect of the new EU regulations*
  This Topic is sponsored (through additional funding) by Statoil and Energos. The work on mass balance is part of a larger EU project named AWAST. A questionnaire has been prepared which had been sent out to members of the group for distribution to incineration plants in Member Countries. The Topic Leader has also carried out a literature search for data. The results have been presented in a database and a preliminary has been completed. The work on dioxins is a project to estimate the effect of the new EU regulations on dioxin emissions. A questionnaire has been prepared for this Topic and distributed to Member Countries.

- *Review of Waste Processing Technologies for RDF*
  The processing of residual waste (after recovery of recyclables) in order to produce a specific fuel fraction provides an alternative method for energy recovery, and is increasingly practised. The fuel fraction is generally referred to as refuse derived fuel (RDF). RDF can take various forms including a loose or flock material, which has been reduced in size or further densified to produce a fuel pellet. The final form of RDF is dependent on the mode of energy recovery. Consequently there are many methods for producing RDF and these may include some or all of the following processing systems: screening, air classification, dry, palletising, magnetic recovery. The different technologies currently operating in Finland have been reviewed and the results were presented at the second meeting of Task 36 in The Netherlands. The second part of the project deals with the variation of the quality of the RDF-fuels produced at some production sites and the relevance of the national quality standard. Sites in Holland and Germany are currently being visited.

- *High Efficiency Conversion in Conventional Grate Fired Systems.*
  The aim of this Topic is to collate and exchange information between Member Countries on the technology and processes for high efficiency power generation. So far ten waste-to-energy plants in The Netherlands have been visited and a literature study has been completed on corrosion in waste-to-energy plants.

  The information received is currently being evaluated and preliminary conclusions have been reached that (in theory) there are two processes causing corrosion:
  deposits on superheater tubes. Transport in deposits of FeCl to flue gases.
  too high material temperature and too high temperature difference between flue gases and material. Higher temperatures also stimulates deposits, because it makes fly-ash sticky.

The corrosion in the superheaters is influenced by many factors. The most important factors noticed are:

- process control, which influenced the stability of the combustion. Unstable combustion stimulates corrosion
- too high material temperatures caused by: superheater tube configuration (co-current, counter current); fouling of the boiler and overloading the boiler (can be a matter of company's strategy for economical reasons)

Important features are:

- good boiler cleaning during operation (explosion-cleaning in addition to hammer cleaning);
- good temperature control of flue gases forwards of the superheater;
- cladding (alloy 625) of superheater tubes or composite tubes;
- adaptations in design and construction: superheater configuration (vertical walls, co-current, other materials)

Problems have also been noticed in the first pass of the waste-to-energy plant - mostly in the area above the ceramic lining where flue gases contact the membrane water wall (evaporating tubes) and the roof of the first pass. Progress on this Topic was reported at the meeting in Australia in December 2002.

Collaboration with Other Tasks

The Topics on Waste Gasification are being carried out in co-operation with Task 33 'Thermal Gasification of Biomass'.

Deliverables

The deliverables for the Task in 2002 included: two progress reports to the ExCo; audited financial reports as required by the ExCo; minutes of the Task meetings and technical reports as detailed in Appendix 3.

Task 37: Energy from Biogas and Landfill Gas

Overview of the Task

The overall objectives of Task 37 are to review and exchange information on anaerobic digestion (AD) to produce, upgrade and utilise biogas as an energy source, digestate (compost) as an organic fertiliser and the anaerobic degradation process as a link in the chain of waste (water) treatment.

The scope of the work focuses on adoption of appropriate waste management practices; promotion of the commercialisation of biogas installations; improvement of the quality of the products and improving environmental standards. Through the work of the Task communication between RD&D programmes, the industry and governmental bodies should be initiated and/or further stimulated.

To achieve the goals, the Task maintains strong relationships with the governments of Member Countries, R&D institutions and industry. Partners are plant providers, producers of gas upgrading and gas utilising utilities, actual and future operators and potential clients interested in the products of anaerobic digestion, i.e. fertiliser (digestate) and biogas.

Participating countries: Austria, Denmark, Sweden, Switzerland and United Kingdom. Finland will join this Task in 2003
Task Leader: Dr Arthur Wellinger, Nova Energie GmbH, Switzerland
Operating Agent: Mr. Bruno Guggisberg, Swiss Federal Office of Energy, Switzerland

The Task Leader together with an Associate Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 37, please refer to Appendices 2-5 inclusive; the Task website www.novaenergie.ch/iea-bioenergy-task37 and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings and Workshops

Two major Task meetings and one shorter business meeting were held in 2002. The first meeting took place on 10-12 March in Karlsruhe, Germany. Germany is the country with the outmost number of biogas plants in all fields (MSW, agriculture and industrial waste). The meeting included a workshop on 'AD technology in Germany and China' with invited guests from the local University, Hainan, PCR and German plant providers which was attended by 12 observers.

The second meeting was held on 20-22 October in Horsington, United Kingdom with site visits to the AD co-digestion plant in Holsworthy, Devon and the demonstration unit of Organic Power Ltd.

In between the above Task meetings a short business meeting was held alongside the '12th European Conference & Technology Exhibition on Biomass for Energy, Industry and Climate Protection' in June in Amsterdam, The Netherlands.

Work Programme

In 2002 the group worked on the following topics:

- quality management
- potential of co-digestion (including energy crops)
- feedstock separation
- website: maintenance and plant list
- information exchange industry forum

The progress made on each topic is summarised below.

- *Quality management, Leader: R. Braun*
  There is a high interest from national administrators and plant operators concerning the hygienic requirements of substrates for digestion. It was decided to publish a comprehensive and easy to read brochure on the topic. The background to this is the new EC regulation on 'Health rules concerning animal by-products not intended for human consumption' which was brought into force at the end of 2002.

- *Potential of co-digestion, Leaders: R. Braun/A. Wellinger*
  A technical report titled 'Potential of Co-digestion – limits and merits' has been finished and was made available on the Task's website in August 2002. It was decided to also produce a popular version in a printed form addressing potential operators in waste water treatment and agriculture, politicians, administrators and consultants.

- *Feed stock separation, Leaders: A. Seadi/A. Wellinger*
  The separation of waste is becoming a key issue for a decision to introduce AD at a community level. The Task therefore decided to publish a brochure on 'Source Separation of Household Waste'. A tentative schedule has been established and a first draft has been written. The publication should appear in July 2003.

- *Website, Leaders: A. Wellinger/Roost*
  The website has been updated every month. The plant list – as one of the pages on the website cites all the AD plants digesting among other waste materials at least 2500 tons of MSW per year, mostly source separated. The list was updated by the end of the year.

- *Information exchange Industry Forum, Leaders: C. Maltin/A. Wellinger*
  There is a continuous exchange of information with most of the plant providers. During the first annual meeting a few were involved in the workshop.

Collaboration with other Tasks

During the Horsington meeting the Task met with members of Task 36: Energy from Integrated Solid Waste Management Systems'. It was decided to invest in ideas for collaboration during 2003 and to include common activities in the work programme for 2004-2006.

Website

The Task 37 website www.novaenergie.ch/iea-bioenergy-task37 is a major commitment in the programme of work.

Deliverables

The deliverables for the Task in 2002 included: the website, two progress reports, minutes of the Task meetings and the technical report on the potential of co-digestion. During the Amsterdam meeting a contribution was provided to the '12th European Conference & Technology Exhibition on Biomass for Energy, Industry and Climate Protection' on the collaboration within international networks (IEA and EU). This was published recently. Details are given in Appendix 3.

Task 38: Greenhouse Gas Balances of Biomass and Bioenergy Systems

Overview of the Task

The objective of Task 38 is to integrate and analyse information on greenhouse-gases, bioenergy, and land use, thereby covering all components that constitute a biomass or bioenergy system. The Task focuses on the application of methodologies to mitigation projects and programmes. It builds on the work and achievements of Task 25 – the predecessor Task.

Participating countries: Australia, Austria, Canada, Croatia, Denmark, Finland, Ireland, The Netherlands, New Zealand, Norway, Sweden, United Kingdom and USA
Task Leader: Dr Bernhard Schlamadinger, Joanneum Research, Austria
Operating Agent: Dr Josef Spitzer, Joanneum Research, Austria

The Task Leader directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 38, please refer to Appendices 2-5 inclusive, the Task 38 website www.joanneum.at/iea-bioenergy-task38 and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Progress in R&D

Task Meetings and Workshops

The Task was very active in 2002. On 22-24 April a workshop jointly organized with Task 29 and the COST E21 network was held in Graz, Austria. The focus of the workshop was 'The economics of substitution management to reduce net GHG emissions and forest-based carbon mitigation projects: dealing with permanence, leakage, additionality, uncertainties, and socio-economic and environmental issues'. The aim was to write timely papers on the above-mentioned issues and to provide these to negotiators under the United Nations Framework Convention on Climate Change. This was undertaken by three working groups (WG):

- WG1 is preparing a paper on 'The role of wood for substitution in reducing net GHG emissions';
- WG2 prepared a paper entitled 'Forest-based mitigation projects: options for carbon accounting and for dealing with non-permanence', which has been submitted to the UNFCCC and is now available under: www.unfccc.int/resource/webdocs/2002/12.pdf;
- WG3 is producing a paper titled 'Socioeconomic, institutional and environmental aspects to support long-term success of LULUCF projects'.

Further information about the workshop can be found at: www.joanneum.at/iea-bioenergy-task38 (click on 'Workshops', then 'Graz 2002').

In June the Task co-organised two meetings. An 'Internal Task 38 workshop' in co-operation with NOVEM and Utrecht University and a joint Task 35 and Task 38 working session on 'Biofuel Trade' in Utrecht, The Netherlands. The aim was to discuss collaborative in-depth analysis of economic and GHG aspects of biomass trade and to develop a work plan for future collaboration between the two Tasks. It was decided that Task 35 would select two concrete bio-fuel trade chains, for which Task 38 will calculate GHG balances. It was also agreed to prepare a joint position paper on this item.

An open workshop on 'Biomass Trade: economic and greenhouse gas considerations (Biotrade)' in co-operation with Task 35, was organised at the '12th European Conference on Biomass for Energy, Industry, and Climate Protection' on 19 June. The main objective of this workshop was to analyse economic and GHG aspects of international biomass trade. Topics addressed were:
- GHG and energy balances and economics of international bioenergy trading chains;
- biomass resource potentials;
- optimal use of land in terms of the CO_2 balance: sequestration, indigenous utilisation and export compared, trade-offs and synergies;
- formulation, implementation and verification of criteria for sustainable bioenergy trade
- policy frameworks, pilot projects and implementation schemes.

Further information, including power point presentations and video files about the workshop, can be found at: www.joanneum.at/iea-bioenergy-task38 (click on 'Workshops', then 'Amsterdam').

Work Programme

Work on the development of 'country reports' dealing with: background information; information on domestic 'policies and measures' and on bioenergy and carbon sequestration projects continued. During the working sessions in Utrecht the status of the work was presented and evaluated by the NTLs, especially regarding what information concerning the 12 countries was already available and what was still missing. NTLs were invited to deliver the information still needed. The country report was also presented to ExCo49 in Vienna, and the ExCo asked for a proposal on how this could be expanded to more generic issues relevant to ExCo and/or other Tasks. A proposal was presented at ExCo50 in Finland. Also Ireland as a new participant in the Task delivered information for this programme.

Work on case studies to analyze concrete bioenergy and carbon sequestration projects continued. The goal is to assess and compare the GHG balances of such projects in the participating countries, and to make recommendations for optimizations of these systems. All case studies will be finished in 2003. The case studies, which are listed below, now include the item for USA. A possible item for Ireland is under discussion.

- *Australia:* GHG balance of two bioenergy systems (co-firing of biomass with coal and a wood-fired conversion facility), both based on conventional hardwood plantation forestry;

- *Finland and Sweden:* GHG balances of actual bioenergy and carbon sequestration projects with links between increased use of construction wood and the use of biomass-fired cogeneration plants, replacing fossil fuels;

- *New Zealand:* Assessment of the GHG balance of a bioenergy cogeneration plant (heat and electricity) based on the use of sawmill residues;
- *United Kingdom:* Comparison of small-scale bioenergy solutions for a rural community versus centralized power and heat generation; and net energy production of bioenergy crops versus short-rotation forests versus long-rotation forests;
- *Croatia:* Assessment of the GHG emissions reduction potential by biodiesel production in the context of Joint Implementation;
- *Canada:* GHG balance of a small pyrolysis plant using both sawmill residues and thinnings from a juvenile spacing program to produce bio-oil, used either in a pulp mill lime kiln or for export of biofuel;
- *USA:* Assessment of the GHG emission reduction potential associated with anaerobic digestion of organic wastes in Ventura County, California.

The Task continued work on a paper on the relationship between soil carbon sequestration and bioenergy, addressing the implications for the overall GHG balance of bioenergy and land use projects, and for carbon accounting under the Kyoto Protocol. The paper is coordinated by Annette Cowie (State Forests of New South Wales, Australia) and includes collaborators from most countries participating in Task 38, as well as one representative each from Tasks 30 and 31.

A set of 40 overhead transparencies for general use by participants is currently being updated. These cover general Task information and specific results from participating countries.

Collaboration with Other Tasks

This Task integrates the greenhouse gas balance theme across the value chain and in doing so collaborates actively with other Tasks. Current collaboration includes Task 35 on the use of biofuels as a commodity in international trade for reducing CO_2 emissions; Task 29 and COST E21 and also Tasks 30 and 31. These have already been mentioned above under work programme.

Website

The Task 38 website is being continuously updated and extended. It is currently being redesigned to focus more on the substance of biomass fuel cycles, in addition to the current content. The new structure for the website will be implemented next year. The Task 38 bibliography has now been modified into a database-system which can be accessed through the website (existing entries can be modified and new entries can be added). NTLs and other Task participants are invited to add new items to this database: www.joanneum.at/iea-bioenergy-task38/bibliography.

Deliverables

The new Task 38 brochure was finalised and distributed, to replace the Task 25 brochure. This new brochure contains information on methodologies for GHG balances developed by Task 25, and an overview of the objectives, work scope and results of Task 38. Copies are

available from the Task management or can be downloaded from Task 38 website. The Task 38 paper titled 'Answers to 10 Frequently Asked Questions about Bioenergy, Carbon Sinks and Global Climate Change' has been reprinted. The original 5000 copies from the first print run were distributed worldwide and several hundred downloads from the Task website can also be reported. Copies are available from the Task management or can be downloaded from the Task 38 website.

Papers and reports produced in 2002 are listed in Appendix 3. The deliverables for the Task included: two progress reports to the ExCo; audited financial reports as required by the ExCo and minutes of the Task meetings.

Task 39: Liquid Biofuels

Overview of the Task

The objective of Task 39 is to provide participants with comprehensive information to assist with the development and deployment of biofuels for motor fuel use. The Task is building upon the successes of previous efforts to deal in a coordinated manner with both the technical and the infrastructure issues related to biofuels. To meet this objective, the Task is:

- providing information and analyses on policy, regulatory and infrastructure issues that will help participants encourage the establishment of the infrastructure for biofuels as a replacement for fossil-based biofuels;
- catalyzing cooperative research and development projects to help participants develop improved, cost-effective processes for converting lignocellulosic biomass to ethanol.
- providing information and analyses on specialized topics relating to the production and implementation of biodiesel technologies;
- providing for information dissemination, outreach to stakeholders, and coordination with other related groups.

The Task structure allows each of these components to benefit from the coordinated interaction with the others and allows participants to deal with biofuels in a comprehensive manner.

Participating countries: Austria, Canada, Denmark, Finland, Ireland, The Netherlands, Sweden, United Kingdom, USA and the European Commission
Task Leader: Dr Don Stevens, Battelle Northwest Laboratory, USA
Operating Agent: Dr Raymond Costello, US Department of Energy, USA

The Task Leader together with two SubTask Leaders directs and manages the work programme. A National Team Leader from each country is responsible for coordinating the national participation in the Task.

For further details on Task 39, please refer to Appendices 2-5 inclusive; the Task website www.forestry.ubc.ca/task39 and the IEA Bioenergy website www.ieabioenergy.com under 'Our Work: Tasks'.

Task Meetings and Workshops

The Task was very active in 2002 with a number of meetings and workshops. The Working Group on policy and regulatory issues held three working meetings, all in connection with the Working Group on biodiesel. The first of these was in March in Utrecht, The Netherlands; the second in June in Amsterdam, The Netherlands – in connection with the European Biomass Conference – and the third in November in Vienna, Austria.
In addition, the Working Group on technical aspects of conversion of lignocellulosic biomass held two workshops. The first of these was in Gatlinburg, USA, in connection with the annual Biotechnology for Fuels and Chemicals Conference. The second workshop was held in December in York, United Kingdom.

These are discussed in greater detail below.

Work Programme

The work programme for the Task includes the following elements:

- *Providing Information on Policy, Regulatory, and Infrastructure Issues*
  The Working Group on policy and regulatory issues continued several projects. The overall objective is to provide governments and policy makers with improved information that will help them identify and eliminate non-technical barriers to liquid fuels deployment. Work continued in the following areas:

  Country-specific information on biofuels. The Task is compiling country-specific information on biofuels including fuels usage, regulatory changes, major changes in biofuels policies, and similar items. The purpose of this effort is to provide a central source of relevant information on biofuels. A survey sheet has been developed and sent to participants. The responses from the survey will be used to produce an updated report on this topic. The Task is examining ways to interact with Task 38 and to achieve a common format for these 'Country Reports'.

  Case Studies. The Task is compiling information on representative biofuels facilities that exist at present including commercial facilities, development/demonstration facilities, and major laboratory demonstrations. This information will provide a ready reference to the current state-of-the-art in producing biofuels. The case studies on biodiesel in Europe are underway, and compilation of information on other biofuels is starting.

  Ethanol and biodiesel standards. The Task is compiling existing equality standards for ethanol and biodiesel in the participating countries. The information will serve as a reference for those interested in standards. Information developed in Task 27 was shared among participants, and further needs were identified. The Task is looking for ways to collaborate with a European Commission project on bioethanol standards.

  Roadmaps and Strategies. Recent 'Roadmaps' and 'Strategy Plans' developed by the participants are being compiled. The Task is providing a summary of such documents and references to where they can be obtained. Work has started on this project.

Financial Instruments. The Task is compiling information on the types and effectiveness of various financial instruments used by governments to assist with biofuels developments. This part of the work is expected to be complete in 2003.

Agreed Calculations. The Task is assisting other groups in the development of 'Agreed Calculations' for producing energy and carbon dioxide balances related to biofuels pathways. The work is intended to assist with the development of data that will allow better life-cycle and similar analyses. This is part of a European Commission project led by NOVEM. IEA Bioenergy is participating on an 'in-kind' basis. The project has been awarded in principle, and final negotiations were underway at the end of 2002.

- *Technical Aspects of Lignocellulosic Biomass-to-Ethanol Processes*
  The Task provides an information exchange network for participants who are conducting research and development activities in the area of lignocellulosic biomass-to-ethanol. The Working Group in this area is focused on the technical and economic issues related to this important technology option.

  In 2002, a workshop was held in connection with the 24th Symposium on Biotechnology for Fuels and Chemicals. This meeting was held on 28 April-1 May in Gatlinburg, Tennessee. Presentations were made on the state of development of lignocellulosic biomass by five of the nine Task 39 participants.

  A workshop on lignocellulosic biomass-to-ethanol was also held on 17-18 November at the British Sugar facilities in York, UK. The workshop provided a focused overview of the state of the technology for converting lignocellulosic biomass to ethanol. Top academic and industry representatives presented overviews of their work and provided their view of the needs and opportunities for producing ethanol from these feedstocks. The proceedings of this meeting will be available on CD in early 2003.

- *Specialized Topics Related to Biodiesel*
  Task 39 includes efforts to address the specific issues related to implementation of biodiesel. These include policy and regulatory issues that apply to the implementation of this fuel plus specialized technical issues. Biodiesel is included in the Task to ensure that all major biofuels are treated on an inclusive basis.

  In 2002, the Working Group in this area continued to work closely with the policy and regulatory group, and ongoing projects are listed above. During the ongoing meetings, the significant increases in biodiesel production both in Europe and North America have been noted. These increases are largely the result of policy mandates, but they are generally different than those for ethanol fuels. Task 39 is analyzing these differences and putting them in context.

  This working group has also started a project to conduct two specific studies on biodiesel. These include one to identify the 'best case' European biodiesel studies, and a second to review the commercial production of biodiesel worldwide. These projects will be completed in 2003.

Newsletter

The Task published two newsletters in 2002. These provide information about Task activities and international events related to biofuels. The newsletters are available from the newsletter editor whose contact details are provided in Appendix 5.

Collaboration with Other Tasks/Networking

The Task has ongoing interactions with related groups. In 2002, there have been ongoing interactions with Task 35 regarding the possibility of a joint project on technology evaluation. Discussions have also been held with Tasks 30 and 31 on joint interests in determining feedstock availabilities for liquid fuels. The Task is also working with various EC-funded projects as described earlier to ensure effective information exchange.

Website

The Task has constructed a web page to improve access to the information developed by this Task. The web site address is www.forestry.ubc.ca/task39. Related information from previous activities is listed at www.liquid-biofuels.com.

Deliverables

The Task produced two newsletters and constructed a website that became operational in 2002. The newsletters and other information about the Task are available on the website. Meeting minutes of the Working Group on Policy and Regulatory issues were also prepared and are available from the Task Leader. A CD-format summary of the papers presented at the workshop organized by the Task in York England, will also be available from the Newsletter Editor. Progress reports and an annual audit report have been provided to the Executive Committee. These Tasks products are listed in Appendix 3. The Final Summary Report from the previous Task (Task 27), includes a new report on biodiesel.

TABLE 1 - IEA BIOENERGY TASK PARTICIPATION IN 2002

Task	AUS	AUT	BEL	BRA	CAN	CRO	DEN	FIN	FRA	IRE	ITA	JAP	NEL	NOR	NZE	SWE	SWI	UK	USA	CEC	Total Participants in Task
29. Socio-economic aspects of bioenergy systems		●			●	⊖				●		●				●		●			7
30. Short rotation crops for bioenergy systems	●			●	●	●	●								●	⊖		●	●		9
31. Conventional forestry systems for sustainable production of bioenergy	●		●		⊖		●	●						●	●	●		●	●		10
32. Biomass combustion and co-firing	●	●	●		●		●	●					⊖	●	●	●	●	●	●	●	14
33. Thermal gasification of biomass		●					●	●			●		●			●	●	●	⊖	●	10
34. Pyrolysis of biomass														●					●	⊖	3*
35. Techno-economic assessments for bioenergy applications		●			●			⊖					●			●			●		6
36. Energy from integrated solid waste management systems	●				●			●	●			●	●	●		●		⊖		●	10
37. Energy from biogas and landfill gas		●					●									●	⊖	●			5
38. Greenhouse gas balances of biomass and bioenergy systems	●	⊖			●	●	●	●		●			●	●	●	●		●	●		13
39. Liquid biofuels		●			●		●	●		●			●			●		●	⊖	●	10
Total Task Participation	**5**	**7**	**2**	**1**	**8**	**3**	**7**	**7**	**1**	**3**	**1**	**2**	**6**	**5**	**4**	**10**	**3**	**9**	**8**	**5**	**97**

*Actual participation is higher because these are joint programmes with CEC participants. ⊖ = Operating Agent for the Task.

BUDGET IN 2002: SUMMARY TABLES

Table 2: Budget for 2002 by Member Country ($US)

Member country	Total ExCo funds	Total Task funds	Total funds
Australia	7,900	61,702	69,602
Austria	9,100	86,643	95,743
Belgium	6,100	22,273	28,373
Brazil	5,500	13,200	18,700
Canada	9,700	100,372	110,072
Croatia	6,700	39,173	45,873
Denmark	9,100	90,116	99,216
European Commission	7,900	48,926	56,826
Finland	9,100	85,172	94,272
France	5,500	12,256	17,756
Ireland	6,700	42,643	49,343
Italy	5,500	10,000	15,500
Japan	6,100	24,256	30,356
Netherlands	8,500	72,899	81,399
Norway	7,300	48,502	55,802
New Zealand	7,300	49,446	56,746
Sweden	10,900	124,372	135,272
Switzerland	6,700	34,000	40,700
UK	10,300	114,372	124,672
USA	9,700	97,116	106,816
Total	155,600	1,177,439	1,333,039

BUDGET IN 2002: SUMMARY TABLES

Table 3: Budget for 2002 by Task ($US)

Task	Number of participants	Annual contribution per participant	Total Task funds
Task 29: Socio-economic aspects of bioenergy systems	7	12,000	84,000
Task 30: Short rotation crops for bioenergy systems	9	13,200	118,800
Task 31: Conventional forestry systems for sustainable production of bioenergy	10	12,273	122,730
Task 32: Biomass combustion and co-firing	14	10,000	140,000
Task 33: Thermal gasification of biomass	10	10,000	100,000
Task 34: Pyrolysis of biomass *	3	11,000	11,000
Task 35: Techno-economic assessments for bioenergy applications	6	10,000	60,000
Task 36: Energy from integrated solid waste management systems	10	12,256	122,560
Task 37: Energy from biogas and landfill gas	5	14,000	70,000
Task 38: Greenhouse gas balances of biomass and bioenergy systems	13	13,973	181,649
Task 39: Liquid biofuels	10	16,670	166,700
Total			1,177,439

*Norway and the European Commission pay directly. Actual participation is higher than indicated because this is a joint programme with the European Commission.

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Notes

Biodiesel production site in Mureck, Austria. Apart from rape seed, waste oil from restaurants is also used as a raw material. Collection is co-ordinated by a local company and school children actively participate which is highly educational. (Courtesy H. Scheuer, Croatia)

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Top: Courtesy Dr Arto Timperi, Timberjack, Finland
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