Overview of Biofuels Task Force Activity to Date

Seventeen APEC economies participate in the Biofuels Task Force as members or observers. These include Australia, Canada, China, Chile, Hong Kong, Indonesia, Japan (observer), Korea, Malaysia, Mexico, New Zealand, Peru, Philippines, Russia, Thailand, Chinese Taipei, and the United States. The Philippines joined most recently, following EWG-36 in Manila. The Asia Pacific Energy Research Centre (APERC) and Expert Group on New and Renewable Energy Technologies (EGNRET) are also represented, and Brazil is a non-APEC observer. Delegates from participating economies serve on the Executive Committee and in Task Groups on biofuel economics and trade, biofuel vehicles and infrastructure, and biofuel resources.

A brief chronology of Task Force activity is as follows:

2005/10 Seventh APEC Energy Ministers Meeting (EMM-7) in Gyeongju, Korea endorses creation of a Biofuels Task Force as part of a balanced approach to oil security including investment, fuel efficiency and alternative fuels.

2006/05 First Biofuels Task Force meeting in Singapore agrees upon terms of reference for the Task Force which are endorsed by EWG-32, to include focus on biofuel economics and trade, fuel flexible vehicles and infrastructure, and resources.

2006/10 Second Biofuels Task Force meeting in China drafts initial consensus messages for ministers on biofuel economics, infrastructure and resources.

2007/01 Third Biofuels Task Force meeting in Japan reviews consensus messages, and work gets underway on a study of liquid biofuels, guidelines for developing biodiesel standards, and a survey of biomass resource assessment in APEC.

2007/05 Report of the Biofuels Task Force is welcomed by the Eighth Energy Ministers Meeting (EMM-8) in Darwin, with findings that biofuels from several crops are cost-competitive and biofuels can displace a sizeable share of oil use over time.

2007/10 Fourth Biofuels Task Force meeting in Thailand incorporates workshop on technical standards to promote biofuel trade, and Budget and Management Committee of APEC approves projects on biofuels and employment, biofuel resource elasticity, and potential biofuel resources on marginal lands.

2008/10 Fifth Biofuels Task Force Meeting at National Renewable Energy Laboratory in the United States incorporates workshop on biofuel resource assessments, and BMC approves a project on biofuel feedstock costs, technology and economics.
APEC Biofuels Projects Completed in 2008

Several projects with Biofuels Task Force involvement were completed in 2008:

- An assessment of guidelines for developing biodiesel standards in APEC.
- A study of the future of liquid biofuels in the APEC region.
- A survey of biomass resource assessments and assessment capabilities.

Guidelines for the Development of Biodiesel Standards in the APEC Region

The project’s objective is to establish guidelines for development of biodiesel standards in the APEC region that will enhance biodiesel trade. The use of biodiesel for transport can reduce air emissions, increase domestic supply of renewable fuel and create new markets for agricultural sectors. Biodiesel fuel can be produced from various animal fats and vegetable oils, but the quality of biodiesel produced depends on the natural characteristics of feedstocks. The feedstocks for biodiesel production in Europe and the United States (such as soy and rapeseed) are completely different from those in key developing APEC economies (such as palm), and allow the production of biodiesel with superior performance in cold weather. Thus, if blends of biodiesel from Asian feedstocks are to be widely traded (especially to economies with colder climates) they will need to take into account the European and American biodiesel standards (EN 14214:2003 and ASTM D 6751:2003) which are already developed and widely used.

This project, initiated by the Expert Group on New and Renewable Energy Technologies under the APEC 21st Century Renewable Energy Development Initiative Collaborative IX, received a grant of $50,000 from the APEC Support Fund for 2007. It is being led by Ms. Peesamai Jenvanitpanjakul, Acting Director of the Environment, Ecology and Energy Department at the Thailand Institute of Scientific and Technological Research (TISTR). An RFP was issued in 2007, and Hart Energy Consulting was selected to do the work. A workshop was held in Bangkok on 25-26 October 2007, in coordination with the Fourth Task Force meeting. A second workshop was held in Taipei on 16-18 July 2008. A background report, issued in April 2008, catalogues technical standards for biodiesel across all APEC economies. This report and the workshop presentations can be downloaded from www.egnret.ewg.apec.org. The report can also be found at www.apec.org/apec/publications/all_publications/energy_working_group.html.

The subject of biofuel standards was raised at a meeting of the APEC Automotive Dialogue in Singapore on 10-12 September 2008, in which the Chair of the Task Force participated. A representative of the Japan Automotive Industry made a presentation on recommended biofuel specifications for a Worldwide Fuel Charter, including ethanol and biodiesel, and noted that comments on this Charter were requested by 30 September. The Chair then offered the project background report in its entirety as a set of comments on the Charter. A final project report will be issued in early 2009.
Study of the Future of Liquid Biofuels in APEC Economies

The project compiles baseline data and information on the development of liquid biofuels in APEC economies. Topics include liquid biofuel technology, fuel specifications, potential benefits to auto-manufacturers, national energy policies, and regional directives in supporting and promoting the use of liquid biofuels to lessen the over-dependence on fossil fuels and to cope with environmental issues resulting from the use of fossil fuels.

This project was initiated by Thailand through the Energy Working Group and received a grant from the APEC Support Fund in 2006. The National Renewable Energy Laboratory (NREL) of the United States was the sole bidder on the project and was offered a sole source contract in August 2006. A project report was issued in early 2008. As part of the project, a biofuels website has been established at www.biofuels.apec.org. This includes basic data on ethanol and biodiesel production by year and economy, typical feedstocks for biofuels in each economy, biodiesel blends and standards by economy, cost analyses and resource assessments from the Biofuels Task Force and other sources, installed production capacity for biofuels, biofuels trade, and other useful information.

Survey of Biomass Resource Assessments and Assessment Capabilities in APEC

The project aims to understand what biomass resource assessments have been undertaken in APEC economies, as well as the capability of APEC economies to undertake such assessments. Particular attention is paid to the potential of various crops, crop residues, forest wastes and urban wastes to be utilized for production of bioethanol and biodiesel to displace oil use in the transport sector and thereby to grow oil exports or limit oil imports.

Various APEC economies have credible biomass resource assessments. By sharing information, the project provides a clearer picture of potential biomass resources throughout the APEC region, and thus a real sense of the potential of biofuels to limit the upward pressure on oil prices and growing oil import dependency over the long term.

Most APEC economies have extensive capabilities to assess biomass resources, such as the level of geographic detail at which data on yields of crops, crop residues, forest residues and urban residues are available. The draft project report provides a shared view of their capabilities to systematically assess biofuel resources and suggest practical ways to improve these capabilities so that the resource potential can be better understood.

This project received a grant of $50,000 from the APEC Support Fund for 2007. An RFP was issued, two proposals were received, and the National Renewable Energy Laboratory (NREL) of the United States was selected as the contractor. The project was led by Anelia Milbrandt, Research Scientist, NREL, and supported by Ralph Overend, Chief Scientist, National Biofuels LP. The U.S. Department of Energy also provided $50,000 to support this and related work on biofuels resource assessment at NREL.
During a Workshop on Biofuel Resource Assessment that took up the second day of the Fifth Task Force meeting, Milbrandt presented key findings from the draft report while others provided additional information for inclusion in the final version. Presentations were offered by workshop participants on biofuel resource assessments in Australia, Canada, Indonesia, Japan, Malaysia, New Zealand, Russia, and Chinese Taipei. Information from these presentations was incorporated in a revised draft report after the meeting, and a final report should be issued to the APEC Secretariat in November. A guest presentation was also provided on biofuel resources from sugarcane in Brazil. The Biomass Inventory Mapping and Analysis Tool used in Canada was demonstrated as well. Copies of the presentations were posted on the website at www.biofuels.apec.org.

The final project report was issued in December 2008, distributed to Task Force members, and made available through the Task Force website to the general public. The findings were also presented to participants in the APEC Automotive Dialogue in Seoul and the Biomass 2009 Conference in Washington in March 2009.

There is a substantive evaluation for almost every APEC economy, including estimates of the portion of conventional petroleum demand for transport that might potentially be displaced. Many economies have surprisingly sophisticated capabilities to map biofuel resources using geospatial satellites, which could be applied to help ensure that future biofuels development is sustainably focused on existing cropland.

The key finding is that second-generation biofuels from farm and forest residues could potentially displace two-fifth of gasoline use and one-fifth of crude oil imports in the APEC region as a whole. A corollary finding is that first-generation resources from conventional food crops have far less long-run potential. Even if rising crop yields made it possible to use the equivalent of 20 percent of today's grain production for biofuels over time, first generation feedstocks could displace only about 5 percent of crude oil imports in the region. So the second generation potential is several times larger than the first generation potential.

But of course, there are substantial variations among economies. In land-poor economies like Japan, Korea and Chinese Taipei, the second-generation ethanol potential amounts to less than 2 percent of crude oil imports. In the United States, with vast agricultural output but an equally enormous appetite for transport fuel, the second generation potential from farm and forest residues amounts to about 9 percent of crude imports – substantial but not immense. In quite a few economies, as varied as Australia, Canada, New Zealand, the Philippines and Thailand, the crude displacement potential from such residues is in a moderate range between 17 and 26 percent. In Indonesia and Malaysia, with large agricultural sectors and modest demand for transport fuel, the estimated potential is 51 percent and 59 percent, respectively. In China, the potential is estimated at nearly 90 percent, but this will decline as transport fuel demand continues its rapid upward trend.
APEC Biofuels Projects to Be Completed in 2009

To progress the work on resource assessment, several studies were started with APEC support in 2008 and should be completed during 2009:

- An Assessment of Biomass Resources from Marginal Lands is assessing the potential for production of “second-generation” feedstocks like jatropha and grasses on lands which are poorly suited to conventional agricultural crops.

- An Assessment of Biomass Resource Elasticity is examining how higher market price for biofuel feedstocks may stimulate greater feedstock output.

- A Study of Employment Opportunities from Biofuel Production is examining how biofuel production can create jobs and advance rural development.

Assessment of Biomass Resources from Marginal Lands in APEC Economies

The project aims to understand how the biofuel resource potential in APEC economies may be augmented through the development of marginal and underutilized lands that are poorly suited to conventional agricultural crops (due to limited water, poor soil quality and other factors) but well suited to the production of non-food biofuel feedstocks such as jatropha (for biodiesel) and grasses (for ethanol). It should also build the capacity of developing APEC economies to assess the potential for additional biofuels production from such lands.

APEC economies have large amounts of marginal land that is currently underutilized, but that holds potential for the production of nonfood biofuel feedstocks such as jatropha and grasses. However, the amounts of such land in most economies have not been systematically assessed. The report of the Biofuels Task Force indicates that some such feedstocks are already cost-competitive with fuels derived from petroleum. This implies substantial potential to expand biofuels production on marginal land that has not heretofore been utilized for productive agricultural purposes. However, as advancing biofuels production technologies and higher oil prices have only converged in the marketplace quite recently, this potential is as yet poorly understood.

By sharing information in a systematic way, the project should give energy experts, agricultural economists, and officials in energy and agriculture ministries a clearer picture of the marginal land available to biofuel resource production throughout the APEC region, and thus a better sense of the potential of biofuels to limit the upward pressure on oil prices and growing oil import dependency. Since such interested parties will be involved in formulating and conducting the analysis, their capacity to assess the potential for biofuels production on marginal lands will be enhanced.

The project was approved by the APEC Budget and Management Committee in August 2007 with a $45,000 grant from the APEC Support Fund. Pursuant to an RFP issued in early 2008, the National Renewable Energy Laboratory in the United States was chosen to perform the work. Anelia Milbrandt of NREL is the lead project consultant.
The first phase of the project will focus on the extent to which APEC economies have analyzed their marginal lands and assessed the biofuels resource potential on them. Marginal lands are defined as lands with poor climatic or physical characteristics that make them difficult to cultivate for conventional crops. Examples of such characteristics include limited rainfall, extreme temperatures, low-quality soil, and steep slopes. Assessments in Australia, China, Japan, New Zealand, Peru, the Philippines, Russia and the United States have indicated significant potential for biofuels on such marginal lands.

The second phase of the project will focus on data collection, with an emphasis on saline lands, abandoned agricultural lands, scrublands and grasslands. Using a Geographic Information System (GIS), protected areas and other environmentally sensitive lands will be excluded to arrive at an estimate of total marginal land available. Proximity to roads and populations will also be assessed to arrive at an estimate of the marginal land that could be practically exploited for biofuels in terms of access to transport and labor.

**Assessment of Biomass Resource Elasticity in APEC Economies**

This project aims to show how biofuel resource potential could be affected by the market price of biofuel feedstocks and the application of available techniques to boost output. With higher feedstock prices, it becomes economical to farm more intensively, with more careful irrigation, using more expensive and higher-yielding seed. This should lead to greater production potential, easing tradeoffs between food and fuel production. Yet the extent to which higher prices lead to greater production – the price elasticity of feedstock supply – is not well understood. By involving officials and economists from developing economies in the analysis, the project will enhance their capacity to assess relationships between market prices, technology application, and biofuel resource potential.

This project was approved by the APEC Budget and Management Committee in October 2007 with a $45,000 grant from the APEC Support Fund. Pursuant to an RFP issued in early 2008, three professors from the Center for Agriculture and Rural Development (CARD) at Iowa State University were selected to perform the work. Amani Elobeid described the approach to the project that the team of researchers is taking. Three project drafts have been submitted to the Chair for comment, and the third of these has been distributed as a review draft to the Task Force for comment by May 8, 2009.

The initial phase of the project involved a literature review, which reveals that crop yields are a function of a variety of economic, environmental and technological variables. Factors which have a positive effect on crop yields include land improvements, conservation tillage, denser planting, earlier planting, irrigation, pest control, weed control, fertilizer use, farm programs, and R&D investments in new plant varieties. Factors that have a negative effect on crop yields include land degradation (such as through soil loss, soil compaction, or loss of soil fertility) and reduced rainfall. Several studies have shown a substantial and statistically significant relationship between feedstock prices and crop yields, presumably because such factors can boost such yields.
The draft study indicates that several technological factors can substantially boost biofuel yields over time for a variety of crops in a wide range of economies. These factors include agricultural inputs such as fertilizer and advanced, high-yielding seed. Yield trends are reported for several key conventional biofuel feedstocks, including maize, sugar, soy, and palm, for almost every APEC economy. Estimates are then made of the potential for increasing yields over time, which could raise the availability not only of first-generation grain feedstocks over and above food requirements, but also of associated farm residues for the second-generation production of ethanol from lignocellulose.

**Study of Employment Opportunities from Biofuel Production in APEC Economies**

This project aims to understand how the expanding markets for biodiesel and ethanol for transport fuel may expand employment opportunities for men and women in APEC economies. The focus is on how biofuel production may boost employment in the farm sector (which raises the feedstocks for production) and the biofuel sector (which converts the feedstocks to biodiesel and ethanol) and may thereby advance rural development goals.

Various APEC economies are aware that expanded biofuel markets may stimulate employment opportunities, but not of the extent that a given amount of biofuel production will boost the farm and/or biofuel sectors. Furthermore, experts may be unaware of the added potential to advance rural development goals. The report of the Biofuels Task Force indicates that biofuels from a wide variety of crops are cost-competitive. This implies substantial potential to expand biofuels production in a cost-effective and environmentally sustainable fashion, with corresponding growth of employment in developing economies. However, as more mature biofuels production technology and higher oil prices have only converged in the marketplace quite recently, this potential is as yet substantially unrealized and poorly understood.

By sharing information systematically, the project should give energy experts, agricultural economists, labor economists, and officials in energy, agriculture and economy ministries a clearer picture of the potential of expanded biofuels markets to boost employment in the farm and biofuel sectors of APEC economies.

This project was approved by the APEC Budget and Management Committee in October 2007 with a $45,000 grant from the APEC Support Fund. Pursuant to an RFP issued in early 2008, IBM Global Business Services Canada and Doyletech were chosen to perform the work. Two preliminary drafts have been submitted to the Chair for comment.

The project includes a literature review of employment arising from ethanol and biodiesel plants, as well as related employment in the farm sector of APEC economies. This involves calculations of jobs created per million liters per year of production. It also involves the synthesis of estimates of “multiplier effects” of biofuels production on other economic activity, as well as opportunity costs that might occur through loss of employment in oil production and refining sectors when oil is replaced by biofuels. An APEC biofuels employment model is being built to give quantitative projections of biofuel-related employment opportunities for men and women across the APEC region.
Project on Implications of Biorefineries for Energy and Trade in the APEC Region

This project, which is being undertaken by the Expert Group on New and Renewable Energy Technology under the APEC 21st Century Renewable Energy Development Initiative Collaborative IX, will examine the benefits of biorefineries that can produce a variety of useful co-products in addition to biofuels, thereby helping to make biofuels more economically viable in the marketplace. The objective is to provide APEC decision makers with recent advances in biorefinery development. A workshop will be held in Chinese Taipei in October 2009, in conjunction with the 33rd meeting of EGNRET, to discuss the future of biorefineries from the perspectives of technology, economics, market penetration, standards and regulations, and trade opportunities. A report will then be prepared to integrate and synthesize the information developed in the workshop.

The project, led by Chinese Taipei, was approved by the APEC Budget and Management Committee in October 2007 with a $50,000 grant from the APEC Support Fund.

New APEC Biofuels Projects Starting in 2009

A project on biofuel economics was approved by the APEC Budget and Management Committee in October 2008, while a project on the resource potential of algae for biofuels production will be resubmitted in March 2009 and a project on biofuel transportation and distribution infrastructure is ready for submission in May 2009 pending EWG approval.

Biofuel Feedstock Costs, Technology and Economics

This project aims to expand, refine and update the analysis of biofuel economics that was presented in the Biofuels Task Force Report to the 8th Energy Ministers Meeting (EMM-8). That analysis found that biofuels from a variety of feedstocks are cost-competitive with fuels derived from petroleum. But costs of conventional feedstocks have increased substantially, as have the costs of petroleum products with which biofuels compete, so the project will update the analysis with current and projected feedstock costs and petroleum product costs. And technology for production of second-generation biofuels from non-food feedstocks is advancing rapidly, so the project will update the analysis with the latest cost assumptions for second-generation biofuels. In October 2008, the project received $50,000 in support from the APEC Operating Account. An RFP was issued in March 2009, and five competing bids have been received. A team is being formed to evaluate the bids and recommend a consultant with a view to beginning work on the project in May.

Assessment of the Potential Use of Algae for Biodiesel Production in APEC

This project seeks to use a common methodology to assess the amount and location of algal biomass in the APEC region that could be suitable for the production of biodiesel. Algal biomass offers the possibility of a sustainable, low GHG emissions feedstock that is widely available, grows rapidly, yields more biofuel per hectare than oil plants, contains no sulfur.
or other toxic substances, is highly biodegradable; does not involve destruction of natural habitats, and does not compete with food production on agricultural land. Microalgae contain up to 40% lipids by weight and can be grown in many places such as bogs, marshes, swamps, salt lakes, wastewater treatment ponds, and deposits of animal waste. Algae could thus provide a major resource potential of biofuels to displace petroleum. The project seeks $50,000 in support from the APEC Operating Account. It was not approved by the Budget and Management Committee in October 2008. The Australian project proponent, Tom Beer, has resubmitted it for consideration in the first budget cycle for 2009 in March.

**Biofuel Transportation and Distribution Infrastructure Strategies**

Project synopses on biofuels transportation and distribution infrastructure were developed by the Task Force Chair in cooperation with the APEC Automotive Dialogue and endorsed by the Dialogue at its meeting of 10-12 September 2008. The two synopses have now been combined into a single synopsis for consideration by EWG-37. A full-scale project proposal to look at effective strategies for both transportation and distribution infrastructure was drafted by the Chair for consideration by the Auto Dialogue at its meeting in Seoul on March 31 – April 1, 2009, on which occasion the Auto Dialogue endorsed it. Thus, if the combined synopsis is be also endorsed by EWG, the project will be ready to submit to the BMC in the second funding cycle for 2009 in May.

The transportation portion of the project would develop a set of criteria and best practices for evaluating options to expand the transportation infrastructure for biofuels. Among the possible criteria to be examined include the amount of current and projected biofuels production from different feedstocks, the degree to which such production is geographically concentrated or dispersed, the extent to which current and future biofuel supply can be absorbed by local markets for transport fuel, the quality of existing transportation (road, rail and ship/barge) networks, the likely durability of supply and demand at the sending and receiving ends of proposed pipelines, and the cost of constructing long-distance ethanol pipelines as technology evolves. The best practices will draw from both analytic and economic literature on energy networks and from experience with evolving biofuel markets in a broad range of APEC economies.

The distribution component of the project would examine a variety of approaches to facilitate the expansion of distribution infrastructure for ethanol and biodiesel. One approach to be examined is the formation of government-industry partnerships to identify regions where biofuel production is expected to be concentrated and where targeted expansion of biofuel filling stations could help demand and supply to evolve in a systematic, reinforcing fashion. Other approaches might include financial incentives for the construction of biofuel filling stations and the planning of major highway projects that incorporate such filling stations. A report would be prepared, in consultation with the APEC Automotive Dialogue and the APEC Biofuels Task Force, to summarize and evaluate the main options identified.
**Study of Sustainable Biofuel Development Practices**

This project’s objective is to specify conditions and practices that allow biofuels to be planted and harvested in a sustainable fashion. In particular, the goal is to identify means for ensuring that biofuels development is cost-effective, does not compromise the security of food supplies, does not deplete available water resources, and does not result in a net increase of carbon dioxide emissions. Insofar as there are tradeoffs between these different components of sustainability, the project would identify them and suggest affordable options for developing biofuels while preserving the environment.

The main project output would be a report on practices for sustainable development of biofuels. Particular emphasis would be given to practices which can avoid the destruction of carbon sinks such as savannas and rain forests, which might result from the direct or secondary land use effects of feedstock production (in other words, from planting of the feedstocks themselves or the planting of other crops that the feedstocks have displaced). Such practices may include the systematic documentation of the geographic source of biofuel feedstocks, the systematic tracking of land use in particular areas, the compensation of biofuels cultivation with reforestation efforts elsewhere, or other measures under consideration. As the implementation of such practices may entail significant financial and human resources, attention would be given to the cost and practicality of different practices that have been proposed. The goal would be to arrive at a set of suggested best practices for consideration and adoption.

The project sought $80,000 from the APEC Operating Account for a report and workshop but did not obtain approval from the Budget and Management Committee in October 2008. Thus, the Chair plans to resubmit the project in an improved and simplified form in 2009, with a desk study to focus on points of commonality among the sustainability criteria being developed through multilateral fora like the Global Bioenergy Partnership (GBEP), the Roundtable on Sustainable Palm Oil (RSPO), and the Roundtable on Sustainable Biofuels (RSB), as well as within certain individual APEC economies.

**Planning Ahead**

It is anticipated that a sixth meeting of the Task Force might be held in the latter half of 2009. This would allow discussion of ideas for new projects and evaluation of ongoing projects as they approach completion. Suggestions for a meeting venue are welcome.