Japan – New Approaches to Clean Fuels Progress

Japan is currently the world’s third-largest oil consumer after the United States and China – and it’s the second-largest in the Asia-Pacific region. The country has virtually no domestic oil (or natural gas) reserves; consequently it is the second-largest net importer of crude oil, which represents the most consumed energy resource in Japan. According to International Energy Agency data (2007), Japan’s refined product demand totaled 5.02 million barrels per day, a decline of 1.7% from the previous year. This demand is about 20% of the total for the Asia-Pacific region.

For the transportation sector, gasoline demand started to decrease since 2005 due to lower vehicle growth from an aging population, energy efficiency targets, and fuel substitution. There are almost 76 million vehicles (Ministry of Land, Infrastructure and Transport) in use in Japan, with passenger cars making up about 76% of this number. Diesel vehicles are not very popular in Japan with only about 0.04% of new car sales in 2005.

Starting in 1997, the Japan Petroleum Energy Center (JPEC), supported by the Ministry of Economy, Trade and Industry (METI), implemented the Japan Clean Air Program (JCAP) to improve air quality. Carried out in three major phases, studies were conducted on existing fuels and vehicles, on evaluations of future vehicles and fuel technologies to reduce emissions, and on analyzing air quality conditions in real urban situations to better characterize air pollution.

Under the JCAP II program to examine new challenges in automobile and fuel technologies for better air quality, one investigation theme involved the influence of oxygenated fuel (using ETBE) on vehicle exhaust emissions, CO₂ emission profile, fuel economy and materials compatibility. The research demonstrated no significant increase in exhaust emissions in durability driving tests. In some cases, CO₂ was lowered and slight penalty on fuel economy observed. Fuel property range is broadened by the oxygenate blending so that T50 and RON properties should be balanced. The research program generally found no problems with the use of ETBE blends at 8 vol% for in-use gasoline vehicles.

In 2007, a new project known as Japan Auto-Oil Program (JATOP) was initiated through JPEC. The aim of this five-year activity is to establish optimal automobile and fuel use technologies that simultaneously address three issues – reduction in CO₂ emissions in the transport sector; diversification of fuels; and further reduction in auto emissions. The specific technology areas being explored for JATOP include:

- Technologies for expanded use of biomass-based fuels;
- Technologies for wider use of diesel engine powered vehicles that excel in emissions control and fuel efficiency; and
- Technologies for investigating and evaluating air quality through improved air quality modeling.

Similarly, METI has lead a multi-year process to acquire appropriate technical and scientific data on the use of ETBE blended gasoline, followed by comprehensive risk assessment of impacts and benefits to the environment and public health. Performance properties were considered for vehicles following use at 100 refueling stations, which increased to some 1000 stations. Evaluations of environmental protective measures, such as effectiveness of underground storage tank (UST) regulations, were conducted. The resulting outcomes demonstrated that bioethers are acceptable components for the fuel supply, and expanded use of such blends are anticipated within the couple of years.

This approach brings sound scientific investigations and appropriate data development into informed decisions on fuel quality standards. The JPEC and METI progression of clean fuels and vehicles programs provides a regional model for how to redesign fuel quality risk management systems and ensure responsible infrastructure is put into place for successful industry and consumer support.

The implementation of oxygenated fuel use is also considered within the framework of Responsible Care® principles. Japan’s petroleum industry has instituted sound management practices for fuel production, transfer, storage and dispensing. Leak detection monitoring and maintenance practices for fuel pipelines and underground gasoline storage tanks help to ensure environmental and water resources protection. Availability of effective clean-up

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An Interview with Ms Joanne Sofia Chong, Asian Clean Fuels Association

Joanne Sofia Chong joined ACFA in March 2009 as Communications Manager, bringing with her over ten years of experience in communications and marketing. Besides spending several years as a corporate and financial communications consultant in Singapore and China, Joanne also held regional communications and marketing roles in companies involved in hotel real estate, hospitality and service education. She holds a Master of Social Science (Applied Economics) from the National University of Singapore.

Q: Could you briefly tell us about your interest in and transition to this position as Communications Manager for ACFA?

Coming into this role with ACFA is a move that merges my professional experience and personal interest in environmental issues. I believe that communications, in its broadest sense, is a strategic tool that can powerfully impact business results. In ACFA, I get to contribute to the Association’s goals in this spirit, at the same time knowing that with every step of progress we make as an organisation I am doing my part in making the environment a better place to live in for us and our children.

Q: How has working with a not-for-profit association differed from that of private company, in terms of strategy and communications?

The biggest difference is the context in which the two companies operate in which determines the strategy and communications mix. Private companies invariably focus on financial performance and all communications are designed to support growth in the bottom-line. A not-for-profit association, on the other hand, is driven by an agenda that is not centered on its profitability. This calls for a more macro approach in developing supporting communications strategy and tactics, as well as demands greater sensitivity to complexities inherent within the broader context which the association serves.

Q: Could you relate how your experience with business development and marketing is assisting to advance the mission of ACFA?

The mission of ACFA is to promote the use of clean fuels in Asia and the Middle East on the basis of sound science and technology, cost effectiveness and the impact on the environment. The success of the Association lies in its ability to effectively communicate its ideas and knowledge to a wide spectrum of people including governments, policymakers and oil companies. At the core of this is ACFA’s ability to understand the complex considerations of every stakeholder and how ACFA can contribute to their success. For over a decade I have been in the business of generating and sharing ideas with people from various origins and cultures who have different motivations. In essence I am looking to apply my experience in dealing with people and building fruitful relationships in this new role although the content is new.

Q: How important is establishing strong contacts with multiple stakeholders when dealing with such complex issues as clean fuels policies?

From ACFA’s perspective, it is very useful to understand the motivations and concerns of all stakeholders that will be impacted by the policies when we deal with the various parties. However, the Association is focused on its mandate to be the voice of scientific rationale, economic reason and environmental conscience. Our role is to facilitate a thought process based on sound science and economic principles, provide objective consult and share relevant knowledge with governments and policymakers to enable them to make policy decisions that best serve the country’s interests.

Q: Based on your time with ACFA, what would you say are the organisation’s successes in moving the region forward on fuel quality and air quality improvements?

As a new staff of the association I am very impressed with the work ACFA has done to improve fuel quality and air quality in Asia and the Middle East. In particular ACFA has been providing input to governments and policymaking bodies in the region in matters relating to fuel quality and vehicle standards. For example, ACFA has successfully sponsored and advised the Chinese government in upgrading its national gasoline specifications to Euro 3 standards.

Another prime example is the collaboration between ACFA and the United Nations Environment Program Partnership for Clean Fuels and Vehicles (UNEP-PCFV). Since 2006, ACFA and UNEP-PCFV have co-organised three Gulf Cooperation Council policy development meetings for clean fuels and vehicles for the Middle East. The meetings in Beirut and Cairo resulted in the League of Arab States declaring its resolve to phase out lead in gasoline and to lower sulphur levels in fuels. These meetings facilitated ongoing discussion, engagement and cooperation at the national and regional levels amongst the nations and states, as well as provide a way forward for the implementation of cleaner fuels and vehicles programs and harmonization of standards within the region.

ACFA’s involvement in such high level policy decisions speaks volumes of the Association’s standing amongst decision makers and in the industry.

Q: What do you see as the current challenges for ACFA and region in addressing clean fuels and vehicles policy?

In the current economic climate and with crude oil prices at the present levels, clean fuels and vehicles policy or energy security issues take a backseat on government agendas.

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An Interview with Ms Joanne Sofia Chong, Asian Clean Fuels Association

(continued from p2) agendas. Already some countries have attempted to delay earlier plans to implement stricter fuel quality and vehicle emissions control policies. These policies have long lasting and extensive consequences for the nation on the whole and ACFA sees it as a necessity to continue engaging policymakers and all stakeholders during this down time to keep the goals in sight even as the implementation timelines shift.

Regardless of economic conditions, there is a constant pressure for governments to focus on current issues, an action bias that could lead to longer term considerations (such as corporate social responsibility) being compromised. It is vital that policymakers understand that the country’s long-term interests are best served when they maximise the benefits of their clean fuel policies while minimising the potential risks involved. ACFA believe it has a role to play in promoting a stronger understanding of product stewardship issues so that they are adequately addressed.

At the same time, there is an overwhelming amount of information regarding clean fuels and various energy alternatives available. The complex information environment makes it increasingly difficult for policy makers to objectively assess the best course for the country, bearing in mind that every country is unique. One of ACFA’s challenges is to continue its enabler role (to governments, policymakers and industry) in this ‘noisy’ environment and staying relevant.

Q: With ACFA now nearly a decade in operation, what new communications tools and outreach efforts can be developed to maintain the organization’s success and effectiveness?

Throughout the years ACFA has relentlessly shared its knowledge and expertise in the use of clean fuels and components with governments and policymakers in Asia and the Middle East to assist them in their decision making. The deliberately personal and targeted approach has worked very well and will continue to be a cornerstone of ACFA’s work. The Association aims to reach out to a wider (but still targeted) audience through new communications platforms including the highly evolved Internet space and by collaborating with like-minded organisations around the world.

Japan – New Approaches to Clean Fuels Progress

(continued from p1) technologies and prompt action on remediation when needed help to reinforce commitments to safe use of motor fuels. These broadly employed practices present a model approach for using oxygenated and cleaner-burning fuels.

Japan is one of the leading countries globally in setting and enforcing fuel and emissions regulations (along with the U.S. and E.U.). The Air Pollution Law in Japan requires the Central Environment Council (CEC) under the Ministry of Environment to establish permissible limits for auto fuel properties. To ensure compliance with these permissible limits, METI establishes necessary regulations for auto fuel quality under authority of the Law on the Quality Control of Gasoline and Other Fuels.

Japan currently has two specifications that regulate fuel quality: a mandatory environmental standard regulated by CEC; and a voluntary technical standard known as the Japanese Industrial Standards (JIS) under METI. The CEC environmental standard controls several fuel properties, whereas, the JIS cover a broader range of fuel characteristics. The two gasoline grades currently available in Japan are RON 89 (regular) and RON 96 (premium). The refining industry supplied 10 ppm maximum sulphur content gasoline since 2005, three years ahead of the requirement of January 2008 and before any other Asian country.

To help achieve the Kyoto Protocol goal of reducing greenhouse gas (GHG) emissions by 6% from 1990 levels by the year 2010, the Japanese government set biofuels targets to displace crude oil with about 500,000 kiloliters of biofuels equivalent in the transportation sector. METI has established a bioethanol standard of 3 vol% and comparable fuel ethers (mainly as ETBE) specification of 7 vol%.

The Petroleum Association of Japan (PAJ), comprising refiners and primary petroleum products distributors, announced in 2006 its members’ aim to blend about 840,000 kiloliters of ETBE (equivalent of about 360,000 kiloliters of bioethanol) with gasoline by 2010. The PAJ prefers ETBE blending due to fungibility, quality control, and cost effectiveness. Field testing and evaluations of ETBE-gasoline blends have been conducted since 2007 without any reported problems.

METI, with the Ministry of Agriculture, Forestry and Water, organized the Committee of Innovative Biofuels Production of the Future. The main objectives are targeted at second-generation biofuels production using non-food feedstocks and implementation of domestically produced biomass fuels. Four working groups were established to define and assess candidate biomass materials (as related to biodiversity), production process technologies, life cycle analysis, and bio-refinery operations.

METI believes that incorporating biofuels will be one of the main options to CO2 emissions control for transportation fuels. METI’s “Biofuels Technology Innovation Plan” includes research and development programs to improve feedstock production and process yields. METI is also evaluating efficiency and feasibility of advanced biofuels options along with electric vehicle and fuel cell technologies.

Japan continues to explore new avenues for reducing the transportation sector’s dependence on oil. The New National Energy Strategy has targeted reducing this dependence to 80% by the year 2030. The Next-Generation Vehicle and Fuel Initiative was established by METI to investigate, develop, and deploy innovative technology platforms including the highly evolved Internet space and by collaborating with like-minded organisations around the world.

Based on data generation and scientific assessments, and cooperative efforts by industry and government, Japan has taken a progressive approach to address advanced vehicle technologies and fuel quality improvements. Together the programs highlighted above can help achieve its goal to be one of the most eco-friendly motorized societies by 2030.
The 7th Asian Petroleum and Technology Symposium was recently held in Ho Chi Minh City, Vietnam. Organized by the Japan Petroleum Energy Center (JPEC), the theme of this event was “Advancement of Fuel Quality and Refining Technology for the Next Generation.” Over 100 delegates from numerous Asian countries participated in the plenary session and two working group sessions that covered fuel quality and refining and production.

Mr. Masyuki Nakano, JPEC president, gave the opening address for the conference. He noted the purposes for this technical symposium to:
• Overcome the technology barriers and challenges for automobiles and refining;
• Improve fuel quality throughout the region; and
• Address simultaneously energy security issues.

Mr. Kanji Nakayama, executive vice president of the Japan Automobile Manufacturers Association (JAMA) stressed that improving air quality throughout the region is the responsibility of both the auto industry and the petroleum refining industry, working cooperatively with governments and other stakeholders.

Dr. Nguyen Anh Duc, deputy general director for the Vietnam Petroleum Institute, PetroVietnam, summarized the country’s perspective on fuel quality and specifications. He indicated that PetroVietnam is working to set specifications for biofuels, including biodiesel blends, for approval by the Ministry of Industry and Trade.

The plenary session included a review of the “Road Map for Cleaner Fuels and Vehicles in Asia,” presented by Mr. Bert Babian, Clean Air Initiative for Asian Cities (CAI-Asia) Center. In general, he noted that air quality trends in Asian cities have improved significantly over the past 10 years, as shown in Figure 1. He further stated, however, that with the dramatic increase in vehicles, particulate emissions have become a pollutant concern in many Asian cities.

The Fuel Quality Working Group session included presentations by representatives of JPEC, JAMA, Petrolimex, LEMIGAS, PTT, and Philippines’ Department of Energy. Highlights from this session are as follows.

Ms. Hoang Thi Long Van, deputy manager of Petrolimex technical department, presented a summary of proposed changes to gasoline and diesel fuel quality specifications being considered by Ministry of Industry and Trade. Table 1 below gives some of the key specification changes being proposed.

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**Table 1: Petrolimex’s Proposed Specification Changes**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Current</th>
<th>Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Induction Period, minutes, min</td>
<td>480</td>
<td>240</td>
</tr>
<tr>
<td>Diesel Distillation, T90, oC, max</td>
<td>360</td>
<td>370</td>
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<tr>
<td>Viscosity at 40°C, CST, min-max</td>
<td>2 - 4.5</td>
<td>1.5 - 5.8</td>
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<tr>
<td>Density at 15°C, kg/m³, min-max</td>
<td>820 - 860</td>
<td>810 - 870</td>
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<tr>
<td>Lubricity, µm, max</td>
<td>460</td>
<td>report</td>
</tr>
<tr>
<td>Particulate contaminant, mg/l, max</td>
<td>10</td>
<td>report</td>
</tr>
<tr>
<td>Water, ppm, max</td>
<td>200</td>
<td>0.05 vol%</td>
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</tbody>
</table>

Ms. Hoang also indicated that RON 83 gasoline would be phased out, and Euro III-equivalent specifications would be implemented in 2012. Other gasoline octane grades would be upgraded to RON 92, 95 and 97 in 2012.

Mr. Koji Oyama, with JPEC, presented on the Japan Auto Oil Program (JATOP) and the current status of automotive fuels in Japan. JATOP was initiated in 2007 as successor to the Japan Clean Air Program completed in 2006. JATOP works in three main areas:

1. Research for fuel diversification:
   • Study on use of high concentration (over 5 vol%) of biodiesel blends;
   • Study on use of biofuel-blended gasoline; and
   • Quality study on fuels that may be available in the future, such as unconventional petroleum fuel.
2. Research for improved efficiency and reduced CO₂ emissions:
   1. Evaluation of potential diesel vehicles; and
   2. Study on new indicators of anti-knock quality and ignitability compatible with new combustion technologies.
3. Study on air quality improvements.

Ms. Eva Agagones, from the Philippines Department of Energy, presented an update on fuel quality standards for her country.

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BEIJING OLYMPIC GAMES ACHIEVED GREEN GOALS

A review conducted by the United Nations Environment Programme (UNEP) concluded that Beijing succeeded in cleaning up its serious air pollution, and met or exceeded almost all of its green environmental goals during the 2008 Olympic Games. According to the UNEP, the greatest gains were made in air quality, where carbon monoxide levels declined by 47% and particulate matter levels lowered by 20% during the Games. The city also reached near complete phaseout of hydrochlorofluorocarbons, which deplete upper atmosphere ozone and contribute to global greenhouse warming. Beijing has adopted strict Euro-IV equivalent vehicle fuel quality and emissions standards to reduce transport sector caused pollution. Other emissions gains during the period included a 38% reduction on nitrogen dioxide levels and 14% decline in sulphur dioxide.

UNEP’s review indicates that much of improvements were maintained even after the Olympic Games ended. Beijing’s air quality challenges are considerable since an estimated 1,000 new vehicles are registered there each day. The efforts put into place have helped to establish permanent improvements to Beijing’s transportation infrastructure and vehicle emissions standards, actions that are encouraging other metropolitan areas in China to follow.

CALIFORNIA ADOPTS LOW CARBON FUEL STANDARD REGULATION

The California Air Resources Board (CARB) has approved the Low Carbon Fuels Standard (LCFS) regulation that requires the transportation fuel used in the state have reduced carbon intensity (CI) by an average of 10% by the year 2020. The CI of the fuel is a measure of the direct and indirect greenhouse gases (GHG) emissions associated with each step of the fuel production and use, known as the “wells-to-wheels” for fossil fuels and “field-to-wheels” for biofuels. The CI is expressed in terms of grams of CO2-equivalent per mega-Joule (gm CO2/MJ) to standardize the energy content of different fuels.

The requirement begins with a 0.25% CI reduction as of 2011, with gradually increasing requirements over the ten years. The development of the regulation has been controversial due the inclusion of indirect land use changes that can take place from the production of biomass-based fuels, especially conversion to food-crop lands.

CARB was charged to develop the LCFS regulation by a 2007 Executive Order by state Governor Arnold Schwarzenegger, as an early action under state law AB32, known as the California Global Warming Solutions Act of 2006. The state is advancing action to address climate change and GHG emissions ahead of the federal government. The LCFS regulation is part of a very broad multi-year effort to reduce GHG emissions in the state across virtually all sectors of power generation, manufacturing and consumer product use. The LCFS regulation applies to in-state transportation fuel producers, importers and blenders. The regulation is intended to create a lasting market for clean transportation technology, and to stimulate the production and use of alternative, low-carbon fuels in California.

PHILIPPINES REDUCES GASOLINE BIOFUEL SPECIFICATION

The Philippines Department of Energy’s Technical Committee on Petroleum Products and Additives recently reviewed and released revised conventional gasoline specification that would limit the content of bioethanol to 1 vol% maximum. This limitation was proposed to differentiate conventional gasoline from E10 blends of gasoline and avoid confusion in the marketplace. Currently, under the Biofuels Act that came into effect in February 2009, the ethanol blending level was set at E5 nationwide, and increasing to the E10 level in 2011. The act also sets the biodiesel content level of B2 for diesel fuel blends.

MALAYSIA SETS ‘EURO-2M’ FUEL SPECIFICATIONS FOR AUGUST 2009

Malaysia is planning to introduce gasoline and diesel fuel specifications that meet Euro II-equivalent quality standards (also known as Euro-2M) nationwide later this year. A new RON 95 gasoline grade will be introduced in mid-July 2009 to replace the current RON 92 gasoline grade, and the Euro-2M specifications will be effective a month later in August 2009.

Malaysia’s plan to move to the Euro-2M compliant fuels was delayed from the original target of 2007, even though specifications were already issued for gasoline and diesel fuels, mainly due to fuel pricing issues. Under the Euro-2M standards, the sulphur content limit is being reduced to 500 ppm maximum. The gasoline specifications will include a benzene limit of 5 vol% maximum, density requirement of 780 kg/m3 max, and maximum limit to RVP of 65 kPa (although a waiver at 70 kPa maximum can be granted to oil companies once the standard is implemented). Petronas reports that existing refineries already produce gasoline meeting or exceeding the Euro-2M requirements. Malaysia plans to further tighten fuel specifications to Euro IV-equivalent standards (Euro-4M) with sulphur limits of 50 ppm maximum sometime around 2014 to 2015.

PAPUA NEW GUINEA SETS FIRST TIME FUEL SULPHUR LIMIT

The Papua New Guinea government recently released the Customs Regulation 2008 (Prohibited Imports – Certain Petroleum Products) that for the first time placed regulatory limits on sulphur content for imported fuel.

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She summarized the cleaner fuel quality and air quality mandates due to legislative directives. She also noted various concerns and issues that must be addressed for clean fuels, such as prices, supply availability, compatibility with vehicles, investment requirements by producers and fuel quality monitoring.

Mr Oberlin Sidjabat, with LEMIGAS, reviewed research results on the effects of biodiesel blending (splash technique) on engine performance. The findings indicate that proper specifications of the biodiesel fuel are key to ensuring quality performance. He recommends that the biodiesel fuel should be blended into the tank already containing conventional diesel fuel.

Mr Akira Ogura, representing JAMA’s Fuels and Lubricants Committee, examined the World Wide Fuel Charter (WWFC) and its recommended biofuel specifications. He noted that the WWFC is working toward global harmonization on fuel quality recommendations, as illustrated in Figure 2.

In the Refining and Production Working Group session, Mr Idemit-su Kosan gave a presentation on future petroleum refining direction to adjust to Japan’s changing demands. He indicated several potential key changes to future fuel quality in Japan, including:

- Increasing gasoline octane number to 95;
- Expanding gasoline blending for ETBE;
- Reducing sulphur content levels for bunker fuels; and
- Introduction of biofuels use.

Mr Mastura Jarani, with Petronas manufacturing planning and supply group, presented on Malaysia’s refining landscape beyond 2010. He highlighted that gasoline produced in Malaysia has sulphur levels below 150 ppm, compliant with Euro II-equivalent fuel specifications. He did indicate, however, that diesel fuel sulphur levels remain high for some production and that adjustment on operations and blending facilities are still needed to reduce these levels.

On behalf of the Japan Energy Corp., Mr Yasuhiro Araki, spoke about the refinery challenges in producing ultra clean fuels. He noted the importance of reducing sulphur content in gasoline and the problem of octane losses that can occur as sulphur level reach 10 ppm and lower.

The successful 7th Asian Petroleum Technology Symposium highlights the need for continued improvements in fuel quality for the region in partnership with advanced clean vehicle technology to help reduce emissions, and thereby improve air quality throughout the area.

Figure 2: World Wide Fuel Charter Progression

Outline of The Categories in WWFC

1. Category 5: Fuels needed to achieve future emission levels and emission control
2. Category 4: EURO IV-V: Fuels for markets with further advanced requirements for emission control, to enable sophisticated NOx and PM after-treatment technologies
3. Category 3: EURO II: Fuels for markets with advanced requirements for emission control
4. Category 2: EURO II-III: Fuels for markets with stringent requirements for emission control
5. Category 1: EURO I: Fuels for markets with minimal requirements for emission control


Upcoming Conferences & Events

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<th>Event</th>
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<th>Location</th>
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<tr>
<td>Alternative Fuels &amp; Vehicles Asia 2009</td>
<td>9-10 June 2009</td>
<td>Beijing, China</td>
</tr>
<tr>
<td>Asia Pacific Oil &amp; Gas Conference</td>
<td>4-6 August 2009</td>
<td>Jakarta, Indonesia</td>
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<tr>
<td>Clean Energy Expo Asia</td>
<td>18-20 November 2009</td>
<td>Singapore</td>
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