PACIFIC ENERGY SUMMIT

UNLOCKING THE POTENTIAL OF NATURAL GAS IN THE ASIA-PACIFIC

2011 SUMMIT REPORT

NBR THE NATIONAL BUREAU *of* ASIAN RESEARCH

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Front cover photo: (left to right) Datuk Abdul Rahim Hashim and Ho Sook Wah (International Gas Union and Malaysia Gas Association), seated next to Dennis Blair (Board of Directors, The National Bureau of Asian Research), take notes during one of the plenary sessions.

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TABLE OF CONTENTS

MAIN FINDINGS

- The Asia-Pacific, the world's most economically dynamic region, seeks to maintain economic growth, yet faces twin challenges: strengthening energy security as it seeks to meet escalating energy demand, and curbing the rise of greenhouse gas emissions.
- Most countries in the region rely heavily on oil and coal rather than on natural gas, which has a significantly lighter carbon footprint, emitting on average 29% and 44% less carbon dioxide than oil and coal, respectively. Increasingly abundant, natural gas provides a near-term, cost-effective, and achievable means for an accelerated transition to a lower-carbon economy fueled by renewable energy sources.
- Unconventional gas production technology offers access to vast new reserves of natural gas. Emerging LNG infrastructure in the region, rising production, and increasing global availability have enabled natural gas to play a significant role in energy diversification efforts, thereby strengthening energy security.
- Experts predict a Golden Age of gas for the Asia-Pacific region; however, such forecasts are predicated on increased investment in infrastructure for unconventional gas development, expanded penetration of natural gas in power generation, and market structures and innovative policy that offer gas a competitive and comparative advantage over oil and coal.
- Successful gas development requires transport infrastructure (and an investment climate to support its construction) coupled with a pricing policy that both satisfies domestic gas-consuming interests and gives adequate return to upstream investors.
- Oil-linked pricing for LNG has limited the penetration of natural gas in developing Asia. As the trend toward market liberalization continues in other regions, unlocking the full potential of natural gas in the Asia-Pacific will require genuine market reform.
- Subsidies encourage inefficient gas use and supply shortages, stunt upstream and midstream development, and overstimulate downstream investment, undermining the long-term prospects for gas. As policymakers and government leaders determine pricing policy, they must balance political considerations and domestic socio-economic conditions with the need to avoid damaging market distortions.
- Governments seeking capital investment for natural gas development must provide investors with a sound, sustainable, and stable regulatory and investment environment that allows for an adequate return on investment.
- Pricing and regulation are the most effective ways to influence consumer behavior. To transition to a lower-carbon economy, carbon must be priced to incorporate climate change externalities, thereby making gas more competitive against other fossil fuels. The ongoing ambiguity in carbon pricing policy creates uncertainty in the market and a challenge for both industry and government.
- Countries where resource development has traditionally been in the hands of government and national companies could benefit from increasing the role of the private sector.

TAKING STOCK: THE ENERGY AND CLIMATE SECURITY OUTLOOK FOR THE ASIA-PACIFIC

Oil prices "are entering a danger zone for the global economy," warned **Fatih Birol**, Chief Economist of the International Energy Agency (IEA), in his opening address on February 21 at the 2011 Pacific Energy Summit in Jakarta.

Birol's comments came as oil prices spiked to the highest levels in two years—prompted by political upheaval in the Middle East—leading to concerns that inflationary pressures would slow the global economic recovery. He went on to weave the flux in international oil markets together with the most pressing threat to the Asia-Pacific region and world environment: the devastating impact of rising global temperatures. "Without finding a solution in the energy sector," Birol continued, "we have no chance whatsoever to address the climate change issue."

Speaking to a gathering of over 150 regional energy experts, industry executives, government leaders, and top-level policymakers, Birol stated that growing energy demand from China, coupled with increased gas supplies from the region, would alter the regional energy outlook and drive expanded use of natural gas. "This would make the Asia-Pacific natural gas market very dynamic."

Birol's comments set the stage for Summit participants, hailing from fifteen countries across the region, to address the theme, "Unlocking the Potential of Natural Gas in the Asia-Pacific." The Summit assembled expert panels to host seven plenary sessions and two in-depth

Session one panel (left to right): Mikkal Herberg (The National Bureau of Asian Research), Stephen Green (Chevron Indonesia Company), Fatih Birol (International Energy Agency), Ken Koyama (The Institute of Energy Economics, Japan), and Satya W. Yudha (The House of Representatives of the Republic of Indonesia, Commission VII) discuss the global and regional outlook for natural gas.

workshops to engage in frank, pragmatic, and forward-looking debate focused on four core themes:

- Natural gas as an energy source for transitioning to a low-carbon economy
- The growing role of natural gas, an increasingly abundant resource, in meeting rising energy demand
- The fiscal, regulatory, and legal steps Asia-Pacific nations must take to ensure adequate natural gas supplies alongside the investment, infrastructure, and planning needed to unlock the full potential of natural gas
- Current and projected domestic natural gas markets, and how to support the development of greater demand for natural gas, particularly in the power sector

Over the course of two days, experts at the heart of the region's energy circles applied their collective expertise to develop innovative business models, policy tools, and market strategies that will harness the untapped potential of natural gas.

> The strategic view for natural gas is clear and compelling.
>
> —Dennis Blair, Board of Directors, The National Bureau of Asian Research (NBR)

Why Natural Gas? Why Now?

In tandem with its phenomenal economic progress, the Asia-Pacific region has developed a ravenous appetite for energy resources. Energy security is essential to realize the region's growth prospects, yet the heavy reliance on oil and coal casts a growing shadow on efforts to ensure climate security.

Mark Thurber (Stanford University) and Minister Gabriel Kapris (Ministry of Commerce and Industry, Papua New Guinea) discuss structuring domestic markets.

The Asia-Pacific region is facing dual challenges: to sustain economic growth and meet rapidly growing energy demand, while curbing the negative environmental impacts of that growth. These competing priorities present significant challenges, especially if coal and oil continue to dominate the energy supply mix. However, the substantial supply of a cleaner-burning fuel—natural gas—offers a low-carbon, near-term, and cost-effective energy solution across sectors: for government leaders and policymakers seeking to meet growing demand for clean energy; industry executives operating in increasingly carbon-constrained markets; and environmental advocates calling for immediate climate mitigation measures.

Increasingly abundant and offering diversity in the energy mix, natural gas is poised to strengthen energy security for sustained and sustainable economic growth. Natural gas is the cleanest burning of fossil fuels, emitting on average 29% and 44% less carbon dioxide than oil and coal, respectively. Natural gas can play a central role in the pursuit of clean energy development as a reliable alternative for fueling vehicles, industry, and power stations, in addition to serving as a partner energy source to accelerate the transition to renewable energy.

The Epicenter of Unprecedented Growth

Unprecedented growth defines the Asia-Pacific region today, with China at the forefront of rapid economic expansion, and India following closely behind. Over the past two decades, the Asia-Pacific has accounted for more than two-thirds of the growth in world energy demand. From 2001–07, China's energy demand alone grew by the equivalent of all the annual energy consumption of Latin America, in effect creating a new continent of energy demand in just 6 years. According to IEA projections, China will account for half of global oil demand growth in the next 5 years. By comparison, over the next 25 years, demand from OECD countries such as the United States, Japan, and Europe will remain flat.

Oil production capacity has been declining in many countries, specifically

Francis Saturnino Juan (Energy Regulatory Commission, Philippines) answers a question during the open discussion on natural gas in power generation.

in the United States, Europe, and Mexico, and capacity increases in other countries have barely kept pace with rising demand. Birol noted that in order to meet global oil demand growth over the next 10 years, 90% of production growth will need to come from Middle Eastern and African countries.

Tatsuo Masuda (Nagoya University of Commerce and Business, Japan Petroleum Exploration Corporation) answers a question during the closing Summit discussion.

More broadly, countries in the Asia-Pacific region increasingly rely on large domestic supplies of inexpensive coal for their energy needs, a trend reinforced by the lack of adequate investment and infrastructure for alternative fuel options. Currently, the region accounts for two-thirds of global coal consumption due to mushrooming demand for electricity. China and India alone are expected to account for 80% of the entire global increase in coal consumption over the next 25 years, with 80% of that coal being used to generate electricity. China's coal consumption could double in the next 20 years. The projected environmental impact associated with these trends is staggering and not limited by political boundaries.

"We are at a special moment to tackle this issue because the pressure of climate change is evident, and also, it's imminent," said **Tatsuo Masuda**, Professor, Nagoya University of Commerce and Business Graduate School, and Advisor to the Japan Petroleum Exploration Company.

Energy use is responsible for nearly two-thirds of the global greenhouse gases—largely carbon dioxide—that lead to climate change. Environmental concerns prompted leaders across the region to set targets for reducing carbon emissions, a burden that now rests with government officials and policymakers. Given the inherent tensions that exist in the desire for sustained and sustainable growth, new emission goals will be difficult to achieve without incentives, pricing reform, political will, regional cooperation, and—most importantly—alternatives to oil and coal.

THE GOLDEN AGE OF GAS: A CONFLUENCE OF ESSENTIAL ELEMENTS

"I see a Golden Age for gas starting," Birol declared, "and the start of this new age will be driven by Asia, both in terms of production and consumption."

By 2015, Asia is expected to be the world's largest regional gas market. Today, the natural gas supply picture is robust and changing dramatically—globally and regionally. Resources and supplies are now flowing from Australia, eastern Russia, Papua New Guinea (PNG), and Timor Leste,

Minister Dato' Sri Peter Chin Fah Kui (Ministry of Energy, Green Technology, and Water, Malaysia) takes notes during a plenary session.

adding to existing supplies from Indonesia and Malaysia. Supplies of liquefied natural gas (LNG), or natural gas that is super-cooled to a liquid and reduced in volume in order to transport it long maritime distances economically, are also being augmented by new unconventional gas sources, which include coal bed methane (CBM), shale gas, and tight gas.

> I see a Golden Age for gas starting, and the start of this new age will be driven by Asia, both in terms of production and consumption.
>
> —Fatih Birol, Chief Economist, International Energy Agency

"The growth in 2010 was something we've never seen before," said **Hiroshi Hashimoto**, Senior Researcher, Institute of Energy Economics, Japan (IEEJ). "The world created 20%—or 40 million tons—more LNG than the previous year."

With the advent of new technology, unconventional gas has essentially redefined the energy outlook. In the United States, the "shale gas revolution" transformed the country from a gas importer to potential exporter and has contributed to reducing the cost of natural gas from $8/million British thermal units (mmBtu) four years ago to $4/mmBtu today. The remarkably swift changes that occurred in North America, redirecting gas supplies to Europe and Asia, prompt the question: Could a

new wave of LNG projects predicted for Asia bring energy and climate security—a Golden Age of natural gas?

In Asia, gas accounts for just 11% of energy use, compared to nearly 26% in U.S. and European markets. What would constitute a regional Golden Age for gas? Summit participants largely agreed that the era would be characterized by sustained economic growth through the clean development and efficient use of gas, especially in the countries where it has been traditionally underutilitized. Natural gas would enable energy equity through improved energy access and also serve as a bridge fuel to accelerate the transition to a low-carbon economy and renewable resources.

Leland Jourdan (Chevron Indonesia Company) asks a question during the plenary session on natural gas supplies.

"We've had false starts before, so our task today is to ensure that we embark on this new era for real," said **Peter Hughes**, Director & Head of Energy Practice, Ricardo Strategic Consulting.

Working together, experts pieced together the elements needed to precipitate a Golden Age for natural gas. Three essential factors emerged: investment and infrastructure to maximize the potential of both conventional and unconventional gas supplies; expansion of natural gas's role in power generation; and market structures, pricing, and policy tools that allow gas to compete effectively with coal and oil.

Tapping into Unconventional Gas: A Continuous Path to Improved and Reliable Supply

After a banner year in 2010, LNG supplies—bolstered by new sources of unconventional gas—now represent 10% of global gas consumption and are expected to grow another 10% in 2011. Flourishing LNG supplies in the region have drawn new importers and diversified trade flows. Regional trade has expanded to interregional trade—between the Atlantic, the Pacific, and the Middle East.

Unconventional gas illustrates dynamic and promising changes in the industry and is dramatically altering perceptions. Natural gas is increasingly seen not as a scarce resource but as relatively plentiful. In the United States, the rapid scale-up of shale gas production transformed the national energy outlook, turning the country from a large projected LNG importer to possibly even an exporter.

SPOTLIGHT ON UNCONVENTIONAL GAS: LEVERAGING TECHNOLOGY TO POWER ASIAN ECONOMIES

The new abundance of U.S. shale gas is credited to the combination of hydraulic fracturing and lateral drilling. Often described as a game changer, this development is also a strong reminder that one key approach to accessing greater supplies of natural gas lies in technology.

Jim Slutz, an expert on energy project development, led the workshop "The Potential for Unconventional Gas in the Asia-Pacific." The workshop highlighted how successful innovations in the United States could benefit countries across the Pacific. Advanced technology, Slutz noted, put the U.S. shale gas revolution on the fast track and transformed the domestic energy outlook in just a decade. The share of shale gas in U.S. gas production tripled from 2000 to 2010 and accounted for nearly a quarter of U.S. gas supply. BP estimates that unconventional gas will account for well over half of U.S. gas production by 2030.

How could this approach be successfully applied to a country such as China, which, according to a report commissioned for the Summit by FACTS Global Energy (FGE), has an estimated 1,000 trillion cubic feet (tcf) of CBM and 918–1,589 tcf of recoverable shale and other unconventional gas? The workshop explored innovations in technology—enabling cost-effective development—and how they might recalibrate the regional energy outlook by facilitating increased supplies of natural gas.

Australia provides a compelling example. Over the next five years, it will become one of the biggest LNG exporters in the world, explained **Chris Gascoyne**, Managing Director, Singapore FGE. Australia has even greater resource-development opportunities, he added, "but commercializing it will depend on technology issues and finding a market."

The U.S. Trade and Development Agency (USTDA) is helping to develop the unconventional gas opportunities in Asia by assisting with feasibility studies and reverse trade missions to foster private-public partnerships in India, China, and Indonesia. "We try to leverage the expertise of the private sector and project owners and use that combined knowledge to drive the projects forward," stated **Mark Dunn**, Regional Manager for Asia, USTDA.

As the U.S. gas industry gained experience with hydraulic fracturing, specialized equipment was developed to address the environmentally damaging methane and other air emissions associated with the completion and workover of hydraulically fractured wells, explained **Carey Bylin**, Program Manager, Climate Change Division, U.S. Environmental Protection Agency. "The lessons we've learned in the United States, using technologies that can increase revenues for the companies and reduce greenhouse gas emissions, are available and should be considered as this resource is developed worldwide."

Drawing on extensive experience in unconventional gas project development and implementation, Jack Lewnard advised regional developers to seek a "holistic technology transfer," noting that unconventional gas expertise is concentrated among various distinct segments of the trade. "That's the historic development of our industry," he remarked. "So it's essential to put all the pieces together for success."

However, upstream development, delivery, and infrastructure for receiving gas are increasingly technologically demanding and inflexible. "For gas supply, technology is critical, both for cost and sustainability," said **Jack Lewnard**, Vice President and Chief Technology Officer, Gas Technology Institute (GTI).

Additionally, production methods still raise environmental concerns, largely centered on wastewater disposal and chemicals used to access various forms of unconventional gas. Lewnard affirmed that innovations have improved modeling and reduced the environmental footprint of drilling, which also lower risk and costs. "We're on a continuous path of improved efficiency."

If reliable gas supplies are essential to jump-start the gasification of Asian economies, significant investment in infrastructure and technology for both conventional and unconventional gas is fundamental. A number of energy executives pointed to the prospects for the Gorgon LNG project in Western Australia, which required approximately $42 billion up front. Industry leaders also reminded Summit participants, as they consider today's pressing investment options, that the gas industry works in the long-term, and it can be decades before a project realizes production outputs.

"What actions are necessary to move these investment decisions forward more effectively?" asked **Jim Slutz**, President & Managing Director, Global Energy Strategies. "If we could solve investment hurdles, we may end up actually exceeding project projections."

Carey Bylin (U.S. Environmental Protection Agency) comments on environmental considerations for natural gas development.

Boutique to Base-Load: Gas-Fueled Power Generation

"For the Golden Age of gas to truly take hold, natural gas must evolve from a marginal, 'boutique' energy resource for Asia to a base-load fuel, with greater penetration in the power generation sector," said **Mikkal Herberg**, Research Director, Energy Security Program, The National Bureau of Asian Research (NBR).

Delegates overwhelmingly agreed that fuel-switching for generating electricity could transform the energy sector. Yet, as with unconventional gas development, major investments are required for the scale-up of infrastructure such as pipelines, storage facilities, and the conversion of existing power plants.

Malaysia, capitalizing on an indigenous resource, emerged as a regional leader in the gas-fired power sector, starting with one gas-fueled plant in 1984 and expanding to 25 plants today. In 2010, 52% of Malaysia's electricity was powered by natural gas. Early infrastructure development and effective delivery to demand centers are at the heart of the country's success, explained **Dato' Sri Peter Chin Fah Kui**, Minister, Malaysia's Ministry of Energy, Green Technology, and Water. He stressed the added value that comes from natural gas as a fuel source: "Combined cycle technology has changed the economics of gas for power generation, this offers net efficiencies of over 55%, with substantially lower emissions than from oil or coal fired plants."

Datuk Abdul Rahim Hashim, President, International Gas Union and Malaysia Gas Association, made similar observations. He cited the "3 As" of natural gas—abundant, affordable, and acceptable to address environmental concerns. In applying natural gas to fuel power generation, he added, "you also have the '3 Es': economic, efficient, and environmentally sustainable."

Price, however, is a critical factor if we are to successfully channel gas into power generation. "This is an issue across the region; only realistic electricity prices can make it feasible for generators to pay for natural gas to generate electricity and allow gas to compete with coal," Herberg remarked.

Markets and Policy for a Golden Age

"In today's quickly shifting world economy, the issue of a competitive and comparative advantage for gas is clearly extremely important, especially in the Asia-Pacific market," said **Ed Chow**, Senior Fellow in the Energy and National Security Program at the Center for Strategic and International Studies (CSIS).

> For the Golden Age of gas to truly take hold, natural gas must evolve from a marginal, "boutique" energy resource for Asia to a base-load fuel, with greater penetration in the power generation sector.
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At the start of the 21st century, Peter Hughes recalled, a new era for natural gas was announced for Europe. Yet predictions failed to account for a fuel market that priced gas out of the power-generation sector—resulting in a false start. Today, Asia is on the cusp of a Golden Age of gas, but cheap coal still presents tough competition, especially in India and China, the region's demand growth centers.

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>
> —Ed Chow, Senior Fellow in the Energy and National Security Program at the Center for Strategic and International Studies (CSIS)

"If we look at the current differential between coal and gas prices on a BTU basis, there is only one way to improve the economic viability of gas: to reduce the price gap," said **Ken Koyama**, Director, Institute of Energy Economics, Japan (IEEJ).

Numerous Summit participants called for carbon pricing, which would incorporate climate change externalities, thereby making gas more competitive against other fossil fuels. Pricing and regulation, they agreed, are the most effective ways to influence consumers, change behavior, and incentivize a low-carbon economy. They also pointed to the ongoing ambiguity in carbon-pricing policy, which creates uncertainty and volatility in the market and a challenge to industry and policymakers alike.

Booming and reliable LNG supply has nurtured the evolution of natural gas as a traded commodity on the global market. Yet according to a 2009 International Gas Union survey, there are eight different pricing patterns around the world. While markets have evolved in Europe and the United States, oil-indexing, or oil-linked prices, remain the standard in the Asia-Pacific.

"Over 30 years, although linking LNG pricing to oil has been appropriate for the prosperous markets of Japan, South Korea, and Taiwan, the resulting high LNG prices have slowed the acceptance of LNG in developing Asia, particularly China and India," Mikkal Herberg remarked.

Summit delegates overwhelmingly agreed that expanding natural gas use in the Asia-Pacific will lead to greater market liberalization. The issue triggered lively exchanges on how to facilitate market reform and when such reform will truly take hold. As a reference point, Hughes pointed to the transformation in the European gas market.

"In continental Europe, the market is undergoing profound and radical change," he stated. "It is transitioning away from oil indexation and moving toward a spot market-based pricing structure that is likely to happen in the not-too-distant future."

Jim Jensen, President, Jensen Associates, added, "The last two years have provided a very interesting market test of two theories of how international gas pricing would ultimately develop." One theory pegs the United States as the most

influential market in terms of determining world prices. The other theory posits that the growing availability of LNG would link previously isolated regional markets and create a world gas market. "We still are a long way from a worldwide commodity market imitating oil," Jensen concluded. "But it's going to be interesting to watch how it evolves."

ASIA IS TOO BIG TO FAIL: MEETING THE REGION'S GROWING NEED FOR CLEANER ENERGY

Securing adequate energy resources for sustainable economic growth presents a wide range of challenges, but it is a must, remarked Tatsuo Masuda. "Asia is too big to fail."

The Asia-Pacific region consists of 48 countries and territories and has an estimated population of almost 4 billion people—approximately 60% of the world's population. The region harbors a tremendous and growing hunger for energy. Over the next 25 years, energy demand is expected to rise approximately 65%, substantially outpacing global demand and growth. Yet today around 800 million people in Asia still do not have access to electricity.

Energy analysts predict that, between now and 2025, $10 trillion will need to be invested in electricity generation in the Asia-Pacific just to keep the percentage of people with access to electricity constant. An additional $10–$12 trillion will be necessary to allow growth in primary energy demand. This puts the cost outlook at $1.5 trillion per year through 2025.

"The strategic view for natural gas is clear and compelling," said **Dennis Blair**, Board of Directors, The National Bureau of Asian Research (NBR). He called on experts to collaborate on tactical approaches to realize this vision in the plenary session "Structuring Domestic Markets for Successful Development."

As a primer for Summit delegates, **Bret Mattes**, CEO & Managing Director, Star Energy, identified the "key realities" that shape the Asia-Pacific energy sector: increasing dependency on Middle East supply; increasing dependency on large-scale infrastructure connectedness and regional networks; and in the aftermath of the 2008 global economic recession, an industry that is capital constrained.

Left to right: Moderators Edward Chow (Center for Strategic and International Studies) and Peter Hughes (Ricardo Strategic Consulting) share key points from the Summit dialogue during the closing discussion.

Xu Yongfa (China National Petroleum Corporation Research Institute of Economics and Technology) shared his insight on China's natural gas prospects.

China: Leading a New Era

"If there is one country that could change the game for gas, in terms of volume, it would be China," Fatih Birol predicted. As the "ground zero" of Asia's economic and energy demand growth, China also seeks to balance government commitments to reduce CO2 emissions. China has committed to reducing its overall carbon intensity by 40% from 2005 to 2020. As the world's fourth-largest consumer of gas, last year China consumed approximately 110 billion cubic meters of gas. This number is expected to jump to 250 billion cubic meters in the next five years, according to the targets set out in China's 12th Five-Year Plan.

"China's natural gas industry is in a systematic and rapid development stage," stated **Xu Yongfa**, President, CNPC Research Institute of Economics and Technology. China will need to import considerable quantities of LNG from the Asia-Pacific market, but it is also entering a new era, now being the world's fifth-largest producer. Xu Yongfa pointed to eight new LNG terminals to be completed by 2013, adding to the three completed in 2010. Despite the scale of expansion, natural gas currently accounts for only 4% of the country's energy mix, with a predicted increase to 10% by 2020, mainly going to industry, residential, and other purposes, but not to electricity generation.

Traditionally, oil and gas production has been in the hands of government and national companies. This is set to change, announced Xu Yongfa, referring to a 2010 policy aimed at introducing greater private sector involvement. "That will actively accelerate the pace of market orientation in China's gas industry."

Papua New Guinea: At the Crest of the Next Wave

PNG is a compelling contrast to China and Indonesia. With a population of just 6 million and fantastic natural resources, it is in the early stages of development, and still faces tremendous infrastructure challenges. Fifteen tcf of proven recoverable reserves place PNG alongside Indonesia and Australia in a wave of expanded regional gas development. Construction of PNG's first gas project, managed by Exxon, began in 2010, at a cost of $15 billion, and annual LNG exports are estimated to peak at $2 billion. Currently, gas development is in the hands of the national company, Petromin, which holds the state's interest in all petroleum and mining projects.

"PNG's gas development strategy takes into account that gas development requires substantial upfront investment," said **Gabriel Kapris**, Minister of Commerce and Industry, Papua New Guinea. The country's first LNG project will be export driven, Kapris stated, pointing to China and Japan as major destinations.

"PNG is destined to be an important part of the supply equation," said **Bruce McConaghy**, General Manager, New Ventures and Business Development, Petromin PNG Holdings Limited. Building quickly on its initial gas project, PNG will have three, possibly four, LNG projects within five years. "The state fully supports the investment environment, and it legislates for fiscal stability over the life of projects."

Petromin is seeking funding for future gas development opportunities, McConaghy announced. "We are reaching out to potential partners throughout Asia and the world, trying to find people who can develop the synergies with Petromin… and can bring the capital and technology into PNG."

Kapris added that PNG planned to develop domestic gas-based uses, including petrochemical and energy-intensive mineral processing industries, such as aluminum smelting. "Given [LNG's] contribution to low-carbon development, our demand for LNG will continue to be strong, and we expect that LNG will continue to provide impetus for growth for the future," Kapris concluded.

ONE SIZE DOES *NOT* FIT ALL: EFFECTIVE STRATEGIES FOR A DYNAMIC REGION

There is "a great deal of heterogeneity within any one basin, within any one field," said Jack Lewnard, noting the perils of developing a resource at up to 10,000 feet below ground. His point reinforced the importance of recognizing the great variability that exists in the Asia-Pacific region—in the field and beyond.

"We need to recognize that different markets require different solutions," said **Andy Gibson**, Senior Vice President, ExxonMobil Oil Indonesia Inc. "Each economy requires an individualized approach…a customized package of energy solutions for individual markets."

Chairman Syed Yusuf Hossain (Bangladesh Energy Regulatory Commission) comments during session one.

SPOTLIGHT ON INDONESIA: A LABORATORY OF CHANGE

Among the accelerating economies of the Asia-Pacific region, Indonesia is Southeast Asia's largest economy. As the host country of the 2011 Pacific Energy Summit, Indonesia is a vital trade partner and regional gas supplier, providing strong leadership in the region's energy sector. The world's third-largest exporter of LNG, Indonesia currently supplies 11% of the world's LNG exports from three production centers: Arun in Aceh Province, Bontang in East Kalimantan Province, and Tangguh in West Papua Province. LNG accounts for 36% of Indonesia's total natural gas production.

Bret Mattes described the archipelagic nation as a "laboratory of change" and noted that large investors recognize Indonesia's great potential. While making strong commitments to curb greenhouse gas emissions—29% by 2020—Indonesia is also navigating a course of sustained economic growth. **Gita Wirjawan**, Chairman, Indonesia's Investment Coordinating Board, announced government plans to propel the economy forward. "We have crafted our investment roadmap to take advantage of the low-hanging fruit in the first phase—to build the hard and soft infrastructure. Then we head into the next phase: industrialization on a large scale."

Gita Wirjawan (Indonesia Investment Coordinating Board) shares Indonesia's investment opportunities and growth trajectory.

Wirjawan joined a number of key Indonesian policymakers, energy experts, and government and industry leaders at the Summit. Together, they articulated a strategy to fuel growing demand in Indonesia for cleaner energy.

"Indonesia's energy consumption increases by 7% per year," remarked **Luluk Sumiarso**, Director-General for Indonesia's Ministry of Energy and Mineral Resources' Directorate-General of Renewable Energy and Energy Conservation. "We want to manage the demand side and ensure more efficient energy use, and natural gas provides that bridge."

Indonesia is experiencing a significant paradigm shift, from oil to gas production, stated **R. Priyono**, Chairman, Executive Agency for Upstream Oil and Gas Business Activities. "Gas is and will be playing a crucial role in fulfilling Indonesia's energy demand and energy security." The trajectory of the

Spotlight on Indonesia continued

national gas industry, he explained, is to prioritize domestic uses but still maintain and respect international relations.

Due to its sprawling geography, infrastructure development costs in Indonesia are exceptionally high. The domestic fuel market price is another challenge, according to **Satya W. Yudha**, Member, Commission VII, House of Representatives, Republic of Indonesia. "Of the $20 billion Indonesia will earn on oil and gas in 2011, $14 billion will go to subsidies."

Indonesia seeks to maintain long-term trade relationships, while providing its economy with a competitive edge. Meanwhile, domestic energy demand is outpacing Indonesia's pipeline network and production. As the country promotes greater economic growth and opportunity across the archipelago, it strives to adequately supply population centers, which are far from production centers, as well as remote outer islands.

In seeking energy security, Indonesia also aims to achieve energy equity by improving energy access. "Indonesia is a top gas exporter, but has only a 67% electrification ratio," said **Asclepias Indriyanto**, Executive Director of the Indonesian Institute for Energy Economics (IIEE). "We'd like to think that natural gas has a role in improving the welfare of people."

Currently the national electricity utility, PLN, only receives 60% of the gas it needs to meet rising energy demand, a result of inadequate infrastructure linking gas producers and consumers, explained **Nasri Sebayang,** Director of Planning and Technology at PLN. "Nowadays, we are not talking about the competition between gas and coal. We are talking about the system itself."

Mark Thurber (center) moderates the roundtable discussion on the role of natural gas in Indonesia's economic growth with panelists (left to right) Widjajono Partowidagdo (Institut Teknologi Bandung), Asclepias R.S. Indriyanto (Indonesian Institute of Energy Economics), Tony Nash (Economist Intelligence Unit), and Tengku Nathan Machmud (PT Perusahaan Gas Negara).

Gibson stated that natural gas has proven its ability to evolve over time to meet the needs of global markets. **Tony Nash**, Global Director, the Economist Intelligence Unit, Worldwide Custom Research, observed that government and industry have evolved accordingly. "There has been a change in the government mindset; from revenue only to revenue and development. From the private sector, the mindset is no longer limited to extraction and revenue, but an effort to balance this with local development."

There has been a change in the government mindset; from revenue only to revenue and development. From the private sector, the mindset is no longer limited to extraction and revenue, but an effort to balance this with local development.

—Tony Nash, Global Director for the Economist Intelligence Unit, Worldwide Custom Research Business

Sin Foong Wong, Head of Oil, Gas, Mining, and Chemicals for the International Finance Corporation (IFC) for East Asia and the Pacific, agreed and encouraged an expanded role for the private sector in countries where gas development has been in the hands of state-owned companies. "It makes sense for the private sector to be the driver, for its speed of response and efficiency, especially as we get closer and closer to the customer," he remarked. Wong also stressed the development impact the IFC could have in a country such as China. "It could be important to expand gas distribution infrastructure, to get gas to the less developed regions." For remote areas without access to energy, Wong emphasized the potential for a higher quality of life and, with a cleaner fuel, a significant opportunity for climate mitigation.

Reconciling Political with Economic Correctness: Investors and Industry, Government and Policymakers

"If oil is like playing roulette, gas is like playing chess," said Dennis Blair, reflecting on the strategic differences between successfully developing two different energy resources.

As a local or regional commodity, natural gas's significant upfront costs, which militate for predictable, cost-recovering prices over a long period of time, are in tension with domestic demand for an affordable energy resource to fuel economic growth. To realize the next generation of natural gas projects, cooperation across sectors is paramount: among investors and industry executives and government leaders and policymakers.

Industry executives at the Summit identified the gateway to investor confidence and capital: a host government that provides a sound and sustainable regulatory environment, is committed to honoring contracts, and establishes a pricing structure allowing a competitive return on investment.

Sin Foong Wong (International Finance Corporation) provides insight on financing natural gas development.

"Governments must realize that there's competition for capital inflow from every country in the world," said **Stephen Green**, Managing Director, President & CEO, IndoAsia Business Unit, Chevron Indonesia Company. "We encourage governments to give industry a seat at [the] policy development table."

Satya W. Yudha deftly summarized how governments and policymakers grapple with competing priorities. "If you deliver gas domestically to attract economic growth, it is politically correct, but it is not economically correct without any price adjustment according to the oil price fluctuation."

Francis Saturnino C. Juan, Executive Director of the Energy Regulatory Commission, faces a similar dilemma in the Philippines. "We have to make it attractive for investors to come in…but at the same time, we have to look after the welfare of our consumers. We seek to find that sweet spot where our consumers can bear that additional burden."

The Price Fulcrum

Bruce McConaghy delivered a key message to participants in the plenary session "Ensuring Future Supplies: Mapping a Natural Gas–Powered Strategy." "The economic imperative for policymakers," he declared, "is to send the right price signals for natural gas and LNG. If we're going to

move to a lower-carbon economy, we have to have carbon priced correctly."

Pricing issues, a reoccurring theme throughout the Summit discussions, were addressed from different angles. In the plenary session "Investing in Infrastructure and Technology for a Gas-Powered Future," Sin Foong Wong laid out the case for a practical approach to gas price negotiation. "I think it really behooves us to make sure that the price we derive from the value chain accrues more toward the upstream," he stated, "to provide greater development incentive, since that is usually where the greatest risks are taken."

> The economic imperative for policymakers is to send the right price signals for natural gas and LNG. If we're going to move to a lower-carbon economy, we have to have carbon priced correctly.
>
> —Bruce McConaghy, General Manager, New Ventures and Business Development, Petromin PNG Holdings Limited

If the price of natural gas is the fulcrum between supply and demand, energy experts concurred that the tipping point is skewed by subsidies and price divergence—the gap between domestic and export price. How can governments establish pricing policies that balance upstream and infrastructure interests with consumer and domestic industry demands?

Industry leaders at the Summit agreed that subsidies stunt upstream and midstream development and overstimulate downstream investment, undermining long-term strategic advantages. Yet various government representatives noted that moves to roll back subsidies must be incremental. Drastic measures are not politically feasible and maximizing the benefits of natural gas will require balancing domestic socio-economic conditions against real market forces.

"We've talked a lot about gas for export versus for domestic use," said **Mark Thurber**, Associate Director, Program on Energy and Sustainable Development, Stanford University. "I actually think the question should be framed as how to support gas development for both export *and* domestic use, because you need to make both—upstream investment and gas-fueled economic advancement—successful." Thurber suggested that the introduction of hybrid markets, with both liberalized and planned components, can be a way to ease the transition from capped domestic prices to a more market-based pricing regime.

Regional Cooperation: Finding Common Ground in a Diverse Region

Energy is increasingly interwoven with geopolitics, and leaders across the region acknowledge that the great task of achieving energy and climate security will require a joint effort. "In Indonesia, we apply the concept of carrying things together to make the burden lighter," offered Luluk Sumiarso.

Meanwhile, as LNG trade expands, it has the potential to forge greater connections

between individual markets. As countries seek both hard and soft infrastructure solutions, regional cooperation becomes increasingly relevant. "How can we coordinate policies and come up with one or two common agendas across the region to tackle this huge energy challenge?" Tatsuo Masuda asked. In addition to coordinating a regional domestic price, collaborating for greater energy efficiency, and internalizing the cost of coal burning, delegates offered examples such as the ASEAN Infrastructure Fund, an initiative to launch new financial vehicles for establishing infrastructure.

Increased collaboration among neighboring countries can leverage greater market stability and sustainability, said **Tadashi Maeda**, Head, Corporate Planning Department, Japan Bank for International Cooperation, and Special Advisor to the Cabinet of Japanese Prime Minister Naoto Kan. "Japan and the Republic of Korea combined have nearly a 60% market share of LNG. That's very strategically important." Maeda stressed Japan's intention to accelerate greater cooperation and alliances with South Korea, take greater responsibility in the marketplace, and actively invest in neighboring countries such as Australia, Indonesia, and PNG.

Lessons for a Gas-Powered Future

As an established natural gas producer, Bangladesh has effectively channeled its indigenous resource into 80% of its energy mix to power electricity, vehicles, and industry. Yet as a developing country Bangladesh is also facing the consequences of an unbalanced development equation, stated **Syed Yusuf Hossain**, Chairman, Bangladesh Energy Regulatory Commission. "We didn't get the benefit of industrialization and sustained economic growth as in the West… but on the receiving end, we are suffering the overall effects of global climate change." He urged leaders to be cautious as they choose their energy sources. "Finding more energy is not enough. We must identify a cost-effective energy source: safe, reliable, adequate in supply, and also sustainable."

Bangladesh is a country that offers a number of important insights into matching

Kwon Hong Ryu (Wonkwang University, Seoul Bar Association) discusses natural gas pricing mechanisms and trends.

strong domestic market demand with new gas resources. Lessons learned also came from recent industry developments, and Summit discussion returned to the Gorgon project in Australia. Jim Slutz noted that the upfront investment totaled nearly 50% of the Australian government's financial stimulus package during the economic downturn. "These projects can have an incredibly positive impact on the local economy and jobs," he said.

Gorgon will have the largest carbon dioxide sequestering facility in the industry and has a strong environmental record. "Absent collaboration across the stakeholder chain, Gorgon would still be a potential, not a reality," Stephen Green reminded participants.

A DESTINATION FUEL: NATURAL GAS BEYOND 2020

To successfully realize a low-carbon economy, clean development is essential. Experts recognize that the industry is still grappling with a number of issues, including gas leakage and venting during natural gas production, processing, transmission, and distribution.

"The oil and gas industry loses 100 billion cubic meters of natural gas to the atmosphere annually—about 3% of annual global natural gas consumption," said Carey Bylin. "This is not an insignificant amount when we talk about security of supply." To effectively and efficiently stem

Left to right: Sammy Hamzah (PT Ephindo), A. Edy Hermantoro (Ministry of Energy and Mineral Resources, Indonesia), Daniel Purba (PT Pertamina), Jack Lewnard (Gas Technology Institute), Bruce McConaghy (Petromin PNG Holdings Limited), and Tadashi Maeda (Japan Bank for International Cooperation) discuss current and future natural gas supplies.

leakage, she advised that cost-effective mitigation measures be taken along the entire oil and gas value chain. New technology can achieve greater efficiency, reduce methane emissions, and increase natural gas sales for relatively little additional cost.

Panel experts also reminded their colleagues that the pursuit of gas should not derail efforts for zero-emission fuels and renewables, while recognizing that without the implementation of global climate regulation and a carbon tax gas will remain challenged by coal.

Beyond the Bridge

Sustained and sustainable economic growth for improved living standards and prosperity is where all Asia-Pacific countries find common ground. Economists agree the region will also play an important role in the global economic recovery. Natural gas is poised to underpin this transition, as a multipurpose resource to fuel industry, power, transportation, communities, and energy equity.

Natural gas, delegates agreed, is more compatible with a sophisticated economy, suiting a market that is attentive to environmental responsibility, as well as to growth. While natural gas has evolved alongside the region's shifting energy paradigm, its development remains a long-term commitment, requiring long-term vision. On the cusp of a Golden Age of natural gas, defining and strategizing a growing role for this resource reaffirms our commitment to energy and climate security.

> We say that natural gas is a bridge fuel, but this implies a medium-term outlook … It's time to start talking about gas as a *destination* fuel.
>
> —Peter Hughes, Head of Energy Practice, Ricardo Strategic Consulting

"We say that natural gas is a bridge fuel, but this implies a medium-term outlook," asserted Peter Hughes. He noted that reserves now enabling production horizons in excess of one hundred years, coupled with new carbon capture and sequestration technology, could alter the premise of natural gas as a bridge fuel. "It's time to start talking about gas as a *destination* fuel," he suggested. "That would really launch the Golden Age of natural gas." ✦

SUMMIT AGENDA

Agenda Overview

UNLOCKING THE POTENTIAL OF NATURAL GAS IN THE ASIA-PACIFIC

February 21–23 | Shangri-La Hotel | Jakarta, Indonesia

Monday, February 21

17:30–21:00	Opening Reception and Dinner Program – *Ballroom A*	

Tuesday, February 22

08:00–9:00	Registration with Welcome Coffee and Refreshments	
09:00–10:40	SESSION 1	The Global Energy Outlook: The Role of Natural Gas in Meeting Asia's Energy Demand – *Ballroom A*
11:00–12:30	SESSION 2	Market Evolution and Adaptation: Contracts, Pricing Mechanisms, and Supply Security in Asia – *Ballroom A*
12:30–13:45	LUNCH	Discussion | Developing Effective Energy Investment Policy: New Perspectives for New Partnerships – *Ballroom B*
13:45–15:15	SESSION 3	Ensuring Future Supplies: Mapping a Natural Gas–Powered Strategy – *Ballroom A*
15:45–17:30	SESSION 4	Natural Gas in Power Generation – *Ballroom A*
17:30–19:30	Evening Reception – *Ceria Room*	
19:30	Private Dinners and Meetings	

Wednesday, February 23

08:00–9:00	Welcome Coffee and Refreshments	
09:00–10:30	SESSION 5	Structuring Domestic Markets for Successful Development – *Ballroom A*
11:00–12:30	SESSION 6	Investing in Infrastructure and Technology for a Gas–Powered Future – Ballroom A
12:30–14:30	LUNCH	Discussion | Transformation: Turning Potential into Reality – Ballroom B
14:45–16:45	ROUNDTABLE 1	The Role of Natural Gas in Indonesia's Economic Growth – *Java Room*
14:45–16:45	ROUNDTABLE 2	The Potential for Unconventional Gas in the Asia-Pacific – *Sumatra Room*
16:45	Coffee, Tea, and Refreshments	

Detailed Agenda

UNLOCKING THE POTENTIAL OF NATURAL GAS IN THE ASIA-PACIFIC

February 21–23 | Shangri-La Hotel | Jakarta, Indonesia

Monday, February 21

17:30–21:00 **Opening Reception and Dinner Program**

Ballroom A **Welcome**

Dennis BLAIR
Board of Directors, The National Bureau of Asian Research

Dinner Discussion

Planning for the Future:
Energy Security and Climate Change Challenges in the Asia-Pacific

Asia's success in reducing poverty and sustaining high economic growth rates has transformed the region. Clean, affordable, and reliable energy supplies are urgently needed to continue this trajectory and mitigate climate change and environmental impacts that threaten to negatively affect the rise in living standards. Policymakers face a wide array of challenges in meeting growing energy demand and protecting the environment. Summit participants will explore the pressing need for sound energy policies to address the region's economic, social, and environmental challenges, setting the stage for Summit discussions of policy and market solutions to the twin challenges of climate change and energy security.

- Looking ahead to 2030, which energy and climate issues are of greatest concern to regional policymakers and industry leaders and how can we avoid or mitigate future problems with action now?
- Which policies and technologies might significantly bend the region's energy demand growth curve downward without slowing economic development?
- What steps could be taken to reduce growth in carbon emissions while supporting continued economic growth?
- How can we address the diversity of political, economic, and environmental conditions and concerns in each country and work toward harmonizing policies as solutions for these challenges?

Moderator: Tatsuo MASUDA
Nagoya University of Commerce and Business
Japan Petroleum Exploration Corporation

Panelists: Fatih BIROL
International Energy Agency

Luluk SUMIARSO
Ministry of Energy and Mineral Resources, Indonesia

Tuesday, February 22

08:00–09:00 Registration with Welcome Coffee and Refreshments

09:00–10:40 SESSION ONE

Ballroom A ***The Global Energy Outlook: The Role of Natural Gas in Meeting Asia's Energy Demand***

Coal, oil, natural gas, nuclear energy, and renewable forms of energy all have important roles to play in the Asia-Pacific's energy and economic future. But among the options available today, natural gas is well-positioned to fuel economic growth, meet increasing demand for power, and partner with renewable energy sources to support the transition to a low-carbon economy.

- What is the current long-term global energy supply and demand outlook and what roles will different energy sources play for economies in the Asia-Pacific?
- Given the projections for large increases in coal consumption, is it possible to increase the natural gas-to-coal ratio to reduce overall emissions and meet future energy demands?
- What steps are needed to enable gas to effectively compete with coal?
- Why does Asia consume comparatively less gas than other regions and to what extent is gas consumption expected to grow?
- How do policymakers approach gas utilization strategies in this context?

Moderator: Mikkal HERBERG
The National Bureau of Asian Research

Panelists: Fatih BIROL
International Energy Agency

Stephen GREEN
Chevron Indonesia Company

Ken KOYAMA
The Institute of Energy Economics, Japan

S.W. YUDHA
The House of Representatives of the Republic of Indonesia, Commission VII (Energy, Mineral Resources, Environment, Research and Technology)

10:40–11:00 **Coffee Break**

Tuesday, February 22

11:00–12:30 SESSION TWO

Ballroom A ***Market Evolution and Adaptation: Contracts, Pricing Mechanisms, and Supply Security in Asia***

Growth in the global liquefied natural gas (LNG) trade and advances in the development of unconventional gas resources are transforming the gas supply and demand balance and the price outlook while driving changes in how gas markets operate. For the Asia-Pacific, recent developments in the global gas market, changing supply and demand patterns, and increasingly robust spot markets are altering the dynamics of the regional gas trade and raising questions about how gas will be priced and purchased in the future.

- What current changes in gas pricing and trading are underway in the North American and European gas markets and how might those changes affect the Asian gas market?
- How can policymakers balance the desire for supply security with greater price flexibility?
- What is the likely evolution of the contract system in Asia and how will growing spot markets and abundant LNG capacity affect the price of gas in the Pacific Basin?

Moderator: Edward CHOW
Center for Strategic and International Studies

Panelists: Hiroshi HASHIMOTO
The Institute of Energy Economics, Japan

James JENSEN
Jensen Associates

Kwon Hong RYU
Seoul Bar Association
Wonkwang University

12:30–13:45 **LUNCH**

Ballroom B

Tuesday, February 22

13:45–15:15 SESSION THREE

Ballroom A ***Ensuring Future Supplies: Mapping a Natural Gas–Powered Strategy***

Due to recent technological innovations, natural gas is more affordable and abundant. However, in order to adequately supply the growing market, accelerated investment in gas exploration and production, more widespread development and application of new technologies, and public policies facilitating long-term investment are required.

- Which countries will be the primary natural gas suppliers to Asia-Pacific economies and how reliable will those supplies be in the years to come?
- What are some existing and emerging technologies that may affect how gas is extracted, transported, and consumed? How can public policies facilitate the diffusion of those technologies and geological models to grow natural gas markets?
- Where might regional cooperation maximize affordability and reliability of gas supplies and what obstacles need to be overcome for greater trans-boundary cooperation?
- What are the best strategies for promoting producer and consumer dialogue?

Moderator: Sammy HAMZAH
PT Ephindo

Panelists: A. Edy HERMANTORO
Ministry of Energy and Mineral Resources, Indonesia

Jack LEWNARD
Gas Technology Institute

Tadashi MAEDA
Japan Bank for International Cooperation

Bruce MCCONAGHY
Petromin PNG Holdings Limited

Daniel PURBA
PT Pertamina (Persero)

15:15–15:45 **Afternoon Break**

Tuesday, February 22

15:45–17:30 SESSION FOUR

Ballroom A ***Natural Gas in Power Generation***

Due to abundant supplies, existing infrastructure, low costs, and supply security issues, the power sectors in the Asia-Pacific rely heavily on coal to meet current demand. In order to increase natural gas consumption, end-use applications must be further developed. The power sector faces substantial projected demand increases with economies and populations rapidly growing and offers a key opportunity to promote a greater use of natural gas in meeting energy demand. Not only would natural gas help increase overall electrification rates, switching from coal-fired to gas-fired power plants would drastically reduce carbon emissions. Greater integration of gas into the power sector could help to bring electricity to isolated communities, raise living standards, and provide significant environmental and public health benefits. Moreover, the versatility of gas-fired power plants allows for the greater integration of renewable energy into the grid.

- What are the obstacles to greater use of gas in the power sector and what actions are needed to address these challenges?
- How can existing energy generation and energy distribution technologies help address energy access and supply issues?
- What types of policies can encourage the use of gas for power generation while factoring in domestic socioeconomic considerations and development goals?
- How can natural gas support increased use of renewable energy sources?

Moderator: Peter HUGHES
Ricardo Strategic Consulting

Introducer: Minister Dato' Sri Peter CHIN Fah Kui
Ministry of Energy, Green Technology, and Water, Malaysia

Panelists: Andy GIBSON
ExxonMobil Oil Indonesia Inc.

Datuk Abdul Rahim HASHIM
International Gas Union
Malaysian Gas Association

Francis Saturnino C. JUAN
Energy Regulatory Commission, Philippines

17:30–19:30 **Evening Reception**

Ceria Room

19:30 **Private Dinners and Meetings**

Wednesday, February 23

08:00–09:00 Welcome Coffee and Refreshments

09:00–10:30 SESSION FIVE

Ballroom A ***Structuring Domestic Markets for Successful Development***

Domestic gas markets must simultaneously incentivize investment, stimulate demand, and account for domestic socioeconomic and environmental conditions. The ongoing challenge for countries seeking to increase their relative consumption of gas is how to strike a balance between ensuring adequate investment returns, and improving environmental outcomes, while also keeping energy prices affordable.

- How do gas market structures differ among economies in the Asia-Pacific?
- What are the lessons learned by observing the evolution of domestic gas markets around the world, and how can we apply these insights to economies currently seeking to expand domestic gas consumption?
- What steps can be taken in domestic gas market development to maximize energy efficiency and mitigate negative environmental impacts?
- What types of fiscal, legal, and regulatory frameworks accelerate investment and facilitate successful public-private partnerships?

Moderator: Mark THURBER
Stanford University

Introducer: XU Yongfa
China National Petroleum Corporation Research Institute of Economics and Technology

Panelists: Minister Gabriel KAPRIS
Ministry of Industry and Commerce, Papua New Guinea

Bret MATTES
Star Energy

R. PRIYONO
Executive Agency for Upstream Oil and Gas Business Activities (BPMIGAS), Indonesia

10:30–11:00 **Coffee Break**

Wednesday, February 23

11:00–12:30 SESSION SIX

Ballroom A ***Investing in Infrastructure and Technology for a Gas-Powered Future***

Natural gas infrastructure is expensive, technically complex, and requires sizable market demand and years of reliable operation in order to be economically viable. The cost and availability of drilling rigs and production platforms must also be factored in to project development plans. Together, these needs place a premium on the availability of long-term financing, strategic planning, managing costs, and reliable public-private partnerships.

- Given the large financing requirements, what key issues need to be addressed to create viable and creditworthy gas infrastructure projects?
- What is the current outlook for investment in upstream exploration and production capacity, and how can strategic planning help ensure rig availability aligns with production goals?
- How are new technologies for producing, transporting, and utilizing natural gas transforming the state of the industry, and what are the implications of those advances for countries developing their domestic gas resources and infrastructure?

Moderator: James SLUTZ
Global Energy Strategies

Panelists: Syed Yusuf HOSSAIN
Bangladesh Energy Regulatory Commission

Nasri SEBAYANG
PT Perusahaan Listrik Negara

Sin Foong WONG
International Finance Corporation, World Bank Group

Wednesday, February 23

12:30–14:30 **LUNCH**

Ballroom B **Discussion | *Transformation: Turning Potential into Reality***

Building on key themes, issues, and proposals that emerged from the Summit discussions, panel moderators will prompt participants to share ideas for moving forward.

Moderator: Dennis BLAIR
Board of Directors, The National Bureau of Asian Research

Panelists: Edward CHOW
Center for Strategic and International Studies

Sammy HAMZAH
PT Ephindo

Mikkal HERBERG
The National Bureau of Asian Research

Peter HUGHES
Ricardo Strategic Consulting

Tatsuo MASUDA
Nagoya University of Commerce and Business
Japan Petroleum Exploration Corporation

James SLUTZ
Global Energy Strategies

Mark THURBER
Stanford University

14:30–14:45 **Afternoon Break**

Wednesday, February 23

14:45–16:45 ROUNDTABLE WORKSHOPS

Java Room **Roundtable 1 | *The Role of Natural Gas in Indonesia's Economic Growth***

Focusing specifically on Indonesia's energy supply-and-demand markets and regulatory frameworks, what are the various ways that natural gas can help support Indonesia's economic growth? What are the greatest opportunities for natural gas to benefit its growing economy and consumers? What can policymakers and industry leaders do to further promote natural gas as a bridge energy source?

Moderator: Mark THURBER
Stanford University

Featured Speaker: Gita WIRJAWAN
Indonesia Investment Coordinating Board

Panelists: Asclepias R.S. INDRIYANTO
Indonesian Institute for Energy Economics

Tengku Nathan MACHMUD
PT Perusahaan Gas Negara

Tony NASH
Economist Intelligence Unit

Widjajono PARTOWIDAGDO
Institut Teknologi Bandung

Sumatra Room **Roundtable 2 | *The Potential for Unconventional Gas in the Asia-Pacific***

What are the future prospects for unconventional gas in Southeast Asia and Northeast Asia? What policies and regulatory frameworks support the exchange of technological capabilities and unconventional gas development? How might the diferent extraction methodologies used in developing unconventional reserves affect the nature of investments and public-private partnerships? What obstacles still exist with regard to unconventional gas technologies and extractions, and what are the environmental concerns associated with extraction?

Moderator: James SLUTZ
Global Energy Strategies

Panelists: Mark DUNN
U.S. Trade and Development Agency

Chris GASCOYNE
FACTS Global Energy

Jack LEWNARD
Gas Technology Institute

16:45 **Coffee, Tea, and Refreshments**

PAPERS FROM THE PACIFIC ENERGY SUMMIT

To inform and shape plenary session discussions and prompt specific and thought-provoking discussion, the 2011 Summit organizers commissioned the following:

Natural Gas in Asia: History and Prospects
Mikkal Herberg
The National Bureau of Asian Research
University of California–San Diego

Asian Natural Gas—Supply, Infrastructure and Pricing Issues
James Jensen
Jensen Associates

Evolving Roles of LNG and Asian Economies in Global Natural Gas Markets
Hiroshi Hashimoto
Gas Group, Institute of Energy Economics, Japan (IEEJ)

Europe's Evolving Gas Market: Future Direction and Implications for Asia
Peter Hughes
Ricardo Strategic Consulting

The Policy Tightrope in Gas-Producing Countries: Stimulating Domestic Demand Without Discouraging Supply
Mark Thurber and Joseph Chang
Program on Energy and Sustainable Development, Stanford University

Unconventional Gas and Implications for the LNG Market
Alexis Aik and Christopher Gascoyne
FACTS Global Energy

These papers are available at www.nbr.org.

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ExxonMobil

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Japan Bank for International Cooperation

PT Pertamina (Persero)

Star Energy

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