



2015 SUMMIT REPORT



PACIFIC
ENERGY SUMMIT

2015 • BEIJING

Strengthening Markets for Energy and Environmental Security



REPORT FROM THE
Pacific Energy Summit

**STRENGTHENING MARKETS
FOR ENERGY AND
ENVIRONMENTAL SECURITY**

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PACIFIC ENERGY SUMMIT

About the Pacific Energy Summit

The Pacific Energy Summit is an annual, invitation-only meeting that convenes leaders from government, business, and research to explore innovative solutions to the dual challenges of rising energy demand and a changing climate. The urgency of meeting this energy demand to sustain the economic growth that has lifted millions out of poverty, while safeguarding the environment and climate, demands cooperation and collaboration across nations, sectors, and research areas. The Summit is a consultative effort, bringing together a wide array of stakeholders to develop an interactive and diverse program.

Bringing Depth to High-Level Discourse—The Pacific Energy Summit facilitates frank exchange of information and perspectives by bringing together leading policymakers, industry representatives, and research specialists in a high-trust setting.

Focus on Market-Based Solutions—We are committed to practical and tenable approaches to energy and environmental challenges. The world needs realistic solutions based in an informed understanding of the economic and environmental needs of the region, and the Pacific Energy Summit strives to provide this essential foundation for a productive discussion.

Collaborative and Interactive Experience—We embrace the diverse expertise of all participants by encouraging dialogue before, during, and after the program itself. Participation is limited to ensure concrete discussions and a high-quality exchange of ideas and expertise.

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Key Findings



Left to Right: 2015 Pacific Energy Summit co-chairs Zhou Dadi (China Energy Research Society) and Dennis C. Blair (Sasakawa Peace Foundation USA; NBR Board of Directors); Tan Rongyao (National Energy Administration, People's Republic of China)

Energy systems around the world are at a critical juncture. As the global population continues to grow and standards of living improve, more and more people will demand increasing amounts of energy, creating immense needs for new investment and technology. Nowhere is this more true than in Asia, which leads world energy demand growth. Collectively, these trends will test the ability of current policy and investment frameworks to deliver adequate supplies of energy at an affordable cost.

To address these issues, the 2015 Pacific Energy Summit convened over 200 senior government representatives, industry executives, and energy specialists on May 27–29 in Beijing around the theme “Strengthening Markets for Energy and Environmental Security.” Representatives from eighteen countries gathered to offer their expertise and leadership on these important issues, yielding important conversations on transnational approaches to developing market-based energy policies.

1. Economic Growth and Energy Transformations in the Asia-Pacific

- Rapid economic growth, rising living standards, and shifting demographics drive energy and environmental outlooks. As the Asia-Pacific has seen significant developments in all these areas, prospects for the region’s energy and environmental security are in flux. Managing this high threshold of change will require strategies to ensure that energy policies can promote both economic and environmental goals across the Asia-Pacific.
- Asia’s energy demand doubled between 2000 and 2013, yet 700 million people in Asia remain without access to electricity. Higher standards of living across the region will lead the public to require more and more energy, pushing governments to fulfill greater demand.
- Without decisive action on the part of policymakers and industry leaders, increasing energy demand will exacerbate the damaging effects of local pollution and likely contribute to more pronounced global climate change. To balance the goals of economic growth, energy security, and environmental sustainability, policymakers and industry leaders must pursue energy policies that embrace the market while addressing negative externalities. These policies could include diversifying energy mixes, ameliorating the environmental effects of coal use and production, and embracing trading schemes for carbon dioxide (CO₂) and other emissions.

KEY FINDINGS

2. China's Energy Transformation and the Asia-Pacific Market

- Given China's position as the world's largest energy producer and consumer and as the second-largest economy in the world, trends in the country's energy sectors can have profound impacts on global energy markets. China is undergoing a historic energy transition due to rapid industrialization and economic growth.
- China seeks to transform its energy production, consumption, technology, and systems simultaneously. Its challenge is to pursue this energy technology and efficiency revolution while ensuring that the economy has the fuel needed for robust economic growth.
- In the face of immense energy demand and increasing reliance on imports, Beijing is pursuing a strategy of developing overseas energy investments, diversifying its energy supply, and establishing strategic international energy partnerships. The country has also set ambitious new energy and environmental targets, which will reshape both China's and the region's energy landscape.
- The impact of China's actions on regional and global energy outlooks remains uncertain. China's slower economic growth in recent years has in part led to a much slower than expected rise in coal use, and some analysts have predicted that Chinese coal consumption in 2040 could be less than in 2012. However, even if these shifts in the country's demand trajectory continue, its energy needs will remain immense, and further action will be needed to achieve regional energy and environmental security goals.

3. Pairing Technology and Policy to Improve Coal Use

- Coal continues to dominate Asia's energy mix, and its importance in emerging Asia's economic growth stems from the fuel's perceived reliability, its low price compared with other fuel sources, and its abundance in the region. However, without action to ameliorate negative environmental effects, continued reliance on coal will be detrimental to local and global environmental security.
- China is the world's largest producer and consumer of coal, and Chinese coal consumption has been a driving factor in global energy consumption growth. However, the country's coal demand growth is slowing, and the government is making great strides in improving the sector's efficiency with the installation of new, larger ultra-supercritical plants and the closing of older, smaller plants. In contrast, many countries in Southeast Asia are seeing a rise in coal demand, which is often fulfilled by low-cost, low-efficiency coal-fired power plants.
- In order to preclude the negative environmental impact of coal use, collaboration on improving clean coal technologies (CCT) and developing more commercially viable carbon capture and sequestration (CCS) technology is needed at many levels, including through national policies, multilateral engagements, and public-private partnerships.
- An "all-of-the-above" strategy toward diversifying the composition of the Asia-Pacific's energy mix must be pursued along with initiatives to improve and widely implement technologies that might be able to ameliorate the emissions from coal use. To accomplish this, it will be necessary for policymakers and industry leaders to work closely together both on national policy development and international technology exchange and shared best practices.

4. Promoting a Healthy Society through Clean Air Policies

- The World Health Organization estimates that urban air pollution caused roughly 2.6 million deaths in Asia in 2012. Stakeholders have strong incentives to reduce pollution, and different actors are developing options for best addressing this key concern, such as emissions trading and subsidy reform.
- The adverse consequences of air pollution for public health and the environment stem not just from CO₂ emissions but also from the presence of particulate matter and other pollutants such as sulfur dioxide (SO₂), nitrogen oxides, and mercury, all of which must be curbed to sustain public health.
- For environmental policies to be efficient and effective, enforcement must be prioritized. Clear disclosure of policy changes serves to inform and engage public participation, thereby building the political will to address negative externalities such as air pollution.
- In order to enact effective policies to combat air pollution and harmful emissions through emissions trading, committed measurement and monitoring of pollution are also vital. Updated data can allow for adjustments to improve the functionality of the market.

5. Bringing Wind and Solar to Scale

- While interest in embracing renewable energy is strong in Asia, its share in the region's energy mix remains dwarfed by fossil fuels. Solar and wind use has grown rapidly but still constitutes less than 5% of Asia's power mix.
- Countries across the Asia-Pacific have a vested interest in maximizing indigenous sources of renewable energy to achieve greater energy security from reduced exposure to supply disruption, as well as environmental benefits. For the tens of millions of Asians who remain without access to gridded energy systems, distributed off-grid systems using solar and wind energy could be a viable low-carbon path.
- Given that a continuous supply of energy is necessary for a thriving economy, numerous delegates at the 2015 Summit argued that it can be difficult to support economic development and ensure broader stability by relying solely on interruptible power sources such as wind and solar. As such, substantial investments have been made toward developing storage and backup energy systems for these resources. More research and development will be needed, however, to address these ongoing concerns.
- Policymakers, academic experts, and industry leaders disagree over whether scaling up wind and solar to a level where they dominate central grids is technically or economically practical. Some argued that even with the widespread availability of energy storage, fundamental technological breakthroughs would be still be required in these sectors.

KEY FINDINGS

6. The Future of Nuclear Energy in the Asia-Pacific

- Governments across Asia, and particularly in Northeast Asia, have outlined plans to construct more nuclear power plants than any other region in the world. Of the 57 nuclear reactors currently under construction worldwide, 48 are located in Asia.
- Nuclear energy can play an important role in meeting the region's growing electricity needs, but producers must strengthen collaboration to bolster safety and better address public concerns. Greater international cooperation and increased transparency around the process of implementing and enforcing regulatory, safety, and operating standards could strengthen best practices and raise overall public confidence.
- China has embraced the promise of nuclear power at a very fast pace, with 23 reactors in operation, 27 under construction, and many more planned. Some have predicted that by 2035, nuclear power could count for 10% of the total power installed in the country, easing its reliance on other energy sources.
- Japan has approved the restart of nuclear power generation, and the current Japanese government plans for nuclear power to make up 20%–22% of the country's energy mix by 2030. This figure would approach but not match the 30% share nuclear held before the Fukushima disaster.

7. Developing a More Integrated Asian Gas Market

- Asia contains the world's top importers of liquefied natural gas (LNG). Yet despite rapid growth in natural gas trade and development, gas remains an underutilized energy resource in Asia. Integrating more gas into the region's power-generation mix would help meet both energy security and environmental goals.
- Although China's demand for gas grew sixfold in the last fifteen years, demand growth is slowing down. This trend is partly caused by the country's slowing economic growth alongside the relative affordability of coal compared with gas. However, as part of China's overall strategy to improve its energy security, the country will continue to diversify its energy mix. It will also seek technological solutions to reduce the cost of accelerating production of its shale gas resources, which has so far proved logistically difficult and expensive.
- Since 2011, Japan's dependency on natural gas imports has dramatically increased, and high prices produced a large balance-of-payments deficit. Because many LNG contracts link the price of LNG to the price of oil, falling oil prices over the past year have eased Japan's deficit. Still, the country is looking to secure its LNG supply and optimize its broader energy mix.
- A natural gas hub in Asia could increase the predictability and stability of gas prices. The development of more open gas markets is necessary to generate reliable price signals that can provide a real alternative to oil indexation.
- There is a tremendous need for more private investment in the gas sector; realizing Asia's potential for embracing gas as a major fuel source will require improved infrastructure and broader sector development. Policymakers must commit to market-based policies over the long term that encourage investment and innovation.

8. *Building a Resilient Global Oil Market*

- Structural changes in the global oil market—namely increased unconventional, tight oil production in North America and rising consumption in many emerging economies—have overturned traditional energy geopolitics. Nonetheless, price volatility has been a historical feature of oil markets, and government policies need to recognize this reality.
- Current low oil prices provide an opportunity for governments to remove or reduce direct subsidies that support high domestic oil demand. Indonesia and China have already begun enacting such policies, thereby easing the strain on each government's budget.
- As a major oil producer and consumer, the United States has witnessed a significant jump in unconventional oil production—the largest source of incremental growth in the global oil supply in recent years. Production levels have thus far held steady, but there is concern that long-term low oil prices will have severe implications for future investment and output in the United States and elsewhere.
- Recent oil market volatility highlights the importance of developing more collaborative regional responses to market uncertainty, including building strategic oil stockpiles, given that most nations in Asia have similar energy security concerns.

Full discussion of these key findings:

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BUILDING A RESILIENT GLOBAL OIL MARKET

Strengthening Markets for Energy and Environmental Security



He Jiankun (National Experts Panel on Climate Change, People's Republic of China; China Energy Research Society) delivers a welcome at a session on “Economic Growth and Energy Transitions in the Asia-Pacific.”

“The Asia-Pacific region is the key area of the world for energy consumption, and also has the highest rate of energy consumption growth in the world. Under such circumstances, the energy transition and energy revolution of the Asia-Pacific is very important for the global community to realize energy and environmental targets.”

— **He Jiankun**, *Vice Chairman, National Experts Panel on Climate Change, People’s Republic of China; Vice Chairman, China Energy Research Society*

The Asia-Pacific is home to four of the world’s five largest energy consumers, and developing Asia is projected to account for 65% of global energy growth by 2035, four times the combined shares of Latin America and Africa.¹ Under a business-as-usual approach, this surge in energy use will lead to increasing carbon dioxide (CO₂) emissions from the region. According to the International Energy Agency (IEA), energy use is responsible for more than two-thirds of global CO₂ emissions.² The transportation sector will become the largest source of greenhouse gas (GHG) emissions, accounting for 46% of total emissions by 2035.³ Curbing such emissions poses a particular challenge for Asia, which by 2030 will produce 31% of the world’s total CO₂ emissions from the transportation sector.⁴

Amid this transformational rise in energy demand, the makeup of the Asia-Pacific’s energy mix is also in a transitional state. Fossil fuel-based energy systems might struggle to keep up with rising demand, and governments are placing higher priority on environmental considerations and clean-energy sources. North America’s increased unconventional oil and gas production has not only resulted in

decreased energy imports but has raised the prospects for exports from that region. In many Asia-Pacific countries, by contrast, the share of energy imports has increased dramatically in recent years, and this dependence is only expected to intensify. This rising import dependency will take place alongside evolving energy mixes within the region. In China, the world’s largest energy consumer, government policies aim to reduce coal demand and increase the use of natural gas, whereas much of Southeast Asia will rely more on coal, as a cheap and abundant fuel, than on other fuel sources. Yet although the overall energy mix continues to be dominated by fossil fuels, especially coal, countries across the Asia-Pacific are looking to broaden their mix to embrace a wider range of energy sources, including wind, solar, nuclear, and hydropower.⁵

The economic and environmental costs of the status quo are rising, and addressing these challenges will require political courage and unprecedented collaboration on both a regional and global scale. Decisions made among nations in the Asia-Pacific will have profound effects on global energy and environmental security. The prospects for sustaining economic development, satisfying soaring energy

demand, and mitigating the trend of increasing emissions necessitate action from policymakers and industry leaders from across the region to develop market-driven solutions. Using market-oriented policies will provide an opportunity to address energy and environmental security challenges by more efficiently managing supply and demand. Market signals indicate where investment is most needed but also require governments to provide appropriate investment policies and regulatory frameworks in order to promote energy security, economic prosperity, and environmental sustainability.

Economic Growth and Energy Transitions in the Asia-Pacific

While Asia has witnessed a historic expansion in energy access, with energy demand doubling between 2000 and 2013, 700 million people in Asia remain without access to electricity. Increasing standards of living will lead the public to require more and more energy, pushing governments to fulfill ever increasing demand. Although all countries in developing Asia aim to increase

economic prosperity, governments have also highlighted in varying degrees the importance of pursuing environmental security as a national priority.

Many organizations—including the Asian Development Bank (ADB), the IEA, and the U.S. Energy Information Administration—forecast continuing growth in energy demand and expect the region to confront related energy security and sustainability challenges. As **Keisuke Sadamori**, Director for Energy Markets and Security at the IEA, noted, oil demand in particular has grown dramatically in Asia, leading to increased vulnerability to supply disruptions due to potential political instability and insufficient energy infrastructure. In part to offset this vulnerability, **Yongping Zhai**, Technical Advisor of the Energy Sector Group at ADB, emphasized developing Asia's immense need for continued investment in energy sector development, totaling roughly \$400 billion per year until 2035, and the IEA reported that from 2000 to 2013, average annual energy investments in non-OECD Asia totaled \$296 billion.⁶



“Today few regions of the world, if any, are more pivotal to the global economy, and no input is more critical than reliable energy supplies to driving economic growth within the Asia-Pacific region. We believe trust, long-term relationships, and energy development partnerships are the building blocks of energy security.”

— **Melody Meyer**, *President, Chevron Asia Pacific Exploration and Production Company;*
Member, NBR Board of Directors

Rising energy demand will exacerbate the damaging effects of local pollution and likely contribute to more pronounced global climate change. **Ming Sung**, Chief Representative for the Asia-Pacific at the Clean Air Task Force and Chairman of the Asia Clean Energy Innovation Initiative, emphasized the urgency of combating environmental degradation and climate change in the short term. Improving energy efficiency is an attractive course of action for the Asia-Pacific and was described in Summit discussions as “low-hanging fruit.” Mr. Sadamori emphasized the potential of initiatives that promote international cooperation for improving energy efficiency throughout the region. A number of panelists called for more widespread transfers of knowledge on energy efficiency and pollution reduction from developed economies to emerging economies. Building on this recommendation, Mr. Sung also suggested broader government promotion of more sustainable development and efforts to drive down the costs of lower-emission power generation, which he calculates will save money in the long term.

China’s Energy Transformation and the Asia-Pacific Market

Central to the Summit’s mission is a focus on assessing the energy and environmental challenges facing individual countries and exploring how country-specific lessons can help strengthen regional and global frameworks for energy and environmental policy. China is undergoing a historic energy transition in the wake of three decades of rapid industrialization and economic growth, and the government has set ambitious energy and environmental targets in an effort to reshape the country’s energy outlook.

China is the world’s largest energy producer and consumer and the second-largest economy in the world. Though still high compared with other countries in the Asia-Pacific, its energy intensity is improving rapidly as policies are put in place to enhance energy efficiency and shift toward a less energy-intensive economy.⁷ As the world’s largest net oil importer, China is one of the major forces shaping supply and demand balances in

“Energy is a problem, but it is also a solution. The solution would be going from dirty energy to clean energy. All our resources are being put into supporting energy efficiency, renewable energy, and some clean fuel, which contribute to reducing environmental impacts.”

— **Yongping Zhai**, *Technical Advisor,
Energy Sector Group,
Asian Development Bank*



“To mitigate climate change and enhance the world’s energy security, countries in the Asia-Pacific need to work together. We must ensure that incremental energy demand growth is increasingly met by non-fossil sources. We must also ensure that all new buildings in this rapidly growing region are built with the best energy efficiency technologies.”

— **Jonathan Fritz**, *Acting Deputy Chief of Mission, Minister Counselor for Economic Affairs, Embassy of the United States in the People’s Republic of China*

international oil markets.⁸ Due to the country’s increasing reliance on imports of oil and natural gas, energy supply vulnerability has become a key strategic concern for Beijing, which is pursuing a strategy of developing its overseas energy investments, diversifying its energy supply, and establishing strategic energy partnerships throughout the region and beyond.

Summit delegates noted that China is seeking to transform its energy production, consumption, technology, and systems simultaneously. Its challenge is to navigate this energy technology and efficiency revolution while ensuring that the economy has sufficient energy supplies to sustain

economic growth. According to **Mikkal E. Herberg**, Research Director of NBR’s Energy Security Program, “China is facing a profound energy transition, going from the previous resource-intensive, high-growth, high-investment model toward a more sustainable economic model and energy mix.” Due to its importance in global markets, the country’s attempts to complete this dramatic transition without sacrificing economic development or environmental security will have profound impacts on global energy and environmental outlooks.

To achieve this goal, Chinese policy aims to support continued economic growth while



“China is facing a profound energy transition, going from the previous resource-intensive, high-growth, high-investment model toward a more sustainable economic model and energy mix.”

— **Mikkal E. Herberg**, *Research Director, Energy Security Program, NBR*

increasing its emphasis on the environment. Beijing plans to curb rising GHG emissions by reducing coal use, boosting the role of natural gas, and expanding supplies of nuclear, hydroelectric, and renewable power on an enormous scale; meanwhile, China has already invested more in its renewable energy sector than any other country.⁹ It has committed to capping coal consumption by 2020 and is also making great strides in improving the efficiency of its coal sector. **He Jiankun**, Vice Chairman of China's National Experts Panel on Climate Change and Vice Chairman of the China Energy Research Society, contended that the Chinese government understands very well that its public commitment to reach peak carbon emissions by 2030 is just a starting goal in the campaign to reduce future GHG emissions.

Some panelists noted that Beijing may struggle to implement many of these ambitious goals. A key challenge remains in efforts to boost the use of cleaner-burning natural gas, which emits roughly half the carbon per unit of energy that coal does. Although natural gas use is rising rapidly, the need to increase the price of natural gas to encourage greater production and pay for more expensive imported gas undermines efforts to substitute gas for more affordable coal. Furthermore, Chinese industry has thus far been unable to deploy hydraulic fracturing technology to extract shale gas at North America's recent successful rate.¹⁰ This difficulty is due in part to a combination of differing



Ken Koyama (Institute of Energy Economics, Japan), considers China's role in shaping the Asia-Pacific energy landscape.

geological formations, lack of access to the most up-to-date technology, and complications related to Chinese land use laws and ownership rights. Additionally, reaching Beijing's ambitious targets for scaling up nuclear energy may not be easy as a result of safety considerations and increased public concerns following the Fukushima accident in Japan. Overall, Beijing's success or failure in addressing these and other challenges will have major implications both for energy markets and for the environment.

Encouraging Innovation to Improve Energy Policy Outcomes



Arthur Hanna (Accenture Strategy, World Economic Forum) delivers remarks on the issues of energy security, affordability, and sustainability.

“One of the things that has happened in China is the shutting down of some of the smaller production capability. We’re likely to see that continue. Coal obviously remains dominant, but the nature of coal production is likely to change.”

— **Arthur Hanna**, *Senior Managing Director for Energy, Accenture Strategy; Project Lead, Global Agenda Council on New Energy Architecture, World Economic Forum*

Pairing Technology and Policy to Improve Coal Use

Coal still dominates much of Asia’s energy mix. Its importance for emerging Asia’s economic growth stems from coal’s perceived reliability, its low price compared with other fuel sources, and its abundance in the region. Without action to curb the negative environmental effects of inefficient coal-fired power generation, continued reliance on coal will be detrimental to local and global environmental security.

Coal consumption in China has been a driving factor in the incremental growth of global energy consumption: over one-third of growth over the past decade has come from coal in China, according to the IEA’s *2014 World Energy Outlook*.¹¹ However, according to a 2014 NBR report, different studies on China’s coal consumption offer a range of projections for future growth.¹² As **Kevin Tu**, China Program Manager at the IEA, noted, the growth of coal consumption in China is expected to slow down substantially in the future. **Ken Koyama**, Managing Director and Chief Economist at the Institute of Energy Economics, Japan (IEEJ), also highlighted

that China’s slower economic growth rate in recent years has in part led to a much slower rise in coal use than expected. IEEJ’s low-growth scenario predicts that total Chinese energy consumption in 2040 could be less than in 2012.¹³ Nevertheless, regardless of transitions to other fuels, China will continue to dominate global coal markets, as the size of the Chinese market is more than half the global total.

China’s progress in reducing its dependence on coal for electricity generation is an important step in addressing global air pollution. Yet although the Chinese government has made great strides to curb coal-related emissions, more effort is needed. Heavy industries in China and most of the country’s power generation continue to rely predominantly on coal.¹⁴ As **Arthur Hanna**, Senior Managing Director for Energy at Accenture Strategy and Project Lead for the Global Agenda Council on New Energy Architecture at the World Economic Forum, noted, “one of the things that has happened in China is the shutting down of some of the smaller production capability. We’re likely to see that continue. Coal obviously remains dominant, but the nature of coal production is likely to change.” As a result of these

and other policy shifts, analysts expect China to see a 20% decrease in its power-generation capacity from coal by 2020.¹⁵

Meanwhile, coal consumption will continue to grow elsewhere in the Asia-Pacific. **Han Phoumin**, Energy Economist at the Economic Research Institute for ASEAN and East Asia, wrote in a working paper for the Summit that coal consumption, in absolute terms, is projected to almost double in Asia from 2,507 million tons of oil equivalent (Mtoe) in 2011 to 4,155 Mtoe in 2035.¹⁶ This trend would result in sustained GHG and CO₂ emissions that have profound negative impacts on the global climate.

In the face of this forecast, participants agreed that clean-energy policies cannot be successful in the longer term without addressing emissions from coal. Therefore, emerging economies in the Asia-Pacific and other parts of the world should

deploy more efficient and advanced coal technologies. International financial institutions can support these goals by providing investment in clean coal technology. CCT offers high efficiency and reduced emissions, but it also tends to be quite expensive. As Dr. Han pointed out, the countries that most need CCT are often the least able to afford it. Additionally, although carbon capture and sequestration has been cited as a way to ameliorate the negative effects of increased coal demand, the IEA has reported that CCS will not be able to make a major contribution by 2030 due to inadequate investment and R&D.¹⁷

However, participants noted the importance of continuing to commit resources in support of R&D designed to improve the performance of these technologies and facilitate their deployment. In addition to reducing CO₂ emissions associated with



Han Phoumin (Economic Research Institute for ASEAN and East Asia) discusses the potential role of carbon capture and sequestration in reaching global climate change goals.



Zhang Shiqiu (Peking University) provides a Chinese perspective on policies that will most effectively reduce primary and secondary air pollution.

coal production, CCS can be utilized in gas production. Thus, the widespread deployment of CCS has the potential to profoundly benefit the region's environmental security. Although this technology is still not ready for deployment on a commercial scale, utilizing the latest CCS and CCT technologies is of great importance to emerging Asia and the global fight against GHG emissions. When discussing what can be done at the national level, through multilateral engagements, and in public-private partnerships to support more rapid expansion of CCT and to develop commercially viable CCS technologies, Summit panelists noted that more R&D is needed. In this vein, participants asserted that the newly created Asian Infrastructure Investment Bank should focus on creating standards for financing plants that utilize new technology rather than investing in inefficient plants.¹⁸

In recognition that coal will continue to be a large part of the energy mix in Asia for the foreseeable future, the deployment of improved technology is critical. International cooperation is a key consideration, and policymakers must commit to technology collaboration. **Samuel Tumiwa**, Deputy Representative for North America at ADB, argued that strong political leadership and targeted financing will be needed.

Summit participants agreed that stakeholders must pursue an “all-of-the-above” strategy toward diversifying the composition of the Asia-Pacific's energy mix and make a concerted effort to improve



Samuel Tumiwa (Asian Development Bank) moderates the Summit session titled “Pairing Technology and Policy to Improve Coal Use.”

and widely implement technologies that could ameliorate emissions from coal use. To accomplish this goal, it will be necessary for policymakers and industry leaders to work closely together to develop national policy, exchange international technology, and share best practices.

Promoting a Healthy Society through Clean Air Policies

As countries in the Asia-Pacific look to optimize their energy mixes and reduce emissions, some governments are also looking to combat the effects of air pollution on public health and the environment. The Summit convened academic experts and key

policymakers to specifically discuss these issues, focusing not just on CO₂ emissions but also on particulate matter and other pollutants that must be curbed to sustain the health of citizens, such as SO₂, nitrogen oxides, and mercury. The World Health Organization estimates that urban air pollution caused roughly 2.6 million deaths in Asia in 2012.¹⁹ Stakeholders have strong incentives to reduce this pollution, and actions that are less likely to compromise continued strong economic growth will be more attractive to policymakers, consumers, and industry leaders. With this in mind, Summit participants highlighted market- and policy-driven solutions to these challenges.

In the United States, SO₂ trading schemes not only were effective in controlling emissions but reduced the costs of national power generation. China has also seen success in reducing SO₂ emissions, as **Zhang Shiqiu**, Professor at Peking University's College of Environmental Sciences and Engineering, highlighted. Due in part to government policies, SO₂ emissions in China were reduced by more than 14% from 2005 to 2010. Yet while air quality has improved with respect to some pollutants, much work remains to be done. Dr. Zhang noted that although many of the most problematic primary pollutants that are directly emitted, such as SO₂, have been reduced in China in recent years, secondary pollution, including



Satya Widya Yudha (Commission VII, House of Representatives, Republic of Indonesia) addresses the audience.



Fan Ying (Chinese Academy of Sciences) describes China's experience with pilot carbon trading platforms.



Benjamin Shobert (NBR) speaks on the public health challenges that stem from air pollution in the Asia-Pacific.

“When looking at air quality issues, it’s not just about pollution control; it’s about the design of human systems and institutional systems, as well as where people live, how they get around, and how you supply power.”

— **Mark Thurber**, *Associate Director for Research, Program on Energy and Sustainable Development, Stanford University*

particulate matter 2.5 and ground-level ozone, is worsening.

Fan Ying, Director of the Center for Energy and Environmental Policy Research at the Chinese Academy of Sciences, emphasized the proven track record of carbon trading as a cost-effective method for incentivizing reductions in CO₂ emissions. As Dr. Fan described, pilot carbon-emissions trading schemes have been instituted in seven provinces and cities in China. Although some participants expressed skepticism about the extent of the trading activities, the Chinese government’s plans show signs of moving forward to establish a national carbon-trading platform in 2016. Commenting on this initiative, Dr. Fan emphasized the importance of improved emissions monitoring, which would allow for more accurate calculations to improve the function of future carbon trading platforms.

Enforcement is another key question, as well-minded policy goals can be thwarted by inadequate commitment or capability to properly enforce policies. Dr. Zhang argued that along with enforcement, adequate disclosure of information and

encouragement of public participation must be present for green governance to succeed. **Satya Widya Yudha**, Vice Chairman of Commission VII in Indonesia’s House of Representatives, agreed, citing his government’s experience in promoting public awareness of government efforts to promote cleaner energy in the country. Because air pollution is an issue that directly affects the public, the communication of policies and their goals is essential to ensure understanding, which can help maintain the necessary political will.

“The consequences of pollution and global warming here in Asia know no borders,” noted **Admiral Dennis C. Blair**, co-chair of the Pacific Energy Summit, President and CEO of Sasakawa Peace Foundation USA, and a member of the Board of Directors at NBR. “There have to be cooperative efforts in order to reduce pollution from the energy sector, with all its negative effects on public health.” In addition to mitigating the impact of air pollution on public health, increased cooperation could help address the impact of pollution on climate change.

Global Prospects for Alternative Energy Sources



Panelist **Christopher Dent** (University of Leeds) addresses the audience during the roundtable discussion on “Bringing Wind and Solar to Scale.”

“With the recent surge of renewable energy developments over the last decade or so, East Asia has been one of the key drivers. It is the world’s largest producer, investor, and manufacturer of renewable energy products or generation.”

— **Christopher Dent**, *Professor, East Asia’s International Political Economy, University of Leeds*

Bringing Wind and Solar to Scale

In the face of concerns surrounding rising CO₂ emissions from overreliance on fossil fuel, governments are increasingly focused on developing renewable energy capacity. Countries across the Asia-Pacific have a vested interest in maximizing indigenous sources of renewable energy to achieve greater energy security by reducing exposure to supply disruptions, as well as to improve environmental security. On the current energy path, Asia’s CO₂ emissions are projected to double to over 20 billion tons by 2035.²⁰ “Energy is a problem, but it is also a solution,” said **Yongping Zhai** from the ADB. “The solution would be going from dirty energy to clean energy. All our resources are being put into supporting energy efficiency, renewable energy, and some clean fuel, which contribute to reducing environmental impacts.” Wind and solar energy development is being pursued vigorously by national governments and multilateral lenders because such development can reduce fuel

import risk and can create local strategic industries. Additionally, for the tens of millions of Asians who remain without access to gridded energy systems, distributed off-grid systems using solar and wind energy could be a viable low-carbon path toward improved energy access.

East Asia leads in terms of renewable energy growth globally. As **Christopher Dent**, Professor for East Asia’s International Political Economy at the University of Leeds, pointed out, “With the recent surge of renewable energy developments over the last decade or so, East Asia has been one of the key drivers. It is the world’s largest producer, investor, and manufacturer of renewable energy products or generation.” East Asia produces about 55% of the world’s wind turbines, and Chinese and Taiwanese companies make about 75% of the world’s solar photovoltaics.

A controversial topic of discussion was the role of subsidies, whether in the form of feed-in tariffs, tax credits, or other fiscal measures, in incentivizing the development of wind and solar technology

around the world. There are some concerns about how to optimize the targeting of these types of subsidies and whether they could negatively affect market forces. However, as **Daniel Mallo**, Head of Energy Project Finance and Metals & Mining for the Asia Pacific at Societe Generale Corporate and Investment Banking, stated, these policies “have allowed the wind and solar industries to grow in size and achieve economies of scale, and have

reduced costs to the point where the solar industry is close to being able to wean itself off subsidies.” This is a substantial development, though differing economic, consumption, and industrial factors will affect how these policies can translate from country to country.

One of the drawbacks of solar and wind is that they are often intermittent sources of energy; they cannot provide energy at all times for use whenever needed. As a result of this limitation, grid connectivity and technological advances in improving power storage are key factors in developing solar and wind power to their full potential. Looking ahead, there was disagreement among Summit participants over whether scaling up to the point where wind and solar dominate central grids is technically or economically practical, even with the widespread availability of energy storage, without fundamental technological breakthroughs in these sectors. However, participants generally agreed that renewable energy is an essential part of any country’s energy mix and can pave the way toward more sustainable energy systems. Though challenges remain to wind and solar reaching their full potential, numerous scientific research projects are underway that could innovate and transform clean-energy industries, including those focused on renewable energy, energy efficiency, and smart-grid technologies.



Armond Cohen (Clean Air Task Force) moderates the roundtable discussion on “Bringing Wind and Solar to Scale.”

The Future of Nuclear Energy in the Asia-Pacific

Summit participants also highlighted the opportunity nuclear energy could provide for reducing reliance on fossil fuel, and nowhere in the world is the prospect of a nuclear renaissance more promising than in Asia. Although nuclear energy faced a setback following the Fukushima accident, over four years later the global outlook for nuclear power is robust. Governments across Asia, and particularly in Northeast Asia, have outlined plans to construct more nuclear power plants than any other region in the world. Indeed, there are currently 57 nuclear reactors under construction worldwide, 48 of which are located in Asia.²¹ However, obstacles remain to the region realizing the full potential of nuclear energy. For example, following Fukushima, increased concerns over safety and heightened negative public opinion prompted policymakers to restore public confidence by implementing new regulatory frameworks and enhancing the integrity of their operating systems.

Countries have taken varied approaches to moving forward with nuclear energy. The Japanese government has approved the restart of nuclear power generation, with the first plants scheduled to resume operations in 2015.²² Toshiro Okada, Director and Senior Energy Advisor for the International Affairs Division within the Agency for Natural Resources and Energy of Japan's Ministry of Economy, Trade and Industry, outlined for Summit participants that the current

Japanese government plans for nuclear to make up 20%–22% of the country's energy mix by 2030, approaching but not matching the 30% share nuclear held before the Fukushima disaster. Mr. Okada described how the Fukushima accident and the subsequent public response resulted in a policy review, the establishment of new safety standards, and the establishment of a Nuclear Regulation Authority in Japan. An expanding nuclear sector in



Xu Yuming (China Nuclear Energy Association) analyzes the role nuclear energy could play in China's energy mix.

the Asia-Pacific presents economic benefits for many countries. Canada, for example, sees niche opportunities for sales of heavy-water reactors and high-quality uranium, as well as the transfer of technology and services to contribute to nuclear safety and social license in the region, according to **Stewart Beck**, President and CEO of the Asia Pacific Foundation of Canada. He also pointed out that the role of nuclear energy is diminishing within Canada's energy mix.

Meanwhile, "India is one of the few countries that believes that no course correction is necessary as a result of Fukushima," **T.P. Sreenivasan**, Vice Chairman and Executive Head of India's Kerala State Higher Education Council and former Governor for

India at the International Atomic Energy Agency, pointed out. Ambassador Sreenivasan observed that even if India's ambitious plans for nuclear expansion are met, the share of nuclear energy in the country's energy mix will not exceed 6% by 2035. India thus has a long way to go in order to fully embrace the opportunities offered by its civil nuclear deal with the United States, in part due to delays caused by controversies surrounding the passage of its nuclear liability law.

The outlook for nuclear energy is also positive elsewhere in the Asia-Pacific. According to **Yongduk Pak**, Managing Director of the International Energy Cooperation Group at the Korea Energy Economics Institute, nuclear energy is "a very practical



Yongduk Pak (Korea Energy Economics Institute) gives remarks during the roundtable discussion on "The Future of Nuclear Energy in the Asia-Pacific."



Toshiro Okada (Ministry of Economics, Trade and Industry, Japan) discusses Japan's important role in shaping the development of nuclear energy use in the Asia-Pacific.

option” to cope with both energy security and climate change. He explained that it provides reliable base-load power and is a relatively cost-competitive energy source because uranium prices and supply security are more stable than for other fuels. As a clean fuel with virtually no greenhouse gas emissions, “nuclear energy,” Dr. Pak argued, “is not an option. It’s a must.”

The future success of nuclear energy will ultimately depend not only on current nuclear powers but also on emerging nations and how they manage nuclear power development. One Summit participant pointed out that the nuclear energy sector is developing very quickly in China. Nuclear power currently makes up a small part of China’s overall energy mix, but at the time of the Summit the country had 23 reactors in operation, 27 under construction, and many more planned. Summit participants expressed optimism that by 2035, nuclear power could account for 10% of the total power installed in China.²³

Adopting common international regulatory, safety, and operating standards would mark significant improvement over the current practice of navigating separate regulatory and safety standards within each nation. Some participants argued that these standards could be implemented not only within the Asia-Pacific but also globally. Furthermore, improved transparency around the process of implementing and enforcing these standards would highlight the increased emphasis on safety and continued promotion of nonproliferation. In sum, a greater level of public awareness and more stringent safety standards could



Mark Thurber (Stanford University) discusses the prospects for clean air policies at a Summit media roundtable.

help make nuclear energy a secure, economical, environmentally preferred, and popular source of energy for generations to come.

Resilient Energy Markets



Jeff Appleton (ExxonMobil) contributes his perspective on gas investment in the Asia-Pacific.

“To capitalize on the potential that gas offers, industry needs to invest and governments need to commit to a framework that gives industry the confidence to invest.”

— Jeff Appleton, *Senior Vice President, LNG Marketing, ExxonMobil*

Developing a More Integrated Asian Gas Market

Building on the prospect of using energy policies as a tool for addressing environmental security concerns, Summit participants highlighted the potential of natural gas as a cleaner alternative to other, more dominant fossil fuels. As an energy resource, gas produces lower emissions than oil and coal.²⁴ Integrating more gas into the region’s power-generation mix could therefore help meet energy security and environmental goals. As numerous Summit participants noted, increased pipeline gas from Russia and Central Asia, coupled with rising LNG supplies and possible shale gas developments, could open the door to a more flexible and price-responsive gas market in Asia, making gas a more competitive fuel source. Meanwhile, the prospect of LNG exports from the United States could further improve the supply picture.

Although Asia contains the world’s top LNG importers, gas remains an underutilized energy

resource in the region despite the rapid growth in natural gas trade and development. In 2011 the second Pacific Energy Summit, held in Jakarta, discussed the potential that natural gas holds for increasing energy security in Asia. Part of the impetus for this was the IEA’s suggestion of the possibility of a coming “golden age of gas” in a 2011 special report that projected that Asia would increasingly embrace the use of gas in its energy mix. The IEA forecasted that Asia could generate nearly half of the 62% projected growth in global gas demand from 2008 to 2035.²⁵ However, since the publication of this report, overall demand growth in the region has not reached expectations despite substantial demand growth in China and the unexpected boost in LNG demand following Japan’s shutdown of nuclear operations after the 2011 nuclear accident at Fukushima.

The absence of a true market price for gas based on competitive forces results from the lack of a globally integrated gas market and the common practice of linking LNG prices to oil prices in contracts. These issues have contributed to the “Asian

premium,” the phenomenon in which gas prices in Asia are higher than in Europe and North America.

In their working paper for the Summit, **Peter Hughes**, Director of Peter Hughes Energy Advisory and Partner of global gas partners gmbh, and **Daniel Muthmann**, Partner and Managing Director of global gas partners gmbh, conclude that “while the recent fall in oil prices has effectively eliminated the Asian premium applying to gas supplied into the region’s markets, this has not removed the structural reasons for the existence of this premium.” Accordingly, policymakers across Asia, and particularly in China, are looking to prevent a potential re-emergence of the Asian premium if oil

prices rise by promoting more competitive gas markets. As Mr. Hughes and Mr. Muthmann noted, the development of gas-on-gas competition and the liberalization of gas markets are greatly desired within the region.²⁶

Uncertainty in the outlook for gas markets is a serious concern for Asia’s top gas importers. As a key example, **Tadashi Maeda**, Representative Director and Senior Managing Director at the Japan Bank for International Cooperation, described how the share of natural gas in Japan’s power generation was 32% before Fukushima, whereas it rose to 50% after the disaster. This spike in Japanese demand for LNG caused a huge balance-of-payments deficit for the country. Though falling oil prices lessened the impact of the Asian premium, easing Japan’s deficit as a result, the government is looking to secure the country’s LNG supply and optimize its broader energy mix. To achieve this goal, Japan has placed priority on diversifying LNG sources and increasing its spot market dependency to allow for more flexibility.

Meanwhile, China’s demand for gas grew sixfold since 2000, according to **Shan Weiguo**, Head of Gas Market Study at China National Petroleum Corporation (CNPC) Research Institute of Economics and Technology. However, the growth of China’s gas demand has noticeably slowed from an average of 16% during 2000–2013²⁷ to less than 10% in 2014 and 2015.²⁸ In light of this trend, Summit participants speculated that official targets for the growth of gas demand would not be met if the market is left to its



Tadashi Maeda (Japan Bank for International Cooperation) participates in the Summit session on “Developing a More Integrated Asian Gas Market.”

own devices; rather, reaching these targets will require government intervention, in part because of the steady deceleration in China's rate of economic growth. Overall, Asian countries have been unable to embrace the potential of natural gas due mainly to the hurdle of higher prices compared with other fuel sources, such as coal.

As a potential solution, a number of Summit participants noted the possibility of developing an Asian hub for gas, whether in Shanghai, Singapore, or elsewhere, which they argued could help further reduce the Asian premium. Additionally, given Northeast Asia's growing dependence on LNG imports, **Keun-Wook Paik**, Senior Research Fellow at the Oxford Institute for Energy Studies and Associate Fellow for the Environmental and Resources Program at Chatham House, raised the possibility of an alliance among China, Japan, and South Korea for both LNG and imported pipeline gas to take advantage of what he sees as renewed strength in the negotiating power of consumers. As Dr. Paik observed, "at this moment this is not really a seller's market. It's a buyer's market."

Summit participants noted the tremendous need for increased private investment in the gas sector, given that realizing Asia's potential for embracing gas as a major fuel source will require improved infrastructure and broader sector development. "While domestic gas production in the Asia-Pacific and pipeline imports are expected to increase, it will only be at a rate that meets 60% of demand by 2025,"



Keun-Wook Paik (Oxford Institute for Energy Studies; Chatham House) explains how the inclusion of more gas in Asia's power mix could promote energy and environmental security.

explained **Jeff Appleton**, Senior Vice President for LNG Marketing at ExxonMobil. He further noted that "LNG will be needed to meet the remaining demand, and this will require significant investment by industry." Indeed, the IEA projects that the world will need \$48 trillion to meet energy demand in 2035.²⁹ In reaction to this gap in investment, Mr. Appleton noted that the challenge for policymakers is to commit

to market-based policies to stabilize industry investment over a long time period and encourage innovation, cooperation, and trade.

Summit participants also highlighted investment in technology as a priority within China. As part of its all-of-the-above energy approach, China will continue to seek technology solutions to reduce the cost of exploiting its domestic shale gas resources. Although domestic shale gas output may fall short of meeting the target of gaining a 10% share of the domestic market by 2020, China aims to double its number of LNG terminals between 2015 and 2020 and is looking to significantly increase its pipeline imports of gas to ensure adequate supplies for its

consumers. More broadly, governments across Asia are exploring how best to embrace the potential that natural gas provides for regional energy and environmental security.

Building a Resilient Global Oil Market

As home to the five largest oil consumers and four of the five largest oil producers, the Asia-Pacific plays a central role in the global oil market. When oil prices plummeted in 2014 and 2015, rapid market fluctuations triggered developments in regional markets that may change how oil fits in the energy



Peter Hughes (Peter Hughes Energy Advisory Limited; global gas partners gmbh) moderates the Summit session on “Developing a More Integrated Asian Gas Market.”

“Countries in the Asia-Pacific have fundamentally common energy security interests, especially oil security interests. The region is deeply dependent on imported oil from the Middle East, and the region has common interests in stable supplies and reasonable, affordable prices.”

— Mikkal E. Herberg, *Research Director, Energy Security Program, NBR*

mixes of the region. However, oil markets have a history of boom and bust cycles, and it is uncertain how long oil prices will remain at lower levels or what the next shock to the market will be. **James Slutz**, Senior Study Coordinator of the U.S. National Petroleum Council, explained that the benefits and drawbacks of low oil prices are not always immediately clear. Oil price signals are an important component of allocating capital and driving investment in new technology, as energy development requires long lead times and facilities have long lives.

As Mr. Slutz noted, structural changes in the oil market, including higher unconventional, tight oil production in North America and rising consumption in many emerging economies, will have varying repercussions. For example, as the world's largest importer of oil, China benefits economically from lower oil prices and has begun to adjust its tax and fiscal policies to encourage domestic production and adopt market-based pricing for consumers. The Chinese government has raised consumption taxes on gasoline and diesel three times since November 2014.³⁰ However, **Kang Wu**, Vice Chairman for Asia at FACTS Global Energy (FGE), explained

that China also faces new challenges in promoting the use of cleaner energy sources such as renewables and biofuels, which have become less price competitive due to low oil prices.

In India, where demand for imported oil is expected to grow faster than anywhere else in the world, low prices could limit incentives for upstream exploration and development and discourage more efficient vehicles, resulting in higher emissions.³¹ Summit participants argued that India should take the opportunity presented by low oil prices both to extend price deregulation of liquefied petroleum gas and kerosene by further cutting subsidies and to fill its strategic oil stockpile. Meanwhile, for Japan, low oil prices will have little impact on oil demand, which is still expected to decline, or the direction of the country's energy policy.³² Indonesia, a major oil importer and producer, is balancing reduced tax revenues from production royalties with improvements in the country's current account deficit. Mr. Satya Widya Yudha noted that the fall in oil prices offers an opportunity for governments to reduce the large share of fuel subsidies in their budgets, as Indonesia has begun over the past year.

Summit participants observed that Asia's dependence on the Middle East remains a significant energy security vulnerability. "The oil price collapse will prolong Asia's dependence on Middle East oil and gas," particularly if other sources of oil do not come online due to low oil prices, argued **Younkyoo Kim**, a Professor in the Division of International Studies at Hanyang University. Furthermore, the repercussions for LNG markets are unclear and require recalculation. This state of dependence causes substantial anxiety on the part of oil importers, particularly India. **Narendra Taneja**,

Chairman of the Energy Security Group of the Federation of Indian Chambers of Commerce and Industry and President of the World Energy Policy Summit, noted that two-thirds of India's imported oil comes from the Middle East.

The United States has seen a significant jump in domestic unconventional oil production, which constitutes the largest source of incremental growth in the global oil supply in recent years. Production levels have continued to hold steady despite depressed prices, but there is concern that long-term lower oil prices will have severe implications for future



Summit speaker **Ming Sung** (Clean Air Task Force, Asia Clean Energy Innovation Initiative) listens to his fellow panelists address the audience.



Chen Weidong (CNOOC Energy Economics Institute; Renmin University) discusses the effects of oil market volatility on Asia-Pacific economies.

investment and output in the United States and other supply sources.³³

“Countries in the Asia-Pacific share fundamental energy security interests, especially oil security interests,” noted Mr. Herberg, who added, “The region is deeply dependent on imported oil from the Middle East, and countries have common interests in stable supplies and reasonable, affordable prices.” As such, the recent volatility of oil markets highlights the importance of developing more collaborative regional responses to such uncertainty. Greater market stability can lead to broader energy security, stemming from

increased investments in new discoveries, especially in high-cost deepwater and frontier areas, as well as in alternative fuels such as renewables.



Left to right: Kang Wu (FACTS Global Energy), Narendra Taneja (Federation of Indian Chambers of Commerce and Industry; World Energy Policy Summit), and Younkyoo Kim (Hanyang University) engage following the Summit session on “Building a Resilient Global Oil Market.”

Actionable Policy Solutions for the Asia-Pacific



Between formal sessions, Summit delegates engage on balancing the goals of energy and environmental security.

“The spirit of the energy sector that we see in our series of conferences is that there really has to be international cooperation in order to have success. Both suppliers and consumers are interlinked across national borders, and it is only by figuring out win-win solutions that the overall demands for energy here in Asia can be met in any kind of realistic way.”

— Admiral Dennis C. Blair, *Chairman and CEO, Sasakawa Peace Foundation USA; Member, NBR Board of Directors*

Energy and climate security are global phenomena, and the international exchange of ideas surrounding these essential issues is necessary to spur progress. The 2015 Pacific Energy Summit provided a unique opportunity to convene a select group of high-level stakeholders to identify actionable policies to support open, competitive, and flexible energy markets to achieve both energy and environmental security. As energy demand rises in the Asia-Pacific, the challenge of combating climate change and supporting economic growth will grow ever more significant, and policy decisions made in the short term will have long-standing ramifications. These key trends must be factored into policy formulations and investment decisions for energy and environmental security, as well as economic growth. Summit discussions shed light on a wide range of issues, including China's energy transformation, the development of CCT and CCS technologies, the negative effects of air pollution on public health, and the scaling up of wind and solar energy, as well as on options for realizing the potential of nuclear energy, building a more competitive gas market in Asia, and moving forward amid oil price volatility.

China's ability to achieve its ambitious energy and environmental goals is a key global consideration, as what happens in China reverberates around the world. China served as a particularly appropriate host country for the 2015 Summit, as the country is at a crossroads: Chinese leaders are seeking to transform energy production, consumption, and technology simultaneously in an effort to transition from an energy-intensive, coal-dependent economy to a more efficient energy system powered by cleaner fuels such as natural gas, nuclear energy, and renewables. If successful in this ambitious venture, China could provide a startling success story, demonstrating to emerging economies in the Asia-Pacific and other regions of the world that the transition from energy-intensive development to environmentally conscious development is possible without sacrificing economic success. However, if China fails, its experience will be a warning that adjusting a country's development trajectory is a more arduous task than even Asia's largest economy could accomplish.

“China is making serious efforts to develop its low-carbon energy supply systems, but there remain substantial challenges in determining how to best pursue green energy goals. Energy markets in particular pose challenges, as when looking at prices, coal is still cheapest.”

— Zhou Dadi, *Vice President, China Energy Research Society*

Due to the continuing significance of coal in Asia's energy mix, greater efforts to develop, demonstrate, and deploy CCS and CCT are necessary to achieve global environmental goals. The public's calls for cleaner air and water must be heeded alongside the essential goals of economic growth and greater access to energy. These objectives are difficult, though not impossible, to balance, and Summit participants highlighted emissions trading and strong enforcement of environmental policies as potential solutions. Furthermore, the development of efficient storage systems necessary for increasing the utilization of renewable energy requires more research and new financing techniques. Policymakers also must continue to proactively strengthen regulations and technical approaches to improve nuclear energy safety and increase transparency in order to cultivate greater public acceptance of the virtues of nuclear power.

The paradigm shift for global oil and gas in the Asia-Pacific is still unfolding as the shale gas revolution and the evolving geopolitics of supply and demand

dramatically affect global markets. While the prospects for large-scale shale gas production in China and other countries outside North America remain uncertain, new pricing mechanisms for gas based on the merits of an integrated market for gas in the Asia-Pacific could allow for this cleaner-burning fuel to realize its potential in the region. As the Asia-Pacific's dependence on oil imports from the Middle East continues to grow, new regional frameworks that include major energy producers and consumers should be explored as a solution to fill the gap in the current architecture for regional and global oil security. These new frameworks should emulate confidence-building dialogues such as the Shangri-La Dialogue, as argued by Mikkal E. Herberg in his 2015 NBR report “U.S., Japanese, and Asian Energy Security in a New Energy Era.”³⁴ Mr. Herberg lays out the benefits of promoting cooperation, developing practical approaches to regional security concerns, and encouraging regional dialogues focused on energy issues among high-level leaders. Such an

approach would benefit participants by building on strategic approaches identified at the Summit and could include a variety of Asia-Pacific powers.³⁵

The 2015 Pacific Energy Summit provided a useful forum for discussion and served as an incubator for new ideas on how to proactively address these universal challenges facing individual nations, the Asia-Pacific region, and the planet. The Summit serves to galvanize thought leaders into taking action to address the Asia-Pacific's most significant energy and environmental questions, and Summit delegates should build on the conversations by moving forward with engagement and cooperation across public and private sectors. Now more than ever, there is a need for consultation between stakeholders in the public and private sectors to ensure that well-conceived

policies and regulatory frameworks are in place across all energy subsectors. Such collaboration will facilitate the new investment and technology needed in the Asia-Pacific and allow the work of the Summit and its partners to continue to encourage global leaders to take decisive action for the sake of the future.



Shi Dinghuan (China Renewable Energy Society) delivers luncheon remarks on China's policies for developing and implementing renewable energy technologies.



Summit co-chair Zhou Dadi (China Energy Research Society) asks a question during the opening session of the Summit.

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Agenda Overview

SPECIAL SESSION

Welcome: **David K.Y. TANG**, K&L Gates; NBR Board of Directors

HE Jiankun, National Experts Panel on Climate Change, People's Republic of China;
China Energy Research Society

Economic Growth and Energy Transitions in the Asia-Pacific

Moderator: **Xavier CHEN**, Statoil China; Beijing Energy Club

Panelists: **HAN Wenke**, Energy Research Institute, National Development and Reform Commission
Keisuke SADAMORI, International Energy Agency

Ming SUNG, Clean Air Task Force; Asia Clean Energy Innovation Initiative

Yongping ZHAI, Asian Development Bank

OPENING

Forging Strong Markets to Support Environmental and Energy Security

Welcome: **Dennis C. BLAIR**, Sasakawa Peace Foundation USA;
NBR Board of Directors

CHAI Songyue, China Energy Research Society

ZHOU Dadi, China Energy Research Society

Remarks: **TAN Rongyao**, National Energy Administration, People's Republic of China



Left to Right: Kevin Tu (International Energy Agency), Samuel Tumiwa (Asian Development Bank), Wu Yin (China Energy Research Society), Rahul Tongia (Brookings India), and Han Phoumin (Economic Research Institute for ASEAN and East Asia) following the Summit session “Pairing Technology and Policy to Improve Coal Use.”

SESSION ONE

China's Energy Transformation and the Asia-Pacific Market

Moderator: **Mikkal E. HERBERG**, *The National Bureau of Asian Research; University of California, San Diego*

Panelists: **Arthur HANNA**, *Accenture Strategy; World Economic Forum*
Ken KOYAMA, *Institute of Energy Economics, Japan*

SESSION TWO

Developing a More Integrated Asian Gas Market

Moderator: **Peter HUGHES**, *Peter Hughes Energy Advisory Limited; global gas partners gmbh*

Panelists: **Jeff APPLETON**, *ExxonMobil*
Tadashi MAEDA, *Japan Bank for International Cooperation*
Keun-Wook PAIK, *Oxford Institute for Energy Studies; Chatham House*
SHAN Weiguo, *China National Petroleum Corporation Research Institute of Economics and Technology*

LUNCH

Partnering for Success in Dynamic Markets

Remarks: **Melody MEYER**, *Chevron Asia Pacific Exploration and Production Company; NBR Board of Directors*

Moderator: **Dennis C. BLAIR**, *Sasakawa Peace Foundation USA; NBR Board of Directors*

Innovation Drives the Energy Transition

Remarks: **SHI Dinghuan**, *China Renewable Energy Society*

Moderator: **Dennis C. BLAIR**, *Sasakawa Peace Foundation USA; NBR Board of Directors*

ROUNDTABLE ONE

The Future of Nuclear Energy in the Asia-Pacific

Moderator: **Younwon PARK**, *Korea Advanced Institute of Science and Technology*

Panelists: **Stewart BECK**, *Asia Pacific Foundation of Canada*

Toshiro OKADA, *Ministry of Economics, Trade and Industry, Japan*

Yongduk PAK, *Korea Energy Economics Institute*

T. P. SREENIVASAN, *Kerala State Higher Education Council, India*

XU Yuming, *China Nuclear Industry Association*

ROUNDTABLE TWO

Bringing Wind and Solar to Scale

Moderator: **Armond COHEN**, *Clean Air Task Force*

Panelists: **Christopher DENT**, *University of Leeds*

HE Dexin, *World Wind Energy Association; China Wind Energy Association*

Daniel MALLO, *Societe General Corporate and Investment Banking*

ZHOU Aiming, *Asian Development Bank*

DINNER

Dialogue: **Dennis C. BLAIR**, *Sasakawa Peace Foundation USA;
NBR Board of Directors*

ZHOU Dadi, *China Energy Research Society*

Moderator: **Mikkal E. HERBERG**, *NBR;
University of California, San Diego*

SESSION THREE

Welcome: **WU Yin**, *China Energy Research Society*

Pairing Technology and Policy to Improve Coal Use

Moderator: **Samuel TUMIWA**, *Asian Development Bank*

Panelists: **HAN Phoumin**, *Economic Research Institute for ASEAN and East Asia*

Rahul TONGIA, *Brookings India*

Kevin TU, *International Energy Agency*

WU Yin, *China Energy Research Society*

SESSION FOUR

Promoting a Healthy Society through Clean Air Policies

Moderator: **Mark THURBER**, *Stanford University*

Panelists: **FAN Ying**, *Chinese Academy of Sciences*

Benjamin SHOBERT, *NBR; Rubicon Strategies Group*

Satya Widya YUDHA, *Commission VII, House of Representatives, Indonesia*

ZHANG Shiqiu, *Peking University*

The New Energy Architecture Challenge: Balancing the Energy Triangle

Remarks: **Arthur HANNA**, *Accenture Strategy; World Economic Forum*

LUNCH

Remarks: **HE Jiankun**, *National Experts Panel on Climate Change, People's Republic of China; China Energy Research Society*

Jonathan FRITZ, *Embassy of the United States in the People's Republic of China*

Moderator: **Dennis C. BLAIR**, *Sasakawa Peace Foundation USA; NBR Board of Directors*

SESSION FIVE

Building a Resilient Global Oil Market

Moderator: **James SLUTZ**, *National Petroleum Council*

Panelists: **CHEN Weidong**, *CNOOC Energy Economics Institute; Renmin University*

Younkyoo KIM, *Hanyang University*

Narendra TANEJA, *Federation of Indian Chambers of Commerce and Industry; World Energy Policy Summit*

Kang WU, *FACTS Global Energy (FGE)*

CONCLUSION

Moderators: **ZHOU Dadi**, *China Energy Research Society*

Dennis C. BLAIR, *Sasakawa Peace Foundation USA; NBR Board of Directors*

Summit Working Papers and Additional Reading

To inform plenary sessions and promote thought-provoking discussion during and after the event, the organizers of the Pacific Energy Summit commissioned original research engaging top experts on energy and environment policy questions.

Working Papers

China's Market-Oriented Reforms in the Energy and Environmental Sectors

An Bo, Asian Development Bank

Lin Weibin, China Energy Research Society

Zhou Aiming, Asian Development Bank

Zhou Wei, Asian Development Bank

This paper presents a brief overview of the policies, regulations, measures, plans and schemes aimed at facilitation and accomplishing market-oriented reforms of China's energy sector in recent decades.

Enabling Clean-Coal Technologies in Emerging Asia

Han Phoumin, Economic Research Institute for ASEAN and East Asia

This working paper discusses the rapid increase of coal use in coal-fired power generation to meet growing electricity demand in emerging economies of the East Asia Summit region and calls for policies to support the dissemination of clean-coal technologies to abate carbon dioxide and greenhouse gas emissions.

Gas in Asia: From Regional Premium to Global Commodity?

Peter Hughes, Peter Hughes Energy Advisory Limited; global gas partners gmbh

Daniel Muthmann, global gas partners gmbh

This paper assesses the progress that the global gas market has been making in realizing the potential for gas to increase its share of the worldwide energy mix, and, in particular, the role that the gas markets of Asia have been playing, and may play in the future, toward reaching this potential.

Briefs

The Impact of Low Oil Prices on China

Kang Wu, *FACTS Global Energy (FGE)*

India's Perspective on Oil Market Volatility

Manish Vaid, *Observer Research Foundation*

The Impact of Low Oil Prices for Indonesia

Satya Widya Yudha, *Commission VII, House of Representatives, Republic of Indonesia*

The Impact of Low Oil Prices on Japan's Economy, Oil Demand, and Policy

Tomoko Hosoe, *FGE Japan*

Osamu Fujisawa, *FGE Japan*

The Effects of Lower Oil Prices on Russia

Ekaterina Grushevenko, *Russian Academy of Sciences*

The Impact of Low Oil Prices on South Korea

Younkyoo Kim, *Hanyang University*

The Impact of Low Oil Prices on North America

Frank A. Verrastro, *Center for Strategic and International Studies*

Essay

One Hundred Years of Sino-U.S. Energy Cooperation

Chen Weidong, *CNOOC Energy Economics Institute; Renmin University*

Access these publications as well as additional material on Asia's energy and environmental challenges at www.nbr.org.

Summit Participants

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Department of International
Relations, University of Seoul,
Republic of Korea

AINLEY, Rupert

Embassy of the United Kingdom,
People's Republic of China

AL-BUAINAIN, Ibrahim

Aramco Asia,
People's Republic of China

AN, Da

CNOOC Energy Economics
Institute,
People's Republic of China

AN, Qi

Beijing Energy Club,
People's Republic of China

APPLETON, Jeff

ExxonMobil, *Singapore*

ASO, Kennichi

Ministry of Foreign Affairs,
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ATKINSON, Dwain

Embassy of the United States,
People's Republic of China

BALACHANDRAN, Gopalan

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Embassy of the United States,
People's Republic of China

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CHEN, Liuqin

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Research Institute,
People's Republic of China

CHEN, Luyu

Zhongqian Electric Group Co., Ltd.,
People's Republic of China

CHEN, Weidong

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CHEN, Xavier

Statoil China; Beijing Energy Club,
People's Republic of China

CHEN, Zongfa

China Huadian Corporation,
People's Republic of China

CHOI, Young Chul

Ministry of Foreign Affairs,
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Johns Hopkins University,
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COLLINS, Jimmie

U.S. Pacific Command,
United States

COTTEN, Randy

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Cutler International, LLC,
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United States

DING, Michael

Accenture,
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DUAN, Boqing

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People's Republic of China

EGGLESTON, Peter

Chevron Asia Pacific
Exploration and Production
Company, *Singapore*

ENKHTUVSHIN, Ganbaatar

Ministry of Energy, *Mongolia*

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Chinese Academy of Sciences,
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China Energy Net,
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Embassy of the United States,
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GAN, Mei

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People's Republic of China

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Energy Research Institute,
National Development and
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Reform Commission,
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Institute, *People's Republic of China*

HANDCOCK, Nicholas

Accenture,
People's Republic of China

HANNA, Arthur

Accenture Strategy; World
Economic Forum,
United Kingdom

HAO, Xiangbin

China Energy Net,
People's Republic of China

HAO, Xu

CCCC Water Transportation
Consultants, Co., Ltd.,
People's Republic of China

HE, Dexin

World Wind Energy Association;
China Wind Energy Association,
People's Republic of China

HE Jiankun

National Experts Panel on Climate
Change; China Energy Research
Society,
People's Republic of China

HENG, Kunleang

Ministry of Mines and Energy,
Cambodia

HERBERG, Mikkal E.

The National Bureau of Asian
Research; University of California,
San Diego,
United States

HU, Min

Energy Foundation China,
People's Republic of China



Jonathan Fritz (Embassy of the United States in the People's Republic of China) responds to questions from Summit participants during lunchtime remarks.



Meredith Miller (NBR) introduces the panelists of the Summit session "Pairing Technology and Policy to Improve Coal Use."

HU, Weiping

China Overseas Development
Association,
People's Republic of China

HUANG, Dongfeng

Zhejiang Energy Research
Society, *People's Republic of China*

HUANG, Jing

Accenture,
People's Republic of China

HUANG, Sam

Accenture,
People's Republic of China

HUGHES, Peter

Peter Hughes Energy Advisory
Limited; global gas partners
gmbh, *United Kingdom*

IQBAL, Erfa

Embassy of Pakistan,
People's Republic of China

IRWIN, Conway

Embassy of the United States,
People's Republic of China

IWATANI, Shigeo

Trilateral Cooperation
Secretariat, *Republic of Korea*

JARVIS, Ben

Embassy of Australia,
People's Republic of China

JIANG, Chunli

China International Economic
Exchange Center,
People's Republic of China

JIANG, Liping

Energy Research Institute of
State Grid,
People's Republic of China

KANE, Lee

Embassy of Canada,
People's Republic of China

KIM, Sang-hyup

KAIST, Graduate School of
Green Growth,
Republic of Korea

KIM, Younkyyo

Hanyang University,
Republic of Korea

KOYAMA, Ken

Institute of Energy Economics,
Japan, *Japan*

KUSHNER, Jonathan

Kreab, *Japan*

LEI, Zhongming

Qingdao University of Science
and Technology,
People's Republic of China

LI, Baoshan

Chinese Renewable Energy
Society, *People's Republic of China*



Xavier Chen (Statoil China; Beijing Energy Club) moderates the special session “Economic Growth and Energy Transitions in the Asia-Pacific.”



Summit participants actively listen to a panel discussion on Asia-Pacific energy security.

LI, Bin

Embassy of the People's
Republic of China, *United States*

LI, Gengsheng

Tianjin Energy Investment
Group Co., Ltd.,
People's Republic of China

LI, Jianliang

Guangzhou Development
Group Incorporated,
People's Republic of China

LI, Jifeng

China Information Center,
People's Republic of China

LI, Mingzhi

National People's Congress,
People's Republic of China

LI, Qinzheng

CEFC Global Strategy
Holdings, Inc.,
People's Republic of China

LI, Ruifeng

Shenhua Science and
Technology Research Institute,
People's Republic of China

LI, Yalan

Beijing Gas Group Co., Ltd.,
People's Republic of China

LI, Zaiwen

Southwest Energy and Mineral
Resources Corporation Co., Ltd.,
People's Republic of China

LIN, Fu

Cornell University, *United States*

LIN, Jun

Chevron Asia Pacific Exploration
and Production Company,
Singapore

LIN, Weibin

China Energy Research Society,
People's Republic of China

LIU, Ge

Trilateral Cooperation
Secretariat, *Republic of Korea*

LIU, Huihong

China Energy Research Society,
People's Republic of China

LIU, Qiang

Chinese Academy of Social
Sciences, *People's Republic of China*

LIU, Xiaoyu

Asian Development Bank,
Philippines

LIU, Ying

Renmin University,
People's Republic of China

LOH, Stanley

Embassy of Singapore,
People's Republic of China

LUO, Fei

Guizhou Nanyuan Electric
Power Technology Co., Ltd.,
People's Republic of China

LWIN, Thein

Pyithu Hluttaw Natural
Resources and Environmental
Conservation Committee,
Myanmar

MA, Dingping

Chongqing Energy Research
Society, *People's Republic of China*

MA, Gail

The Australian National
University, *Australia*

MA, Li

State Grid Energy Research
Institute, *People's Republic of China*

MADSEN, Robert

Kreab, *Japan*

MAEDA, Tadashi

Japan Bank for International
Cooperation, *Japan*

MALLO, Daniel

Societe Generale Corporate and
Investment Banking,
Hong Kong SAR

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Japan Bank for International
Cooperation, *Japan*

MCWALTER, Michael

Port Moresby Petroleum
Company Ltd.,
Papua New Guinea

MEI, Baichun

GE China,
People's Republic of China

MEYER, Melody

Chevron Asia Pacific Exploration
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National Bureau of Asian Research
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The National Bureau of Asian
Research, *United States*

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China Energy Research Society,
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MORIN, Francois

World Nuclear Association,
People's Republic of China

NAKA, Shinya

Mitsubishi Corporation, *Japan*

NOMOTO, Kazuhiro

Japan Bank for International
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NOUN, Chivorn

Embassy of Cambodia,
People's Republic of China

OKADA, Toshiro

Ministry of Economy, Trade
and Industry, *Japan*

OU, Jianping

Changsha Municipal Energy
Bureau, *People's Republic of China*

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Oxford Institute for Energy
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United Kingdom

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Institute, *Republic of Korea*

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Korea Advanced Institute of
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PRZYCHODNIAK, Marcin

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SADAMORI, Keisuke

International Energy Agency,
France

SENGUPTA, Prabir

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Corporation Research Institute
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People's Republic of China

SHI, Dafu

Anhui Energy Group Co., Ltd.,
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SHI, Dinghuan

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SLUTZ, James

National Petroleum Council,
United States

SONG, Xuefeng

Shenergy Group,
People's Republic of China

SREENIVASAN, T.P.

Kerala State Higher Education
Council, *India*

STEPHENSON, Brett

AmCham China,
People's Republic of China

SUKHBAATAR, Tsendenjav

Embassy of Mongolia,
People's Republic of China

SUN, Yongxiang

Development Research Center,
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People's Republic of China

SUNG, Ming

Clean Air Task Force; Asia Clean
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TAN, Rongyao

National Energy Administration,
People's Republic of China

TANEJA, Narendra

Federation of Indian Chambers of
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Energy Policy Summit, *India*

TANG, David K. Y.

K&L Gates LLP; The National
Bureau of Asian Research Board of
Directors, *United States*

THURBER, Mark

Stanford University,
United States

TIAN, Yang

China Overseas Development
Association,
People's Republic of China

TONGIA, Rahul

Brookings India, *India*

TSUGARU, Ryosuke

Mitsubishi Corporation, *Japan*

TU, Kevin Jianjun

International Energy Agency, *France*

TUMIWA, Samuel

Asian Development Bank,
United States

TUN, Lean

Ministry of Mines and Energy,
Cambodia

UTOMO, Budi

Coordinating Ministry for Economic
Affairs,
Republic of Indonesia

WANG, Dongrong

China Power International
Development, Ltd.,
People's Republic of China

WANG, Hao

Yunnan Provincial Energy
Administration,
People's Republic of China

WANG, Huguen

China Electric Power Research
Co., Ltd.,
People's Republic of China

WANG, Jin-zhao

Development Research Center,
State Council,
People's Republic of China

WANG, Tao

Carnegie-Tsinghua Center for
Global Policy,
People's Republic of China

WANG, Wanxing

Energy Foundation China,
People's Republic of China

WANG, Yan

China Electric Power
Investment Group,
People's Republic of China

WANG, Zhen

China National Petroleum
Corporation,
People's Republic of China

WEN, Zongkong

Guangdong Energy Research
Society,
People's Republic of China

WU, Jianghong

China Power Investment
Corporation,
People's Republic of China

WU, Kang

FACTS Global Energy (FGE),
People's Republic of China

WU, Stacie

BHP Billiton, *Singapore*

WU, Xinxiong

National Committee of the
Chinese People's National
Consultative Conference,
People's Republic of China

WU, Xu

Guangzhou Development
Group Incorporated,
People's Republic of China

WU, Yin

China Energy Research Society,
People's Republic of China

XIA, Yishan

China Institute of International
Studies, *People's Republic of China*

XIE, Chao

Energy Research Institute of
State Grid,
People's Republic of China

XIONG, Wei

State Development and
Investment Corporation,
People's Republic of China



Left to Right: Thein Lwin (Pyithu Hluttaw Natural Resources and Environmental Conservation Committee, Myanmar), Peter Eggleston (Chevron Asia Pacific and Exploration Company), and Tun Lean (Ministry of Mines and Energy, Cambodia) take notes during the session on “China’s Energy Transformation and the Asia-Pacific Market.”

XU, Ping

Guangdong Yudean Group Co.,
Ltd., People's Republic of China

XU, Yuming

China Nuclear Industry
Association,
People's Republic of China

XUE, Ting

Yunnan Provincial Energy
Administration,
People's Republic of China

YAN, Minjie

Planning and Design Research
Institute of Coal Industry Co.,
Ltd., *People's Republic of China*

YAN, Xiaolu

National Energy
Administration,
People's Republic of China

YAN, Xueying,

China Energy Net,
People's Republic of China

YAN, Yu

Delegation of the European Union,
People's Republic of China

YANG, Rui

Zhejiang University,
People's Republic of China

YANG, Shenggao

Guizhou Nanyuan Electric
Power Technology Co., Ltd.,
People's Republic of China

YANG, Zhaoqian

Shaanxi Coal and Chemical
Industry Group, Co., Ltd.,
People's Republic of China

YAO, Yebin

Zhejiang Energy and Radiation
Institute, *People's Republic of China*

YE, Chun

National Energy Administration,
People's Republic of China

YIN, Jun

Ministry of Science and
Technology,
People's Republic of China

YU, Jianjun

China National Offshore Oil
Corporation,
People's Republic of China

YU, Xinyang

China Energy Research Society,
People's Republic of China

YUDHA, Satya Widya

Commission VII, House of
Representatives,
Republic of Indonesia

ZAGDRAGCHAA, Batbold

Asia Pacific Institute, *Mongolia*

ZENG, Lin

CCTE Clean Energy Co., Ltd.,
People's Republic of China

ZHA, Daojiong

Peking University,
People's Republic of China



Left to Right: Tom Cutler (Cutler International, LLC) and Kang Wu (FACTS Global Energy) enjoy a chat between Summit events.

ZHANG, Ying

Accenture,
People's Republic of China

ZHANG, Youbin

Anhui Energy Group Co., Ltd.,
People's Republic of China

ZHANG, Yu

Accenture,
People's Republic of China

ZHAO, Eric

Aramco Asia,
People's Republic of China

ZHAO, Wei

Embassy of Canada,
People's Republic of China

ZHENG, Xinye

Renmin University,
People's Republic of China

ZHENG, Zhou

Hefei Jntech New Energy Co., Ltd.,
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ZHENG, Ziting

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Asian Development Bank,
Philippines

ZHOU, Dadi

China Energy Research Society,
People's Republic of China

ZHOU, Dongbo

TOTAL, People's Republic of China

ZHOU, Min

Accenture,
People's Republic of China

ZHOU, Wei

Asian Development Bank,
Philippines

ZHOU, Yunheng

Zhejiang University,
People's Republic of China

ZHU, Hongguang

National Energy Administration,
People's Republic of China

ZHU, Kai

CNOOC Research Institute,
People's Republic of China

ZHU, Xinlei

Beijing Energy Club,
People's Republic of China



The audience listens to a moderated panel discussion on “Pairing Technology and Policy to Improve Coal Use.”

Summit Leadership

The National Bureau of Asian Research (NBR) launched the Pacific Energy Summit in 2009 with the vision to find innovative solutions to energy and environmental challenges in the Asia-Pacific, and was fortunate to be joined this year by the China Energy Research Society (CERS). As Summit co-hosts, NBR and CERS would like to express our gratitude for the insights, contributions, and support of our core Summit leadership—our advisers, lead sponsor, partner, sponsors, and collaborating institutions—as well as the Summit staff. We are also deeply appreciative of our moderators, panelists, and paper authors, who played an integral role in developing and strengthening this year’s program.

Secretariat and Co-Host

The National Bureau of Asian Research is a nonprofit, nonpartisan research institution dedicated to informing and strengthening policy in the Asia-Pacific. NBR conducts advanced independent research on strategic, political, economic, health, and energy issues affecting U.S. relations with Asia. Drawing upon an extensive network of the world’s leading specialists and leveraging the latest technology, NBR bridges the academic, business, and policy arenas. The institution disseminates its research through briefings, publications, conferences, congressional testimony, and email forums, and by collaborating with leading institutions worldwide.



Co-Host

The China Energy Research Society is a nonprofit and nongovernmental organization established in 1981. Since its establishment, with the aim to meet the economic and social needs of energy development in China, CERS has integrated its work with the practices of energy policy in China. Through its research, CERS has achieved influential results that have contributed positively to the Chinese government’s strategic deployment and decision-making on energy issues. Today, CERS is one of the most influential academic research societies in the fields of energy policy and technology in China.



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Chevron is one of the largest integrated energy companies in the world. Headquartered in San Ramon, California, and conducting business in more than 100 countries, the company is engaged in every aspect of the oil and natural gas industry, including exploration and production; refining, marketing and transportation; chemicals manufacturing and sales; and geothermal and power generation.



Partner

Asian Development Bank (ADB) is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration. ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to approximately two-thirds of the world's poor: 1.6 billion people who live on less than \$2 a day, with 733 million struggling on less than \$1.25 a day. Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.



Sponsors

Accenture is one of the world's leading organizations providing management consulting, technology, and outsourcing services, with more than 323,000 employees; offices and operations in more than 200 cities in 56 countries; and net revenues of \$30.0 billion in 2014. Our four growth platforms—Accenture Strategy, Accenture Digital, Accenture Technology, and Accenture Operations—are the innovation engines through which we build world-class skills and capabilities; develop knowledge capital; and create, acquire, and manage key assets central to the development of integrated services and solutions for our clients.



ExxonMobil is the world's largest publicly traded international oil and gas company. It holds an industry-leading inventory of global oil and gas resources. It is the world's largest refiner and marketer of petroleum products, and its chemical company ranks among the world's largest. It applies science and innovation to find better, safer and cleaner ways to deliver the energy the world needs.



Collaborating Institutions

The Center for Energy Governance and Security (EGS) of Hanyang University conducts dynamic research on today's global energy issues while bringing together groups of energy experts from the United States and major countries in the Asia-Pacific (Korea, China, Japan, Singapore, and Australia). Furthermore, building upon comprehensive network base from all three sectors (government, business, and academia), global energy governance, energy security, and region-specific issues of significance to the Asia-Pacific region will be actively explored and discussed.



The Korea Energy Economics Institute (KEEI) is a national research council of the Republic of Korea dedicated to conducting research in the field of energy and natural resources. KEEI aims to contribute to improve national energy security by collecting and analyzing information in the energy sector, examining current energy-related issues, and assisting the development of policies on energy and natural resources. In addition, KEEI actively conducts research on overseas energy issues by collaborating with the world's leading research institutes and promotes research cooperation among industry, government, and academia.



Participants enjoy remarks by featured speakers during Summit meals.

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NBR's Trade, Economic, and Energy Affairs Group

Fostering collaborative solutions to shared challenges in the Asia-Pacific

NBR's Trade, Economic, and Energy Affairs Group collaborates with a broad range of U.S. and Asian specialists from industry, research, and policy to conduct innovative research and convene high-level dialogues. Guided by an in-house research team and a select group of senior advisors, the group's research focuses on three broad areas: (1) energy security and policy, (2) energy and the environment, and (3) trade, investment, and economic engagement.

Highlighted initiatives include:

Pacific Energy Summit

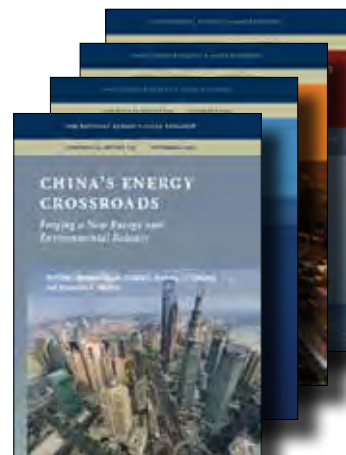
As economies in the Asia-Pacific region continue to grow at astonishing rates, the Pacific Energy Summit aims to foster economic and energy security in the Asia-Pacific by developing practical solutions to the dual challenges of rising energy demand and global climate change. The annual, invitation-only Summit convenes 200 global leaders to articulate practical and tenable policy solutions to energy and environmental challenges.



**PACIFIC
ENERGY SUMMIT**

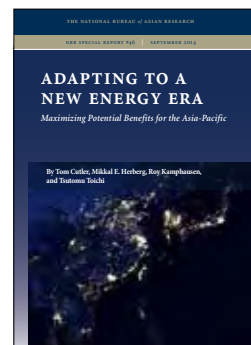
Energy Security Program

Dramatic developments are taking place in Asian energy markets, and these changes will affect the geopolitical situation in the Asia-Pacific region. Rising demand has led to increasing dependence on energy imports and a growing sense of energy insecurity among the major Asian powers. To address these issues, this initiative convenes senior policy and industry leaders and Asia energy specialists from across the region for high-level discussions on Asia's energy policies and their geopolitical implications. Experts share insights and recommendations through an invitation-only spring workshop; NBR's annual Energy Security Report, which compiles expert essays on each year's specific topic; and a public fall launch event.



Adapting to a New Energy Era

An unexpected boom in U.S. and Canadian production of shale gas and tight oil has accelerated an already steady decline in U.S. imports of Middle East oil and gas. At the same time, China, Japan, and the rest of Asia have emerged as major importers of oil and natural gas from the Persian Gulf. This initiative aims to provide in-depth and academically rigorous research into how the United States, Japan, and other countries can craft stronger diplomatic, strategic, and economic tools to support common energy security interests.



“NBR does a terrific job at getting great people, with great ideas, and making it into a process of dialogue and interaction that leads to recommendations that are very useful in the policymaking process.”

— **Robert Hormats**, *Former Under Secretary of State for Economic Growth, Energy, and the Environment, Department of State, United States*

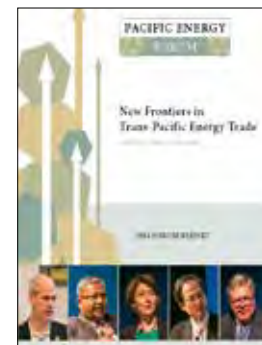
Innovation and IP Policy

Economies in the Asia-Pacific have shown unprecedented growth rates in recent years, and the United States aims to engage with the many burgeoning economies in the region. As India, China, and others work to further develop their economies, intellectual property and innovation policies have increasingly appeared in national and international discussions. To assess these key issues, NBR has developed projects looking at intellectual property protection and innovation policy development in the Asia-Pacific and how emerging players in the region continue to shape global discourse on the future of these policies.



Pacific Energy Forum

Broad and fundamental global energy shifts, along with rapidly evolving technologies and capabilities, suggest that Asia and North America need to fundamentally reconsider their current energy relationship. The Pacific Energy Forum gathers experts and leaders from Asia, the United States, and Canada to assess the key policy questions that will shape the future trans-Pacific energy relationship and enhance energy and environmental cooperation among key actors in the region.



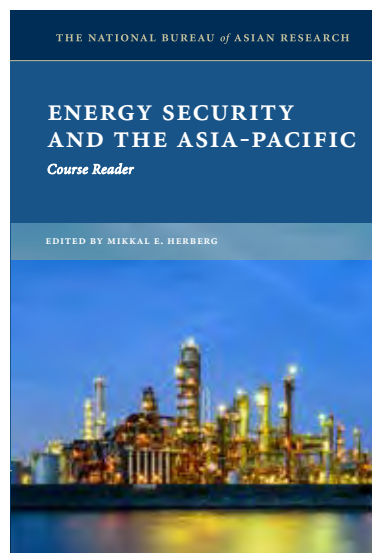
For more info on these programs, please contact Laura Schwartz, NBR's Project Manager for Trade, Economic, and Energy Affairs, at pacificenergy@nbr.org.

Energy Security and the Asia-Pacific

Course Reader

The Asia-Pacific is now the center of growth in global energy and commodity demand. Driven by rapid and sustained economic development across the region, this shift has triggered important changes in global energy flows. It has also posed major new energy security challenges for Asian governments and fundamentally altered the geopolitics of global energy.

This special collection of essays from leading experts in the field, selected from previous NBR publications, provides students with a strong foundation for understanding the trends and challenges shaping the energy security outlook for the Asia-Pacific and the world.



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