THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# INDONESIA:
# A REGIONAL ENERGY LEADER IN TRANSITION

By Natalie Bravo, Clara Gillispie, Mikkal E. Herberg, Hanan Nugroho, Alexandra Stuart, and Nikos Tsafos

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# INDONESIA:
## A REGIONAL ENERGY LEADER IN TRANSITION

*Natalie Bravo, Clara Gillispie, Mikkal E. Herberg, Hanan Nugroho, Alexandra Stuart, and Nikos Tsafos*

# INDONESIA:
# A REGIONAL ENERGY LEADER IN TRANSITION

## TABLE OF CONTENTS

## THE NATIONAL BUREAU *of* ASIAN RESEARCH

The NBR *Special Report* provides access to current research on special topics conducted by the world's leading experts in Asian affairs. The views expressed in these reports are those of the authors and do not necessarily reflect the views of other NBR research associates or institutions that support NBR.

The National Bureau of Asian Research is a nonprofit, nonpartisan research institution dedicated to informing and strengthening policy. NBR conducts advanced independent research on strategic, political, economic, globalization, 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. NBR also provides exceptional internship opportunities to graduate and undergraduate students for the purpose of attracting and training the next generation of Asia specialists. NBR was started in 1989 with a major grant from the Henry M. Jackson Foundation.

Funding for NBR's research and publications comes from foundations, corporations, individuals, the U.S. government, and from NBR itself. NBR does not conduct proprietary or classified research. The organization undertakes contract work for government and private-sector organizations only when NBR can maintain the right to publish findings from such work.

To download issues of the NBR *Special Report*, please visit the NBR website http://www.nbr.org.



This is the fifty-third NBR *Special Report*.

NBR is a tax-exempt, nonprofit corporation under I.R.C. Sec. 501(c)(3), qualified to receive tax-exempt contributions.



Front cover image: Mountain and fog © iStock.com/harreha.

For further information about NBR, contact:

The National Bureau of Asian Research
1414 NE 42nd Street, Suite 300
Seattle, Washington 98105

206-632-7370 Phone
206-632-7487 Fax
nbr@nbr.org E-mail
http://www.nbr.org

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# Introduction: Sustaining a Positive Role for Energy in Indonesia's Rise

*Clara Gillispie*

**CLARA GILLISPIE** is Director of Trade, Economic, and Energy Affairs at the National Bureau of Asian Research (NBR). She can be reached at <cgillispie@nbr.org>.

Indonesia's strong economic growth and successful democratic transition have made the country a major political and economic power in Southeast Asia and in the broader Asia-Pacific. It is now a key strategic and economic partner for the United States and has become increasingly important in shaping a peaceful, prosperous future for Asia. The successful national elections in 2014—encapsulated by the rise of President Joko "Jokowi" Widodo—coupled with signs that Indonesia is potentially entering a revitalized era of domestic policy and governance reform, confirm the country as a leading force in the region's continued and stable development.

A central element for understanding Indonesia's success story is the positive role that energy has played in supporting the country's rise. Indonesia has traditionally been a leading energy supplier in the Asia-Pacific, with a diverse wealth of resources, including oil, natural gas, coal, and geothermal potential. Meanwhile, progress on expanding domestic access to supplies critical for a range of sectors has been essential to sustaining industry, improving public health, and satisfying growing demand for electricity. As a result, the rich potential of Indonesia's energy resources has played a critical role in the country's economic growth while contributing to higher levels of prosperity across Asia.

However, rapidly rising domestic energy demand, combined with slowing oil and gas production, threatens to undermine the energy sector's capacity to support domestic economic growth and poses serious challenges to Indonesia's role as an important energy exporter to the region. As noted by the U.S. Energy Information Administration, the International Energy Agency, and other organizations, Indonesia's total primary energy consumption grew by almost 50% between 2003 and 2013. Moreover, new demand growth in the coming decade will quickly dwarf these numbers, as the essays in this report explore. Although Indonesia's potential to harness domestically available energy resources remains substantial, legal and policy uncertainties surrounding the development of the country's energy sector are continuing to affect Indonesia's ability to attract the investment needed to reinvigorate domestic production of oil and gas. As highlighted during President Jokowi's October 2015 visit to the United States, as well as in a number of newly announced policy initiatives throughout the year, encouraging such investment is a shared interest of both Indonesia and the United States; it is also an issue to which policymakers will need to pay even greater attention.

Indonesia is looking to strengthen its environmental policymaking as well. As Indonesian parliamentarian Satya Widya Yudha, experts at the World Resources Institute, and other leading policymakers and specialists have recently noted, the country is facing very real challenges related to public health concerns about rising air pollution and carbon dioxide ($CO_2$) emissions. These concerns have been exacerbated by a range of factors, including the dramatic expansion of Indonesia's transportation sector and infrastructure and unsustainable practices employed by both industry and the public. These challenges admittedly go well beyond the energy sector, yet they require Indonesia to continue to think holistically about its approach to natural resource management. Undertaking this process will undeniably have far-reaching impacts on the country's energy and economic systems. However, questions remain on identifying best practices for moving forward and on securing the funding and other resources available to effectively pursue these options.

Ultimately, as a natural leader in Southeast Asia and a key partner to the United States, Japan, and other countries in the Asia-Pacific, Indonesia's economic and energy success is of

vital concern not just for Indonesia but for the region as a whole. With these issues in mind, the National Bureau of Asian Research (NBR) convened its 2015 Energy Security Program under the theme "Indonesia: A Regional Energy Power in Transition." Each year this program examines a major development in Asian energy markets and details how key regional stakeholders might work together to better respond to the economic, environmental, and geopolitical implications of ongoing market and policy developments. For 2015, program discussions focused on a range of market and policy issues facing Indonesia, with key themes including the role that energy plays in Indonesia's development, issues driving the country's reduced oil and gas production and the implications for the economy, the outlook for policy and regulatory reform, strategies for strengthening energy and environmental security, and questions related to energy governance.

To explore these issues in depth, NBR commissioned four essays from authors representing the diverse range of stakeholders involved in these discussions, including experts from the policy community, industry, and the research community. The arguments in these essays were then debated and discussed in greater detail at a high-level workshop that was jointly convened by NBR and the US-ASEAN Business Council on July 23, 2015, to promote further examination of recommendations for public policy. Based on these discussions, as well as conversations with senior advisers and leaders from the policy community and industry, NBR then worked with authors to revise the draft essays to reflect both key workshop findings and major developments in the second half of the year. These essays are published here collectively for the first time as an NBR Special Report.

In the opening essay, Alexandra Stuart of the US-ASEAN Business Council provides an exceptional overview of Indonesia's energy outlook and policymaking environment. She begins by detailing the country's energy supply and demand picture as well as identifying the key stakeholders and policy framework that shape the country's near- and long-term planning. Within this context, Stuart then highlights six core challenges for the Jokowi administration as it strives to achieve the objectives of the new national energy policy: reducing energy subsidies, developing infrastructure, reforming the overall regulatory environment, clarifying production-sharing contracts, resolving tensions surrounding resource nationalism, and addressing governance issues in the energy sector. She concludes by offering a range of recommendations for consideration that highlight both the daunting undertaking that the Jokowi administration has embarked on and the continued need for greater, more collaborative efforts to address anticipated challenges.

In the second essay, Mikkal E. Herberg of NBR explores the evolution of the oil industry in Indonesia through the lens of ongoing efforts to manage the country's transition from being a net oil exporter to a net oil importer. He notes that the Jokowi administration and the Indonesian parliament have taken a number of vital steps—perhaps most critically, reducing inefficient oil subsidies—to address long-term concerns for the sector. He also highlights that the current global environment of low oil prices presents further opportunities to continue these efforts in ways that mitigate negative impacts on poor and vulnerable populations. Yet as Herberg observes, the challenge for Indonesia is not just reinvigorating investment in oil production. It is also reshaping unsustainable growth rates in oil consumption and demand from the transportation sector that further complicate the country's oil security outlook.

Next, Natalie Bravo and Nikos Tsafos examine the central role of the power sector in driving Indonesia's increasing demand for energy supplies and describe the complicated nexus between natural gas, coal, and electricity. With the country pursuing ambitious plans to expand access to

electricity to cover several million people currently without reliable access, Indonesia's electricity demand is expected to roughly triple between 2011 and 2035. It is hard to imagine a scenario that does not require a dramatic increase in demand across a range of fuel sources to meet this goal. Furthermore, if the rise in energy demand is not well managed, it is difficult to imagine a scenario that does not lead to a substantial increase in energy-related $CO_2$ emissions. Yet as Bravo and Tsafos note, Indonesia's continued potential for greater utilization and development of natural gas supplies suggests an opportunity to expand access to electricity while avoiding the environmental damage that would come with unmitigated reliance on cheap, low-efficiency coal supplies. However, pursuing this option will require policy action. It will also not negate the fact that coal is anticipated to play a heightened role in the country's energy mix, suggesting that greater attention is still required to manage the impacts of the growth in coal consumption through lower-carbon technology and more effective policies.

Finally, Hanan Nugroho of the National Development Planning Agency of Indonesia offers a very thoughtful assessment of how the country is looking to craft a cohesive approach to energy policymaking that fully integrates environmental considerations. He argues that a number of the so-called traditional definitions of energy security fail to take into account that a driving consideration for Indonesian policymakers is not just securing energy supplies but ensuring that the supplies engaged address sustainability and social license concerns. With this in mind, Nugroho invites readers to reassess Indonesia's energy security using an "A4&S" framework—that is, a strategy for pursuing a cleaner energy mix based on what is available, accessible, affordable, acceptable, and sustainable. In addition to the great potential for natural gas assessed by Bravo and Tsafos, Nugroho argues that Indonesia has incredible (and largely untapped) potential in renewable energy resources, including but not limited to wind, solar, hydroelectric, and geothermal potential. Indeed, if the country is to meet ambitious targets to raise renewable energy to around 23% of its energy mix by 2025, it likely will need to draw heavily on each of these resources. Yet as Nugroho aptly observes, where and to what extent each of these options is developed will be a function of both structural and geographic considerations and the degree to which investment needs, financing, and other market opportunities can be fully realized.

These four essays collectively paint the picture of a country in the midst of a historic moment. Whether Indonesia can capture this moment will depend on its ability to harness market opportunities and implement policies to achieve domestic aims and strengthen its natural role as an energy leader in the wider Asia-Pacific. Although major challenges remain to Indonesia adequately satisfying its growing domestic demand for energy and electricity, the country also has the potential to meet this demand in ways that are more sustainable and responsive to environmental considerations than has been true in the past. Achieving these goals will depend on continued political will and even more robust collaborative efforts. The latter would not only improve Indonesia's energy security and satisfy rising energy demand but also help the country reduce air pollution and uphold its climate commitments.

While NBR's Energy Security Program is always the culmination of the efforts of dozens (if not hundreds) of participants, partners, and collaborators, this year we owe a special debt of gratitude to several groups and individuals who deserve particular recognition. First and foremost, we are grateful for the generous support of our sponsors—the Asian Development Bank, Chevron, ConocoPhillips, and ExxonMobil. Year after year, their contributions have enabled us to examine the central energy security challenges facing the Asia-Pacific—and to do

so in a manner that brings together critical stakeholders from across the region. This makes the program more than just an academic exercise; it facilitates dialogue among stakeholders that develops and tests real-world recommendations for public policy. We are also grateful to the US-ASEAN Business Council, which not only served as a true partner in co-hosting the program's July workshop and the report's fall launch on Capitol Hill but also shared with NBR countless insights and recommendations from its on-the-ground expertise in bringing together policy and industry in Jakarta. Additionally, NBR senior advisor Meredith Miller provided invaluable support and expertise in the development of this year's theme. Her thoughtful comments helped to both strengthen the overall program and integrate perspectives of key stakeholders.

Next, we are appreciative of the insights and perspectives of the senior Indonesian policy leaders and specialists who shared their first-hand experience with the issues raised in this report. Over the past several years, Satya Widya Yudha, deputy chairman of Commission VII (which oversees energy, mineral resources, and the environment within the Indonesian House of Representatives) has been an invaluable contributor to NBR's Pacific Energy Summit. We are grateful for the ideas and the insights that he shared with us through the course of this initiative, including by joining in the program's July workshop in Washington, D.C. We are also especially appreciative of the time and contributions of Arto Suryodipuro, as well as the larger staff of the Embassy of Indonesia in Washington, D.C. Their guidance and feedback before and during the workshop significantly enriched the caliber of this report.

Finally, we are deeply appreciative of our program authors and workshop panelists. These individuals not only gave their time and expertise but pushed us toward new ways of thinking about energy security—and hopefully toward a clearer view of areas for new efforts to yield mutual gains. As you read this report, we encourage you to view these essays as an opportunity to reflect on the incredible progress that has occurred over the course of the past year, while also still appreciating the ongoing challenges that lie ahead. We look forward to continuing to build on these conversations together in our efforts to strengthen U.S.-Asia relations.

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# Indonesia's Energy Policy: Challenges and Opportunities

*Alexandra Stuart*

**ALEXANDRA STUART** is the Director for Indonesia, Energy and APEC at the US-ASEAN Business Council. She can be reached at <astuart@usasean.org>.

## EXECUTIVE SUMMARY

This essay details Indonesia's existing approach to its energy policy challenges, examines recent action taken by the current administration, and offers recommendations for public policy.

### MAIN ARGUMENT

The central energy policy challenge for Indonesia is meeting rising domestic energy demand. There is no shortage of natural resource potential to supply this rising demand, but greater policy coordination and investment are needed in order to boost production of all energy resources if Indonesia wants to avoid becoming a net importer of energy. To this end, President Joko "Jokowi" Widodo has made it a priority to place reformers in key policy positions, and the government has adopted a national energy policy that focuses on strategies and tools for addressing concerns that hinder energy sector investment. There are, however, a number of structural and policy challenges that continue to complicate further progress. The biggest challenges include persisting energy subsidies, a lack of infrastructure, the regulatory environment, corruption, and ongoing questions about economic nationalism.

### POLICY IMPLICATIONS

- Proposed targets for how Indonesia can meet rising energy demand while sustaining the country's environmental outlook are remarkably ambitious. In order to meet the country's targeted energy mix for 2025, natural gas and coal use must more than double and renewable energy use must increase ninefold.
- Jokowi's push for the creation of a "one-stop shop" for investment licenses within the Indonesian Investment Coordinating Board is a step in the direction of streamlining regulatory processes to make investing in Indonesia's energy sector easier. Yet it remains to be seen whether this initiative goes far enough in addressing investor concerns.
- Indonesia's National Energy General Plan (RUEN) was expected to be finalized and released by October 2015; however, it has yet to be officially released or made available online in draft by the government as of late November 2015. The timely release of the RUEN would go a long way toward providing further indication of how the government plans to effectively implement its national energy policy.

The central energy policy challenge for Indonesia is meeting rising domestic energy demand. There is no shortage of natural resource potential to supply this rising demand, but greater policy coordination and investment are needed in order to boost production of all energy resources if Indonesia wants to avoid becoming a net importer of energy. Meanwhile, the country's rapid economic development has brought into sharper focus the tension between this rise in energy demand and concerns over the environment and climate change. Although Indonesia's commitment to reduce greenhouse gas emissions by 26% by 2020 is significant, current policies that emphasize greater production and consumption of coal and palm oil without pursuing sustainable practices, clean-coal technology, and carbon capture and sequestration will almost certainly undermine this goal.

With this context in mind, this essay offers an overview of how Indonesia is approaching its energy policy challenges and offers recommendations for public policy. The essay begins by offering some brief historical background on the role that energy has played in Indonesia's economic rise and reviewing the country's current supply and demand picture. It then assesses the energy goals stated in Indonesia's national energy policy and discusses the major developments under the Joko "Jokowi" Widodo administration to address these challenges. The essay concludes by providing recommendations for Indonesia to pursue further reforms.

## Indonesia's Energy Outlook

### *Economic Transition*

Indonesia is a vast archipelago with a population of 250 million people. It is the largest economy in Southeast Asia, the sixteenth-largest economy in the world, and a member of the Group of Twenty (G-20). Endowed with an abundance and diversity of natural resources, Indonesia has historically produced more energy than it could consume and has been a leading energy supplier in the Asia-Pacific. Even today, oil and gas revenues alone account for around 20% of government revenues.[1] Yet over the last ten years, domestic demand for energy has increased rapidly as a result of steady economic expansion, rising living standards, population growth, and urbanization. During this period, the Indonesian economy grew at an average rate of 6%, having benefitted from high commodity prices. Since the end of 2012, however, the downturn in the commodity cycle has affected demand for Indonesian commodities. Economic growth slowed to 4.7% in 2015, and Indonesia continues to be buffeted by a decline in its terms of trade.

To diversify and strengthen its economy, the country has been attempting to shift away from commodity-supported growth and is pursuing an economy-wide policy of value-added industrialization.[2] As Indonesia pursues this economic transition, the Jokowi government's current national energy policy emphasizes redirecting resources away from exports toward domestic consumption, as well as rebalancing the energy mix toward indigenous supplies. As more resources are routed toward domestic consumption, energy exports will account for a declining share of export revenue. Energy exports were 35% of GDP in 2000 but declined to less than 25% in 2012.[3]

---

[1] "Hit to Indonesia's Oil and Gas Revenue Threatens Deficit, Crude Output," Reuters, April 30, 2015.

[2] International Monetary Fund (IMF), "Indonesia: 2014 Article IV Consultation-Staff Report," March 19, 2015, 6.

[3] International Energy Agency (IEA), *Indonesia 2015* (OECD/IEA: Paris, 2015), 18, https://www.iea.org/bookshop/704-Indonesia_2015.

Nonetheless, the energy sector will continue to play an important role in the Indonesian economy. Despite declining oil production,[4] Indonesia remains a net energy exporter and is a large producer and exporter of natural gas, coal, and palm oil, with its largest export markets including China, Japan, Singapore, South Korea, and the United States. Increasingly, however, these resources are being routed for the domestic market to keep pace with rising domestic demand for energy, which is projected to triple by 2030.[5]

## *Current Energy Supply and Demand Picture*

As noted above, Indonesia remains a major fossil fuel producer and net exporter of energy. In 2013, it was the 24th-largest crude oil producer in the world, accounting for 1% of global production.[6] Indonesia is also a significant global producer and supplier of coal, natural gas, and palm oil:

- *Coal.* Indonesia is currently the largest exporter of thermal coal and the fourth-largest coal producer globally.[7] In 2013, it produced 489 million tonnes (Mt) of coal and exported 329 Mt.[8]
- *Natural gas.* In 2013, Indonesia was the fourth-largest exporter of liquefied natural gas (LNG) and the tenth-largest producer in the world. In 2013, it produced 78.8 billion cubic meters (bcm) of LNG and exported 34.8 bcm.[9]
- *Palm oil.* Indonesia is the largest producer and exporter of palm oil in the world. In 2014, it produced 31 million metric tons (mmt) of palm oil and exported 20 mmt. Indonesian production of crude palm oil represents approximately 50% of total global production.[10]

Energy and mining commodities constitute a significant percentage of export revenue, with coal and gas being the largest contributors, accounting for approximately 27% of total export revenue.[11] Indonesia's role as an energy supplier has begun to shift, however, as the country increasingly directs more resources toward domestic consumption to meet rising demand. This trend could affect future supply to energy trading partners.

According to a recent report by the International Energy Agency, the power sector will be the major driver of energy demand growth in Indonesia.[12] Despite having an abundance of different energy sources, Indonesia currently has an electrification ratio of only 80%, which means that 20% of the population lives without access to electricity. To put this in context, Indonesia's neighbors in the Association of Southeast Asian Nations (ASEAN)—namely Singapore, Malaysia, Brunei, Thailand, and Vietnam—all have 100% electrification. The next section will examine the government's plan for addressing this gap between electricity supply and demand, as well as the overall challenge of rising domestic energy demand.

---

4 Indonesia became a net importer of oil in 2004 and suspended its membership in the Organization of the Petroleum Exporting Countries (OPEC) in 2008.

5 IEA, *Indonesia 2015*, 26.

6 Ibid., 19.

7 Thermal coal or steaming coal is burned for steam to run turbines to generate electricity.

8 IEA, *Indonesia 2015*, 71.

9 Ibid., 39.

10 "Palm Oil," Indonesia Investments, October 15, 2015, http://www.indonesia-investments.com/business/commodities/palm-oil/item166.

11 Edi Saputra, "The Real Cost of Indonesia's Commodity Export Restrictions," *Jakarta Post*, June 8, 2015.

12 IEA, *Indonesia 2015*, 40.

## Indonesia's National Energy Policy

### *Current Political Context*

Inaugurated at the end of October 2014, President Jokowi made it clear at the outset of his term that the government's top priority is boosting economic growth rates to above 7% per year while also reducing poverty. To advance this goal, his economic team focused on three core issues during his first year in office: boosting a slowing economy, stemming the current account deficit, and stabilizing the rupiah (which has depreciated to levels not seen since 1998 in the aftermath of the Asian financial crisis). In August 2015, Jokowi reshuffled his cabinet to replace a number of key economic positions, and at the beginning of September 2015 the government announced a new stimulus package to boost growth and prevent further depreciation of the rupiah.[13]

A major contributor to the current account deficit was Indonesia's oil import bill, which was in large part a result of entrenched fuel subsidies. Jokowi promised during his campaign to shift government spending away from costly fuel subsidies toward investment in education, healthcare, and infrastructure. With low global oil prices working in his favor, he delivered on this promise during his first month in office by eliminating subsidies for gasoline and capping the subsidies for diesel.

Jokowi understands that significant investment is needed in order to boost production to the required level to meet rapidly rising demand, and the government has in place a national energy policy that seeks to address this need. There are, however, a number of structural and policy challenges that inhibit greater investment. The biggest challenges include persisting energy subsidies, a lack of infrastructure, the regulatory environment, and corruption. Economic nationalism, particularly visible in the natural resources sector, is another challenge. These issues will be explored at length later in the essay after first introducing and examining Indonesia's current national energy policy.

### *Current National Energy Policy*

In 2007 the government passed an energy law (Law no. 30/2007) that established a legal basis for energy policy and management at the national level, providing general principles and basic targets for future development and the country's energy mix. It also laid the foundation for regulations on energy conservation and the development of renewable energy. The energy law established the National Energy Council—referred to by its Indonesian acronym DEN (Dewan Energi Nasional)—and mandated that the council draft a national energy policy and update it every five years.[14]

DEN is chaired by the president, the vice president, and the minister of energy and mineral resources and is composed of members from seven ministries (finance, national development planning, transportation, industry, agriculture, research technology and higher education, and environment and forestry) and eight additional expert representatives drawn from academia, industry, and environmental and consumer groups. DEN designs and formulates the national energy policy that is then reviewed and approved by Commission VII in the Indonesian

[13] Chris Manning, "Jokowi Takes His First Shot at Economic Reform," East Asia Forum, September 13, 2015, http://www.eastasiaforum.org/2015/09/13/jokowi-takes-his-first-shot-at-economic-reform.

[14] IEA, *Indonesia 2015*, 27.

parliament. The current secretary general of DEN is Satyr Nugraha, who was appointed by Jokowi in May 2015.[15]

DEN issued a new national energy policy in 2014 (NEP14), which was adopted by the parliament in February and signed by the government in October 2014. The NEP14's medium- and long-term goals are presented in two five-year plans that detail specific policy measures: the National Energy General Plan (RUEN) and the National Electricity General Plan. These two plans are to be aligned with the work of the Ministry of National Development Planning (Bappenas).[16] The basic components of the NEP14 are the following:

- The redirection of energy resources to the domestic market, thereby gradually reducing exports of natural gas and coal and eventually phasing them out entirely
- Rebalance of the energy mix toward indigenous energy supplies by minimizing oil consumption, increasing exploitation and consumption of renewables and coal, optimizing gas production and consumption, and considering nuclear energy as an option of last resort
- The establishment of emergency management structures and the further development of oil buffer stocks
- Complete electrification of the country by 2020 so that the entire population has reliable access to electricity

The NEP14 also lays out plans for an optimal energy mix in 2025, 2030, and 2050, which are detailed in **Table 1**. As can be gleaned from this table, the targets set for 2025 are remarkably ambitious. In order for Indonesia to meet the targeted mix for 2025, natural gas and coal use must more than double and renewable energy use must increase ninefold. The NEP14 specifies coal as the mainstay for the national energy supply but envisions an increasing role for new and renewable energy by 2050. The clear need for Indonesia to produce more of every energy resource in absolute terms places significant pressure on the government and could present

TABLE 1 The NEP14's energy mix targets

| Energy source | 2012 | 2025 | 2030 | 2050 |
|---|---|---|---|---|
| **Crude oil** | 41% | 23% | 22% | 20% |
| **Coal** | 29% | 30% | 30% | 25% |
| **Natural gas** | 24% | 25% | 23% | 24% |
| **New and renewable energy** | 6% | 22% | 25% | 31% |
| **Total energy consumption** | 159 Mtoe | 400 Mtoe | 480 Mtoe | 1,000 Mtoe |

SOURCE: National Energy Council, *National Energy Policy 2014–2025* (Jakarta, 2014).

NOTE: Mtoe stands for million tonnes of oil equivalent.

[15] "Govt Completes Overhaul of Energy Ministry, SKKMigas," *Jakarta Post*, May 8, 2015.

[16] The Indonesian government's central development plans are the National Long-Term Development Plan and four five-year national mid-term development plans. The current 2015–19 plan reflects the priorities of the Jokowi administration.

challenges for the country's energy security. The growing reliance on coal will also have serious implications for Indonesia's commitment to meeting targets for emissions reductions and addressing climate change.

*The National Energy General Plan*. The RUEN was expected to be finalized and released by October 2015; however, it has yet to be officially released and is not available publicly online on DEN's website. Although there are draft versions of the RUEN that have been informally circulated, it is not clear exactly when the plan will be finalized. On October 27, 2015, DEN held a strategic planning meeting in Palembang that focused on identifying cross-sector energy priorities to be incorporated into the RUEN.[17] The timely release of the RUEN would go a long way toward providing further indication of how the government plans to effectively implement the NEP14.

*The National Electricity General Plan*.[18] In the power sector, the Jokowi government's central objective is to add 35 gigawatts (GW) of installed power capacity over the next five years. This electrification plan is a strategic part of the government's National Medium-Term Development Plan 2015–19. Of the 35 GW goal, the government believes that the state-owned electricity company PT PLN can handle approximately 10 GW, while the private sector, or independent power producers, will need to develop the remaining 25 GW.

The government has issued and implemented new regulations to help realize this ambitious program, including regulations on land acquisition in the public interest,[19] as well as releasing a business plan for developing power plants during 2015–24.[20] Coal will account for approximately 60% of the fuel source for the 35 GW of power capacity the government hopes to add. Coal is the preferred source of energy due to its abundance and low cost. Yet greater reliance on coal will have serious implications for Indonesia's target of reducing greenhouse gas emissions unless clean-coal technology and carbon capture and sequestration are pursued.[21] In parallel with the plan to add 35 GW of power capacity, Indonesia intends to build 46,000 kilometers of transmission lines and 103,000 megavolt amperes of electrical relay stations in over one thousand locations.[22]

This is not the first time the Indonesian government has attempted to accelerate the development of power plants. The Yudhoyono government (2005–14) also pursued two fast-track electricity programs to add 10 GW of power capacity each. These programs, however, experienced delays because of licensing and land-acquisition issues, lack of financing, delays in government-backed loans, construction setbacks, and various technical difficulties.[23]

*Prospects for renewable energy*. There is tremendous potential for renewable energy to be developed in Indonesia. Yet its share in the energy mix has remained low in large part because of subsidized domestic oil prices, the regulatory environment, and the perceived higher upfront cost of renewables. Indonesia has the potential to develop almost every kind of renewable energy source—solar power, hydropower, biofuels, biomass, wind, wave, and

---

17 *Sinkronisasi Perencanaan Strategis Bidang Energi 2015–19* [Synchronization Energy Sector Strategic Plan 2015–19], Dewan Energi Nasional (Jakarta, October 30, 2015).

18 PT PLN, "35,000MW for Indonesia," pamphlet.

19 "Land Procurement for Development in the Public Interest," Law no. 2/2012, January 14, 2012; and Presidential Decree no. 30/2015, which amends Presidential Decree no. 71/2012 on land acquisition for public interests.

20 Ministerial Decision ESDM 74K/21/MEM/2015 on Legalization of the Business Plan for Supply of Electrical Power (RUPTL 2015–2024).

21 Pursuing carbon capture and sequestration would, however, change the economics of coal-fired power plants.

22 EY, "Opportunities and Challenges in the Indonesian Electrification Drive," March 2015, http://www.ey.com/Publication/vwLUAssets/opportunities-and-challenges-of-the-indonesian-electrification-drive-february-2015/$FILE/ey-opportunitiesand-challenges-of-the-indonesian-electrification-drive.pdf.

23 "Slow Progress on Indonesia's 10 GW Fast-Track Program," Enerdata, October 27, 2014, http://www.enerdata.net/enerdatauk/press-and-publication/energy-news-001/slow-progress-indonesias-10-gw-fast-track-program_30434.html.

geothermal energy—but, as **Table 2** illustrates, it is currently doing very little to exploit or develop this potential.

**TABLE 2** Indonesia's renewable energy: Potential versus installed capacity

| Renewable sources | Installed capacity | Potential capacity |
|---|---|---|
| **Hydro** | 6,243.00 MW | 75,000 MW |
| **Mini hydro** | 419.00 MW | |
| **Micro hydro** | 187.00 MW | |
| **Solar** | 22.40 MW | 4.8 kWh/m$^2$/day |
| **Wind** | 1.87 MW | 3–6 m/s |
| **Biomass** | 500.00 MW | 49,810 MW |
| **Ocean** | 0.01 MW | 49,000 MW |
| **Geothermal** | 1,341.00 MW | 29,215 MW |

SOURCE: Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia," 2014.

NOTE: The units of measurement noted here for solar and wind energy follow standard industry practices. An important distinction in reading these values for solar is that an MW (or KW) is a unit of power, while kWh is a unit of energy (and so these terms do not have a one-to-one correlation, because all potential energy is not used for power). 22.40 MW is equivalent to 22,400 KW. In a similar vein, the m/s unit measurement for wind provides an assessment of average wind speed.

*Prospects for greater geothermal energy development*. Indonesia holds an estimated 40% of the world's geothermal reserves, equivalent to roughly 29 GW of potential power.[24] Yet although it is the third-largest geothermal energy generator in the world (behind the United States and the Philippines), Indonesia currently only produces 5% of its total potential. One major impediment to the development of geothermal power has been legal. The government has traditionally defined geothermal development as a mining activity, which restricts new projects in forest conservation areas (where most exploration sites are located). This definition has since been altered with the passage of the new geothermal law in 2014, under which activities relating to geothermal development are no longer considered mining activities.[25] As a result, the development of geothermal fields in forest conservation areas is no longer prohibited by the restriction on mining activities under the forestry law. The new law also gives the central government the authority to issue tenders. Challenges remain, however, around electricity pricing and land acquisition.

*Environmental concerns*. In 2011, Indonesia passed the National Action Plan for Greenhouse Gas Emission Reduction. The plan committed the country to lowering greenhouse gas emissions relative to a business-as-usual scenario by 26% on its own and by 41% with international assistance by 2020.[26] This commitment is reflected in the National Long-Term Development Plan, which

[24] "Powering Up: Perspectives on Indonesia's Energy Future," *Economist*, Intelligence Unit, January 15, 2014, 28.

[25] Raras Cahyafitri, "Legal Barrier to Geothermal Development Removed," *Jakarta Post*, August 27, 2014, http://www.thejakartapost.com/news/2014/08/27/legal-barrier-geothermaldevelopment-removed.html.

[26] Hans Nicholas Jong, "Govt Reviews Emission Targets for Paris Talks," *Jakarta Post*, April 8, 2015, http://www.thejakartapost.com/news/2015/04/08/govt-reviews-emission-targets-paris-talk.html.

identifies forestry and peat, energy and transport, agriculture, industry, and waste as primary sectors for emissions reductions. The action plan is also complemented by another presidential regulation (Law no. 71/2011) on the implementation of a national greenhouse gases inventory. The two plans, along with the NEP14, require renewable energy to play an important role in meeting the country's energy demand in order to mitigate climate change.[27] It remains to be seen, however, whether these targets will be met and if the government will be able to overcome challenges to increasing the role of renewable energy in the energy mix. The targets set in the National Action Plan also inform Indonesia's commitments for the Paris 2015 UN Climate Change Conference talks in December 2015. Beyond any commitments made for the Paris conference, Indonesia should signal a post-2020 emissions reduction target.

## Challenges to Achieving the Objectives of the National Energy Policy

There are a number of policy and structural challenges to Indonesia achieving the objectives of its national energy policy. This section examines each of these challenges and assesses to what extent the current Jokowi government has taken action to address them.

### *Subsidies*

In the late 1960s, when oil and gas production and exports were first ramping up in Indonesia, the government introduced subsidies on oil products in the transportation, industrial, and power-generation sectors in order to stimulate economic development.[28] However, since the country ceased to be a net exporter of oil in 2004, heightened demand for oil products and political pressure to maintain subsidies meant that government spending on subsidies steadily increased and became a significant burden on the state budget. The fuel subsidy was projected to balloon to 20% of the Indonesian state budget in 2014 because of anticipated movement in international market prices. Almost unanimously, experts on Indonesian energy policy identified the elimination of fuel subsidies as the top priority for the incoming Jokowi administration. Previous administrations had lacked either the political will or political capital to take on this important reform, and attempts to do so were often met with public protests and, in more extreme cases, rioting.[29]

In addition to fuel subsidies, Indonesia subsidizes electricity prices. In 2012, total spending on energy subsidies was equivalent to the central government's combined capital and social spending and three times its infrastructure budget. Subsidies represent a huge opportunity cost and also disproportionately benefit high-income households.[30] By keeping the domestic prices of fuel (petrol, diesel, and kerosene) and electricity below their true market levels, government subsidies disrupt the normal mechanism for transmitting fluctuations in world oil prices and the rupiah's exchange rate to the domestic market, thereby shifting risk to the government budget.

In an attempt to address this issue, in November 2014 President Jokowi, less than a month after taking office, raised subsidized fuel prices by an average of 30%. This move was widely interpreted

---

27 "Powering Up," 30.

28 Siew Hua Seah, "Can Indonesia's Policy of Reconfiguring Its Energy Mix by Increasing Natural Gas Usage Support Its Initiatives to Reform Energy Subsidies?" Oxford Institute for Energy Studies (OIES), OIES Paper, November 2014, 1.

29 Joe Cochrane, "Indonesia Struggles to End Fuel Subsidies," *New York Times*, May 2, 2013.

30 "Powering Up," 17.

as a positive sign that his administration was serious about reform and intent on delivering on its commitment to reduce fuel subsidies to redirect government spending toward infrastructure development, education, and healthcare. Aside from a few isolated protests, the overall reaction to the price hike was relatively muted. In response to the fuel price increase, Bank Indonesia raised its benchmark interest rate by 0.25 basis points to 7.75% in order to counter short-term inflationary shocks. To cushion the impact of the fuel hike, the government provided low-income families with several social protection cards, including the Indonesia Health Card, the Indonesia Smart Card, and the Prosperous Family Card.

At the start of 2015, the government went even further and announced that effective immediately it would implement a new fuel-pricing system that eliminated gasoline subsidies altogether and capped the cost of diesel subsidies. This combined action by the Jokowi administration meant a spending reduction of an estimated $18 billion, freeing up much needed fiscal space for infrastructure development and social programs.[31] Yet although gasoline subsidies represented the biggest burden on the budget, it is important that the government continue to reduce the remaining subsidies on diesel products and electricity.

### *Lack of Infrastructure*

Investment in infrastructure has not kept pace with economic growth and development. Prior to the Asian financial crisis, Indonesia spent an average of 6% of GDP on infrastructure development, but since 2000 spending has not exceeded 3% of GDP.[32]

Provision of suitable infrastructure is critical for Indonesia to meet its energy goals. For example, boosting production of renewable energy relies on large investments in the transmission grid, while the establishment of a domestic gas market requires additional infrastructure in order to transport gas from one side of the archipelago to the other (gas that might otherwise be destined for export). The government has identified a number of priority projects, such as the Batang coal power plant in Central Java, but these remain plagued by challenges relating to land acquisition and delays or uncertainty around funding.[33]

The Jokowi administration has publicly recognized the strategic importance of investing in infrastructure development. By cutting fuel subsidies, the government was able to reallocate funds in the revised 2015 state budget toward the development of ports, roads, power plants, and dams. While this emphasis is important and welcome, the overall environment for infrastructure development remains challenging. Although a few notable projects have moved forward, there was not a huge uptick in spending in the first half of 2015 as had been expected. The Ministry of Public Works recently reported that 90% of planned projects have been tendered, with contracts signed for more than half of those. The ministry received approximately 40% of the government's 2015 infrastructure budget of 290 trillion rupiah ($21.7 billion).[34] This places pressure on the government to ensure that the drive to develop more infrastructure picks up steam in 2016.

---

31 There is some indication that now that global oil prices are beginning to recover, the Indonesian government is partially reintroducing the subsidy, but this issue will require further investigation.

32 Jay K. Rosengard and Malcolm F. McPherson, *The Sum Is Greater Than the Parts: Doubling Shared Prosperity in Indonesia through Local and Global Integration* (Jakarta: Harvard Kennedy School Indonesia Program and Gramedia Pustaka Utama), 2013, xxxi.

33 "How Not to Build a Power Plant: A Tale from Java Island," Bloomberg Business, May 5, 2015, http://www.bloomberg.com/news/articles/2015-05-04/how-not-to-build-a-power-plant-a-tale-from-java-island.

34 "Some Wins, Some Losses for Widodo in Indonesian Growth Campaign," Bloomberg Business, June 29, 2015.

### *The Overall Regulatory Environment*

Foreign investors in Indonesia's energy sector must contend with a host of legal and regulatory challenges. Uncertainty surrounding permits and licensing, production-sharing contracts (PSC), domestic-market obligations, cost-recovery procedures, and tax obligations reduces investor confidence, which undermines efforts to attract the investment in the sector that is needed to increase exploration and in turn production.[35]

In January 2015 the Indonesian Investment Coordinating Board launched a one-stop service for investment licenses. A total of 22 ministries and other government bodies have each delegated licensing representatives to the investment board's headquarters so that investors will not need to visit the offices of multiple government agencies. Jokowi pushed for the creation of this service in order to simplify investment procedures, something that the president deems essential for raising economic growth. Similar initiatives have been attempted in the past but ultimately fell short due to a lack of coordination among ministries, local governments, and other state bodies. The one-stop service is a step in the direction of simplifying permitting and licensing, yet it remains to be seen whether this initiative goes far enough in addressing investor concerns. So far reports about the overall impact on the investment climate have been mixed, but the initiative nonetheless signifies a good faith effort by the administration to streamline licensing and permitting.

Meanwhile, in August 2015, Jokowi reshuffled his cabinet, replacing six key economic positions, including the coordinating minister for economic affairs; coordinating minister of maritime affairs; coordinating minister for political, legal, and security affairs; minister of trade; minister of national development planning; and cabinet secretary.[36] In September the government announced an ambitious stimulus package motivated by a disappointing average growth rate in 2015 of 4.7% and the continuing depreciation of the rupiah. Six elements of the package have since been unveiled and cover measures ranging from streamlining business regulations to expanding access to microloans.[37] These two actions indicate that boosting economic growth remains a high priority for Jokowi.

### *Challenges with Production-Sharing Contracts*

Contract sanctity provides legal certainty over a long-term horizon that allows high-capital, high-risk investments to move forward. In Indonesia such certainty is provided by PSCs. In the oil and gas sector, however, the 2001 Oil and Gas Law lacks a clear timetable and process for handling renewals, extensions, or divestment of PSCs. Without a legal framework that provides clear guidance on what will happen vis-à-vis expiring PSCs, investors cannot make the required long-term investments to develop new projects or undertake enhanced oil-recovery projects.

On May 8, 2015, the Ministry of Energy and Mineral Resources issued a new regulation that provides much anticipated guidance on expiring PSCs.[38] The regulation recognizes that expiring PSCs should be managed by (1) the state-owned oil company Pertamina, (2) the existing PSC contractor if an extension is granted, or (3) a joint operation between the PSC contractor and

---

35 "Powering Up," 19.

36 "New Economics, Trade Chiefs as Jokowi Reshuffles Cabinet," *Jakarta Globe*, August 12, 2015.

37 The goals of the stimulus package, as articulated by the government, are to maintain conducive macroeconomic conditions (fiscal and monetary stability, accelerated government spending, and stronger balance of payments), boost the national economy, and protect low-income communities and boost the rural economy.

38 Ministry of Energy and Mineral Resources (Indonesia), "Management of Expiring Oil and Gas Production Sharing Contracts," Regulation 15/2015, May 8, 2015, http://jdih.esdm.go.id/peraturan/Permen%20ESDM%2015%20Thn%202015.pdf.

Pertamina. The regulation clarifies procedures and requirements for each of these three scenarios. If an extension on a production contract is granted, it allows Pertamina to have the option to acquire an additional 15% of the expiring oil and gas blocks. The new provisions are designed to give Pertamina a greater interest in oil and gas concessions to increase its share of production.[39]

While the issuance of the regulation was timely and a sign that the government was responding to the industry's call for greater regulatory guidance, these new provisions do not make investment in the Indonesian oil and gas sector more attractive for international companies. One of the first expiring PSCs is the Mahakam block located offshore of East Kalimantan. France's Total E&P and Japan's Inpex currently own and operate this concession, but the PSC is due to expire in 2017. The government has announced that at that time Pertamina will acquire 70% of the concession, and Total E&P and Inpex will split the remaining 30%. It is estimated that there are still at least 1.3 trillion cubic feet of gas reserves in the delta of the Mahakam River, and the block is expected to remain profitable until 2022. Both East Kalimantan and Kutai Kartanegara requested a 19% stake in the concession, but this request was denied by Jokowi.[40] Details of the terms and conditions for the transfer of the concession to Pertamina and the composition of the new shareholders have yet to be determined.[41] How this concession is handled will be an important indicator for all future expiring PSCs.

In July 2015 the Indonesian House of Representatives initiated a draft bill on oil and gas to replace the current oil and gas law that was passed in 2001. The draft bill seeks to modify existing provisions and create new ones to address the needs of the oil and gas industry. Elements of particular note include redefining the types of oil and gas industries, creating new agencies to manage the industry, and further regulating upstream and downstream activities. The draft bill introduces two new state-owned management agencies: the upstream industry will be managed by an upstream cooperation organizer, while the downstream industry will be managed by a buffering business entity. In contrast with the current managing organizations (SKK Migas and BPH Migas), the new organizations will only be allowed to engage in cooperation with companies on behalf of the government. The minister of energy and mineral resources will now have the authority to determine the working area for upstream activities and will give Pertamina preferential access to these working areas. If Pertamina is unable or unwilling to engage in an area, only then will it be auctioned to other companies.

The draft bill is currently being discussed by Commission VII of the parliament and will almost certainly undergo further revision.[42] The trend to grant more control over natural resources to state-owned entities like Pertamina reflects an undercurrent of economic nationalism. Deliberation of a new oil and gas law is a priority for the parliament, but the issue is unlikely to be resolved by the end of 2015.[43] Timely revision of the law would go a long way toward providing certainty about what contract system will ultimately prevail in the oil and gas sector and which institutions and regulatory bodies will be responsible for implementing the new legal framework.

---

39 Raras Cahyafitri, "New Rule Allows Pertamina to Own 15% in Expiring Blocks," *Jakarta Post*, May 20, 2015.

40 N. Adri, "E. Kalimantan Governor Accepts Jokowi Decision on Mahakam Block," *Jakarta Post*, July 6, 2015.

41 "Mahakam Block Still Uncertain," *Jakarta Post*, June 26, 2015.

42 "Draft Bill on Oil and Gas, Issue 2677," Hukum Online, July 6, 2015.

43 Arthur Sirat, "Parliament Doubt the Revised Oil and Gas Legislation Can Be Finished This Year," Katadata, August 13, 2015, http://en.katadata.co.id/news/2015/08/13/parliament-doubt-revised-oil-and-gas-legislation-can-be-finished-year.

### *Resource Nationalism*

Nationalist sentiment across all important extractive sectors of the economy (including the mining and oil and gas sectors) reflects the perception that Indonesians are not benefitting enough from their natural resource wealth. Article 33 of the 1945 Indonesian constitution is routinely referenced in support of this view. A specific application of this sentiment in the mining sector is the promulgation of the 2009 Mining Law. The basis of this law reflected dissatisfaction with the contracts of work and coal contracts of work arrangements and set up a system whereby the Indonesian government would have greater control over licenses in the mining sector. The law has resulted in tremendous uncertainty in the mining sector and created disputes between mining companies and the government over contract renegotiations and procedures for acquiring export permits.

There have been similar trends in the oil and gas sector. In 2012 the Constitutional Court ruled to disband the upstream oil and gas regulator, BP Migas, on the grounds that it contravened Article 33 of the constitution. The court determined that BP Migas had neglected its obligation to ensure that all natural resources would be "controlled by the state to be exploited to the greatest benefit of the people."[44] The political motivation to disband BP Migas centered on the belief that it had become too liberal and disproportionately favored foreign interests.

The Constitutional Court used the same legal argument to overthrow the 2002 Electricity Law that sought to liberalize the electricity sector, and more recently (in April 2015) it overturned the 2004 Water Resources Law. There are currently calls for the court to review over one hundred laws related to investment on the grounds that they contravene Article 33 of the constitution, with cases pending against the 2007 Investment Law, the 2011 Foreign Exchange Law, and the 2009 Electricity Law.[45] If this undercurrent of resource nationalism is not kept in check, it will deter needed foreign investment.

### *Corruption and Lack of Governance in the Energy Sector*

Corruption in the energy sector leads to a significant loss of revenue that threatens the sector's operational performance while undermining its attempts to attract foreign investment, finance new projects, and increase production. Indonesia's Supreme Audit Agency and the Corruption Eradication Commission have both found evidence of irregularities pointing to significant corruption, including cases involving a number of high-profile government officials. The former energy and mineral resources minister, Jero Wacik, and former head of Commission VII, Sutan Bhatoegana, from the previous administration are currently on trial for corruption. In April 2014 the former head of SKK Migas, Rudi Rubiandini, was sentenced to seven years in prison for corruption and ordered to pay a fine.

Since assuming office, Jokowi has made it a priority to place reformers in key positions. To address concerns surrounding governance and corruption issues, the new minister of energy and mineral resources, Sudirman Said, has initiated a shake-up of his ministry and vowed to root out corruption in the energy sector. He does not come from the oil and gas industry but has an extensive background in accounting and corporate governance. One of his first actions

---

[44] See Article 33 of the 1945 Indonesian constitution, available at http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_174556.pdf.

[45] Gilang Ardana, "Muhammadiyah to Carry On with Constitutional Jihad," AmCham Indonesia, August 5, 2015, http://www.amcham.or.id/fe/5041-muhammadiyah-to-carry-on-with-constitutional-jihad.

was to remove the previous director general of oil and gas and make all director-level (echelon 2) employees reapply for their positions.

At the beginning of May, Jokowi approved the selection of five top-level (echelon 1) positions in the Ministry of Energy and Mineral Resources. The five positions include the director general of oil and gas; the director general of mineral and coal; the director general of electricity; the director general of new energy, renewable, and energy conservation; and the secretary general of the National Energy Council. The open and protracted recruitment process for these positions began in December 2014 and is a significant step in ongoing efforts to reform the energy sector and root out corruption. Jokowi also appointed Amien Sunaryadi to be the new head of SKK Migas in an effort to restore investor confidence and improve the sector's reputation. The appointment of Sunaryadi, a former senior official at the Corruption Eradication Commission with a good anticorruption reputation, marks a change in the direction of SKK Migas, one that seeks to rid the sector of corruption. The energy minister also appointed economist Faisal Basri as the head of the reform team for the oil and gas sector, which is expected to review all upstream and downstream business processes, to make recommendations for improving governance, transparency, and accountability.

### *Changes at Pertamina*

As part of a wider effort to professionalize state-owned enterprises, President Jokowi, together with the minister of state-owned enterprises Rini Soemarno, installed Dwi Soetjipto as the new CEO of Pertamina. He was chosen for his success in consolidating several state-owned cement firms and integrating them into the Jakarta-listed giant Semen Indonesia, which successfully expanded into the Southeast Asian market via its subsidiary in Vietnam. Soemarno has also replaced the boards of both PT PLN and PT Pertamina. These initial steps to help professionalize Pertamina bode well but need to be taken further, especially if Pertamina is going to play a larger role in boosting production.

The Jokowi government has also taken steps to review the trading division of Pertamina, known as Petral, which has been targeted for reform because of governance concerns. Petral buys crude oil and fuel on international markets on behalf of Pertamina and supplies Indonesia with a third of its daily oil needs. The energy reform team has called for a reorganization of all processes and authorities for selling and procuring crude oil and petroleum products aimed at improving transparency and accountability.[46] As a result, Petral and its subsidiaries will be liquidated by April 2016 at the latest.

## Conclusion

The Jokowi government is to be commended for taking important and decisive actions to reduce costly fuel subsidies that had become a burden on the state budget and had crowded out investment in alternative forms of energy. However, with demand for energy expected to triple by 2030, Indonesia must continue to address the policy and structural challenges in the energy sector that currently prevent the country from meeting the goals of its national energy policy. Addressing fuel subsidies will hopefully pave the way for greater development of the renewable

[46] "Reform Team Calls for Major Changes in Oil Trade," *Jakarta Post*, December 31, 2014.

energy sector, but the government will need to pay particular attention to regulatory reform to ensure a conducive investment climate. The Jokowi administration has taken initial steps to address governance and corruption issues in the energy sector but also must find a way to ensure that narrow resource nationalism does not derail its efforts to achieve energy security.

In addition to pursuing ongoing regulatory and economic reform via its stimulus packages, the Indonesian government should take the following steps:

1. Revise the 2001 Oil and Gas Law with adequate foreign and domestic stakeholder consultation and opportunity for public comment
2. Make the RUEN available online for public comment
3. Revise the negative investment list to improve the investment climate and liberalize investment in sectors related to infrastructure development (especially energy infrastructure)
4. Follow up on Jokowi's October visit to the United States and the memorandum of understanding signed between the U.S. Department of Energy and the Indonesian Ministry of Energy and Mineral Resources by pursuing greater cooperation in the area of green and renewable energy development

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# Oil in Indonesia: Transitioning to a "New Normal" of Managed Import Dependence

*Mikkal E. Herberg*

**MIKKAL E. HERBERG** is Research Director of the Energy Security Program at the National Bureau of Asian Research (NBR). He is also a Senior Lecturer on international and Asian energy in the School for Global Policy and Strategy at the University of California–San Diego. He can be reached at <mherberg@nbr.org>.

## EXECUTIVE SUMMARY

This essay explores the evolution of Indonesia from a net exporter to a net importer of oil and analyzes the role of this shift in the country's development.

### MAIN ARGUMENT

Oil exports have long been a key driver of Indonesia's prosperity and economic development. However, Indonesia is in the midst of a historic transition from being an oil exporter to a net oil importer as a result of a long-term decline in oil production and rapidly rising domestic oil demand. This transition is partly a reflection of a natural maturing of the country's development toward a broader energy, resource, and manufacturing export model. However, such a rapid shift toward growing dependence on oil imports has added new headwinds to economic growth and aggravated concerns over future energy security. Indonesia's oil resources are still substantial, and more effective policies to promote new investment in oil exploration and development could reduce the weight of oil imports on the economy. Domestic oil demand is also rising much more rapidly than necessary, and new policies are needed to slow the pace of rising demand and reduce the enormous cost of popular but counterproductive oil subsidies.

### POLICY IMPLICATIONS

- Although Indonesia is going through an inevitable transition to a "new normal" of dependence on imported oil, the Jokowi administration needs to more effectively manage that import dependence and work to reduce the burden of expensive oil imports.
- To attract new international investment in oil exploration and development, Indonesia needs to develop more competitive oil investment and taxation terms, streamline oil investment decision-making and required permits, reduce corruption and mismanagement, and clarify the role of regional governments and tax authorities in the oil sector, among other measures.
- To slow the unsustainable rate of growth in oil consumption, Indonesia must implement a more realistic fuel-pricing system that reflects global oil prices and helps dampen rising oil demand. The Jokowi administration must exploit the current decline in global oil prices to take further steps to eliminate pernicious oil subsidies that absorb huge budget funds that would otherwise be available for badly needed investments in healthcare, education, and infrastructure.

The oil industry has been at or near the center of Indonesian economic development and prosperity since the country's independence from the Netherlands following World War II. Oil was first discovered in commercial quantities in Sumatra in 1885 by the precursor of Royal Dutch Shell Petroleum, and Indonesia has been an important global oil producer ever since. Indonesian oil was a key prize in the countdown to the outbreak of war between Japan and the United States in 1941 as control over it became central to Japan's pursuit of reliable oil supplies in the face of the U.S. oil embargo imposed in the middle of that year. Indonesia was one of the five founding members of the Organization of the Petroleum Exporting Countries (OPEC) in 1962. Oil export earnings have played a key role in supporting the country's economic growth, particularly in the wake of the oil price run-ups in the 1970s, which supercharged vital export earnings not long after the advent of the New Order government under President Suharto in 1967.

However, Indonesia is now in a historic transition period as energy resources are increasingly directed toward meeting rapidly rising domestic needs to support economic growth instead of functioning as an export commodity. An effect of this transition is that the balance of energy exports first shifted gradually toward natural gas exports and, more recently, has pivoted again away from gas exports toward coal and palm oil exports. The new national energy policy ratified in 2014 (NEP14) plans for a long-term reduction in oil and gas exports and a heightened focus on domestic energy use and investment.[1] These changes are rooted in Indonesia's natural development toward an export profile that reflects a more diversified economy based on a wider range of resources as well as manufactured goods exports. But the shift also reflects underlying weaknesses in Indonesia's energy and resource policies that have simultaneously led to a rapid and costly decline in oil production and a rise in oil consumption. This trend has increasingly undermined economic growth and drained state budgets. A more balanced and effective set of policies could have slowed both the decline in oil exports and the rapid rise in oil consumption.

This essay will assess the changes in Indonesia's oil sector and oil industry that have led the country to shift from being an oil exporter to being a net oil importer and will examine recent efforts to strengthen the contribution of the oil industry to economic growth. The first section reviews the history of Indonesian oil production and considers the causes of the present production constraints. The second section analyzes the rapid growth in oil demand that has absorbed an increasing share of oil production. The third section discusses the challenges to sustaining or raising future oil production along with what the Joko "Jokowi" Widodo administration should be doing to slow oil demand growth and reduce the negative impact of fuel subsidies.

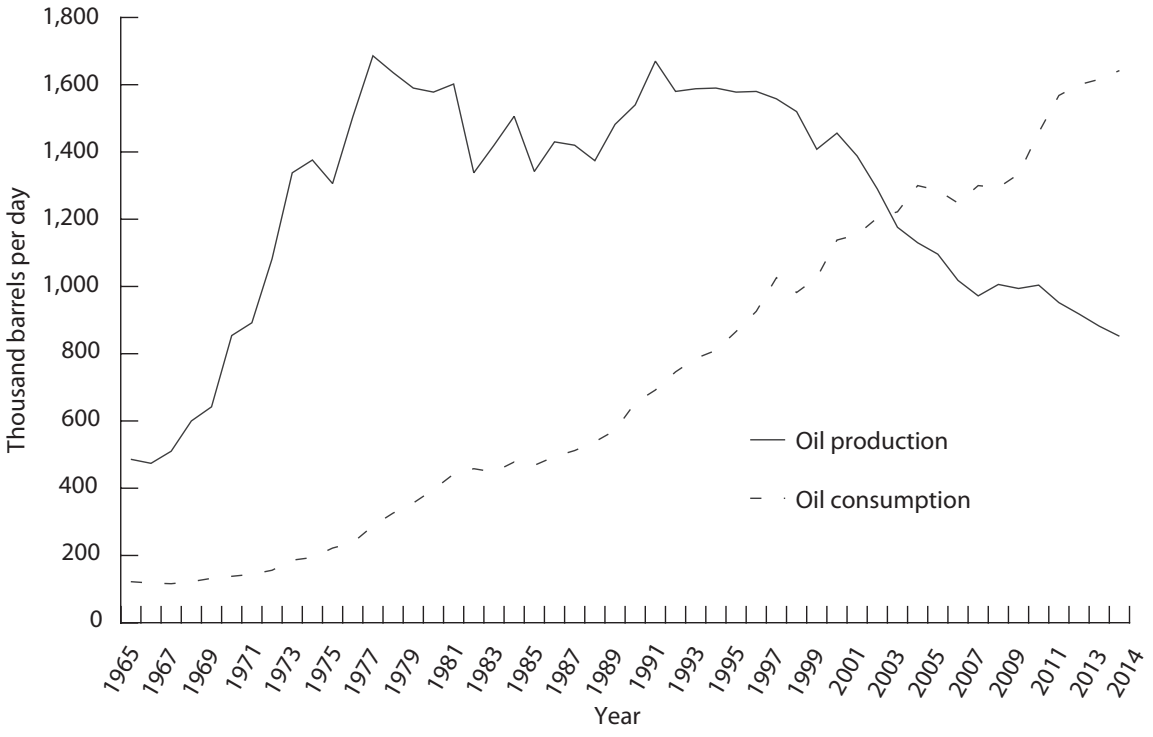
## Developments and Trends in Oil Production

Indonesia has been a significant oil producer since the initial discovery of oil in Sumatra in 1884. But as **Figure 1** shows, the country's oil production rose most dramatically during the late 1960s and early 1970s. Output rose from less than 500,000 barrels per day (bpd) in 1965 to nearly 1.6 million bpd by the mid-1970s.[2] The surge in production and exports coincided with the early years of Suharto's New Order government and the emergence of major oil exploration and development partnerships between Pertamina, the national oil company, and a host of

[1] For a description of the 2014 national energy policy, see "National Energy Policy (Government Regulation No. 79/2014)," International Energy Agency (IEA), http://www.iea.org/policiesandmeasures/pams/indonesia/name-140164-en.php.

[2] BP plc, "BP Statistical Review of World Energy 2015," June 2015.

**FIGURE 1** Indonesia's oil production and consumption, 1965–2014




SOURCE: BP plc., "BP Statistical Review of World Energy 2015," June 2015.

major international oil companies. Indonesia pioneered the use of production-sharing contracts, which defined the oil supply as the property of the people of Indonesia and paid oil companies a contracted share of the production as their investment return. Spiking oil prices in 1973–74 and again in 1979–80 coincided with this rise in production and led to enormous increases in oil export earnings that helped fuel Indonesia's rapid economic growth during the 1970s and early 1980s. In the mid-1970s, oil exports made up 60% of export earnings and 70% of state budget revenues. After peaking in 1977 at nearly 1.2 million bpd, exports remained above 1 million bpd into the early 1990s despite gradually rising domestic oil demand.[3] To its credit, and unlike many other OPEC oil exporters at the time, Indonesia under the Suharto government used the proceeds from oil exports to help diversify its economy and fund the country's revolution in rice production and historic shift toward self-sufficiency.

Yet this period was not without challenges. Despite many successes, the age-old problem of corruption was pervasive at Pertamina. In 1975 a debt crisis in which the company had run up unmonitored debts of nearly $10 billion nearly bankrupted the Indonesian government. Although oil production remained in the 1.4–1.6 million bpd range until the late 1990s, signs of weakness emerged much earlier.[4] As can be seen in **Figure 2**, the underlying level of proven oil reserves

[3] BP plc, "BP Statistical Review of World Energy 2015."

[4] Ibid.

FIGURE 2 Indonesia's oil reserves, 1980–2014


SOURCE: BP plc., "BP Statistical Review of World Energy 2015," June 2015.

began declining in the early 1980s, presaging the production challenges ahead. Reserves declined from nearly 12 billion barrels in 1980 to less than 4 billion by the mid-2000s.[5]

This decline in oil reserves reflected many causes. To begin with, earlier rising production was based on relatively low-cost and robust exploration and development success in onshore and shallow offshore regions of West Java and Sumatra. However, as these fields matured and were producing for years, many began to go into an inevitable natural decline as reservoir pressure declined. New discoveries also became more challenging, requiring moving into deeper waters and exploring new, more remote areas with higher risks and costs. Even under the best circumstances, Indonesia faced an increasingly difficult set of geological prospects that foreshadowed declining production in the future. Second, in the wake of the 1986 oil price crash, when prices dropped from $36 to less than $15 per barrel, the major oil companies were forced to cut investment and spending, and competition among countries to attract new investment intensified. World oil prices from 1986 to 2000 averaged just under $19 per barrel.[6] Yet despite these important changes, Pertamina and the Suharto government resisted the industry's calls to improve contract terms in order to adapt to lower prices and justify continued exploration and development in higher-risk areas. Indonesia had become a major exporter of liquefied natural gas (LNG) and increasingly saw

[5] BP plc, "BP Statistical Review of World Energy 2015."

[6] For average annual prices (dated Brent) during 1986–2000, see ibid.

its petroleum-export future in LNG more than in oil. Moreover, ongoing problems associated with corruption, complex bureaucracy, unstable contract terms, and uncertain field contract extensions increasingly bedeviled industry negotiations with Pertamina. With revenues high and given its previous success, Pertamina shifted increasingly toward limiting the role of foreign companies while retaining the best field prospects for itself. Reserve replacement ratios, which indicate the ratio of newly discovered reserves to oil actually produced, dropped over time to just 40%–50%.[7] All these shifts gradually led to declining investment, declining proven reserves, and eventually declining production in the late 1990s.

Political changes created additional challenges for oil production and exports. The collapse of the Suharto government in 1998 following a period of unrest and violence led to a succession of new administrations that were more driven by resource nationalism than the Suharto regime had been. While these changes brought about a more democratic system, they also unleashed strong nationalistic and populist political pressures. Under these conditions, the environment for investment in oil exploration and development became more complex and difficult. Further complicating the investment environment, new arrangements were put in place that gave the various regional governments a portion of the revenues from oil production. As a result, uncertainty grew over investment conditions.

The Indonesian government recognized that oil industry reforms were needed and in 2001 reduced the power of Pertamina by creating a new regulatory agency, BP Migas, that would be in charge of negotiating production sharing and contract extensions with private companies. Pertamina became just another company in the exploration and production sector. The government also ended its monopoly on the downstream refining and marketing industry. Yet despite these reforms, the cumulative impact of changing conditions eventually showed up in a long-term decline in oil investment and production beginning in the late 1990s. Between 1997 and 2014, oil production declined by nearly 50% from 1.58 million bpd to just 852,000 bpd.[8] With domestic oil demand simultaneously rising, Indonesia became a net oil importer for the first time in 2004, and it left OPEC—the organization it had co-founded—in 2009. The contribution of oil and gas exports to the state budget declined from 21% in 2004 to an estimated 12% in 2014.[9]

## The Other Side of the Equation: Booming Oil Demand and Fuel Subsidies

Indonesia's sharp decline in oil production since the late 1990s has corresponded with strong growth in domestic oil demand. In the wake of the Asian financial crisis of 1997–98 and the political crisis of 1998, Indonesian oil demand increased by 60% over the next fifteen years.[10] The fundamental driver of this trend was rapid economic growth that mirrored strong growth in oil demand across Southeast Asia. Indonesia's economy entered a sustained period during which the use of oil in the transportation sector accelerated quickly. One only needs to navigate the crowded streets of Jakarta filled with passenger cars, small trucks, and millions of motorbikes to appreciate the pace of oil demand growth.

But such booming oil demand has been supercharged by the persistence of large fuel subsidies built into government pricing of oil products. During the 1970s and 1980s, these subsidies were

7 Wood Mackenzie, "Indonesia Energy Markets Outlook 2015—Oil," January 2015.

8 BP plc, "BP Statistical Review of World Energy 2015."

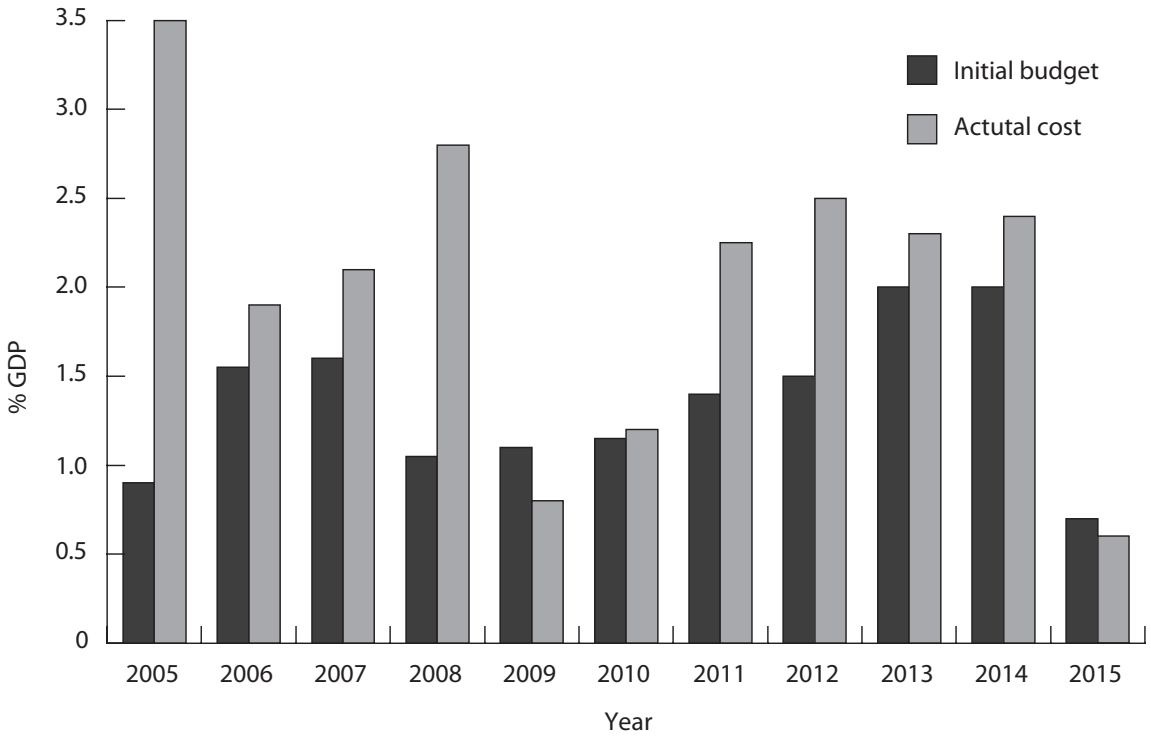
9 PwC Indonesia, "Oil and Gas in Indonesia—Investment and Taxation Guide," 2014.

10 BP plc, "BP Statistical Review of World Energy 2015."

established for gasoline, diesel, fuel oil, and kerosene in order to stimulate economic growth and ostensibly protect the poor from high energy costs. However, they ballooned out of control over the past fifteen years, particularly with the rise in global oil prices after 2003. As **Figure 3** and **Figure 4** show, the World Bank calculates that fuel subsidies in recent years have averaged the equivalent of 2%–4% of GDP and 15%–25% of total central government spending in Indonesia.[11] The costs of energy subsidies have persistently crowded out central government spending for infrastructure, health, and education and have been a primary cause of enormous budget deficits. The rising cost of importing oil during the run-up in global oil prices has also contributed to chronic balance-of-payments deficits and a weakening currency. In this regard, the sharp decline in world oil prices in 2014–15 has provided a welcome reduction in oil import costs and subsidy costs. This has allowed new room for maneuver for the Jokowi government to move forward in reducing oil subsidies.

By holding oil prices far below world levels, fuel subsidies have contributed significantly to the pace of domestic oil demand growth and consequently were a key factor in Indonesia's shift in 2004 from being an oil exporter to being a net oil importer. Indonesia is now importing over 40% of its oil needs.[12]

**FIGURE 3** Fuel subsidy costs, initially budgeted and actual as a percentage of GDP



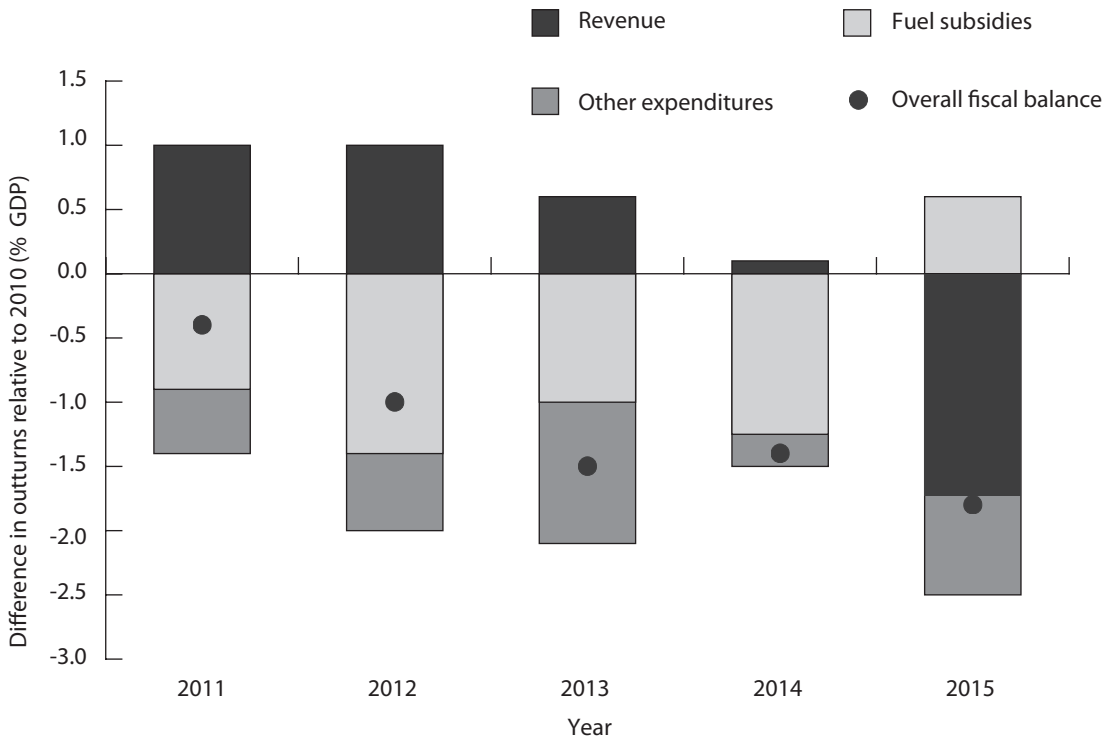

SOURCE: World Bank, "Slower Gains," Indonesia Economic Quarterly, July 2015, 27.

NOTE: Data for the initial budget is drawn from the Indonesian state budget. The 2015 cost is a World Bank projection.

[11] World Bank, "Slower Gains," Indonesia Economic Quarterly, July 2015, 27.

[12] IEA, "Energy Supply Security: Emergency Response of Partner Countries 2014—Indonesia," 2014.

FIGURE 4 Difference in outturns relative to 2010 as a percentage of GDP




SOURCE: World Bank, "Slower Gains," 27.

NOTE: The 2015 figures are World Bank projections.

## Prospects and Challenges for the Future

Indonesia faces a complex set of challenges in managing its future oil industry prospects. As a net importer of oil rather than a net exporter, it now needs to move toward policies that are geared to energy security. The recently adopted NEP14 provides an important new focus on energy security and shifts toward managing demand growth. It aims to re-establish Indonesia's energy independence, strengthen energy efficiency, and accelerate the deployment of indigenous energy sources like coal, natural gas, renewables, and geothermal energy to support domestic energy needs and economic growth. To emphasize energy security, the NEP14 lays out plans for developing oil "buffer stocks" of domestically stored oil that would be available in the event of a supply disruption, whether as a result of a natural disaster like a tsunami or an international conflict.

### *Reinvigorating Oil Production*

In the oil sector, Indonesia faces special challenges. The Jokowi government needs to address opportunities on both the production side and the consumption side in order to reduce the economic drag that the oil sector is currently exerting on the economy. On the oil production side, any expectations of Indonesia becoming a net exporter again are long gone. Given declining mature oil fields, including the large Minas and Duri fields in Central Sumatra, and much more

challenging exploration opportunities in high-risk and costly offshore deepwater areas, Indonesia must work hard to simply stabilize oil production. Stabilizing production or at least slowing its decline would help slow the relentless growth of oil imports and reduce the burden of costly imported oil. Although Indonesia still has many attractive areas for oil exploration, in the new environment of lower global oil prices international companies need more favorable investment conditions to step up spending on these higher-cost opportunities.

Inevitably the need to improve investment conditions runs up against the strong resource nationalism that has always been important in Indonesia but that has intensified in the post-Suharto political environment. Nevertheless, there are clearly areas of agreement over measures needed to attract more investment in exploration and development from the global industry. The Jokowi government recognizes this opportunity and in late 2014 established an oil and gas reform team to work to eliminate inefficiency and improve the oil sector's performance. There are indications that the government realizes that the traditional formula of an 85%-15% split in production revenue needs to be made more attractive to encourage investment in challenging exploration opportunities. A new committee set up by the Ministry of Energy and Mineral Resources is aiming to achieve a 75% reserve replacement ratio by halving the time from awarding a block to discovery.

Other impediments to new investment include chronic corruption, regulatory uncertainty, lack of contract sanctity, onerous domestic market commitments, weak and erratic government policy, and inconsistent and expensive regional revenue demands. For example, the Indonesian Petroleum Association estimates that new exploration investments require 341 separate permits across the ministries and another 101 from local governments.[13] The Jokowi administration has sought to minimize regulatory red tape by reducing the number of licenses required by the Ministry of Energy and Mineral Resources from 52 to 42.[14] The ministry has also handed over the administration of exploration licenses to the Indonesia Investment Coordinating Board to streamline bureaucracy. On the other hand, the 2012 decision by the Constitutional Court that BP Migas violated Indonesia's constitution and the creation of the new SKK Migas have created greater regulatory uncertainty and raised concerns over the stability of contract terms, development plans, and field extension negotiations. Although the Jokowi government has introduced a number of initiatives, many of the initiatives started by previous governments were never completed. Thus, the jury is still out on how much progress can be expected.

### *Taming Oil Demand and Subsidies*

While Indonesia has much work left to do to strengthen the prospects for oil production, the other side of the equation is adopting measures to slow the rise in oil consumption. First, the Jokowi administration needs to push to improve the efficiency of oil use in the transportation sector. This sector has become the primary driver of growth in oil demand, accounting for 60% of total oil use, as private demand for gasoline and diesel has risen with higher incomes coupled with poor public transportation options.[15] Improved energy efficiency in the transportation sector is a key goal of the NEP14, but the details of the new plan remain unclear.

---

[13] Jacqueline Woo, "Indonesia Pumps Up Efforts to Attract Oil and Gas Investments," *Straits Times*, May 16, 2015.

[14] Ibid.

[15] Wood Mackenzie, "Indonesia Energy Markets Outlook 2015."

Beyond improving efficiency, the key to slowing demand growth is tackling fuel subsidies that encourage greater oil use. Various measures have been introduced over the past decade to reduce subsidies. In 2006 the government removed subsidies for diesel and fuel oil consumption in the industrial and power sectors to encourage a switch to coal and natural gas. Subsidies for kerosene were also reduced in 2007, and households were encouraged to switch from kerosene to liquefied petroleum gas to help reduce the subsidy bill. These efforts continue under the Jokowi administration. In November 2014 the government increased transport fuel prices for gasoline and diesel. In January 2015 it decided to float the price of gasoline to market prices while maintaining a fixed subsidy of 1,000 rupiah per liter ($0.09 per liter) for diesel, taking advantage of the decline in global oil prices.[16] Despite worries that higher fuel prices could provoke social unrest, protests over these increases have been relatively modest. Current plans are to adopt more targeted subsidies for the poor, who will receive direct subsidies through fuel cards and other mechanisms to prevent well-off consumers from receiving the majority of the benefits of low prices. However, progress on implementing the subsidy cuts has been slow. While the government had planned to adjust prices every two to four weeks, in the early stages it has been slow to make the indicated adjustments. This indecision reflects the political sensitivity of increasing fuel prices and raises questions about the administration's willingness to follow through on unpopular policies.

Even assuming that Indonesia gradually phases out fuel subsidies, analysts expect that the country's oil demand will continue to increase substantially due to rising per capita income and solid economic growth. Oil demand ultimately is far more sensitive to income and economic growth than to relative prices. Wood Mackenzie, a well-respected energy consulting firm, forecasts that Indonesia's oil demand will grow from 1.6 million bpd in 2014 to 2.3 million bpd in 2030, driven largely by transportation use.[17]At the same time, the firm forecasts that production will continue to decline gradually due to limited geological prospects and slow progress on addressing the political impediments to greater investment. This analysis suggests that Indonesia could be importing nearly 2 million bpd by 2030.

## Outlook

Indonesia is clearly headed for a future as a progressively larger importer of oil. However, the pace of this transformation could be altered by implementing policies that encourage greater investment in new supplies as well as minimize the rate of growth in oil demand by improving efficiency and reducing subsidies. Although the NEP14 incorporates plans to achieve these objectives, the question will be, as always, whether the Indonesian government will follow through with critical policies in the face of strong domestic interests supporting the status quo.

[16] Wood Mackenzie, "Indonesia Energy Markets Outlook 2015."

[17] Ibid.

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# Indonesia: The Nexus of Gas and Electricity

*Natalie Bravo and Nikos Tsafos*

**NATALIE BRAVO** is an independent consultant based in Asia. She can be reached at <natalie.a.bravo@gmail.com>.

**NIKOS TSAFOS** is President and Chief Analyst at enalytica. He can be reached at <nikos.tsafos@enalytica.com>.

## EXECUTIVE SUMMARY

This essay examines the complicated nexus between natural gas and electricity in Indonesia and explores the importance of realizing the potential of gas in Indonesia's energy mix to reduce an excessive reliance on coal for power generation.

### MAIN ARGUMENT

Indonesia's energy needs will grow markedly over the next two decades due to demographics and economic development. But the country's energy system has a tendency to grow on the back of whichever domestic fuel is most abundant and affordable—which today is coal. As such, the government's efforts to bring electricity to all Indonesians rests on an aggressive program of adding coal-fired generation capacity. In part, such reliance on coal is the inevitable byproduct of geography and the country's resource endowment; yet it also reflects pessimism about how much natural gas can contribute to the electricity mix. If Indonesia is to avert the environmental and social catastrophe that will accompany a massive coal buildup, it needs to get natural gas right. This means reforming rules and regulations to unlock the country's immense untapped natural gas potential.

### POLICY IMPLICATIONS

- At a time when countries are intensifying their efforts to limit carbon emissions, Indonesia is doubling down on coal and embarking on a large-scale program to add coal-fired power-generation capacity.
- Indonesia has considerable untapped resources of conventional and unconventional gas, and the full exploitation of those resources will reduce the need to rely so heavily on coal for the country's power-generation needs.
- Indonesia can develop its natural gas resources only by embarking on an ambitious reform program that provides regulatory clarity, streamlines investment decisions, and provides the certainty that companies need to invest in the country.

Indonesia is a hydrocarbon-rich but energy-poor country with per capita energy consumption that is far below regional peers such as Thailand and Malaysia. Delivering affordable and reliable energy to the domestic market has been hampered by geography, chronic subsidies, and a regulatory system that stifles investment in oil, gas, and electricity development and infrastructure.

Yet as an expanding economy with a growing population, Indonesia will need significantly more energy over the next few decades. Faced with declining oil and gas production, Indonesia is naturally turning to the other indigenous resource it possesses in abundance: coal. The domestic market is already heavily reliant on coal, but it will become even more reliant over the next decade as the government embarks on an ambitious program to add 35,000 megawatts (MW) of power-generation capacity, of which 60% will be coal-fired. Carrying out this program, especially based on low-grade domestic coal, will entail an environmental calamity.

If Indonesia is to avoid this fate, it will need to revitalize its natural gas industry. For years, the country was the world's largest exporter of liquefied natural gas (LNG), but in recent years, it has struggled to keep production from falling and to balance the competing needs of the export and local markets. Even so, Indonesia has considerable gas potential, and targeted reforms could help the country unlock its considerable conventional and unconventional reserves, provide energy to its population, and lessen the environmental burden of a massive reliance on coal for power generation.

The first section provides a background of Indonesia's gas and electricity sectors. The essay next discusses the evolution and challenges confronting the country's natural gas sector—in particular the discrepancy between a national surplus and regional deficits. The third section addresses the multifaceted challenges confronting the electricity sector and considers the outlook for electricity generation and the heavy emphasis that the government has placed on coal to meet Indonesia's power needs. The fourth section argues that reforms could unlock significant natural gas supply potential, thus reducing the numerous negative environmental and social consequences of generating more electricity from coal.

## Background

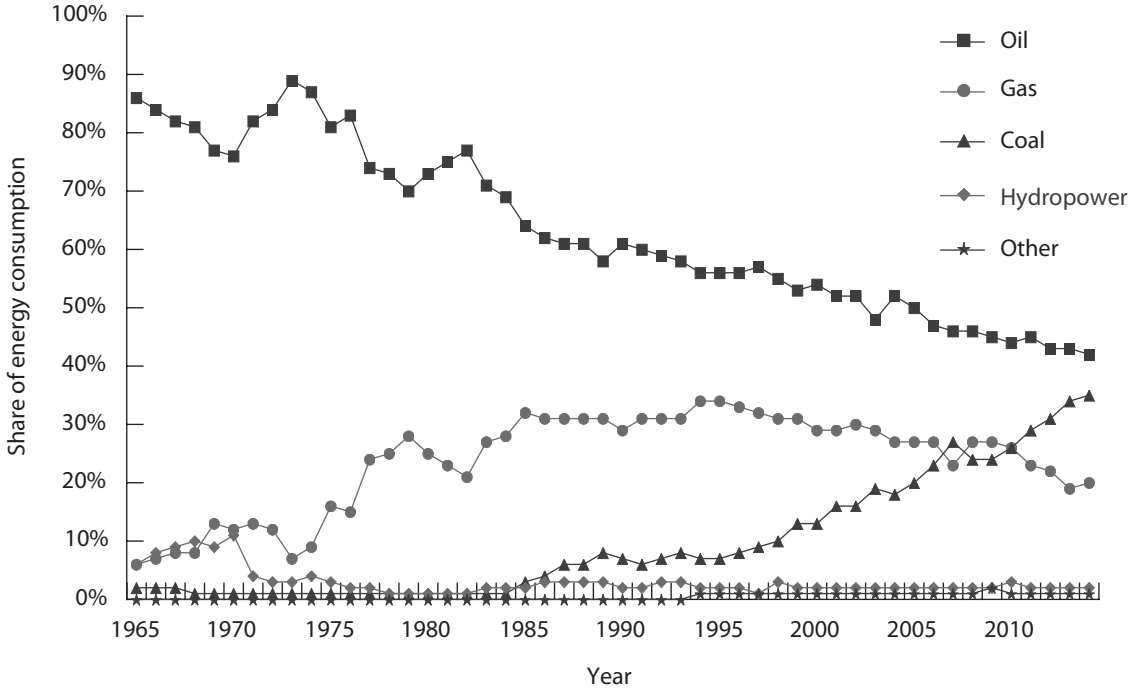
Indonesia is one of the world's oldest hydrocarbon producers: oil was first produced there in 1893, and by 1938, when Saudi Arabia entered the oil market, Indonesia was already producing 150 thousand barrels a day.[1] As a large-scale oil producer, Indonesia naturally relied on oil for its energy needs, and oil provided approximately 80% of the country's energy in the 1970s (see **Figure 1**). As oil output plateaued in the 1980s, Indonesia turned to the next local fuel that was cheap and abundant, natural gas, which by the mid-1990s made up 35% of the fuel mix. But soon enough Indonesia moved on to coal, whose consumption started to rise in the 1990s and took off in the 2000s. By 2014, coal made up 35% of the energy mix (with oil accounting for 42% and gas for 20%).[2]

These transitions underscore a reality in Indonesian energy: the system gravitates to the cheapest domestic fuel source to fulfill its energy needs—cheapest being a function of both

[1] "T38: Crude Oil Production in OPEC Member Countries," in *OPEC Annual Statistical Bulletin* (Vienna: Organization of the Petroleum Exporting Countries, 2005), http://www.opec.org/library/Annual%20Statistical%20Bulletin/interactive/2005/FileZ/XL/T38.HTM.

[2] These numbers refer to total consumption in the country; many Indonesian sources exclude gas consumption at the country's liquefaction facilities from "domestic" demand. Hence, these numbers may differ from some Indonesian sources. For more on the statistics used here, see BP plc, "BP Statistical Review of World Energy 2015," June 2015.

FIGURE 1 Indonesia's primary energy consumption




SOURCE: BP plc, "BP Statistical Review of World Energy 2015," June 2015.

NOTE: These numbers refer to total consumption in the country; many Indonesian sources exclude gas consumption at the country's liquefaction facilities from "domestic" demand. Hence, these numbers may differ from some Indonesian sources.

production and transportation costs in this populous and geographically diverse country. Indonesia, however, remains an energy-poor country, despite being rich in hydrocarbons and a major energy producer. The energy system has been built on exports rather than domestic supply, and delivering adequate, affordable, and reliable energy to the local market has been a perennial challenge: in 2014, per capita energy use in Indonesia was 0.7 tons of oil equivalent versus 1.8 in Thailand and 3.0 in Malaysia.[3] Although low energy consumption is natural for an emerging economy, Indonesia's energy woes have been complicated by two additional factors: (1) heavy subsidies for oil products and electricity have grown to unsustainable levels in recent years, and (2) a complex and unpredictable regulatory system has stifled investment. Together, these factors have produced an energy crisis—a crisis in oil, in gas, and in electricity.

In responding to this energy crisis, Indonesia now risks causing an environmental calamity. In April 2015 the government rolled out an ambitious power-generation plan to add 35,000 MW of

[3] Energy consumption data is from BP plc, "BP Statistical Review of World Energy 2015." Population data is from World Bank, World Development Indicators Databank, http://databank.worldbank.org/data/reports.aspx?Code=SP.POP.TOTL&id=af3ce82b&report_name=Popular_indicators&populartype=series&ispopular=y.

new capacity between 2015 and 2019, 70% of which is expected to come from the private sector.[4] To put this number in context, the country's total generation capacity at the end of 2014 was 51,620 MW.[5] More significantly, 60% of that capacity will be coal-fired, as the government sees domestic coal as a solution to the country's energy and electricity poverty.[6] In official forecasts, authorities see coal consumption tripling between 2013 and 2035.[7] At a time when other countries are looking for ways to restrict coal to meet targets for emissions mitigation, the Indonesian government is doubling down on coal.

The move toward coal is logical: the country has abundant coal reserves, and in 2014 its coal production was seven times as high as its oil production and four times as high as its gas production.[8] Indonesia may be a major oil and gas producer, but it is a far greater coal producer and exporter: in 2014 the country earned $48 billion from exports of oil, gas, and coal, and $21 billion of that came from coal.[9] Yet the shift toward coal is also a recognition that alternative sources of power generation cannot meet Indonesia's energy needs. The move toward coal is in part a failure of gas, whose importance in the country's energy mix and in planning has waned in recent years. If it is to limit the massive environmental consequences of a shift toward coal, Indonesia needs to re-energize its natural gas industry: a healthy and revitalized gas industry is essential to not only Indonesia's but also the world's energy and environmental health.

## Natural Gas: National Surplus, Local Deficit

Indonesia had long produced associated gas, but the country did not fully exploit its gas resources until the late 1970s.[10] Discoveries in Northern Sumatra (Arun in 1971) and East Kalimantan (Badak in 1972) enabled the country to develop two LNG-export projects—Arun and Bontang—which shipped their first LNG in 1978 and 1977, respectively.[11] Export projects generated revenue for the treasury and turned Indonesia into the largest LNG exporter in the world, a position it held until 2006, when it was surpassed by Qatar.[12]

Exports, however, did little to help develop a national gas market. Some local demand emerged around export facilities, especially Arun,[13] but the gas market was otherwise built around pockets of supply and demand—a situation that is only now being slowly rectified. Java is the largest gas demand center, consuming roughly 53% of the country's gas. Most of this gas is used in the power

---

4 "35,000 MW untuk Indonesia" [35,000 MW for Indonesia], PLN, 2015, http://www.pln.co.id/wp-content/uploads/2015/04/35000-MW2.pdf.

5 PLN, "Annual Report 2014," 2014, 16, http://www.pln.co.id/eng/?p=55.

6 Leo Jegho, "Power Up Indonesia, President Jokowi to Launch Ambitious 35,000 MW Electricity Projects," Global Indonesian Voices, April 13, 2015, http://www.globalindonesianvoices.com/20180/power-up-indonesia-president-jokowi-to-launch-ambitious-35000-mw-electricity-projects.

7 National Energy Board (Indonesia), "Outlook energi Indonesia 2014" [Indonesia Energy Outlook 2014], 2014, http://www.den.go.id/upload/outlookenergi/file/outlookenergi.pdf.

8 BP plc, "BP Statistical Review of World Energy 2015."

9 "V.10. Nilai ekspor menurut komoditas" [V.10. Value of Exports by Sector Commodity], Central Bank of Indonesia, Indonesian Financial Statistics, http://www.bi.go.id/seki/tabel/TABEL5_10.pdf.

10 Associated gas is gas produced from an oil field.

11 "Milestones," Badak LNG, http://www.badaklng.co.id/milestone.html; and "Corporate Profile: History," PT Arun NGL, http://arunlng.co.id/Profile/Default.aspx.

12 BP plc, "BP Statistical Review of World Energy 2007," June 2007.

13 For reference to sales to fertilizer and paper plants, see "ExxonMobil in Indonesia Milestones 1898–2010," Exxon Mobil, http://www.exxonmobil.com/Indonesia-English/PA/about_history.aspx.

and industrial sectors, such as in fertilizer production, chemical plants, and refineries, while smaller volumes go to city gas and transportation.[14] Sumatra is the second-largest demand center, accounting for 25% of total consumption. Here, gas is used chiefly in industry because abundant coal makes gas-fired generation uneconomic. These markets, however, were only connected in 2008 when the South Sumatra–West Java pipeline came online. Until then, Java was supplied from local fields. Nor are individual islands fully connected internally: while North Sumatra faced a supply deficit as production from Arun declined, South Sumatra had ample gas and kept exporting to Singapore and Malaysia. Similarly, West, East, and Central Java remain unconnected even today. There has been insufficient investment in building a broader transmission system across the two islands, with the exception of the South Sumatra–West Java interconnector. Without such infrastructure, it has been difficult to balance the national market and resolve the sharp regional disparities in supply and demand.

As oil production declined and economic development led to rising demand for energy, the needs of the energy system outgrew the export-oriented, localized gas market that had been developed until the 1990s. Since the early 2000s, Indonesia has sought to adjust the natural gas system to bring it in line with the needs of meeting rising demand at home. In particular, the country has channeled more gas to the local market. The 2001 Oil and Gas Law called for a domestic market obligation for production-sharing contracts (PSC), whereby 25% of gas from new projects is consumed inside Indonesia. The domestic market obligation, however, has been inconsistently enforced and did not suffice to effect a major change; instead, it more often created confusion and delays as producers sought to find buyers for their gas and negotiated extensively over the price at which the gas would be sold. Even so, these efforts have led to a growing intra-Indonesia trade in LNG: by 2015, there were three LNG-receiving terminals in Indonesia, taking gas from the Bontang and Tangguh facilities. (Arun was shut down in 2014 and was converted into a receiving terminal in 2015.) In 2014 the intra-Indonesian LNG trade amounted to 1.56 million tons (2.1 billion cubic meters).[15] Overall, there has been a pronounced increase in the amount of gas going to the local market rather than being exported (see **Figure 2**).

Yet gas production in Indonesia has been stagnant since the early 2000s as the country has been unable to bring online new fields to replace the declining production of older, more mature fields. For the most part, production has been either steady or in decline, with the Tangguh LNG project, which began production in 2009, being a notable exception that boosted the country's entire production momentarily. Declines have hit both domestic users and LNG export projects; around Java and Sumatra, maturing production of associated and non-associated gas has left considerable unmet and latent demand.

The decline in production comes at a time when the country's proven and potential reserves are diminishing as well: relative to their peak in 2004, proven and potential reserves have shrunk by 20%.[16] Moreover, the success rate of exploration wells has declined in recent years from an unusually high 47% in 2009 to a below average 20% in 2013.[17] Discoveries now tend to be farther

---

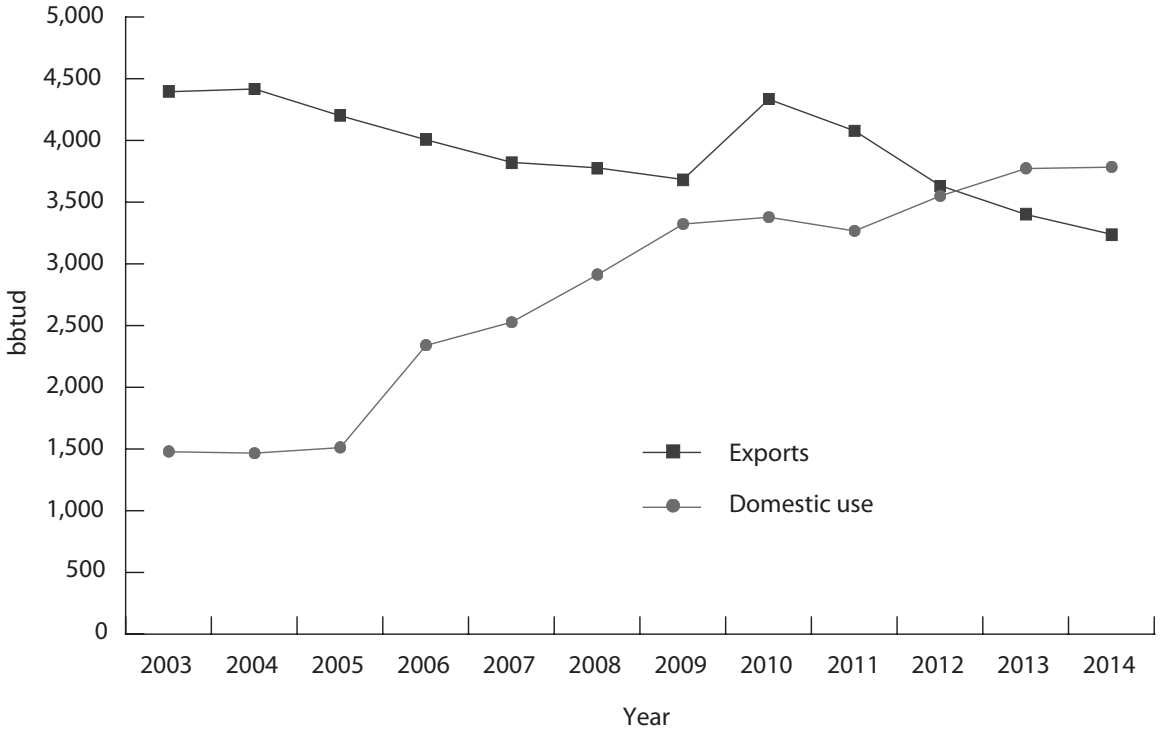
[14] This finding is based on "contracted" demand calculations from SKK Migas. See Ministry of Energy and Mineral Resources (Indonesia), *Peta jalan kebijakan gas bumi nasional 2014–2030* [National Gas Policy Roadmap 2014–2030] (Jakarta, August 2014), http://prokum.esdm.go.id/Publikasi/Peta%20Jalan%20Kebijakan%20Gas%20Bumi%20Nasional%202014-2030.pdf.

[15] International Group of Liquefied Natural Gas Importers, "The LNG Industry in 2014," 2014, http://www.giignl.org/sites/default/files/PUBLIC_AREA/Publications/giignl_2015_annual_report.pdf.

[16] Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia," 2014, http://prokum.esdm.go.id/Publikasi/Handbook%20of%20Energy%20&%20Economic%20Statistics%20of%20Indonesia%20/HEESI%202014.pdf.

[17] Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources (Indonesia), *2013 Oil and Gas Statistics* (Jakarta, 2013), 29.

FIGURE 2 Indonesia's natural gas allocation




SOURCE: SKK Migas, "Annual Report 2014," 2014, 88.

NOTE: bbtud stands for billion British thermal units per day.

away from the demand centers of Java and Sumatra, as well as smaller and technically more complicated, creating more challenging economics for development.

At the same time, demand for gas is growing, and additional supply is needed in both Java and Sumatra. The power and industrial sectors are the largest gas markets and will continue to drive growth because they still use considerable fuel oil and diesel that could be displaced by natural gas—not to mention the greater demand coming from a growing economy. The demand potential outside these two sectors is more limited in part because government programs encouraging residential use of liquefied petroleum gas limit household natural gas demand to larger cities such as Jakarta. The commercial and transportation sectors will account for some growth, but the low likelihood of a policy shift supporting major gas use in these sectors will similarly limit new demand.

## Power Challenges

In this context, it is not hard to see why enabling gas might be viewed as more a problem than a solution. Until the mid-1980s, almost all of Indonesia's electricity was generated from either oil products or water. It was only in the mid-1980s that the country started to use coal in its power

sector and in the early 1990s when gas was first used in the fuel mix.[18] Yet since 1999, coal has been the dominant fuel in the power sector, and in recent years the country has generated more than half of its electricity from coal.

Indonesia's power supply is controlled by PLN, a state-owned, vertically integrated company tasked with running the country's power distribution and transmission. PLN is also in charge of power generation, though the market is open to independent power producers that must sell power to the company. In 2014, PLN purchased 23% of its total power supply from independent power producers, up from 8% in 2000.[19] Despite the huge call for infrastructure development across the value chain, development has been hindered by PLN's limited capacity and poor financial health, caused by rising generation costs and subsidies (stemming from controls over retail prices for electricity).

The challenges facing the Indonesian electricity sector are immense and often similar to those confronting the gas sector. Three challenges stand out: access, reliability, and affordability. In 2014, electrification reached 84%, up from 28% in 1990 and 64% in 2009.[20] The government targets 97% by 2022. Electrification, however, does not mean equal or full access to electricity. In Jakarta, households consumed 2,451 kilowatt hours (kWh) per capita in 2014, roughly two and a half times the average in Java as a whole (1,010 kWh) and five times the rate outside Java (493 kWh), where more than 100 million Indonesians live. Over 10 million people still live in areas where the electrification rate is below 60%.[21] Many areas rely on diesel generators for power,[22] and Indonesia relies more on oil for generating electricity than other regional countries do: in 2013, 12% of its electricity was generated from oil versus 5% in Singapore, 4% in Malaysia, 2% in Vietnam, and 1% in Thailand.[23] Indonesia's electricity consumption is similarly at odds with that of its neighbors: on average, an Indonesian consumed 0.8 megawatt hours (MWh) of electricity in 2013 versus 1.3 MWh in Vietnam, 2.5 MWh in Thailand, 4.5 MWh in Malaysia, and 8.8 MWh in Singapore.[24] In other words, the average Indonesian would need to consume five times as much electricity to catch up with Malaysia and eleven times as much electricity to be on par with Singapore.[25]

Power supply has also been unreliable. Those connected to the grid can experience supply interruptions, especially during peak hours, and for those waiting to connect to the grid, infrastructure development is often delayed. Nowhere is this more telling than in the captive power market. Captive power includes electricity generated off-grid by independent parties—mainly, industrial and commercial users—for their own use. Captive power generators are designated either for a user's main use (by choice or out of necessity) or as a reserve for when grid power is not available or too expensive (e.g., during peak times). Captive power is hard to measure but is estimated at over 16 gigawatts (GW), including main and reserve units; roughly half of this capacity is in Java.

---

18 "Statistics: Statistics Search," International Energy Agency (IEA), http://www.iea.org/statistics/statisticssearch.

19 PLN, "Annual Report 2014," 16.

20 For electric coverage statistics from 2009–14, see the yearly PLN statistics reports, available at http://www.pln.co.id/eng/?p=2773; and for 2014 data, see PLN, "Annual Report 2014."

21 PLN, *Statistik PLN 2014* [PLN Statistics 2014] (Jakarta: PLN, 2014), 20, http://www.pln.co.id/wp-content/uploads/2012/01/Statistik-PLN-2014_for-website-10-Juni-2015.pdf.

22 For more on diesel generation, see the PLN statistics reports from various years at http://www.pln.co.id/eng/?p=2773. In 2014, PLN reported having over 4,400 diesel generators outside the main Java area.

23 "Statistics: Statistics Search," IEA.

24 Ibid.

25 To be fair, Singapore's numbers are skewed by heavy industry.

Affordability is another central challenge. PLN reported that in 2014 the cost to produce electricity was 50% higher than the average sales price.[26] As fuel prices have risen, so too have subsidies for electricity: subsidies for electricity rose from almost nothing in 2004 to 1% of GDP in 2014.[27] Removing subsidies and ensuring that support only goes to those who need it is a high government priority. Under the 2016 draft budget, electricity subsidies will total around 37 trillion rupiahs, down significantly from over 100 trillion in 2014.[28] Closing this gap will generate additional funds that the government could channel to investments that improve access and reliability. But the sheer size of these subsidies underscores how politically and economically challenging it will be to remove them completely and allow prices to fully reflect market fundamentals.

At the same time, Indonesia is unsurprisingly moving toward coal for one simple reason: generating electricity from coal is considerably cheaper than generating it from either natural gas or oil products. Gas-based electricity is twice as costly as coal-based electricity, while electricity from diesel or fuel oil is four times as expensive.[29] The average generation cost for different types of generation is presented in **Table 1**.[30] Moreover, coal prices are less volatile than either oil or

TABLE 1 Average generation cost (rupiah) per kilowatt hour

| Generation type | Fuel | Maintenance | Depreciation | Others | Personnel | Total |
|---|---|---|---|---|---|---|
| **Hydro** | 23.97 | 41.65 | 99.31 | 3.47 | 20.80 | 189.19 |
| **Steam** | 565.30 | 48.94 | 106.11 | 1.44 | 4.57 | 726.37 |
| **Diesel** | 2,448.35 | 356.07 | 128.37 | 14.76 | 116.75 | 3,064.30 |
| **Gas turbine** | 2,472.46 | 127.97 | 270.56 | 2.82 | 18.99 | 2,892.80 |
| **Geothermal** | 1,007.56 | 137.87 | 144.56 | 1.62 | 15.28 | 1,306.88 |
| **Combined cycle** | 1,203.06 | 48.11 | 75.26 | 3.52 | 5.79 | 1,335.74 |
| **Solar** | – | 465.85 | 3,144.13 | 0.95 | – | 3,610.93 |
| **Average** | 1,115.37 | 62.84 | 105.68 | 2.56 | 10.27 | 1,296.73 |
| **Rented** | – | – | – | – | – | 375.49 |

SOURCE: PLN, *Statistik PLN 2014* [PLN Statistics 2014] (Jakarta: PLN, 2014), table 38, 38, http://www.pln.co.id/wp-content/uploads/2012/01/Statistik-PLN-2014_for-website-10-Juni-2015.pdf.

NOTE: PLN rents private power plants to supplement power generated at its own plants and power purchased from indepdent power producers. A majority of power generated at rented plants is from diesel, which PLN supplies.

26 PLN, *Statistik PLN 2014*, 77.

27 Director General of the Budget (Indonesia), "2015 Budget in Brief," 2015, http://www.anggaran.depkeu.go.id/dja/acontent/FINALBIBAPBN2P.pdf.

28 Raras Cahyafitri, "Govt to Give Electricity Subsidies Only to Poor," *Jakarta Post*, September 21, 2015, http://www.thejakartapost.com/news/2015/09/21/govt-give-electricity-subsidies-only-poor.html.

29 PLN, *Statistik PLN 2014*.

30 Because various technologies have dual-fired capacity, it is difficult to make a direct one-to-one association between generation types and fuel sources. With that important caveat, it is fair to understand "combined cycle" to be the main gas source, "diesel" and "gas turbine" to be oil (with maybe some gas), and "steam" to be coal as a general framework.

gas prices: between 2010 and 2014, the cost of coal-fired generation rose by only 21%, whereas the cost of gas-fired generation rose by 80% as gas prices increased.[31]

In its latest long-term outlook, the National Energy Board (DEN, for Dewan Energi Nasional) reinforced the growing reliance on coal. DEN forecasts a doubling of energy use between 2013 and 2030, and an increase of four and half times current energy use through 2050 (with no slowdown in energy consumption).[32] By 2020, DEN expects coal to become the dominant fuel and retain its role through 2045—at which point "new and renewable energies" will take over.[33] Oil and gas will continue to grow, of course—gas use is expected to double through 2025—but the forecast demonstrates a strong reliance on coal and new and renewable energy. Other forecasts show a similar trend: the International Energy Agency (IEA) expects that coal will surpass oil as the dominant fuel sometime between 2025 and 2035.[34] The Institute for Energy Economics, Japan, sees a growing role for coal as well, with coal surpassing gas by 2020, but it expects oil to remain the largest energy source through 2040 (at a level that is higher than either DEN or the IEA forecasts).[35] In short, coal is widely regarded as a major solution to Indonesia's energy needs, with gas playing a secondary role.

This reliance on coal will have widespread side-effects, but the full impact on the environment and on society will depend on two factors. The first factor is whether Indonesia will deploy advanced technology and build ultra-supercritical coal plants rather than subcritical or supercritical plants, a task that has been made harder by tighter restrictions on public financing for coal projects. The second factor is whether Indonesia will develop a more comprehensive roadmap for stakeholder engagement about where plants are constructed so as to minimize the social, economic, and environmental footprint of these plants and ensure that they are developed with the health, safety, and livelihood of the local populations in mind.[36] Moreover, the turn to coal is partly based on an unreasonably pessimistic view of domestic gas potential, which the next section will consider. A better than expected outcome for gas could further reduce the country's turn to coal.

## Unlocking Gas Supply

### *Opportunities for Development and Exploration*

It is hard to see a scenario whereby Indonesia will not rely heavily on coal for its future electricity needs. Yet natural gas could help constrain the growth in coal demand; after all, Indonesia holds considerable potential in natural gas, possessing conventional gas reserves that are greater than those of all other countries in Southeast Asia and are the third-largest in Asia after Australia and China.[37] Exploration also continues in the less-explored waters of western Indonesia, where there is great potential in deepwater basins. In addition, there has been progress on important gas projects across the country, with several beginning operation in 2015: Pertamina, Medco,

---

31 PLN, "Annual Report 2014," 188.

32 National Energy Board (Indonesia), "Outlook energi Indonesia 2014."

33 New and renewable energies include biodiesel and, after 2025, 15 GW of nuclear power.

34 IEA, "Southeast Asia Energy Outlook 2015," World Energy Outlook Special Report, 2015, https://www.iea.org/publications/freepublications/publication/WEO2015_SouthEastAsia.pdf.

35 Institute of Energy Economics, Japan, "Asia/World Energy Outlook 2014," October 2014, http://eneken.ieej.or.jp/data/5875.pdf.

36 Justin Sink and Alex Nussbaum, "In Coal Setback, Rich Nations Agree to End Export Credits," Bloomberg Business, November 17, 2015, http://www.bloomberg.com/news/articles/2015-11-18/in-latest-blow-to-coal-rich-nations-agree-to-end-export-credits.

37 BP plc, "BP Statistical Review of World Energy 2015."

and Mitsubishi's 2 million metric tonne per annum (mmtpa) Donggi-Senoro LNG project in Central Sulawesi, which includes 310 million cubic feet equivalent per day (mmcf/d) of supply for LNG exports and 60 mmcf/d for local buyers;[38] Premier Oil's Pelikan/Natuna A project, which will supply 200 mmcf/d to Singapore;[39] and Petronas's Bukit Tua field in the Kepodang block in offshore Central Java, which will supply 116 mmcf/d to local buyers.[40] TOTAL and Inpex's South Mahakam 3 project in offshore East Kalimantan, which will supply 80 mmcf/d to the Bontang LNG plant, is also expected to go online in 2015.

Yet these new gas volumes have mostly offset declines at older fields. More large-scale gas development is needed to see strong growth in gas production. Deepwater gas development and LNG feedstock are two forms of large-scale development that could help increase gas production. Indonesia's first deepwater gas project—Eni's 450 mmcf/d Muara Bakau development in offshore Kalimantan—is expected online in 2017; gas will be delivered to Bontang LNG, with 70% designated for export and 30% for local markets.[41]

However, many large-scale gas projects face delays. Chevron's Indonesia Deepwater Development project, including five fields (Bangka, Gendalo, Gehem, Gandang, and Maha) with plans to supply 1.1 billion cubic feet per day to Bontang LNG, would be a mega-project for the country. Development has been in the works since the 2000s, and while Bangka (stage 1) is going ahead (with production of gas expected to begin in 2016), the larger deepwater hubs at Gendalo and Gehem (stage 2) have faced ongoing delays and are now stalled indefinitely. Inpex and Shell's 2.5 mmtpa Abadi LNG project on the deepwater Masala block and BP's Tangguh Train 3 expansion have also been repeatedly delayed and are unlikely to come online before 2020.

Indonesia had high hopes for unconventional gas as well, but slow progress over the past decade has led the government to drastically scale back expectations. Despite 453 trillion cubic feet in estimated coalbed methane (CBM) resources, mainly in East and South Kalimantan and South Sumatra, inconsistent state and local regulation, land-acquisition issues, poor resource quality, and insufficient fiscal incentives are just a few challenges stalling CBM development.[42] In 2014, output was less than 1 mmcf/d, including small volumes from Vico's Sanga-Sanga block in Kalimantan utilized by a local power plant.[43] Out of 54 active CBM contract areas, few have achieved test or pilot production, and excitement among investors has for the most part calmed. Adjusting to reality, the government has lowered CBM production targets to 8.9 mmcf/d by 2015 and 23.9 mmcf/d by 2020.[44] As for Indonesia's shale gas industry, it is considerably less developed, with only one designated contract area. For now, conventional gas remains the only likely substantial source of new gas through 2030.

---

38 "Senoro Gas Field Produced First Drop LNG in DSLNG Refinery," Medco Energi, June 30, 2015, http://www.medcoenergi.com/en/subpagelist/view/12/2286.

39 "Pelikan—First Gas," Premier Oil, March 10, 2015, http://www.premier-oil.com/premieroil/media/press/pelikan-first-gas.

40 "Petronas Produces First Gas from Kepodang Field," Offshore Energy Today, November 4, 2015, http://www.offshoreenergytoday.com/petronas-produces-first-gas-from-kepodang-field.

41 "Indonesia's Eni to Produce Gas from Muara Bakau Early 2017," Platts, December 11, 2014, http://www.platts.com/latest-news/natural-gas/jakarta/italys-eni-to-produce-gas-from-indonesias-muara-27924107.

42 Solving all of these issues will be especially difficult and will take considerable political will. Those issues that relate only to the central government (for example, fiscal incentives in PSCs) are more likely to be addressed. Rohmad Hadiwijoyo, "CBM Could Redraft Indonesia's Energy Charts," *Jakarta Post*, April 21, 2014, http://www.thejakartapost.com/news/2014/04/21/cbm-could-redraft-indonesia-s-energy-charts.html; and Raras Cahyafitri, "Govt Mulls New Scheme for Coal Bed Methane," *Jakarta Post*, August 13, 2015, http://www.thejakartapost.com/news/2015/08/13/govt-mulls-new-scheme-coal-bed-methane.html.

43 For more on this output, see the Vico Indonesia website, http://www.vico.co.id/sites/ext/Pages/Home.aspx#nonkonvensional.

44 Raras Cahyafitri, "Government Lowers Coal Bed Methane Output Target," *Jakarta Post*, March 26, 2014, http://www.thejakartapost.com/news/2014/03/26/government-lowers-coal-bed-methane-output-target.html.

In many emerging economies, the greatest obstacle to developing new natural gas supply is price: countries built on cheap energy find it very hard to stomach the significant price increases that private investors demand in order to invest in new and more complex gas fields. In Indonesia, however, price is not the main problem. Over the past few years, the country has made a significant effort to raise natural gas prices, and buyers have come to accept that the era of cheap natural gas is over. Beginning in 2011, BP Migas (now SKK Migas) targeted older domestic and export contracts below $3 per million British thermal units (mmBtu) for renegotiation, bringing prices up to $5–$6/mmBtu for domestic buyers and even higher for overseas buyers. PLN, for instance, reports that it paid on average $8.50 per thousand cubic feet (mcf) for gas in 2014, up from $4.54/mcf in 2011.[45] The intra-Indonesian LNG trade is similarly lucrative: in 2013, Indonesian buyers paid over $12/mmBtu for LNG from the Bontang project and $9/MMBtu for LNG from the Tangguh project—prices that are similar to many cross-border transactions around the world.[46] These higher prices are slowly leading to infrastructure development (including several domestic LNG terminals in Java and Sumatra), even though there are still many bottlenecks preventing more gas from being used at home.

### *Recommendations*

Indonesia needs to overcome several obstacles to realize its full potential in natural gas (and hence dent the rising dependence on coal and avert the environmental and health consequences of increased coal use). First, it should take steps to streamline approvals and the permitting process. The number of approvals needed from a wide variety of ministries and offices is burdensome, and often the pace of the process is very slow. Of course, this is not a problem solely in the oil and gas sector: in 2015, Indonesia ranked 114th in the World Bank Doing Business index, with particularly low scores in enforcing contracts (172nd), paying taxes (160th), dealing with construction permits (153rd), and registering property (117th).[47] But the problem has grown worse: one study estimated that it now takes on average fifteen years from the discovery of oil and gas to startup, compared with four to five years in the 1970s and 1980s.[48] The process is further hindered by the lack of coordination between different agencies and the often contradictory goals and decrees pursued by various elements of the bureaucracy.

Second, Indonesia needs to reduce uncertainty and improve legal and regulatory clarity. Past and likely future changes to the oil and gas regulatory body highlight this problem: in 2012 the country's constitutional court ruled that BP Migas, the body established to oversee the upstream oil and gas sector, was unconstitutional, and it ordered that BP Migas be disbanded.[49] The responsibilities reverted to the Ministry of Energy and Mineral Resources until September 2013, when SKK Migas was created. Now, there is talk that the country might institute a new legal and regulatory framework to replace Law no. 22. Despite considerable follow-up legislation to clarify and detail the law, it remains unclear. None of this provides the clarity that investors need.

---

45 PLN, "Annual Report 2014," 188.

46 Directorate General of Oil and Gas, Ministry of Energy and Mineral Resources (Indonesia), *2013 Oil and Gas Statistics*, 58.

47 World Bank, "Ease of Doing Business in Indonesia," Doing Business project, http://www.doingbusiness.org/data/exploreeconomies/indonesia.

48 Lukman Mahfoedz, "Improving Oil and Gas Investment Climate in Indonesia" (press conference at the 2014 Indonesia Petroleum Association annual general meeting, Jakarta, December 9, 2014), http://www.ipa.or.id/assets/presentation_and_speech/ipa_press_conference_agm_2014_-_9_dec_2014_r1.pdf.

49 BP Migas itself was created under the November 2001 law governing upstream oil and gas investment (Law no. 22) and replaced Pertamina as the industry's regulator.

Another example of uncertain and unclear policy is the government's refusal to extend expiring licenses, which has been a major disincentive to investment. This policy shift is important given the large number of producing gas assets whose licenses are expiring soon. Moreover, for operators of assets still in the development stage, especially more capital-intensive gas developments, a refusal to extend PSCs affects project economics and operators' willingness to move forward. Notably, the government's June 2015 decision not to extend the Mahakam PSC (expiring in 2017), which is operated by Total and Inpex, and instead hand over operatorship to Pertamina sent a major signal to other investors. Given the importance of the Mahakam PSC (which is a major supplier to Bontang LNG and accounts for a quarter of Indonesia's gas production) and the significant annual investment and technical experience required to maintain production, the decision to give Pertamina a 70% stake and reduce the current foreign operator's stake to 30% is concerning. Companies are fearful that their blocks may face similar fates and are unwilling to move forward with development until they are guaranteed PSC extensions. Chevron's Indonesia Deepwater Development project and Inpex's Abadi LNG are two examples of projects requesting approval now for PSC extensions that are unlikely to move forward without some guarantees. With the Mahakam PSC expiring in only two years and the final details of the new agreement yet to be hammered out, this is yet another example of the government's slow decision-making process.

Third, the government needs to prioritize gas exploration and put the proper fiscal and tax incentives in place to encourage new exploration despite below- and above-ground risks. Indonesia is a mature hydrocarbon state where exploration is costlier, discoveries are smaller, and the gas found is often far from demand centers. Indonesia might also consider a push to specifically incentivize development of smaller, marginal gas fields, which can bring important incremental gas in the medium term.

## Conclusion

Indonesia is at a crossroads, and its choices today will shape its path for the next several decades. Coal is a compelling option for generating power and making electricity accessible, reliable, and affordable for all Indonesians. But coal also has widespread environmental side-effects from localized pollution to carbon emissions, and the surest way to limit those effects is to double down on natural gas. In recent years, Indonesia has struggled to find a balance between supplying the local market and exporting gas. It also has struggled to advance the multitude of projects that have been in development for years. The country's goal for managing its gas resources should be twofold: (1) to remove barriers to the development of existing gas projects to deliver medium-term gas growth and (2) to encourage exploration, which is increasingly challenging and risky, in order to deliver long-term growth. By focusing on exploration and development in a way that benefits the local market and gives companies attractive returns, rather than focusing on diverting a dwindling pool of existing gas and LNG, the government will create a more sustainable system. While domestic supply has risen due to diversions, falling production and low investor confidence make the current system unsustainable. But over the past five years, a domestic LNG market has slowly emerged and prices for gas have risen. In other words, there is slow but steady progress. The next step will require more radical reforms in bureaucracy and will be tougher to implement. But the stakes are very high—for both Indonesia and the world.

THE NATIONAL BUREAU *of* ASIAN RESEARCH

NBR SPECIAL REPORT #53 | DECEMBER 2015

# Redefining Indonesia's Energy Security: Efforts to Adopt Cleaner, More Sustainable Energy Strategies

*Hanan Nugroho*

**HANAN NUGROHO** is the Principal Planner (Energy) at the National Development Planning Agency in Jakarta, Indonesia. He can be reached at <nugrohohn@bappenas.go.id>.

## EXECUTIVE SUMMARY

This essay examines Indonesia's growing desire to integrate emerging concerns, such as environmental considerations, into its energy security strategies and describes how the country's renewable energy potential can play a greater role in this discussion.

### MAIN ARGUMENT

Indonesia is currently confronting a high degree of energy insecurity. Yet despite its diverse and large potential for renewable energy, Indonesia is engaging only a very small share of these domestically available resources—totaling less than 5% of the energy mix. The government is aware of the country's energy insecurity and is taking more serious actions to overcome the problem. Yet more will need to be done if Indonesia is to achieve its goal of making renewables 23% of its energy mix by 2025. Such new efforts must also address concerns about coordination among local and national government bodies, the rapidly changing legal and regulatory environment, the high upfront costs associated with renewable energy development, and a complex geography that can complicate infrastructure development. Redoubled efforts to develop renewable energy not only would strengthen Indonesia's energy security but also could create attractive business opportunities for both domestic and foreign parties.

### POLICY IMPLICATIONS

- Harnessing renewable energy is among the top priorities of the current middle-term development plan led by President Joko "Jokowi" Widodo, and potential sources of renewable energy range from geothermal, hydro, solar, and tidal energy to several types of bioenergy.
- In many cases, sources of renewable energy are found in islands far away from demand centers, which can complicate efforts to develop these resources. Transportation costs between islands are expensive, and infrastructure connecting the vast archipelago is still very limited. Addressing these challenges will require greater attention from policymakers, industry, and NGO partners.
- Securing social license to operate—that is, taking into account local culture and land ownership concerns in the development process—is a further challenge for Indonesia's energy development that affects renewable energy options as well as the construction of nuclear and coal power plants. Indonesian policymakers thus need to think about best practices not only on a project-to-project basis but also as part of their strategic-level planning.

Indonesia is forecast to become one of the richest nations in the world by 2050, and energy is at the core of the country's economic success story.[1] Yet as numerous studies have highlighted, the reality for observers interested in Indonesia's continued prosperity is that the country is currently confronting a high degree of energy insecurity. In 2015 the World Energy Council in its Energy Trilemma Index ranked Indonesia 65th among 130 countries, while the World Economic Forum's Global Energy Architecture Performance Index put Indonesia at 76th out of 125 countries. These rankings suggest that Indonesia's level of energy security is much lower than that of many countries, including many of its neighbors in Asia such as Malaysia, the Philippines, and Japan.[2]

What do these assessments say about Indonesia's energy security outlook, including in terms of environmental security? There is no shortage of academic definitions for what it means to achieve energy security, with a range of preeminent leaders and specialists offering both complementary and competing explanations.

This essay considers options for strengthening Indonesia's energy security outlook by highlighting the country's growing desire to integrate the imperatives and goals of environmental policymaking into its strategies. It begins by offering a definition of energy security and discussing Indonesia's energy security challenges. The next section examines the potential for and barriers to the country's development of renewable energy. The third section then considers several strategies and policies the government is taking to strengthen energy security and identifies market and policy opportunities, particularly for renewable energy.

## Indonesia's Energy Security Challenges

Scholars have sought to define energy security in numerous ways—for example, in terms of supply security, geopolitics, and the stability of market prices. This essay employs a "4A&S" analysis framework both to define what energy security might look like in an Indonesian context and to suggest opportunities for strengthening public policy and industry engagement.[3] Under this framework, a country's energy security is assessed by the presence or absence of five key attributes of energy policies and tools: (1) availability, (2) accessibility, (3) affordability, (4) acceptability, and (5) sustainability. The following discussion assesses Indonesia's current outlook in terms of each attribute. To help frame this analysis, **Figure 1** presents a summary of the problems and challenges for the country's energy security. Because renewable resources are underutilized and largely underdeveloped in Indonesia's existing energy mix, this section focuses on the resources that are currently being employed—oil, natural gas, and coal, among others. The next section then examines the potential for renewable energy to address A4&S challenges.

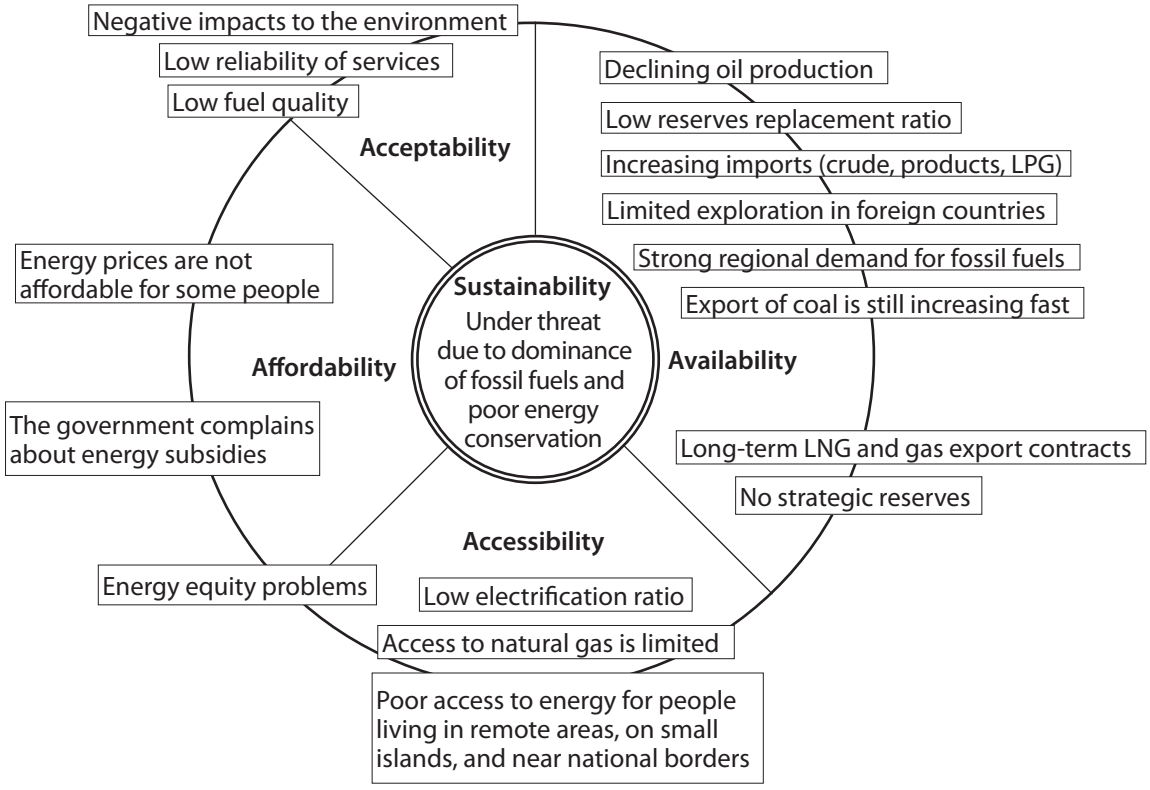
---

[1] Several reports project Indonesia to become one of the world's five-largest economies in 2050. For example, see PricewaterhouseCoopers, "The World in 2050: Will the Shift in Global Economic Power Continue?" 2015, http://www.pwc.com/gx/en/issues/the-economy/assets/world-in-2050-february-2015.pdf; and Republic of Indonesia, *Masterplan percepatan pembangunan ekonomi Indonesia 2011–2025* [Master Plan for the Acceleration of Indonesian Economic Development 2011–25] (Jakarta, 2011).

[2] World Energy Council, "Energy Trilemma Index," 2015, http://www.worldenergy.org/data/trilemma-index; and World Economic Forum, "The Global Energy Architecture Performance Index Report 2015," December 2014, http://www3.weforum.org/docs/WEF_GlobalEnergyArchitecture_2015.pdf.

[3] For more on the 4A&S framework and how it applies to Indonesia and Asia, see Hanan Nugroho, "Questioning Our Energy Security, Policy," *Jakarta Post*, July 27, 2009; Ministry of National Development Planning (Indonesia), "Memperbaiki ketahanan energi Indonesia: Rekomendasi strategi dan analisis" [Improving Indonesia's Energy Security: Recommendation for Strategy and Analysis], 2014, http://rc.bappenas.go.id/files/7814/2846/6103/Memperbaiki_Ketahanan_Energi_Indonesia_Rekomendasi_Strategi_dan_Analisis.pdf; and Norberto Fueyo, Antonio Gómez, and César Dopazo, "Energy Security, Sustainability, and Affordability in Asia and the Pacific," Asian Development Bank, Economic Working Paper Series, no. 401, July 2014, http://www.adb.org/sites/default/files/publication/42782/ewp-401.pdf.

FIGURE 1 Indonesia's energy security challenges




SOURCE: Ministry of National Development Planning (Indonesia), "Memperbaiki ketahanan energi Indonesia: Rekomendasi strategi dan analisis" [Improving Indonesia's Energy Security: Recommendations for Strategy and Analysis], 2014, 6.

## *Availability*

Given that Indonesia is considered to have some of the largest energy reserves in Asia, some might find it surprising that the country has a severe availability challenge. Its availability problems include rising import dependence, a low reserves replacement ratio, and limited exploration in foreign countries.

Indonesia imports approximately one-third of its domestic refinery intake, and imports of liquefied petroleum gas (LPG) are skyrocketing. According to forecasts, the country will become the world's largest importer of gasoline by 2020.[4] Indonesia was once the world's largest exporter of liquefied natural gas (LNG) and is still locked into long-term contracts to serve its LNG customers, in addition to its exports of piped natural gas to Singapore and Malaysia.[5] The percentage of

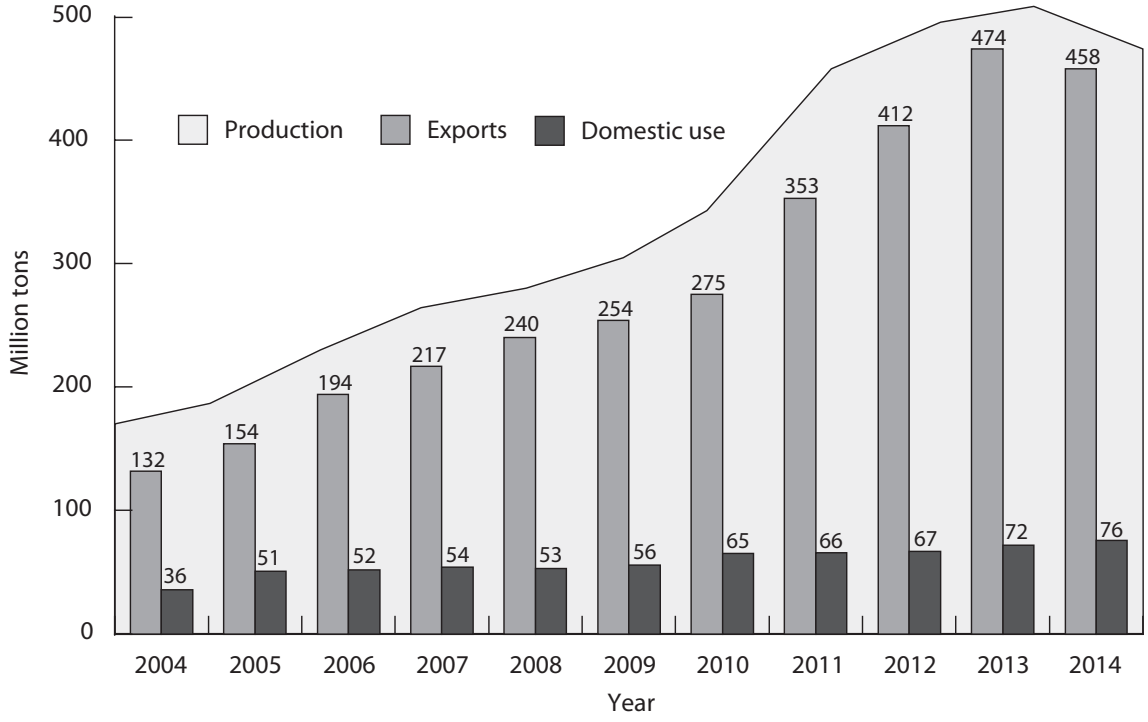
[4] Hanan Nugroho, "Indonesia: Asia's Growing Energy Market," *Jakarta Post*, February 11, 2014, http://www.thejakartapost.com/news/2014/02/11/indonesia-asia-s-growing-energy-market.html.

[5] International Energy Agency (IEA), "Southeast Asia Energy Outlook," World Energy Outlook Special Report, September 2013, https://www.iea.org/publications/freepublications/publication/SoutheastAsiaEnergyOutlook_WEO2013SpecialReport.pdf.

natural gas that supplies the domestic market is still below 50%.[6] Meanwhile, compared with oil and gas, Indonesia's coal reserves are quite large. Yet although the country's production of coal is noticeably increasing, most of this coal is exported rather than used domestically (see **Figure 2**).[7] This overall situation is made worse because Indonesia has not built sufficient strategic petroleum or coal reserves.[8]

In his National Medium-Term Development Plan 2015–19, President Joko "Jokowi" Widodo has prioritized development of the energy sector and enacted ambitious programs to improve the country's energy security.[9] These include the development of 35,000 megawatts (MW) of power plant capacity; the construction of 6,350 kilometers of gas pipelines, 5 floating storage and regasification units, and 78 natural gas pump stations; the cultivation of 900,000 new

**FIGURE 2** Indonesia's production, exports, and imports of coal




SOURCE: National Energy Council (Indonesia), "Executive Reference Data 2014," 2015, 31.

[6] David Aron, "Gas Development Master Plan Indonesia, Final Report," Ministry of National Development Planning (Indonesia), Indonesia Infrastructure Initiative, December 2013. For further discussion of Indonesia's natural gas market, see Natalie Bravo and Nikos Tsafos's essay in this NBR Special Report.

[7] Ginandjar Kartasasmita, "Ketahanan dan kemandirian energi: Sebuah tinjauan mengenai potensi batubara sebagai tulang punggung energi Indonesia di masa mendatang" [Energy Security and Self Reliance: A Review on the Potential of Coal as a Backbone of Indonesia's Energy in the Future], Presidential Advisory Council, 2012; and National Energy Council, "Executive Reference Data 2014," 2015.

[8] Indonesia's oil-refining capacity is limited (1.1 million barrels per day), and the country is relying on imports to meet its products demand. In 2006 the government implemented a policy of replacing kerosene with LPG, which was quite successful in terms of the amount of kerosene replaced. However, because the domestic production capacity for LPG is only 2.5 million tonnes per annum (mtpa), while demand grew to 5.3 mtpa by 2014, the country must increase its LPG imports. For more on this issue, see Kartasasmita, "Ketahanan dan kemandirian energy."

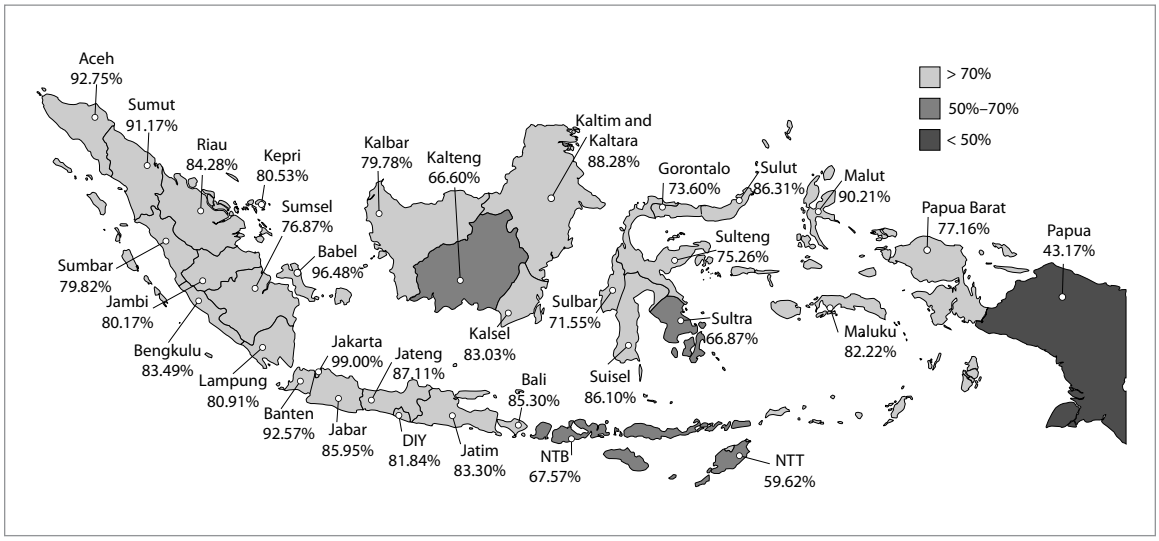
[9] Government of Indonesia, "Rencana pembangunan jangka menengah 2015–19" [National Medium-Term Development Plan 2015–19], 2015.

natural gas customers and households; and the construction of a new oil refinery with the capacity to produce 300,000 barrels per day. Additionally, to address concerns about the domestic availability of supplies, the Jokowi administration plans to increase the domestic market obligation from 53% to 64% for natural gas and from 24% to 60% for coal.[10] However, it is clear that the target for coal will be quite challenging to meet because the domestic ability to consume the commodity is very low compared with the current level of production. This constraint suggests that availability is a question of both the supplies that are available and the infrastructure that exists to serve those supplies.

### *Accessibility*

Indonesia's accessibility challenge is twofold: not only must it address a low electrification ratio, but it must do so in the context of the availability challenge outlined above. Indonesia's electrification rate was 84.35% in 2014, meaning that approximately 40 million people still have no connection to electricity.[11] Meanwhile, as **Figure 3** shows, there is a great disparity in access to energy across numerous regions, which is further indicative of the noticeable inequity among income groups. The country's challenge of promoting access to clean, sustainable energy supply is particularly visible on the small islands, in remote areas, and in areas close to national borders. Papua and (East and West) Nusa Tenggara Provinces have the lowest electrification rates.[12]

**FIGURE 3** Electrification rate by province, 2014




SOURCE: Directorate General of Electricity, Ministry of Energy and Mineral Resources (Indonesia), 2015.

[10] Government of Indonesia, "Rencana pembangunan jangka menengah 2015–19."

[11] For more on Indonesia's electrification ratios, see Ministry of Energy and Mineral Resources (Indonesia), "Development of Electric Power Infrastructure in Indonesia" (presentation given at the 1st Workshop for the Asia-Pacific Economic Cooperation, Tokyo, August 25–26, 2015), http://aperc.ieej.or.jp/file/2015/10/19/Mr._Sujatmiko.pdf; Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia," 2014; IEA, *Energy Policies Beyond IEA Countries: Indonesia 2015* (Paris: OECD/IEA, 2015); and Benjamin K. Sovacool, "Energy Access and Energy Security in Asia and the Pacific," Asian Development Bank, Economic Working Paper Series, no. 383, December 2013, http://adb.org/sites/default/files/pub/2013/ewp-383.pdf.

[12] Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia."

Further complicating this picture is the inadequacy of necessary energy infrastructure. For example, the country's natural gas distribution network is still very limited and serves only approximately 1% of Indonesian households. A modern interconnected electricity system has been built only in the Java-Madura-Bali region, while other regions still rely on hundreds of small systems that provide limited services.[13] The geography of the Indonesian archipelago, which comprises over 17,000 islands, also hinders the progress of achieving the target of 100% electrification set by the current national medium-term development plan.[14]

### *Affordability*

Not only do many Indonesians struggle to pay their energy bills, but the government complains about the burden of the energy subsidy on the state budget. Because of the nature of Indonesia's underdeveloped energy infrastructure and the challenges of delivering supplies consistently to a geographically complicated country, villagers living in remote areas or on small, isolated islands must pay more for energy services than the rich living in urban areas. This disparity exacerbates the existing inequality that the government of Indonesia is trying to reduce.

To address affordability issues so that average Indonesians can pay their energy bills, most fuel and electricity prices in Indonesia are regulated by the government. Consequently, if revenue from selling energy is less than the costs of delivering it (by the state energy companies), the government must provide subsidies from the state budget. Yet as the studies in this report and elsewhere have highlighted, energy subsidies have become a large burden on the government. The government's own analysis of its proposed 2015 budget estimated subsidies for oil and LPG to cost 276.0 trillion rupiah and subsidies for electricity to cost 68.7 trillion rupiah. These subsidies are much larger than the central government's 2015 budget for education (146.4 trillion rupiah) and healthcare (21.1 trillion rupiah).[15] The high cost of subsidies thus not only complicates efforts to expand access to electricity but also limits national efforts to address inequalities in other areas.

### *Acceptability*

A core consideration for Indonesian policymakers is the acceptability of the country's energy systems, particularly the power sector. This problem has two key elements: (1) addressing the numerous complaints about the low reliability of electricity services, including frequent blackouts (particularly in the eastern regions), and (2) reducing the harmful environmental impacts associated with the delivery of energy (e.g., poor mining practices in several areas and decaying infrastructure).

Securing social license to operate—that is, taking into account local culture and land ownership concerns in the development process—is also a challenge for Indonesia's energy development. For example, the country has been using small-scale nuclear energy facilities for research purposes for over five decades. However to date, no commercial nuclear power plant has been constructed despite the large demand for electricity (in Java in particular). Nuclear power is not accepted by many Indonesians due to fears about exposure to radiation and the lack of understanding of the

---

[13] Hanan Nugroho, "Developing the First Nuclear Power Plant in RI," *Jakarta Post*, July 1, 2010.

[14] Government of Indonesia, "Rencana pembangunan jangka menengah 2015–19."

[15] General Directorate of Budget, Ministry of Finance (Indonesia), "Budget in Brief: APBN 2015," October 2014, 14 and 22, http://www.anggaran.depkeu.go.id/dja/acontent/BIBENGLISHVERSION.pdf.

potential benefits of nuclear power plants to the country's energy security, among other factors.[16] Indonesians also express concerns about the environmental impact of operating coal power plants, even though the use of coal in power plants is not currently extensive in Indonesia.

### *Sustainability*

Finally, even as Indonesia looks to address the challenges of availability, accessibility, affordability, and acceptability, a longer-term question for the country will linger about the sustainability of its energy policies. The problem of sustainability lies in the fact that Indonesia's energy mix is heavily dominated by fossil fuels (almost 95%). As Indonesia looks to develop access to energy in its outer islands, this area is still consuming expensive fuels (such as diesel oil). On the consumption side, energy is still being consumed inefficiently, as indicated by Indonesia's poor level of energy intensity compared with many other Asian countries. Efforts to promote energy conservation are still limited, both by sectors and by regions.

## Renewable Energy: Potential and Challenges

### *The Potential of Renewable Energy*

Given this overarching context and the need for resources that are available, accessible, affordable, acceptable, and sustainable, renewable energy has the potential to play a critical role in strengthening the country's energy security. Renewable energy is clean and sustainable, and its development could bring other benefits as well. For example, the large-scale creation of green jobs could help Indonesia combat poverty. Renewable energy development, however, faces several challenges. Indonesia's reserves for renewable energy are diverse, quite large, and scattered throughout the archipelago in supplies of geothermal, solar, hydropower, wind, tidal, and bioenergy resources.

*Geothermal*. Geothermal is a renewable energy resource with great potential in Indonesia and the closest one to actually producing power. Indonesia's reserves total approximately 29 gigawatts (GW), which is equivalent to 40% of the world's reserves, and are distributed across the country. The largest reserves are close to the electricity load centers of Java, Bali, and Nusa Tenggara (11,629 MW) and Sumatra (12,837 MW). But presently only 1,404 MW of geothermal power plants have been installed across Indonesia, representing only 5% of the country's potential.[17]

*Solar*. Situated in the tropical region surrounding the equatorial line, Indonesia has considerable potential to use solar energy. The average daily radiation in Aceh and Papua ranges from 4–6 kilowatt hours per square meter. The application of solar energy throughout the archipelago unfortunately is still very limited, with the current installed photovoltaic capacity standing at only around 30 MW. However, PLN (the state-owned electricity company) and local and provincial

[16] Additionally, development of the country's first nuclear power plant requires the president's approval before any team can be established to build the plant.

[17] Hanan Nugroho, "Renewable Energy in Indonesia: Present Status and Prospects," *Economist*, Intelligence Unit, January 15, 2014; Ministry of Energy and Mineral Resources (Indonesia), "New and Renewable Energy, and Energy Conservation Statistics 2013," 2014; and Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia."

governments with low electrification rates have expressed greater interest in applying solar power on a large scale rather than merely as a stand-alone home system, as solar is usually employed.[18]

*Hydropower*. Indonesia's hydropower potential is estimated at approximately 75,000 MW, but the current installed capacity of the country's hydropower plants is only 8,671 MW, or around 12% of the potential. The greatest potential for hydropower is found in outer islands, such as in Borneo and Papua, far from the electricity demand center in Java. Mini- and micro-hydropower plants could play a significant role in meeting demand for electricity in rural and other remote areas in the archipelago. However, the potential for mini- and micro-hydropower has not been harnessed effectively enough to provide large-scale hydropower.[19]

*Wind*. Most of the country's potential for wind power is found in the Nusa Tenggara islands. Average wind speed in Indonesia is quite slow (3–6 meters per second), yielding an estimated total potential of approximately 62 GW. Indonesia has developed limited facilities for researching wind energy in Nusa Tenggara and southern parts of Java but has not yet developed it for commercial use.[20]

*Tidal*. Indonesia has a vast ocean territory, but energy from the ocean (such as wave, stream, and thermal) is only in the early identification stage. The government has identified the potential for commercial development of approximately 2 GW of wave energy and 41 MW of ocean thermal energy conversion, among other sources.[21]

*Bioenergy*. Bioenergy could produce electricity and can also be used as fuel (liquid, gas, or solid). Indonesia has a diverse and potentially large supply of bioenergy from palm, molasses, corn, rice husk, and city waste, among other sources. Although the potential energy produced from biomass has been estimated at 33 GW, on-grid capacity of installed crude biomass, biogas, and city waste plants in 2013 had achieved only 90.5 MW.[22]

As for liquid fuels coming from biomass resources, in 2013 Indonesia produced nearly 3 million kiloliters of biofuels, roughly two-thirds of which was exported. The installed capacity of biofuel plants for the same year was considerably larger, standing at 5.6 million kiloliters for biodiesel (mostly from palm crude) and around 446,000 kiloliters for bioethanol (from molasses and cassava). The government has mandated the use of biofuels, particularly by the state-owned energy companies, with increasing targets year by year.[23]

## *Challenges to Development*

Despite the diverse and large potential of renewable energy, Indonesia is still using a very small amount of renewable energy, totaling less than 5% of the country's energy mix.[24] For decades the government has subsidized the price of petroleum products (particularly gasoline and diesel oil),

---

[18] Ministry of Energy and Mineral Resources (Indonesia), "New and Renewable Energy, and Energy Conservation Statistics 2013"; and Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia."

[19] Nugroho, "Renewable Energy in Indonesia"; Ministry of Energy and Mineral Resources (Indonesia), "New and Renewable Energy, and Energy Conservation Statistics 2013"; and Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia."

[20] Ibid.

[21] Ibid.

[22] Ibid.

[23] Ministry of Energy and Mineral Resources (Indonesia), "New and Renewable Energy, and Energy Conservation Statistics 2013"; and Ministry of Energy and Mineral Resources (Indonesia), "2014 Handbook of Energy and Economic Statistics of Indonesia."

[24] Nugroho, "Renewable Energy in Indonesia."

which has undermined efforts to promote renewable energy within the archipelago. Among the other barriers to developing renewable energy in Indonesia, four are deserving of special attention.

The most notable one is the lack of coordination among the central government's ministries and institutions that deal with renewable energy development, as well as between the central government, which issues the major policies for the development of renewable energy, and the local governments where most renewable energy projects take place. The situation is made worse by Indonesia's weak human resource capacity to deal with renewable energy, particularly in district and provincial governments.

A second challenge is managing the rapidly changing legal and regulatory environment, which has further inhibited the development of renewable energy. Following Indonesia's economic and political crises in 1998, the number of laws and regulations has increased exponentially. The country's renewable energy business is still adapting to these new laws and regulations—a process that has been complicated by conflicting regulatory interests among sectors and regions. Geothermal is one example of an area where the laws and regulations guiding its development are quite complex.[25]

A third barrier is the high upfront costs associated with renewable energy development. Thus far the main sources of financing for renewable energy development in Indonesia are the central, provincial, and district governments, whose budgets are quite limited. This funding has been supplemented by foreign grants and loans—for instance, from the Japanese government, the governments of some European countries, and the Millennium Challenge Account of the United States. Private sector financing to develop renewable energy in Indonesia is still limited, probably due to the poor investment climate for the sector.

A final challenge in renewable energy development is related to the geography of Indonesia, which comprises over 17,000 islands, 34 provinces, and 514 districts. In many cases, the sources of renewable energy are found on islands far away from demand centers. Transportation costs between islands are expensive, and infrastructure connecting the vast archipelago is still very limited.[26]

## Strategies to Improve Energy Security

Having been lulled by an old paradigm that Indonesia is rich in energy resources, Indonesians are now increasingly concerned that the nation is facing an energy security crisis. Efforts to address this issue are being carried out by the government.

The National Energy Council, which was established in 2009, is responsible for preparing the national energy policy. The most recent national energy policy describes several strategies for improving energy security: (1) intensify energy exploration, (2) limit exports of energy, (3) reduce the country's dependence on energy imports, (4) accelerate the development of energy infrastructure for domestic purposes, (5) expand the use of renewable energy (particularly geothermal, hydro, and local sources), and (6) promote energy conservation.[27] Additionally, one of President Jokowi's development approaches is to "build from the periphery"—meaning that the

---

[25] President of Indonesia, "Undang-undang Republik Indonesia nomor 21 tahun 2014 tentang panas bumi" [Law of the Republic of Indonesia about Geothermal 2014], 2014, available at http://www.indolaw.org/UU/Law%20No.%2021%20of%202014%20on%20Geothermal.pdf.

[26] Nugroho, "Renewable Energy in Indonesia"; and U.S. Energy Information Administration, "Indonesia," October 7, 2015, http://www.eia.gov/beta/international/analysis.cfm?iso=IDN.

[27] "National Energy Policy (Government Regulation no. 79/2014)," available at IEA, http://www.iea.org/policiesandmeasures/pams/indonesia/name-140164-en.php.

construction of infrastructure will be prioritized in remote areas, on small islands, and close to national borders. One objective of this approach is to reduce inequity in energy services among regions. The president also plans on carrying out widespread energy conservation activities and asking for larger participation from the private sector.

### *Renewable Energy*

With the above in mind and aware of the country's potential, the government has published several policies to develop Indonesia's renewable energy resources. The new national energy policy signed in October 2014 has targeted increasing the share of renewable energy in Indonesia's energy mix to 23% by 2025 and 31% by 2050.[28] Given that the current figure is around 5% and also reflects a smaller scale of energy demand than is anticipated for the future, these targets, particularly for 2025, are quite challenging.

Recent government initiatives and policies to promote the development of renewable energy include the following.

*Publication of the new geothermal law in 2014*. The law defines geothermal development as a non-mining activity in order to reduce conflicts with other sectors and ease licensing and bidding procedures, among other reasons. To speed up development, the government might assign state-owned companies to carry out preliminary surveys. Private companies also might propose to the government a geothermal working area to be developed without having to follow the conventional bidding procedures. The government offered five new geothermal working areas in 2015.

*A memorandum of understanding on renewable energy development cooperation*. On November 2, 2015, the governments of Indonesia and India signed a memorandum of understanding on renewable energy development cooperation, witnessed by their vice presidents.[29] The cooperation will take advantage of India's experience in developing renewable energy—particularly solar and wind—and will include technology transfers, joint investments, policy dialogue, and capacity building.

*Regulations to promote solar energy*. The Jokowi administration is developing a policy requiring that new houses install rooftop solar panels to generate electricity. In 2013 the Ministry of Energy and Mineral Resources installed 5.3 MW of solar photovoltaic capacity, serving more than 17,000 rural households.[30] The ministry is carrying out a pilot project to promote application of floating solar panels (in cooperation with the Indonesian Navy) and installed a 4.0 MW solar rooftop at the international airport in Bali.[31] It is also worth noting that a solar panel rooftop is being installed in the presidential office and residence.

*Bioenergy development*. The progress of bioenergy development in Indonesia has been quite impressive in recent years, as indicated by the amount of electricity produced from biomass, the percentage of biofuels blended with fossil fuel, and the number of rural households that take care of cattle to produce biogas. Bioenergy is also among the most productive sectors in terms

---

28 "National Energy Policy (Government Regulation no. 79/2014)."

29 "Indonesia and India Signed MoU on Renewable Energy Cooperation," Ministry of Energy and Mineral Resources (Indonesia), Press Release, November 2, 2015.

30 Raras Cahyafitri, "Solar Power Projects Up in the Air," *Jakarta Post*, February 10, 2015, http://www.thejakartapost.com/news/2015/02/10/solar-power-projects-air.html.

31 "Bali Focuses on Renewable Energy Development," Ministry of Energy and Mineral Resources (Indonesia), October 17, 2015, http://www.esdm.go.id/news-archives/renewable-energy/390-renewable-energy/7790--bali-focuses-on-renewable-energy-development-.html.

of policy and technical regulations published in recent years by the Ministry of Energy and Mineral Resources.[32]

*Feed-in tariffs*. The number of feed-in tariffs published by the government has increased remarkably. This includes detailed figures for each type of renewable energy classified by region in Indonesia. A similarly impressive trend is the rising number of updates to the Indonesian National Standard published for the renewable energy sector.[33]

*Economic measures*. The energy sector, and renewable energy in particular, was included in several economic packages issued by the government in 2015 to accelerate economic growth. Reforms include simplifying licensing and other procedures and emphasizing the construction of energy infrastructure in remote areas.

*Sumba Iconic Island program*. The Sumba Iconic Island program, which aims to supply energy for the whole island of Sumba entirely from renewable energy, is making impressive progress. A highlight of this initiative is that increasingly programs such as those underway in 2015 have involved greater participation of government ministries and the private sector, including aid from foreign parties. Given the existing low electrification rate on the island, however, achieving the program's goal will be quite challenging.

## *Energy Business Opportunities*

As the Indonesian economy is still growing at a high rate, there are business opportunities associated with development of the energy sector. For the current planning period, the electricity sector will require the largest investment, particularly the program to add 35,000 MW of power capacity.[34] Much of this funding is expected to come from foreign sources. Development of downstream infrastructure for domestic natural gas and oil refineries will be the other activities requiring large investments.

The Indonesian government's determination to develop renewable energy will surely open wider business opportunities. Development of geothermal power is an example of a renewable energy business in which foreign investors have considerable experience in Indonesia. Another example is hydropower infrastructure, which has been constructed across the archipelago.

Business opportunities can also be found in the development of solar, wind, and tidal energy, though their application in Indonesia is still limited. The development of bioenergy, such as the generation of electricity from biomass, the production of wood pellets, or biogas, will increase as well. Many of the coming renewable energy projects will take place in remote areas or on small islands of the archipelago.

The development of renewable energy in Indonesia will require not only the construction of infrastructure but also large-scale capacity-building to improve the country's human resources and institutions dealing with the renewable energy business. As a result, the government might seek greater assistance from foreign parties—through either bilateral or multilateral cooperation—to increase its capacity to foster the renewable energy business, particularly at local levels.

---

[32] IEA, "Southeast Asia Energy Outlook," 32.

[33] Ibid.

[34] Ibid.

## Conclusion

Several studies by international energy organizations have shown that Indonesia is facing critical energy security problems. Using the "A4&S" analytical framework that examines energy security in terms of availability, accessibility, affordability, acceptability, and sustainability, this essay has reached a similar conclusion. Availability is the most severe challenge to the country's energy security, due mostly to declining domestic oil production. Likewise, access to energy is still poor for Indonesians living in rural areas and on small islands, including those close to national borders.

The government of Indonesia is aware of the country's energy insecurity and is taking more serious actions to overcome the problem. Renewable energy can play a significant role in improving energy security and is among the top priorities of the current middle-term development planning led by President Jokowi. Potential sources of renewable energy range from geothermal, hydro, solar, and tidal energy to several types of bioenergy. Indonesia has not yet effectively harnessed the potential of most of these energy resources. Its redoubled efforts to develop renewable energy would not only strengthen the country's energy security but create attractive business opportunities for both domestic and foreign parties.

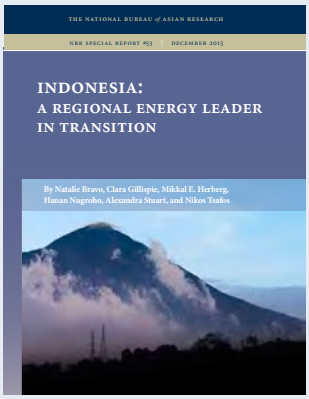
# BACKGROUND ON NBR'S ENERGY SECURITY PROGRAM

Now in its eleventh year, NBR's Energy Security Program convenes top energy and geopolitical experts from industry, research, and policy for an assessment of the developments taking place in Asian energy markets and their implications for geopolitics. To inform and strengthen the public policy dialogue, experts share insights and recommendations through a number of channels, including an invitation-only spring workshop, NBR's annual Energy Security Report, and a public fall launch event.

## PROGRAM THEMES

- **"Indonesia: A Regional Energy Leader in Transition"** (2015) examined the key energy and environmental security challenges facing Indonesia and explored strategies for promoting greater access to energy while stimulating sustainable sector investment.
- **"China's Energy Crossroads"** (2014) detailed major shifts underway in Beijing's energy security strategies, and how the country will impact market, geopolitical, and environmental outlooks for the Asia-Pacific more broadly.
- **"Asia's Uncertain LNG Future"** (2013) explored how and to what extent countries in the Asia-Pacific are integrating liquefied natural gas into their energy security strategies and the key geopolitical and market implications for both the United States and Asia.
- **"Oil and Gas for Asia: Geopolitical Implications of Asia's Rising Demand"** (2012) explored how Asia's rising energy demand, coupled with angst over prices and the reliability of future oil and LNG supplies, is shaping the strategic and economic agendas of Asia's major powers.
- **"Asia's Rising Energy and Resource Nationalism"** (2011) examined if there is a connection between energy insecurity and state efforts to control major sea lanes, the impact of Asia's national oil companies on the global industry, and the emergence of rare earth elements as an arena for national competition.
- **"Pipeline Politics in Asia: The Intersection of Demand, Energy Markets, and Supply Routes"** (2010) analyzed the growth in overland pipelines in industrializing Asia and the resulting implications for Asian regional politics and energy security geopolitics.
- **"The New Energy Silk Road: The Growing Asia–Middle East Energy Nexus"** (2009) assessed the likely evolution of Asia's involvement in Middle East oil and gas development, including how Asia may affect future oil and gas supply development and the implications for U.S. policy.

### 2015 ENERGY SECURITY REPORT




All reports are available at: www.nbr.org

*NBR would like to thank the Asian Development Bank, Chevron, ConocoPhillips, and ExxonMobil for their generous support of the 2015 Energy Security Program. We are also grateful to the US-ASEAN Business Council for cohosting the July workshop and the December launch on Capitol Hill.*

THE NATIONAL BUREAU OF ASIAN RESEARCH • SEATTLE AND WASHINGTON, D.C. • NBR@NBR.ORG, WWW.NBR.ORG

NBR

1414 NE 42ND STREET, SUITE 300
SEATTLE, WASHINGTON 98105 USA
PHONE 206-632-7370, FAX 206-632-7487

1819 L STREET NW, NINTH FLOOR
WASHINGTON, D.C. 20036 USA
PHONE 202-347-9767, FAX 202-347-9766

For more information on NBR's Energy Security Program, please contact Clara Gillispie at eta@nbr.org or 202-347-9767.

# 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 workshop; NBR's annual Energy Security Report, which compiles expert essays on each year's specific topic; and a public launch event.

"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*

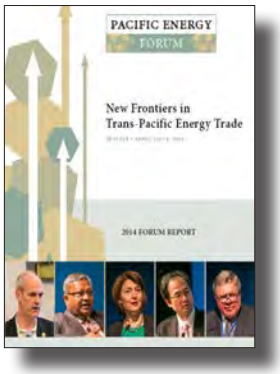
## Adapting to a New Energy Era


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.

## 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.

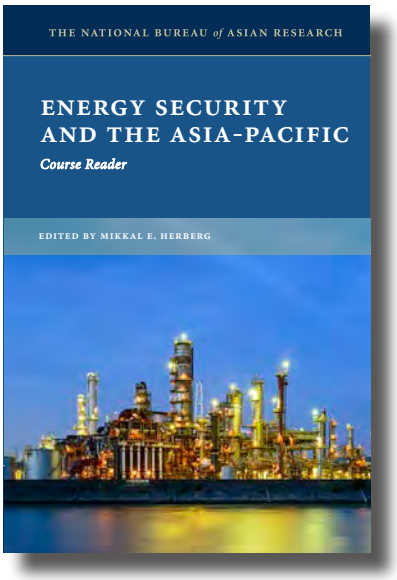
For more info on these programs, please contact Clara Gillispie, NBR's Director of Trade, Economic, and Energy Affairs, at eta@nbr.org.

# 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.




EDITOR Mikkal E. Herberg

CONTRIBUTORS
Michael Bradshaw
Gabe Collins
Andrew S. Erickson
Charles D. Ferguson
Aaron L. Friedberg
Sumit Ganguly
Mikkal E. Herberg
Tomokoe Hosoe
Trevor Houser
Shoichi Itoh
Amy Myers Jaffe
Bo Kong
Kenneth Lieberthal
Damien Ma
John V. Mitchell
Manjeet S. Pardesi
James Slutz
Paul Stevens
Tsutomu Toichi
Nikos Tsafos

ISBN: 978-1-939131-33-1
October 2014

E-book: $44.95 (PDF)
available at www.nbr.org

Print-on-demand: $54.95

- GEOPOLITICS AND ENERGY SECURITY
- COUNTRY STUDIES
- REGIONAL STUDIES
- U.S. IMPLICATIONS

*For more information, please contact* publications@nbr.org *or visit*
http://www.nbr.org/publications/issue.aspx?id=306

NBR THE NATIONAL BUREAU *of* ASIAN RESEARCH

*Seattle and Washington, D.C.*

1414 NE 42ND STREET, SUITE 300
SEATTLE, WASHINGTON 98105 USA
PHONE 206-632-7370, FAX 206-632-7487

1819 L STREET NW, NINTH FLOOR
WASHINGTON, D.C. 20036 USA
PHONE 202-347-9767, FAX 202-347-9766

NBR@NBR.ORG, WWW.NBR.ORG