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Before the Beginning of the Belt and Road International Forum, 2017. Photo by the Russian Presidential Press and Information Office (Permission under CC BY 4.0)

INTRODUCTION

The themes of this issue are the impacts of China's Belt and Road Initiative on the Association of Southeast Asian Nations (ASEAN), and how some of the countries within this region and beyond are responding. In 2013, Chinese President Xi Jinping proposed the building of the New Silk Road Economic Belt and the 21st Century Maritime Silk Road – now collectively called the Belt and Road Initiative (BRI hereafter). The BRI establishes a blueprint for Asia's future infrastructure development, and Southeast Asia has a very important position in this blueprint. Chinese companies have already invested in several projects in the region which are geared to improving the energy capacity and energy connectivity in the region, and have many more planned.

On 24 and 25 May 2018, ESI's Energy Security Division held a workshop and conference to discuss China's BRI and investment in ASEAN's energy sector. The articles in this issue of the Bulletin have been contributed by speakers at the workshop and the conference.

The first article, by Mr. Chea Socheat, Deputy Director General of the General Department of Petroleum in the Ministry of Mines and Energy of Cambodia, presents the situation in Cambodia's petroleum and power sectors, providing details about Chinese investment in these two sectors. China is the largest foreign investor and has contributed much to the significant growth of Cambodia's energy sector. Chinese investment began to surge after the BRI was proposed, and today accounts for about 80 per cent of the total foreign investment in this sector. Cooperating with local companies, Chinese companies have been very active in Cambodia's downstream oil sector. In the power sector, Chinese investments have greatly helped increase Cambodia's electric power capacity. In recent years, the price of electricity there has decreased significantly, and access to power has greatly improved.

The second article, by Mr. Beni Suryadi, Manager of Policy and Research Analytics at the ASEAN Centre for Energy, in Indonesia discusses electricity connectivity in the BRI and ASEAN. China has made significant investments in various national power grid projects in ASEAN, such as in Indonesia and Laos. It has invested heavily in Indonesia's power plants, especially the coal-fired power plant sector and will continue to do so in light of Indonesian President Joko Widodo's ambitious goal to increase electricity capacity. In Laos, Chinese companies have been very active in building not only power plants, but also power

In this issue ...

GMS Nam Theun 2 Hydroelectric Project in Lao PDR, 2017. Photo by the Asian Development Bank. (Permission under CC BY-NC 2.0).

grids. Based on the existing Chinese investment in ASEAN's power sector, the BRI provides ample potential for investment in this sector. That said, the article suggests that China should not only bring investment to the region, but also expertise so that the regional power interconnections can facilitate power trading and also promote science and technology. To make this happen, China must establish a clear mechanism to help the people of ASEAN conceptualise the development of the BRI projects and understand that electricity connectivity projects within ASEAN are not just projects, but are a matter of regional dignity.

The third article by Dr. Zhang Baohui, Professor of Political Science and Director of the Centre for Asian Pacific Studies at Lingnan University in Hong Kong, analyses the BRI from an international relations perspective. Despite China's willingness to be more assertive as a new regional and global public goods provider, few countries in the region want to see China emerging as the dominant state in the regional system. To stop China's rising power and influence, many countries would prefer that the United States controlled the situation and are trying to assist it in maintaining its power. Knowing that this initiative will further enhance China's rise, these countries have been opposing, implicitly or explicitly, Beijing's BRI. However, China is simply too powerful to be made into an enemy of these countries. The reality of the present power distribution is that China is the dominant economic actor in the region, and if it emerges as the world's largest economy, this may force many countries to adopt a very complex strategy towards it. They mix balancing measures with limited "bandwagoning" measures. As a result, even Japan, Australia and Singapore, the three regional countries demonstrating the strongest balancing motives towards China, have started to move towards supporting the BRI.

We hope you find these articles of interest and welcome your views and comments.

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Cambodia's Energy Sector and China's Belt and Road Initiative: For Growth and Mutual Benefit

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Night lights in Phnom Penh, 2011. Photo by Damian Bere (Permission under CC BY-NC-SA 2.0).

Cambodia has undergone rapid economic development in recent years. However, the country still lacks the infrastructure required for the energy sector to keep up with the pace of development. In any country, energy security is the backbone of socio-economic growth and sustainability. Energy supply and access are fundamental to achieving developmental goals. As Cambodia's population increases and industry expands, its consumption of both electricity and petroleum products is forecast to grow at 9.4 per cent and 5.6 per cent per annum, respectively, until 2025.

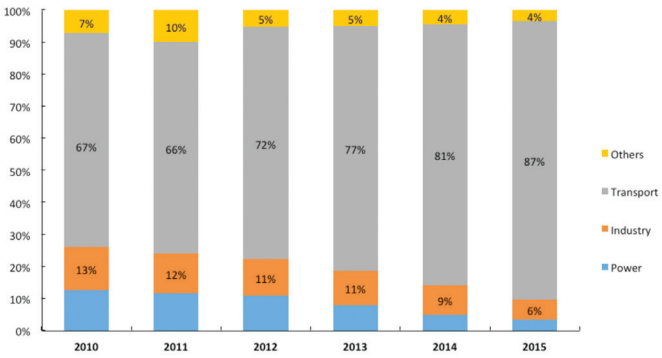
China is the largest foreign investor in Cambodia's energy sector. Its direct investment in this sector has contributed greatly to its significant growth and BRI finance. Most of the financial support for the country's energy infrastructure construction, including hydropower plants, coal power plants, distribution lines and refineries has come from China. In all, it accounts for about 80 per cent of the total foreign investment in the energy sector.

Petroleum Sector

The rapid economic growth and increasing number of vehicles have resulted in a steady increase in the demand for petroleum products (see Figure 1). The downstream businesses of the oil and gas industry have grown significantly in recent years, and imports of petroleum products have increased about 6 per cent per year since 2014 and are likely to continue at this rate for the next several years. The number of oil and gas filling stations doubled nation-wide from 1,500 stations in 2014 to over 3,000 stations in 2017 (see Figure 2).

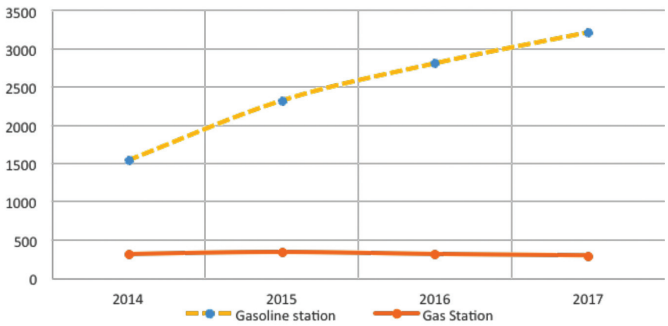
The downstream business has attracted Chinese companies that cooperated with local companies to prepare for the big projects such as oil storage terminals, liquid natural gas (LPG) pipelines and petroleum products pipelines. Since 2014, the General Department of Petroleum has received several applications for

Figure 1: Consumption of Petroleum Products by Sector



Source: General Department of Petroleum, Cambodia.

Figure 2: Number of Gasoline and Gas Stations in Cambodia



Source: General Department of Petroleum, Cambodia.

construction licenses and distribution licenses for pipeline and storage projects. A 5-million-ton refinery, managed in cooperation with a Chinese company, is now under construction. The first stage, with a capacity of 2 million tons, will be completed and put into operation by the end of 2019. The upstream business is quiet compared to the downstream business, probably due to the fall in the price of crude oil in recent years.

Power Sector

Cambodia has made giant strides in producing more electricity domestically and expanding the grid. Electricity generation increased by about 27 per cent in 2015, compared to the 2014 level. This marked the highest increase in electricity generation in Cambodia. In 2017, Cambodia generated about 1,866.49 MW, 40.39 per cent from hydropower and 35.51 per cent from coal-fired power plants. By early 2018, 97.6 per cent of Cambodian households had access to at least one source of electricity: 71.5 per cent on the grid and 26.1 per cent off the grid, mostly in the form of solar home systems and rechargeable batteries.[1]

About 14.48 per cent of Cambodia's total electricity supply is imported from Vietnam; 3.38 per cent is imported from Thailand and 0.71 per cent is imported from Laos. Cambodia's electricity dependence declined from 22 per cent in 2016 to 18 per cent in 2017 and will probably decline to 16.74 per cent in 2018 as projected by the Electricity Authority of Cambodia. According to the Electricity Authority of Cambodia's Report of Electricity Development, the power source capacity rose from 205 MW in 2003 to 2283 MW in 2017, while energy delivered increased from 693 GWh in 2003 to 7966 GWh in 2017. This means that during the 15-year period, the power source capacity increased 11.4 times and the energy delivered increased 11.5 times. As for access to electricity, at the end of 2017, around 2.32 million households had electricity, equivalent to 69 per cent of the total 3.38 households. Household access to electricity increased from 0.23 million in 2003 to 2.32 million in 2017. The significant growth started from 2014, one year after the introduction of the BRI by China. In that year, 1.35 million households had access to electricity, accounting for 42.72 per cent of total households in the country.

China is the largest foreign investor in Cambodia's energy sector, especially in the power industry, including hydropower plants, coal power plants and transmission lines. China has played a major role in fulfilling Cambodia's needs for power through construction of hydropower dams, several of which are already in operation. Kemchay Dam, for example, was constructed with Chinese assistance. With a capacity of 194 megawatts, this hydropower plant supplies electricity to a vast area in the southern part of Cambodia. The biggest hydropower dam is the Lower Sesan II Hydropower Plant, located in northern Cambodia's Stung Treng province. Constructed by China's Hydrolancang International Energy, the Lower Sesan II will be able to generate up to 400MW when it is in full operation at the end of 2018 and will account for about 21 per cent of Cambodia's total electricity supply.

In general terms, since the BRI was proposed, Cambodia's energy sector has benefitted from a great deal of Chinese investment in energy infrastructure development. Cambodia has made great progress in improving the supply of energy to the whole country. Chinese direct investment has also contributed considerably to the economic development of Cambodia since 2014. Seven hydropower plants and two coal power plants have already been put into operation since 2013. The greatest benefits of the increasing number of power plants have been job creation and improved living standards. The price of electricity has fallen from 3,000 Riel per KW/h to 790 Riel per KW/h or below, depending on the consumption of electricity.

Conclusion

Compared to the investment from other foreigners, the Chinese investment in Cambodia, particularly in its power industry, has increased sharply since 2013. The increase in energy infrastructure has contributed in large part to the improvements in energy supply and consumption. It is expected that the consumption of both petroleum products and electricity will continue to increase rapidly to 2030. As Cambodia is still reliant on imports of electricity, the distribution lines and expansion of the grids must be carefully planned in the coming years. However, the development of the petroleum industry must be sped up in order to catch up with the development of the power industry. The petroleum policies, strategy and master plan should be done in a careful way to attract both local and foreign investors.

1 Rutu Dave, et al. *Cambodia: Beyond Connections, Energy Access Diagnostic Report Based on the Multi-Tier Framework* (Washington, DC: The World Bank, 2018).

How Can the Belt and Road Initiative Enhance ASEAN's Electricity Connectivity?

Beni Suryadi, Manager, Policy and Research Analytics, ASEAN Centre for Energy, Indonesia

Transnational energy cooperation, especially the massive development of energy infrastructure and improved market access, will be an important way for China to achieve its ambitious Belt and Road Initiative (BRI) goals. After the country hosted a summit on the BRI in May 2017, the Chinese government even proposed the formation of a "belt and road energy club", a regional grouping made up of governmental departments, companies and research institutions, with the goal of building a consensus on energy cooperation for countries and regions involved in the BRI.[1] Given the BRI's profile, it appears to be a plausible option for ASEAN in pursuing its electricity connectivity via the ASEAN Power Grid (APG).

China Gezhouba Group Corporation in Wuhan, Hubei Province, China, 2017. Photo by Fxqf (Permission under CC BY-SA 4.0).

Chinese Investment in ASEAN's Power Grids: Current Situation

At present, most of ASEAN's cross border electricity transmission projects are running among the member states only. Apart from the direct electricity interchange between China and the ASEAN nations, the cooperation between ASEAN and other nations is mostly in the form of power investment. China, the United States and Japan are three major investors and partners in power cooperation in the region. The cooperation in power investment between every individual ASEAN member state in the region with China is also becoming stronger. Significant development is occurring in various national projects supported by China, such as in Indonesia and Lao PDR.

In 2013, the Vice President of China Power Investment Corporation, a Chinese state-owned enterprise (SOE), and Indonesian Energy and Mineral Resources Minister announced investments of USD 17 billion in Indonesia to build its largest ever power plants, including a 7,000-megawatt hydropower plant in Kalimantan slated for completion in 2020 that will generate power from the Tayan River in North Kalimantan. China Power's main products and services are focused on power generation, including a 6,000-MW hydropower plant in Myanmar that exports electricity to China. In 2016, work started on the first China-built coal-fired power plant in Bengkulu on the island of Sumatra, the USD 360 million Tenaga Listrik Bengkulu, a joint venture between the Indonesian publicly-listed firm PT Intraco Penta and the Chinese SOE, Power Construction Corporation of China (PowerChina), which is slated for completion in 2019. The project has a 25-year turnkey build-own-operate-transfer (BOOT) format that fits into Indonesian President Joko Widodo's goal of adding 35,000 MW of power by 2021.[2]

The same is happening, though on a smaller scale, in Lao PDR, a country that commends itself as being the "battery" for the region. Électricité du Laos (EDL), the state corporation of Lao PDR that owns and operates the country's electricity generation, electricity transmission and electricity distribution assets, awarded the construction of their two latest projects to Chinese companies. A 72-km long 500-KV high voltage power transmission line from Saravane-to-Sekong is under construction by a Chinese company, China National Heavy Machinery Corporation (CHMC), while the 110-km long Ban Hat-Lak 25-Sekong line is being constructed by China Gezhouba Group Corporation (CGGC). Both projects are targeted for completion in 2020. The Saravane - Sekong transmission line is the backbone of Lao National Grid, and there will be an interconnection point at Substation Lak 25, connecting to the line belonging to the Electricity Generating Authority of Thailand (EGAT). Meanwhile, EDL is also conducting a study to connect Ban Hat to Strung Teng in Cambodia. Both are envisioned to be part of ASEAN's comprehensive interconnectivity project, the APG.

The BRI and Opportunities for ASEAN Power Grid Expansion

Based on the existing Chinese investment in ASEAN's power sector, the BRI provides ample potential for investment in the region's power sector. ASEAN itself, as part of its goal to realise a higher penetration of renewable forms of energy in its energy system, is aiming to have 23 per cent of its total primary energy supply coming from renewable energy in 2025. This requires an annual average of about USD 21 billion to construct its power plants to 2025. As the electricity connectivity in the region is predominantly in the hands of the governments, it is preferable that the projects be managed by state-owned enterprises rather than private initiatives. The SOE route is necessary given the scale of the engagement, including the construction of some of the largest power plants in Indonesia. An advantage in working at the government-to-government (G2G) level is the potential for economies of scale, with the Chinese forgoing any additional incentives from the Indonesian government for building the mega projects.[3]

As a country with rapid development in renewable energy technologies, and also becoming in many ways

ASEAN Headquarters in Jalan Sisingamangaraja, South Jakarta, Indonesia, 2010. Photo by Gunawan Kartapranata (Permission under CC BY-SA 3.0).

the leading nation in the world today, China can also bring its grid-interconnection expertise in both policy and technology. The interconnection of power grids between ASEAN and China will support national economic development for all concerned, meet the demands of economic development, increase the diversification of energy supply and promote the availability of electricity in remote areas. The construction of regional power infrastructure interconnections will accelerate the development of upstream and downstream industries such as materials, information and electric vehicles, and create greater economic benefits to become the new engine for regional economic development. Regional power grid interconnections also reduce the cost of energy supply, break the energy resource bottlenecks that have been hindering economic acceleration and promote the transformation and upgrading of regional economic development modes to realise balanced development for all of the countries involved. With regional power grid interconnections, there will be more job creation, and stronger progress in science and technology. Countries such as Cambodia and Lao PDR will be able to export their renewable energy resources to neighbouring countries through power grids, transforming their resource advantages into economic advantages, thereby raising incomes and living standards. This will benefit both import and export countries and help promote regional cooperation.[4]

Conclusion

ASEAN is well-positioned to become the cornerstone of Chinese President Xi Jinping's BRI. ASEAN, a region with vast resources and high electricity demand, provides an opportunity for China to invest and share its technologies to help the region develop and modernise. Especially in the border areas, the governments and private sectors from both China and ASEAN member states can actively facilitate the rapid development of national power grids and interconnection of regional power grids. However, this can only happen if China establishes a clear mechanism through which the people of ASEAN can conceptualise the development of the BRI energy projects and understand that electricity connectivity projects are not just projects, but are a matter of regional dignity. Moreover, the member states of ASEAN should, as a group, welcome the Chinese investments and assistance, rather than as individual countries. Concrete action can then be taken with the ASEAN Interconnection Masterplan Study (AIMS) III, which is to be released in 2019 and will encompass the new and updated electricity infrastructure plan for the region, geared towards enhancing energy connectivity not only across the ten member states, but also beyond the region, and striving for high utilisation and penetration of renewable energy. The vision is that it will not only enhance physical connectivity within ASEAN and with China, but also geopolitical connectivity.

1 Kaho Yu. *The Geopolitics of Energy Cooperation in China's Belt and Road Initiative*. NBR Special Report: Asia's Energy Security and China's Belt and Road Initiative. November 2017. Available at http://www.nbr.org/publications/specialreport/pdf/sr68_asias_energy_security_november2017.pdf.

2 Tai Wei Lim, "Chinese Coal Investments Firing Up the Indonesian Economy" *IPP Review*, 22 March 2018. Available at http://www.ippreview.com/index php/Blog/single/id/673.html.

3 Ibid.

4 ASEAN Centre for Energy (ACE), the Global Energy Interconnection Cooperation and Development Organization (GEIDCO), and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). *Pathways for Energy Interconnection in ASEAN: Accelerating Energy Transition for Sustainable and Resilient Societies,* 2018.

Other Countries' Reactions to the Belt and Road Initiative: An Analysis of Motives and Behaviours

Baohui Zhang, Professor of Political Science and Director of the Centre for Asian Pacific Studies, Lingnan University, Hong Kong

China's rise in general, and specifically its Belt and Road Initiative (BRI), have cornered many countries. Indeed, there is a diverse range of responses to the BRI, from eager participation to evasion and outright boycott. This article discusses regional countries' responses to China's rise and its ambitious BRI project.

ASEAN Foreign Ministers and Philippines President Rodrigo Roa at the closing ceremony of the Foreign Ministers' Meeting held at the Philippine International Convention Center in Pasay City, Metro Manila, 2017. Photo by Richard Madelo (Permission under Wikimedia Commons).

Current Regional Situation under the BRI

China' BRI is a strategic policy dictated by its economic statecraft. By building infrastructure and enhancing connectivity in many parts of the world, China is attempting to make itself economically central to other countries. However, facing a rising China, many of these countries are pursuing various types of balancing efforts in the form of both internal balancing through expansion of their military capabilities, and external balancing through enhanced security cooperation with other countries. Many studies have predicted that China's GDP will surpass that of the US by 2030 and will be significantly larger by 2040.

Essentially, China's power has risen to such an extent that its further rise is perceived as being a threat to other countries' interests. Few countries are keen for China to become *more* powerful. The governments in the immediate region do not want to see China emerge as the dominant state in the regional system. They would like to see China's power and influences checked, if not contained. While these countries do not necessarily worry about their national survival — common sense tells us that China has no intention to seek territorial conquest —they worry about potential loss of autonomy under a hegemonic system.

Regional Countries' Balancing Incentives

To limit China's rising power and influence, several countries have been actually attempting to shore up the role of the United States in the region. Japan, Australia and Singapore are examples. They have been the most ardent supporters of the "Asia pivot". Indeed, they have shown even more interest in the Trans-Pacific Partnership (TPP), which was an initiative of the Obama administration, than has the United States. In essence, these countries have been attempting to shore up US regional primacy, which has been waning due to the rise of China.

For the same reason, they have been opposing, implicitly or explicitly, Beijing's BRI, knowing that this initiative will further enhance China's rise, and thereby further weaken the relative power, influence, and status of the United States. Japan, Singapore and Australia's opposition to the BRI thus reveals their balancing, if not containment, motives towards China.

The Dilemma

However, no country intends to sever ties with China. Quite the opposite, they all aspire to maintain diplomatic and economic relations, albeit complex ones, with China. There are even extensive military-to-military exchanges among them and the People's Liberation Army. China is simply too powerful to become an enemy of these countries.

Indeed, China's rise is an opportunity for these countries to enhance their economic prosperity. Few, if any, are willing to relinquish the economic gains emanating from a normal relationship with China. This is especially true when China is already the dominant economic actor in the region and is on its way to becoming the largest economy in the world. Therefore, other countries are seeking simultaneously to limit China's power while cooperating with it. This complex behaviour characterises almost all of the countries in the region.

Indeed, their responses towards the BRI reveal this complex strategy. Japan, Australia and Singapore initially chose to balance against the BRI by evasion or even outright boycott. They understand that supporting the BRI will accelerate both China's rise and the US' relative decline, thereby jeopardizing their own autonomy in the long term. However, the reality of the present power distribution, which sees China as the dominant economic actor in the region, and its future configuration, which predicts China emerging as the world's largest economy, has also forced many countries to adopt a very complex China strategy. As a result, even Japan, Australia and Singapore, the three regional countries demonstrating the strongest balancing motives towards China, have started to move towards supporting the BRI.

United Nations Industrial Development Organization's Director General Li Yong speaking at an Asian Infrastructure Investment Bank Seminar, "Financing Green Infrastructure: The Role of the Multilateral Development Banks, 2016. Photo by UNIDO (Permission under CC BY-ND 2.0).

Limited Bandwagoning with China

Japan was the first country to change its position on the BRI. After resisting it and the Asia Infrastructure Development Bank for years, Shinzo Abe's government surprised many by sending a very high-level delegation to attend the May 2017 Beijing summit meeting on the BRI. Shortly afterwards, Abe told the Japanese parliament that Japan would be willing to participate in the BRI if the processes were fair and open to Japanese businesses. It is reported that the Japanese government has given the green light to Japanese businesses to participate in BRI projects with their Chinese counterparts.

Singapore, after refusing to attend the same summit meeting, also eventually shifted to a more supportive posture towards the BRI. In July 2017, the Singapore government announced that it was willing to work with China on BRI-related projects. Prime Minister Lee Hsien Loong, during his September 2017 visit to China, reaffirmed Singapore's support for the BRI.

Australia is similarly becoming more positive towards the BRI. After a frosty relationship with China in recent years, Prime Minister Malcolm Turnbull said on 17 May 2018 that he would visit China and insisted that the two countries "have a shared destiny."[1]

Trade Minister Steven Ciobo, who visited Shanghai on a trade mission, praised China "as one of the true global giants." According to Ciobo, "Australia and China share the common goal of improving infrastructure in the region and Australia welcomes the contribution that the BRI can make to regional infrastructure."[2]

Conclusion

The turnaround in Japan's, Singapore's and Australia's policies towards the BRI indicates the importance of economic incentives that also motivate their China policies. Non-cooperation with China could invite retaliation in the form of hidden or open economic punishment by Beijing due to the large size of the Chinese economy and the weight of China in these countries' external trade relations. Hence the economic prosperity of these countries is at stake. Indeed, a *Sidney Morning Herald* story in May 2018 on Australia's new position towards the BRI mentioned the increasing punitive measures taken by Beijing against Australian businesses in China.[3] Due to the tremendous significance of Australia's economic relations with China, shifting to a more cooperative posture towards Beijing is unavoidable.[4] As Ciobo pointed out, Australia's trade relationship with China, annually worth AUD 175 billion, is very important.[5] Indeed, nearly a third of Australia's external trade involves China. Therefore, China may simply be too big to be balanced. Moreover, any attempts to balance against China could result in retaliatory actions which jeopardize both security and economic interests.

1 Kirsty Needham and Darren Gray, "Turnbull Softens Rhetoric as Businesses Feel the Freeze in China," *Sidney Morning Herald*, 18 May 2018.

2 Ibid.

3 Ibid.

4 Ibid.

5 Ibid.

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Christopher Len and Huong Le Thu, "Dammed Mekong: Lasting Challenges for the Region's Energy Security", *The Strategist ASPI*, 3 August 2018.

Anthony D. Owen, "Hydropower: Not So Renewable After All", *Energy Forum*, Q4, 2018.

Peter Hefele and **Anthony D. Owen, "**Unlocking the Door towards Development: Improving Access to Electricity in Southeast Asia", Konrad Adenauer Stiftung Report, 2018.

Dina Azhgaliyeva, Zhanna Kapsaplyamova and Linda Low, "Implications of Fiscal and Financial Policies for Unlocking Green Finance and Green Investment", *ADB Institute Working Paper Series* N861 (2018).

Staff Presentations and Moderating

23 November Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at the Crawford School of Public Policy, ANU, Canberra, Australia.

21 November Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at RMIT University, Melbourne, Australia.

20 November Ira Martina Drupady presented "The State-of-Play of Sustainable Development Goals (SDGs) in ASEAN: Outlook for Energy for 2030 and Beyond" at the *International Association for Political Science Students (IAPSS) Academic Convention 2018*, Singapore.

20 November Anthony D. Owen gave the keynote address to the ESI/KAS Workshop, *Unlocking the Door towards Development: Improving Access to Electricity in Southeast Asia*, Hanoi, Vietnam.

19 November Melissa Low presented "RINGO Pre-COP: Navigating the UNFCCC and COP" at a Webinar organised by Second Nature (USA), Research and Independent Non-Governmental Organization Steering Committee (UNFCCC), on-line.

19 November Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at the *4th Monash Environmental Economics Workshop,* Monash University, Melbourne, Australia.

15 November Melissa Low presented "Introduction to the UNFCCC, its Paris Agreement and What to Expect at COP24", at the *ASEAN Youth Pre-COP Climate Change Capacity Building Workshop*, organised by ESI, Singapore Youth for Climate Action, Environmental Law Students Association at NUS Law, Malaysian Youth Delegation and National Youth Council, Singapore.

13 November Liu Yang gave a guest lecture on "Electricity Market Design: Unlocking Grid Edge Innovations" at Nanyang Technological University, Singapore.

7-9 November Philip Andrews-Speed moderated "Green Belt and Road Conference" at Renmin University and Columbia University, Beijing, China.

7 November Melissa Low presented "Global Environmental Politics: Climate Change" *at GL2103: Global Governance*, organised by the NUS Global Studies Department, Singapore.

5 November Philip Andrews-Speed presented "Governing China's Energy Investments along the Belt and Road: The Experience of Southeast Asia" at the Beijing Institute of Technology, China.

4 November Xunpeng Shi presented "A Permit Trading Scheme to Facilitate Energy Transition: An Application to China's Coal Capacity Control" at the *6th IAEE Asia-Oceania Conference*, Wuhan, China.

3 November Philip Andrews-Speed was a keynote speaker on "Meeting Multiple Energy Challenges: An Institutional Perspective" at the *6th IAEE Asia-Oceania Conference*, Wuhan, China.

2 November Liu Yang convened a *SIEW Roundtable* on "Unlocking Power System Flexibility: Innovative Wholesale Market Design and Business Models" and gave the welcome address, Singapore.

30 October Su Bin presented "One Belt One Road Initiative and Energy Economics Cooperation" at the *One Belt One Road Initiative and Energy Cooperation Workshop*, organised by Wuhan University, Wuhan, China.

29 October Liu Yang was a panellist at the *ASEAN Energy Business Forum* held in conjunction with ASEAN Ministers on Energy Meeting, Singapore.

21 October Christopher Len moderated the *NUS – Sweden Arctic Roundtable*, Singapore.

21 October Christopher Len and Philip Andrews-Speed presented "ESI Research on the Arctic" at the *NUS – Sweden Arctic Roundtable*, Singapore.

20 October Christopher Len and Liu Yang presented "The Arctic Renewable Energy Atlas (AREA) Project: Key Takeaways from the Singapore Workshop" at the *Arctic Circle Assembly 2018,* Reykjavik, Iceland.

20 October Christopher Len moderated at the *Arctic Circle Assembly 2018*, Reykjavik, Iceland.

20 October Liu Yang spoke as a panellist at the *Arctic Renewable Energy Atlas* (AREA) *Project: Key Takeaways from the Singapore Workshop* organised by the 2018 Arctic Circle Assembly, Iceland.

6 October Dina Azhgaliyeva presented on-line "Managing Oil Revenue in the Caspian Region: Azerbaijan and Kazakhstan" at the conference on *Contemporary Issues in Public Administration in Post-Soviet Eurasia*, organised by Nazarbayev University Graduate School of Public Policy, Astana, Kazakhstan.

4 October Melissa Low presented "Singapore's Climate Change Policy" at *GE2230: Energy Futures: Environment and Sustainability*, organised by the NUS Geography Department, Singapore.

2 October Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at an Energy Information Agency seminar, Washington DC, USA.

26 September Melissa Low presented "Energy Equity in Singapore" at *the 4th World Social Science Forum*: *Security and Equality for Sustainable Futures*, Fukuoka, Japan.

26 September Brant Liddle presented "Long-run Income and Price Elasticities of Energy Consumption: The Stylized Facts" at the *36th USAEE/IAEE North American Conference*, Washington DC, USA.

20 September Su Bin presented "Structural Decomposition Analysis Applied to Energy and Emissions: Recent Development and Future Trends" at the China University of Petroleum, Beijing, China.

16 September Xunpeng Shi presented "Will China's BRI Deteriorate the Environment in BRI Countries" at the *Beijing Humboldt Forum 2018*, Beijing, China.

12 September Philip Andrews-Speed moderated "Fostering an Effective Energy Transition in SE Asia" and "New Energy Frontiers for ASEAN" at the *World Economic Forum on ASEAN*, Hanoi, Vietnam.

11 September Dina Azhgaliyeva presented "The Determinants of Energy Efficiency and the Role of Policy: Empirical Evidence from Developing Countries" at the Workshop on *Energy Efficiency Prosperity in ASEAN*, a workshop organised by ESI in Chiang Mai, Thailand.

11 September Liu Yang convened a workshop on "Energy Efficiency Prosperity in ASEAN" jointly organised with the APEC Energy Working Group and gave a welcome address, Chiang Mai, Thailand.

10 September Melissa Low presented "Singapore's Participation at the UNFCCC" at the *Climate Change Negotiations Training Workshop for Singapore Youth*, organised by ESI, Office of Environmental Sustainability, Ridgeview Residential College and National Youth Council, Singapore.

1 September Philip Andrews-Speed moderated at the *ESI-Global Compact Network (GCNS) Youth Seminar: What a Changing Arctic Means for Singapore*, Singapore.

1 September Christopher Len was a speaker at the *ESI-GCNS Youth Seminar: What a Changing Arctic Means for Singapore*, Singapore.

29-30 August Christopher Len moderated at the *Arctic Renewable Energy Atlas (AREA) Workshop and Meetings*, Singapore.

28 August Melissa Low presented "National Perspectives on Climate Change" at the *Climate Change Negotiations Training Workshop for Singapore Youth*, organised by ESI, NUS Office of Environmental Sustainability, NUS Ridgeview Residential College and National Youth Council, Singapore.

27 August Zhong Sheng presented "Summary of Research at ESI: Patent Analysis, Agent-based Modelling of Carbon Market and the International Shipping Project" at Hong Kong Polytechnic University, Hong Kong, China.

23 August Xunpeng Shi presented "Is ASEAN Gas Market Integration Desirable?" at *the 10th International Conference on Applied Energy*, Hong Kong, China.

23 August Dina Azhgaliyeva presented "Energy Storage and Renewable Energy Deployment: Empirical Evidence from OECD Countries" at *the 10th International Conference on Applied Energy* (ICAE2018), Hong Kong, China.

20 August Melissa Low presented "The Role of Youth" at the *Climate Change Negotiations Training Workshop for Singapore Youth*, organised by ESI, NUS Office of Environmental Sustainability, NUS Ridgeview Residential College and National Youth Council, Singapore.

17 August Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at the *EECC Seminar*, Asian Institute for Technology, Bangkok, Thailand.

16 August Melissa Low moderated "Climate Actions and Sustainable Development: Where Are We Now?" at the *Climate Actions and Sustainable Development: Where Are We Now? Dialogue at Marina Barrage*, organised by ESI, NUS Office of Environmental Sustainability, NUS Ridgeview Residential College and National Youth Council, Singapore.

13 August Melissa Low presented "Introduction to the UN Framework Convention on Climate Change and the Paris Agreement" at the *Climate Change Negotiations Training Workshop for Singapore Youth*, organised by ESI, Singapore.

7 August Zhong Sheng presented "Exploring Technological Trajectories and Technological Catch-Up in Solar Energy: Evidence from Patent Data" at MIT Media Lab and the Institute for New Economic Thinking, New York, USA.

12 July Melissa Low presented "Perspectives and Views of the Asia-Pacific Countries on Article 13 of the Paris Agreement and the Enhanced Transparency Framework" at the *Asia Pacific Carbon Forum/Asia Pacific Climate Week*, organised by the United Nation's Environment's Economy Division – Technical University of Denmark (UNEP DTU) Partnership, Singapore.

11 July Melissa Low presented "Carbon Pricing and Policy Packages for Driving Energy Transitions: Singapore's Experience" at the *Asia Pacific Carbon Forum/Asia Pacific Climate Week*, organised by the International Energy Agency and World Bank, Singapore.

11 July Gautam Jindal presented "Singapore NDC and Carbon Pricing" at *the International Greenhouse Gas Conference (IGC) 2018*, organised by the Greenhouse Gas Inventory and Research Center of Korea (GIR), Seoul, South Korea.

10 July Melissa Low presented "Youth Empowerment in Accelerating Action on Climate Change" at the Partners for the Environment Forum 2018, organised by the Ministry of Environment and Water Resources, Singapore.

18-19 June Dina Azhgaliyeva presented "The Determinants of Energy Efficiency and the Role of Policy: Empirical Evidence from Developing Countries" at the *Green Transformation and Competitive Advantage Conference* organised by the German Institute of Development in Bonn, Germany.

13 June Lixia Yao presented "Belt and Road Initiative in Southeast Asia's Energy Sector: Impacts and Implications for the Region" at the 38th *International Academic Conference* in Prague, Czech Republic.

12 June Brant Liddle presented "Revisiting the Income Elasticity of Energy Consumption: An OECD and Non-OECD Country Panel Analysis" at the *41st IAEE International Conference*, Groningen, Netherlands.

30 May Xunpeng Shi presented "Paradoxes in Australia's East Coast Gas Markets: Role of CBM" at the *International Workshop on Best Practice Guidance of Effective Coalbed Methane Recovery Technologies for APEC Developing Economies*, Beijing, China.

24 May Lixia Yao presented "Belt and Road Initiative for Energy Sector in ASEAN and Singapore: Trends, Prospects, and Implications" at the *ESI Workshop on Belt and Road Initiative for Energy Sector in ASEAN and Singapore: Trends, Prospects, and Implications,* Singapore.

24 April Xunpeng Shi presented "Natural Gas in East Asia's Energy Transition" at the 8th *Global Commodities Forum*, organised by the UN Conference of Trade and Development (UNCTD) Geneva, Switzerland.

9 April Xunpeng Shi presented "Long Run Relationship of Electricity Access and Development" at the *2nd Meeting of ERIA's Working Group on Energy Poverty in ASEAN, India and China*, Bangkok, Thailand.

Staff Media Contributions

Philip Andrews-Speed interviewed by *S&P Global Platts* on the role of China's National Energy Administration, 28 November 2018.

Philip Andrews-Speed interviewed by *Radio Free Asia* on China's burning furniture for heat, 26 November 2018.

Philip Andrews-Speed interviewed by *Radio Free Asia* on forecasts of China's coal consumption, 20 November 2018.

Gautam Jindal interviewed by *Shin Min Daily* on open electricity markets, 7 November 2018.

Gautam Jindal interviewed by *Power98 FM* on open electricity markets, 6 November 2018.

Shi, Xunpeng interviewed by 新华网 *(Xinhua Net)* on (专访). 油价上涨或引发复杂连锁反应 (Rising Oil Prices Could Cause Chain Changes), 18 October 2018.

Melissa Low interviewed by *Channel News Asia* on climate change, 3 October 2018.

Allan Loi quoted in "Full Opening of Electricity Market in Singapore to Fire Up Competition: What Will Retailers Do?", *Channel News Asia*, 1 October 2018.

Allan Loi quoted in "Singapore to Open up Retail Electricity Market from November: What It Means for Consumers", *Channel News Asia*, 1 October 2018.

Philip Andrews-Speed interviewed by *PV Magazine* on China's PV deployment and manufacturing, 25 September 2018.

Philip Andrews-Speed interviewed by *Radio Free Asia* on winter gas supply and demand in China, 3 September 2018.

Philip Andrews-Speed interviewed by *S&P Global Platts* on the Belt and Road Initiative in Southeast Asia, 1 August 2018.

Philip Andrews-Speed interviewed by *Radio Free Asia* on summer electricity demand in China, 24 July 2018.

Shi Xunpeng interviewed by 21世纪经济报道 (*21st Century Business Herald*) on 油价上升呼唤中国价格 (Rising Oil Price Calls for Chinese Price), 26 April 2018.

Recent Events

ESI's Dr. Victor Nian opening the seminar on Governing Nuclear Safety and Security in China (Photo by ESI).

ESI's Dr. Philip Andrews-Speed discussing China's nuclear power safety (Photo by ESI).

5 December, "The Outlook for China's Nuclear Power Industry: Technology and Safety" (ESI Seminar)

Dr. Victor Nian, ESI Research Fellow, opened this seminar by examining the outlook for China's nuclear power technology and the challenge of governing the safety of its domestic installations. He began by presenting a historical review of reactor technology and market development in China and worldwide. He then addressed the future of Chinese indigenous technologies in domestic and foreign markets. Next, Dr. Philip Andrews-Speed, ESI Senior Principal Fellow, explained that the safety of China's fleet of nuclear power plants is of concern not only to the country's leadership and citizens, but also to the wider Asian region. He explained that the ability of China's government to ensure the safety of its nuclear power plants has come under scrutiny both at home and abroad due to the rapid growth of the country's fleet of nuclear power plants, the perceived inadequacies of the nuclear safety regulator, deficiencies in the legal framework, potential weaknesses in the safety culture, a lack of transparency in the industry, the potential for malfeasance and corruption and the generally low standard of safety in other energy industries. He concluded the seminar with a summary of the progress made in recent years and the remaining challenges in governing nuclear safety in China.

21 November, "NUS-Sweden Arctic Roundtable" (Joint Roundtable)

On 21 November 2018, the National University of Singapore and the Embassy of Sweden in Singapore organised an NUS-Sweden Arctic Roundtable at the Shaw Foundation Alumni House, NUS. The aim of the event was for NUS participants to learn more about Sweden's interests and activities in the Arctic, and likewise,

Participants at the NUS-Sweden Arctic Roundtable (Photo by NUS).

for the Swedish delegation to learn more about NUS Arctic research activities. Representatives from the Ministry of Foreign Affairs, Singapore also participated in the event.

This event was jointly moderated by Ms. Helena Reitberger (Embassy of Sweden) and Dr. Christopher Len (Energy Studies Institute). It started with welcome remarks by HE Niclas Kvarnström, Ambassador of Sweden to Singapore and a general introduction to NUS by Professor Chow Yean Khow, Executive Director of the Maritime Institute at NUS. This was followed with introductions by the overseas Swedish visitors and NUS participants. HE Björn Lyrvall, Ambassador of Sweden for Arctic Affairs and Associate Professor Katarina Gårdfeldt, Director General of the Swedish Polar Research Secretariat presented Sweden's Arctic engagement and research activities. The NUS presenters then outlined their respective Arctic-related research areas covering the Law of the Sea (Associate Professor Robert Beckman), Arctic engineering (Professor Chow Yean Khow), glacial ice (Associate Professor Chitre Mandar) and energy policy (Dr. Philip Andrews-Speed and Dr. Christopher Len).

The participants then engaged in a free-flow general discussion in which the two sides exchanged views and discussed possible areas of collaboration. The event ended with closing remarks by both HE Björn Lyrvall and Professor Chow Yean Khow. After the roundtable, the participants continued the conversation over a lunch hosted by HE Niclas Kvarnström.

2 November, "Roundtable E: Unlocking Power System Flexibility: Innovative Wholesale Market Design and Business Models" (SIEW Roundtable)

Dr. Liu Yang with Ms. Jennifer Riesz, Dr. Dae Kyeong Kim and Mr. Nicolas Payen (Photo by ESI).

The roundtable organised by ESI for the 2018 Singapore International Energy Week (SIEW) focused on power system flexibility in the context of renewable energy integration. By bringing together global industry experts and business leaders, it aimed to generate discussion on how market players can access opportunities to unlock the system-wide flexibility potential through innovative market design, and also to investigate new business models to encourage long-term investments in modern power systems. Dr. Liu Yang, Senior Research Fellow

ESI's Dr. Liu Yang with Mr. Itamar Orlandi, Mr. Zhiwei Cheng and Dr. Aaron Praktiknjo. (Photo by ESI).

at ESI gave the opening remarks. Ms. Jennifer Riesz, Principal, Operational Analysis and Engineering at the Australian Energy Market Operator (AEMO) presented the Australian case study of integration of distributed energy resources. Dr. Dae Kyeong Kim, Senior Energy Specialist at the Asian Development Bank discussed demand response as a tool to ensuring power system flexibility and regulation of supply. Mr. Nicolas Payen, CEO and Co-founder of Positive Energy Ltd., described the use of block chain technology in the electricity market. Mr. Zhiwei Cheng from Electrify Asia explained time-of-use pricing and smart contracts. Mr. Itamar Orlandi, Head of Frontier Power research at Bloomberg New Energy Finance outlined global experiences with markets and technologies for grid flexibility. Dr. Aaron Praktiknjo, Assistant Professor in the E.ON Energy Research Center at RWTH Aachen University in Germany shared some of Germany's experiences in supporting renewable electricity and investments in conventional generation in its "Energiewende".

25 October, "ENERGY STAR as a Model for Standards and Labelling Programmes" (ESI Seminar)

Mr. Derek Greenauer addressing the audience at ESI (Photo by ESI).

Mr. Derek Greenauer, Director of Global Government Affairs at Underwriters Laboratories gave a presentation on the rise, fall, then resurrection of the ENERGY STAR label as a symbol of integrity for energy efficient products. Today, ENERGY STAR® is the US government-backed symbol for energy efficiency, providing simple, credible and unbiased information that consumers and businesses rely on to make well-informed decisions. Mr. Greenauer detailed the roles that each of the programme stakeholders (product manufacturers, retailers, electric utilities, 3rd party test labs, and the government) plays in the success of the programme. He also discussed how UL helps companies demonstrate safety, confirm compliance, enhance sustainability, manage transparency, deliver

quality and performance, strengthen security, protect brand reputation, build workplace excellence and advance societal well-being. Some of the services offered by UL include: inspection, advisory services, education and training, testing, auditing and analytics, certification software solutions and marketing claim verification.

19 September, "Security of Electricity Supply with Growing Shares of Renewables and Phase-Out of Conventional Generators" (ESI Seminar)

ESI's Dr. Liu Yang introducing Professor Aaron Praktiknjo (Photo by ESI).

Professor Aaron Praktiknjo presented new approaches and insights gained from recent electricity and energy developments in Germany. By applying energy economic theory, he elaborated on what one might identify as optimal levels of reliability in energy systems from a welfare economics perspective. His preliminary conclusions show that the current security of supply in Germany is very high, but the ongoing phase-out of nuclear energy will decrease this as renewables are currently not able to effectively compensate for conventional energy sources. Despite the looming fall in energy security, he noted that German society prefers the phase-out of nuclear energy. He added that energy policy-makers need to re-evaluate the acceptable levels of energy security for society given the impacts of the ever-changing energy landscape.

11 September, "Energy Efficiency Prosperity in ASEAN" (Joint Workshop)

Panellists at the Energy Efficiency Prosperity in ASEAN workshop organised by ESI in Chiang Mai, Thailand (Photo by ESI).

On 11 September 2018, ESI convened a workshop, "Energy Efficiency Prosperity in ASEAN" in Chiang Mai, Thailand. Held in collaboration with the Asia Pacific Economic Cooperation (APEC) energy working group, this workshop was co-timed with the 52nd Meeting of the APEC Expert Group on Energy Efficiency and Conservation and the 51st Meeting of the APEC Expert Group on New and Renewable Energy Technology,

Panellists at the Energy Efficiency Prosperity in ASEAN workshop organised by ESI in Chiang Mai, Thailand (Photo by ESI).

Group photo of event participants at the Energy Efficiency Prosperity in ASEAN workshop organised by ESI in Chiang Mai, Thailand (Photo by ESI).

hosted by Thailand's Ministry of Energy from 10 to 14 September 2018.

With the total energy demand of the ten countries of the ASEAN forecasted to grow by almost two-thirds over the next two decades, the grouping is set to become a significant game changer in the global energy landscape. This workshop examined the role of energy efficiency in transitioning to a sustainable energy system in ASEAN, with a particular focus on the prospects of the Energy Services Company (ESCO) market.

Dr. Liu Yang, Senior Research Fellow at ESI, and Ms. Munlika Sompranon, Director of International Cooperation in the Department of Alternative Energy Development and Efficiency of Thailand's Ministry of Energy, opened the workshop and welcomed ASEAN-wide experts to enhance cross-country learning for energy efficiency prosperity. The experts from the ASEAN Centre for Energy, the Philippines' Department of Energy, Thailand's King Mongkut's University of Technology Thonburi, Vietnam's National Institute for Science and Technology Policy and Strategic Studies, China's National Institute of Standardization, Bangladesh's Institute for Policy, Advocacy and Governance, Sydney's University of Technology, and Singapore's NEXERGY, provided insights into the challenges and prospects of the ESCO market and energy efficiency financing instruments in ASEAN.

Ms. Melissa Low, Dr. Dina Azhgaliyeva, Dr. Victor Nian, and Dr. Zhong Sheng of ESI moderated the workshop sessions and participated in the discussion. The ESI team also participated in the 52nd Meeting of APEC

Expert Group on Energy Efficiency and Conservation and the 51st Meeting of the APEC Expert Group on New and Renewable Energy Technology.

10 September, "The 5th Asian Energy Modelling Workshop" (ESI Workshop)

Participants at ESI's 5th Asian Energy Modelling Workshop (Photo by ESI).

The focus of ESI's *5th Asian Energy Modelling* Workshop was the use of modelling to achieve global sustainability in 2050. Professor Ang Beng Wah, ESI's Executive Director, gave the welcome address. The two-day event broadly covered Nationally Determined Contributions (NDCs) and 2050 targets, carbon markets, the energy-water-waste nexus, as well as other topics. Dr. Edward Byers from the International Institute for Applied Systems Analysis (IIASA) in Austria gave an overview of the global climate and development hotspots assessment, with a focus on Asia. Professor Qiaomei Liang from the Beijing Institute of Technology in China presented an integrated assessment of INDCs under Shared Socioeconomic Pathways through an implementation of C3IAM. Dr. Anna Krook-Riekkola from the Luleå University of Technology in Sweden shared the modelling experience of Sweden, in terms of the challenges in modelling ambitious climate targets and long-term strategies.

Dr. Martin Cames from the Institute for Applied Ecology, in Germany gave an overview of the international aviation sector's contribution to global greenhouse gas mitigation efforts. Professor David Stern from the Australian National University looked at the economy-wide rebound effect. Dr. Fei Teng from Tsinghua University in China focused how non-CO_2 greenhouse gas emissions in China can be further reduced in the country's NDC. Dr. François Lafond of the University of Oxford in the UK discussed time series forecasting of technological progress in renewable energy technologies. Dr. Jooyoung Park of Korea University in South Korea gave an overview of the resource-based paradigm and approaches for a circular economy. Professor Maosheng Duan, from China's Tsinghua University, highlighted the influence of different allowance allocation methods on China's economic and sectoral development.

Professor Toshihide Arimura of Waseda University in Japan, examined carbon pricing in Japan and shared the experiences of the Tokyo ETS and its future prospects. Dr. Young-Hwan Ahn of the Korea Energy Economics Institute (KEEI) gave an update on the South Korean carbon market and the prospects for CO_2 abatement costs in the country. Dr. Xin Zhou of the Institute for Global Environmental Strategies (IGES) in Japan presented an introduction of the integrated Green Economy Modelling Framework and its application to modelling a carbon tax in Mexico. Mr. Maurizio Gargiulo of E4SMA s.r.l. in Italy presented an overview of the IEA-ETSAP technology collaboration programme, including the community, tools and application examples. Dr. Luck Reedman of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia outlined the key considerations in developing a TIMES model for Australia. Dr. Kannan Ramachandran of the Paul Scherrer Institute (PSI) in Switzerland gave examples and insights from Swiss and international studies of incorporating detailed technology data in bottom-up energy systems models. Dr. Su Bin, Senior Research Fellow at ESI, delivered the closing remarks.

The workshop covered a wide range of energy system models, such as bottom-up technology rich models, top-down macroeconomic models, sector specific models, integrated assessment models, agent-based models, climate impact models and decision-making models. The workshop was attended by students, scholars, policy experts and business strategists.

1 September, "Youth Seminar: What a Changing Arctic Means for Singapore" (Joint Seminar)

Group photo of the organisers and key participants of the "What a Changing Arctic Means for Singapore" youth seminar at the Singapore Sustainability Academy (Photo by ESI).

On 1 September 2018, ESI and Global Compact Network Singapore (GCNS) jointly organised a youth seminar entitled "What a Changing Arctic Means for Singapore" which took place at the Singapore Sustainability Academy. This seminar consisted of a panel discussion followed by a Q & A session. Its objective was to raise awareness about the changes taking place in the Arctic and to enable the youth in Singapore to reflect on how developments unfolding more than 7,000 kilometres away will affect them. The panellists discussed what it is like to live and work in the Arctic, how the region is changing and why it matters to Singapore, the ways to advance sustainable development in the Arctic and the implications of a changing Arctic for Singapore's global competitiveness.

Following welcome remarks by Professor Ang Beng Wah, ESI's Executive Director, Mr. Wilson Ang, Executive Director of GCNS and Ms. Esther An, Chief Sustainability Officer of City Developments Limited gave some introductory remarks. The Guest-of-Honour, Mr. Sam Tan Chin Siong, Minister of State, Ministry of Foreign Affairs and Minister of Social and Family Development delivered the event's closing remarks.

The panel discussion was chaired by Dr. Philip Andrews-Speed, Senior Principal Research Fellow at ESI. The panellists included Ms. Gail Mosey, Arctic Renewable

Energy Atlas (AREA) Project Leader at the National Renewable Energy Laboratory (USA), Mr. Johannes Vallivaara, CEO of ProAgria Lapland (Finland), Ms. Goh Shu Hui Gina, Singapore Representative of the Arctic Youth Network, and Mr. Simon Kuik, Head of Research and Development at Sembcorp Marine. Dr. Christopher Len wrapped up the event with a vote of thanks for the co-organisers, participants and audience.

This event was supported by Singapore's Ministry of Foreign Affairs, while the venue space and lunch were sponsored by the Singapore Sustainability Academy and City Developments Limited. The National Youth Achievement Award Council and Eco-Business were supporting partners for this event.

31 August, "India's Global Energy Engagements: Ambitions and Outcomes" (Joint Seminar)

At this seminar jointly organised by ESI and the Institute of South Asian Studies at NUS, Mr. Vikram Singh Mehta, Executive Chairman of Brookings India, and Senior Fellow at the Brookings Institution in the United States gave a presentation on India's energy demand and the ways it is seeking to secure its energy future. Mr. Mehta explained that coal is the main fuel used at India's power stations and that the ever-increasing consumption of coal has led to significant environmental concerns. He noted that nuclear energy has not taken off in a significant manner, but that there is a focus on solar and wind power. Oil and gas will remain in India's energy mix, but the country will continue to search for other long-term energy sources. He examined the progress of the various alternative forms of energy and highlighted that there are many geopolitical, diplomatic and financial challenges.

29 August, "Arctic Renewable Energy Atlas Project (AREA) Workshop Singapore" (Joint Workshop)

Participants at the Arctic Renewable Energy Atlas (AREA) Project workshop (Photo by ESI).

On 29-31 August 2018, ESI hosted the Arctic Renewable Energy Atlas (AREA) Project workshop in Singapore. Initiated by the Arctic Council's Sustainable Development Working Group (SDWG), AREA employs a range of research resources such as maps and data, storytelling, etc., in order to integrate all of the available knowledge and develop the best practices and local policies for renewable energy within the Arctic region.

The three-day event—consisting of the Arctic Renewable Energy Atlas (AREA) Project workshop, meetings and a field trip—was supported by Singapore's Ministry of Foreign Affairs. There were over twenty workshop participants with representatives from Canada, Finland, Iceland, Norway, Sweden, Russia and the US, as well as Southeast Asian participants from the Philippines, Myanmar and experts based in Singapore.

The objective of the workshop was to facilitate the discussion of AREA Project topics by the Arctic participants, focusing on renewable energy resource potential, data management and visualisation, as well as Arctic country energy profiles. In addition, the event provided an opportunity for participants from the Arctic and Southeast Asia to share best practices and exchange knowledge on sustainable energy initiatives and projects, with a focus on energy transition challenges surrounding remote and "islanded" communities in both regions. In this regard, the non-Arctic participants shared the Southeast Asian experience on renewable energy developments, with speakers covering topics such as energy access in remote communities in Myanmar and the Philippines, the deployment of solar energy in the region, low carbon energy finance and institutional governance.

Several ESI researchers participated in the workshop. Dr. Philip Andrews-Speed, Senior Principal Research Fellow, served as a moderator for one of the workshop sessions and presented a comparative overview of the Arctic and Southeast Asian energy landscapes. Dr. Christopher Len and Dr. Liu Yang, Senior Research Fellows, also served as moderators. Mr. Gautam Jindal, Research Fellow, gave a presentation on the Southeast Asian energy landscape. Mr. Leow Foon Lee, Adjunct Principal Research Fellow, delivered a presentation on low carbon energy finance in Southeast Asia.

On 31 August 2018, the workshop participants visited Singapore's Marina Barrage and the Sustainable Singapore Gallery where they learned about Singapore's sustainability efforts and climate action plan, as well as current and planned water and energy conservation projects.

This event was jointly convened by Ms. Gail Mosey (AREA Project Lead) and Dr. Christopher Len (ESI Senior Research Fellow).

16 August, "Climate Action and Sustainable Development—Where are We Now?" (Joint Event)

Speakers at the Climate Action and Sustainable Development —Where Are We Now? Dialogue at the Marina Barrage (With permission from the National Youth Council Singapore).

On 16 August 2018, ESI, together with the NUS Office of Environmental Sustainability and the National Youth Council Singapore, hosted a documentary screening of *Before the Flood* directed by long-time environmental advocate Leonardo DiCaprio and a dialogue entitled "Climate Action and Sustainable Development — Where Are We Now?" to take stock of climate action and sustainable development in Singapore. The event was held at the Marina Barrage, which celebrates its 10th anniversary this year and where the Sustainable Singapore Gallery (SSG) was relaunched in June 2018 with a 1.5-year upgrade to both its format and content. ESI worked with the Public Utilities Board (PUB) to organise a guided tour of the SSG as part of this event. A panel discussion moderated by Ms. Melissa Low, Research Fellow at ESI followed. The panel included Assistant Professor Winston Chow, Department of Geography at NUS and the Intergovernmental Panel on Climate Change (IPCC) Working Group 2 AR6 Lead Author on Cities; Mr. Eugene Ang, Senior Executive, Outreach and Engagement, Communications & 3P Partnership Division of Singapore's Ministry of the Environment and Water Resources; Mr. Veerappan Swaminathan, Founder and Director of the Sustainable Living Lab; and Ms. Karen Lee, Sustainability Lead, Asia, Interface.

13 August, "Climate Change Negotiations Training Workshop for NUS and Singapore Youth" (Joint Workshop)

Participants at the Climate Change Negotiations Training Workshop for NUS and Singapore Youth at The Red Box (Photo by ESI).

Workshop participant Angie Cho sharing her project idea at the final session. (Photo by ESI)

From 13 August to 17 September 2018, ESI conducted climate change negotiations training workshop sessions for thirty-five youth under the age of 35 to help them get a better understanding of the complex negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and how countries are responding. The workshops were conducted in partnership with the NUS Office of Environmental Sustainability, NUS Ridge View Residential College (RVRC) and the National Youth Council of Singapore. This was the first time such a workshop had been conducted for the youth in Singapore. It was co-run as a Year Two RVRC Forum on Resilience. Specifically, the rubrics for class participation and participant briefs for the assignments were designed with the help of Sadaf Ansari, Associate Director of Studies at RVRC. The sessions, conducted by Ms. Melissa Low, Research Fellow at ESI, included an introduction to the UNFCCC and its Paris Agreement, the role of youth, national perspectives on climate change and Singapore's participation at the UNFCCC. One unique feature of the workshop was the online tracking of the Bangkok Climate Change Conference, where countries met from 4–9 September 2018 in Bangkok, Thailand to develop the Paris Agreement climate "rulebook" for adoption by Parties to the UNFCCC by December 2018. Following the workshop's conclusion on 17 September 2018, ESI selected a total of five participants and observers who attended the workshop sessions to represent NUS at COP24 in Katowice, Poland. The NUS delegation comprised students from the Lee Kuan Yew School of Public Policy, NUS Law Faculty and Yale-NUS College.

Workshop participants at NUS Ridge View Residential College (Photo by ESI).

25 July, "Integrated Energy Systems Analysis to Support a More Sustainable, Secure and Resilient Energy Future" (ESI Seminar)

Dr. Peter Burgherr speaking at ESI (Photo by ESI).

Dr. Peter Burgherr, Head of the Technology Assessment Group (TAG) at the Paul Scherrer Institut in Switzerland and PI Future Resilient Systems (FRS) at the Singapore-ETH Centre (SEC) in Singapore gave a presentation on the overarching analytical framework for integrated assessment of energy technologies and scenarios developed and implemented at the Paul Scherrer Institut (PSI), as well as a short overview of the ongoing project activities. He later spoke on the comparative risk assessment of accidents in the energy sector, and its relevance in the broader context of sustainability, energy security, critical infrastructure protection and resilience, with a focus on ongoing research activities within the Future Resilient Systems (FRS) programme. He concluded with a short presentation on energy economic modelling followed by selected highlights.

10 July, "Nuclear Off-Site Emergency Preparedness and Response in the Aftermath of Fukushima" (Joint Workshop)

Mr. Bojan Tomic at the Nuclear Off-Site Emergency Preparedness and Responses in the Aftermath of Fukushima Conference (Photo by ESI).

Professor Gunther Handl at the Nuclear Off-Site Emergency Preparedness and Responses in the Aftermath of Fukushima Conference (Photo by ESI).

Organised by ESI and the Centre for International Law (CIL), this conference aimed to address some of the major international public policy and legal challenges in nuclear emergency preparedness and response (EPR). The speakers first reviewed the drive to harmonise EPR bilaterally, regionally and globally. Mr. Bojan Tomic, ENCO in Vienna examined the policy reasons favouring close coordination of national nuclear EPR measures among neighbouring countries against the background of the Chernobyl and Fukushima accidents. He then discussed emergency planning zones and distances. Panellists then examined the present international normative setting of EPR, principally the IAEA-centred framework (including relevant conventions, safety standards, operational arrangements and services), and international nuclear emergency assistance arrangements (with a special

Professor Gunther Handl (standing) with the panellists (seated) at the Nuclear Off-Site Emergency Preparedness and Response in the Aftermath of Fukushima Conference (Photo by ESI).

focus on the role of the IAEA's Incident and Emergency Centre). Professor Gunther Handl, from the Tulane University in New Orleans reviewed basic international legal EPR requirements and discussed IAEA safety standards, operational arrangements and services, as well as complementary EPR efforts by other organisations and the nuclear industry. Mr. João Oliveira Martins from the Portuguese Environment Agency in Lisbon explored emergency assistance during the early stages of a nuclear accident and the international assistance framework centred on the 1986 Assistance Convention, its mechanisms and the IAEA's special role in it. The conference concluded with a review of the present status of and future prospects for transboundary cooperation on nuclear EPR in the ASEAN region. Dr. Tumnoi Yutthana from the Office of Atoms for Peace in Bangkok provided an overview of nuclear EPR co-operation in the region, its problems and prospects; and discussed important lessons to be learned by the ASEAN region from the European and Nordic experience.

Contact

- Collaboration as a Partner of ESI (research, events, etc)
- Media Enquiries
- ESI Upcoming Events
- Join ESI Mailing List

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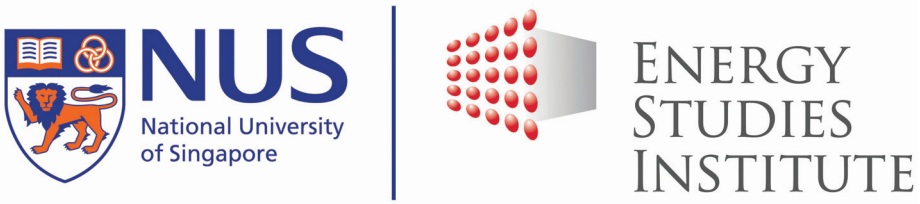

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