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Chinese Pipeline under Construction in Hsipaw, a Town in Shan State, 200 km Northeast of Mandalay, Myanmar. Photo by Axel Drainville / Flickr (Permission Under CC BY-NC 2.0 License)

INTRODUCTION

The theme of this issue is energy market integration in Southeast Asia and the wider Asia-Pacific region.

Greater energy market integration through the construction of a regional pipeline network and a regional power grid could potentially help eradicate energy poverty in the region, enhance energy security and improve energy efficiency. It could also make for less environmentally destructive development.

While the governments of the Association of Southeast Asian Countries (ASEAN) governments have made notable progress in providing electricity to their citizens in recent years, 22 per cent of the region's total population (134 million people) still has no electricity: Cambodia (66 per cent), Indonesia (27 per cent), Laos (22 per cent), Malaysia (1 per cent), Myanmar (51 per cent), Philippines (30 per cent), Thailand (1 per cent) and Vietnam (4 per cent).[1] Some 47 per cent of ASEAN's total population is still relying on the traditional use of biomass for cooking: Cambodia (88 per cent), Indonesia (42 per cent), Laos (65 per cent), Malaysia (3 per cent), Myanmar (92 per cent), Philippines (50 per cent), Thailand (26 per cent) and Vietnam (56 per cent).

The ASEAN Power Grid (APG) is a flagship programme mandated in 1997 by the ASEAN Heads of States. Under the ASEAN Vision 2020, the APG seeks to ensure regional energy security and promote the efficient utilisation and sharing of the region's energy resources by implementing 15 interconnection projects. Four of these identified projects are in operation, three are under construction and eight are under preparation through 2015. The required investment for the APG is estimated at US$ 5.9 billion.

The demand for electricity in ASEAN is projected to grow at a rate that is much higher than the world average and it is hoped that the APG can provide a stable flow of electricity and greatly contribute to economic growth and modernisation by optimising energy generation and development, increasing cross-border trade in electricity and promoting potential reserve sharing schemes. The project is set to be completed by 2020, by which time all of the ASEAN member states would be connected through to a common grid.

There are, however, many obstacles that could impede the progress and success of the APG. The absence of convergence of the electricity markets and tariffs within the region is a major impediment and so far, the negotiations have led only to bilateral, instead of multilateral/regional, electricity trading agreements. The three APG projects that have been constructed to date are the Lao-PDR-Vietnam line, the

In this issue ...

Slums Built on Swampland Near a Garbage Dump in East Cipinang, Jakarta. Photo by Jonathan McIntosh, 2004 / Wikimedia Commons (Permission Under CC BY 2.0)

Lao PDR-Cambodia line and the Thailand-Lao PDR line. Potential APG projects include the Batam-Bintan-Singapore line, the Peninsular Malaysia-Sumatra line, the Sarawak-Peninsular Malaysia line, the Sarawak-West Kalimantan line, the Sarawak-Sabah-Brunei line, the Philippines-Sabah line, the Thailand-Myanmar line and the Kalimantan-Sabah line.

The articles in this issue focus on the opportunities and challenges of integrating Southeast Asia's and the Asia-Pacific's transmission lines and energy market. In the first article, Dr Noeleen Heyzer, Under-Secretary-General of the United Nations and Executive Secretary of the Economic and Social Commission for Asia and the Pacific, proposes the development of an Asian Energy Highway (AEH) to address the region's energy challenges. The APG and Trans-ASEAN Gas Pipeline (TAGP) are both fundamental to the AEH concept. As the AEH is a transnational initiative, there would be policy and institutional challenges associated with it. Its successful implementation would require the development of a regional cooperative framework and the harmonisation of the region's electricity industries, energy laws, rules and regulations.

In the second article, Dr. Philip Andrews-Speed, Principal Fellow and Head of the Energy Security Division at the Energy Studies Institute and member of the Advisory Committee for the ASEAN Energy Market Integration (AEMI) Initiative, discusses the significance of the AEMI initiative as an important condition for achieving sustainable growth within the framework of an ASEAN Economic Community. It is hoped that the AEMI could contribute to energy diversification, energy security, lower energy system costs, as well as greater energy efficiency and electrification rates. He notes that binding treaties and a deeper level of trust and understanding are fundamental to the development of this initiative. It is envisaged that the AEMI would be similar to the European Network of Transmission System Operators for Electricity (ENTSO-E) that is currently running in Europe. The ENTSO-E represents all transmission system operators in the European Union and other electric markets that are connected to it. The ENTSO-E was established to harmonise the EU's electricity markets, engender cross-border trade and facilitate the sharing of technical knowledge and expertise.

The final article, written by Mr. Beni Suryadi, Programme Officer for Regional Energy and Planning at the ASEAN Centre for Energy, provides an overview of progress of the TAGP. He notes that in order for ASEAN to fully embrace the TAGP, more should be done to encourage investment in production facilities and transportation infrastructure, ensure that pricing policies benefit both investors and consumers, and safeguard the equitable distribution of natural resources.

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[1] All of these figures are from International Energy Agency, *Southeast Asia Energy Outlook: World Energy Outlook Special Report* (Paris: OECD/IEA, 2013), Table 1.3, p. 27.

The Asian Energy Highway: Its Critical Role in Supporting Regional Energy Security and Sustainable Energy for All

Dr. Noeleen Heyzer, Under-Secretary-General of the United Nations and Executive Secretary of the Economic and Social Commission for Asia and the Pacific (ESCAP)

Energy: A Major Development Challenge for the Asia-Pacific Region

Energy is essential for inclusive and sustainable development. It plays a significant role in poverty reduction, environmental sustainability, and offers opportunities to improve people's lives. 2012 was a significant year for global action in the area of energy. At the Rio+20 Conference, the Member States of the United Nations recognised the critical role that energy plays in development, as access to sustainable modern energy services contributes to poverty eradication, saves lives, improves health and helps provide basic human needs. It was also the year in which the United Nations General Assembly declared 2014-2024 to be the "Decade of Sustainable Energy for All", recognising "that...access to modern affordable energy services in developing countries is essential for the achievement of the internationally agreed development goals, including the Millennium Development Goals (MDGs), and sustainable development, which would help to reduce poverty and improve the conditions and standard of living for the majority of the world's population." In addition, the Secretary-General launched his "Sustainable Energy for All" initiative, to mobilise action from all sectors of society in support of three interlinked objectives to be achieved by 2030: providing universal access to modern energy services, doubling the global rate of improvement in energy efficiency and doubling the share of renewable energy in the global energy mix.

These goals present a significant challenge for the countries of Asia and the Pacific, given their efforts to accelerate poverty eradication and to ensure sustainable economic growth. Despite progress made in recent years, the Asia-Pacific region still has about 628 million people living without electricity and about 1.8 billion without clean cooking fuel.

Industrial development, along with rising incomes and living standards of growing populations, has led to a considerable surge in regional energy demand. The development centres of China and India are, in particular, expected to continue to lead growth in global energy demand, with forecast increases of about 60 per cent, and more than 100 per cent respectively, from 2010 to 2035.[1] Consequently, meeting these rapidly growing needs in order to ensure the continuation of development, has become a major priority for the governments of the region.

Whilst the Asia-Pacific, on the whole, has considerable potential for the development of a variety of conventional, alternative, and renewable energy technologies, the availability of these energy reserves remains unevenly distributed throughout the region, in terms of both supply and demand, as well as the national capacities to develop such resources. As a result, it has been predicted that, by 2035, most of the countries in the region will be producing less than half of the energy they need, resulting in a heavy dependence on energy imports, particularly oil.[2]

In this context, it has been argued that the realisation of more sustainable energy paradigms are also held back, to a certain extent, by the ongoing legacies and costs of historical investments in less sustainable and inefficient energy production and delivery systems.[3] To address these pressing issues, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) has been investigating a range of solutions to address the region's energy challenges.

ESCAP believes that enhanced regional cooperation presents a unique opportunity to develop a common vision and response to shared vulnerability and to improve energy security for ESCAP member States. To enhance energy security, promote "Sustainable Energy for All", and in recognition of the opportunities inherent within cooperation, ESCAP is proposing a bold new regional initiative - the "Asian Energy Highway" (AEH).

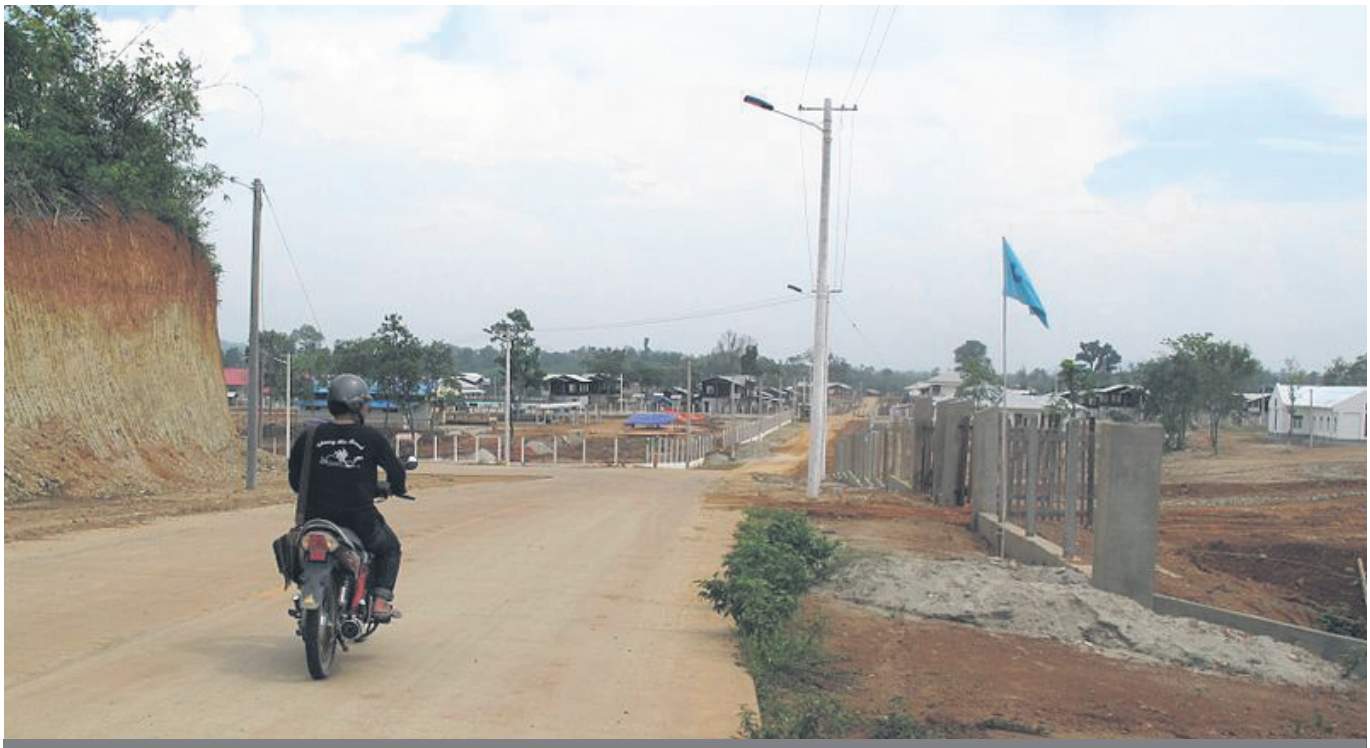
Asian Energy Highway: Vision for Enhanced Energy Security in Asia and the Pacific

The AEH concept is a proposal which aims to recognise and improve upon existing initiatives for sub-regional energy cooperation, by elevating aspects of energy planning, infrastructure development and power trading, in Asia and the Pacific, to the regional level. The development of an integrated regional power grid is expected to be the focal point for enabling improved energy security and access, and optimising efficiencies in energy resource production and consumption, in a cleaner, lower carbon way.

Due to the growth of the power sector in terms of its consumption of energy resources, and its critical role for delivering energy access, several sub-regional initiatives are already now in existence which promote linkages, specifically to form integrated electricity trading opportunities.

Examples such as the ASEAN Power Grid, the Greater Mekong Sub-region Economic Cooperation Program, the proposed SAARC (South Asian Association for Regional Cooperation) energy ring, and the Central Asia-South Asia Regional Electricity Market (CASAREM), are already beginning to provide the sub-regional framework over which a more regionally based AEH concept can be developed.

Integrating these concepts would not only lead to better physical connectivity between countries, but also promote greater institutional cooperation, including the development of capacities for regional energy markets. Under such a potential regional energy arrangement, low-carbon paths that place more emphasis on efficiency and take greater advantage of renewable resources could be explored. Importantly, the AEH would help to address the power deficit as part of working towards the goal of universal access to modern energy services.



New Concrete Road and Electricity Supply for Tang Hpre Village after Relocation. This village had to be moved in order to make way for the Myitsone Hydroelectric Power Dam on the Irawaddy River in northern Myanmar. Photo by Rebecca W, 2011 / Flickr (Permission Under CC BY-SA 2.0 License)

Supporting Universal Access to Modern Energy Services and Supply Diversity

It has been estimated that a total investment of about US$1 trillion will be required to achieve universal energy access by 2030, an average of US$49 billion per year from 2011 to 2030. This requirement is small when compared to global energy-related infrastructure investment - equivalent to about three per cent of the total.[4]

A lack of access to modern energy services severely restricts income generation opportunities. At the same time, household indoor air pollution (IAP) from the use of biomass in inefficient stoves, coupled with inadequate ventilation, presents a significant health risk. WHO estimates that IAP could lead to more than 1.5 million premature deaths per year (over 4,000 per day) in 2030. Amongst these potential casualties, women and children remain the most vulnerable groups, revealing the need to secure women's empowerment and to close gender gaps within any new energy development model.

Globally, it is estimated that to ensure universal electricity access by 2030, a staggering 80 per cent will be provisioned via on-grid and mini-grid technologies.[5] This is especially the case within Asia and the Pacific, where a large proportion of the population lives in rural areas, with low population densities and limited demands. As such, grid-based electrification continues to be the backbone of energy access efforts in Asia and the Pacific, both in terms of investment and the number of people reached.[6]

In supporting these energy access requirements, ESCAP believes that investment in a regionally-integrated power grid presents an opportunity to ensure both a reliable supply to the economic growth centres and also to improve opportunities for regional energy expansion.

Such capacity-building will become increasingly crucial as the geographical intensity of energy access requirements faces increasing demographic pressures. Recent forecasts predict, for instance, a doubling of the populations of Asia's urban centres, from 1.6 billion to 3.1 billion by 2050.[7] Maintaining a secure energy supply for growth centres is critical for ensuring the progress and growth needed for poverty eradication in developing countries, and also as a means to shift economies already approaching key boundaries to more inclusive, sustainable and resilient growth paths.

Another key driver of energy security is diversification of the energy mix. By focusing on regional integration within the power sector, opportunities can be created to not only encourage energy mix diversification in the short-term, but to also invest in dynamic systems with the regional capacity to adjust to ongoing developments in power generation technology. Such integration also creates increased opportunity for energy pooling, where the ultimate evolution of such a system could potentially involve the development of a regionally competitive electricity trading marketplace.

Such a marketplace would also improve capacities for increasing competition in the pricing models of national energy supplies, whilst concurrently providing an opportunity to alleviate government subsidy pressures. Although energy subsidies are currently essential national instruments to ensure affordable energy access for consumers across the region - such programmes are known to create major financial drains on government resources.[8] Enhanced regional power integration, through the AEH concept, could improve capacities to introduce greater pricing competition into national electricity markets, facilitating means to reduce costs while also providing opportunities for alternative energy investments.

Increasing the Share of Renewables in the Energy Mix for the Energy Future We Want

Renewable energy sources, such as solar, geothermal and wind, currently play a limited but growing role in meeting regional energy demands. Small-scale decentralised renewable energy systems are proving to be effective in widening access to energy services in remote areas of the region. However, it will require increased and larger-scale action to address both greenhouse gas emissions, and to improve energy security through supply diversity.

Despite high technical potential for generating electricity, renewable energy systems continue to be underutilised due to concerns regarding cost, reliability, density and relative proximity to centres of energy demand.[9] Improvement in power grid flexibility, through the AEH's regional integration for instance, presents an opportunity to enable optimisation of energy resources in generating electricity in response to varied levels of demand in the region. Wider geographical coverage of generational planning could also facilitate regional load-balancing opportunities, fostering improved potential for development and management of intermittent generation supplies, including improved potential for access to energy storage.[10]

The development of an integrated regional grid, utilising renewable energy technology, could become the focal point for promotion of diversification within the energy generation mix, optimising efficiencies in energy resource consumption, and reducing exposure to power shortages in a cleaner and lower-carbon manner. In this regard, the AEH could complement decentralised renewable energy access services by providing an infrastructure framework and economies of scale, to support bulk renewable power generation and transmission hubs, a system to provide energy to urban and industrial centres.

Improving Energy Efficiency for Win-win Solutions

The majority of Asia-Pacific economies consider energy efficiency to be one of their main priorities for energy, economic and climate policy – as well as being an important factor for enhancing energy security and for improving economic competitiveness. The promotion and implementation of energy efficiency varies considerably throughout the region. Despite the ambitious national efficiency targets established by many Asian countries, a key barrier to the use of more efficient products and technologies in developing countries remains higher initial costs. Even countries which have achieved a relatively rapid improvement in energy efficiency, such as the Republic of Korea, China and the Russian Federation, have only been able to achieve progress by setting clear targets, using the most advanced technology and leveraging their comparative affluence to raise additional private investment.

Developing countries within the region therefore face even greater challenges in doubling their rate of energy efficiency. Incorporating modern and efficient technologies in both the supply and the demand sectors, early in the process of development, has become one of the fundamental challenges for both energy efficiency and ensuring sustainable access. The likelihood of doubling the energy efficiency improvement rate is likely to improve considerably in these countries through regional knowledge sharing and the associated improved technical capacities that would be promoted and facilitated through a regional energy initiative.

The AEH concept presents a unique opportunity to assist developing countries to "leapfrog" traditional energy-intensive development processes. In this regard, a regionally coordinated energy system provides significant potential and enhanced scope for technology-sharing and the engagement of expertise from the private sector to leverage and drive utility improvements.

Policy and Institutional Challenges

The AEH is, by nature, a transnational initiative. Due to the technical complexity involved, significant cooperation at all levels will be necessary in order to facilitate a broader and more inclusive scope for energy planning and coordination within Asia and the Pacific. The promotion of harmonisation between electricity industries, at both an institutional and technical level among countries, will be essential in order to enhance integration opportunities, including regulatory coordination between institutions in developing a stable and secure cooperative development environment. The recognition and management of key policy and institutional bottlenecks is, therefore, critical to ensuring successful realisation of the initiative.

Although such processes can prove challenging, previous ESCAP initiatives in the field of trans-boundary connectivity, such as the Asian Highway and Trans-Asian Railway Network, provide examples and encouragement with regards to how necessary processes can be facilitated on such an ambitious regional scale. Effective and inclusive governance will remain a critical component, however, to appropriately manage the necessary partnerships between governments, research agencies and the private sector in order to facilitate regionally cohesive and effective planning.

Experience indicates that the initial challenge at the regional level lies in developing an institutional framework that can support the necessary intergovernmental cooperation. For this purpose, ESCAP can provide an enabling platform for transparent and progressive collaboration, to help address the natural reluctance which some nations may have to engaging in up-scaled regional energy development.

Transforming effective partnership mechanisms into necessary institutional development is also likely to be critical in ensuring the success and viability of the overall initiative. Such partnerships will need to be appropriately managed in order to maintain both transparency and legitimacy, and to ensure prioritisation of the regional development agenda. Harmonisation of rules and laws safeguarding energy trade in the region is also necessary, and will be critical in addressing concerns about national sovereignty.

The efficient management of large amounts of energy at a regional level is also likely to benefit from moving beyond bilateral arrangements towards a more regionally-based energy trading and development platform. International examples such as the European Network of Transmission System Operators for Electricity (ENTSO-E) do, however, show how work can progress towards the implementation of regional institutions for necessary network planning and development. Models of highly integrated, large-scale energy operation and trading are also available within the Asia-Pacific region, with respect to the Australian Energy Market Operator (AEMO) and its National Electricity Market (NEM), for instance.

Political Commitment: Critical in Moving Forward

An Asian energy compact – in effect, an energy game-changer – is needed to transform the Asia-Pacific into an energy-resilient region. To facilitate this, ESCAP organised the ministerial-level Asian and Pacific Energy Forum (APEF) 2013, to provide an opportunity for the forging of a forward-looking regional energy strategy.[11] It was a key intergovernmental platform for member States to agree on the policy options necessary to build a viable energy future for Asia and the Pacific.

The Asian energy compact, while complementing national economic development plans, should facilitate regional cooperation towards a more integrated energy system,

such as the proposed Asian Energy Highway. The strategy should contribute to the promotion of sustainable development through enhanced energy efficiency and economic competitiveness, renewable energy and environmental protection, and, importantly, through universal access to modern energy services and poverty reduction, at the national and household levels, especially for rural women and girls.

The priority for Asia and the Pacific should be to ensure long-term energy security and supply, and to create an advanced energy delivery system that is scalable and adaptable to new and ongoing developments in energy technology. The Asian Energy Highway will require strong economic and political cooperation and support from all ESCAP member States, and therefore presents both institutional and technical challenges for developing a sustainable solution to energy security and demand development in Asia. By building upon the skills and experiences of previous ESCAP regional infrastructural initiatives, we believe that we will be able to act on and achieve the vision of successfully delivering on the promise of "Sustainable Energy for All".

[1] OECD/IEA, *World Energy Outlook 2011*, at <www.worldenergyoutlook.org publications/weo-2012/> [October 2013].

[2] Asian Development Bank (ADB), *Asian Development Outlook 2013: Asia's Energy Challenge* (Manila: ADB Publishing, 2013).

[3] D. Helm, "The New Energy Paradigm", in *The New Energy Paradigm* edited by D. Helm (Oxford: Oxford University Press, 2007). H. Lund and W. Kempton, "Integration of Renewable Energy into the Transport and Electricity Sectors through V2G", *Energy Policy* 36(9) (2008): 3578–87; A. Zervos, C. Lins, and J. Muth, "Re-thinking 2050: a 100% Renewable Energy Vision for the European Union", *European Renewable Energy Council,* April 2010.

[4] OECD/IEA, 2012. *World Energy Outlook 2011*, op. cit.

[5] GET FiT Plus, "De-Risking Clean Energy Business Models in a Developing Country Context", DB Climate Change Advisors: Deutsche Bank Group, April 2011.

[6] UNESCAP, "Widening Energy Access and Enhancing Energy Security to Achieve the Millennium Development Goals in Asia and the Pacific", *ESCAP Energy Resources Development Series no. 42*. United Nations Economic and Social Commission for Asia and the Pacific, 2012, ST/ESCAP/2646.

[7] ADB, *ASIA 2050: Realizing the Asian Century* (Manila: ADB Publishing, 2011).

[8] UNESCAP, "Widening Energy Access and Enhancing Energy Security", op. cit.

[9] I. Kessides and D. Wade, "Towards a Sustainable Global Energy Supply Infrastructure: Net Energy Balance and Density Considerations", *Energy Policy* (39) (2011): 5322-44.

[10] A. Blakers, J. Luther and A. Nadolny, "Asia Pacific Super Grid: Solar Electricity Generation, Storage and Distribution", *Green* 2(4) (2012): 189–202.

[11] See http://www.unescap.org/apef/ (14 November 2013).

Promoting Energy Market Integration in ASEAN

Dr. Philip Andrews-Speed, Principal Fellow and Head of Energy Security at ESI and member of the Advisory Committee for the AEMI Initiative

Sual Power Plant, Pangasinan, Philippines. Photo by P199, 2012 / Wikimedia Commons (Permission Under CC BY-SA 3.0)

The ASEAN Economic Community (AEC) is one of the flagship projects of ASEAN today. Through the implementation of the ASEAN Trade in Goods Agreement (ATIGA), the ASEAN Comprehensive Investment Agreement (ACIA) and other measures, it is intended to transform ASEAN into a single market with a free flow of goods, services, investment and skilled labour. This in turn should support economic growth and poverty alleviation.

Despite the ambition and scope of the AEC, energy does not appear to play an explicitly important role in its strategy. This is unfortunate as energy is a key input into most forms of economic activity and great differences exist across ASEAN in both the availability of energy resources and the way in which they are managed. ASEAN has expended significant effort over the last 20 years to promote coordinated actions in the field of energy. These are

promulgated in the 5-yearly ASEAN Plans of Action for Energy Cooperation (APAEC) which are researched and drafted by the ASEAN Centre for Energy (ACE), based in Jakarta. Despite the wide range of important initiatives undertaken in the framework of successive APAECs, the issue of energy market integration has not figured prominently on ASEAN's agenda, though it has been a subject of research for the East Asian Summit.

National Highway No. 1 Southeast of Phnom Penh. Photo by KY Geologist, 2005 / Wikimedia Commons (Permission Under CC BY 2.0)

It was in this context that the idea for a project on ASEAN Energy Market Integration (AEMI) was conceived in January 2013 and progressively developed and funded by Chulalongkorn University, Thailand, notably the ASEAN Studies Centre, the Faculty of Economics and the Energy Research Institute. The AEMI Initiative was fuelled by an emerging consensus among a number of ASEAN academics that a successful AEMI would be a necessary condition for achieving sustainable growth in the framework of AEC. It would enhance energy security and environmental viability across the region and undoubtedly yield significant benefits for all involved, from the economic, societal and environmental perspectives. The ultimate objective of the AEMI Group is the adoption of AEMI within the framework of AEC, and its deployment through 2030.

Chulalongkorn University established an AEMI Advisory Committee to steer the process and to maintain momentum. The committee consisted of Dr. Bundhit Euaarporn, Professor, Director, Energy Research Institute (ERI), Chulalongkorn University; Dr. Chayodom Sabhasri, Associate Professor, Dean, Faculty of Economics, Chulalongkorn University; Dr. Philip Andrews-Speed, Principal Fellow, Energy Studies Institute, National University of Singapore; Dr. Suthipand Chirathivat, Executive Director, ASEAN Studies Center, Chulalongkorn University; and Dr. Thierry Lefevre, Professor Director, Centre for Energy-Environment Resources Development (CEERD), Thailand. The AEMI initiative was coordinated by Dr. Nawal Kamel, Visiting Professor, Faculty of Economics, Chulalongkorn University.

The plan was to build a constituency of academics across ASEAN universities and research institutes to make the case for AEMI, design its components and draw a plan for its delivery through 2030.

Track II: The Academic Foundation

An initial brainstorming meeting was held in Bangkok on 10 May 2013. It was attended by more than 20 academic researchers from across ASEAN, mainly energy economists. The participants at this meeting agreed to cooperate to produce a series of background papers which would provide the input to policy discussions to be held later in the year.

The central argument is that successive AEPECs have made important contributions to the development of the energy sector and to energy cooperation in ASEAN, but that this approach to regional energy governance in its current form has reached the limit of its potential. In order to reap greater benefits, member states need to agree to work together to gradually build a regional energy market which will eventually allow for the free flow of energy products, investment, services and skilled labour. In addition to the economic benefit of enhancing GDP, AEMI should bring energy benefits such as improvements in energy security, lower energy system costs, a higher level of energy diversification and improvements in energy development indicators. By linking energy deficient countries to energy abundant countries in the region, AEMI enhances the level of long-term energy security for all countries. With appropriate policies and regulations, AEMI should also lead to improved access to energy for the poor, greater energy efficiency and reduced carbon dioxide emissions.

The path towards energy market integration will not be easy, as has been demonstrated in Europe and other parts of the world. In the case of AEMI, obstacles and constraints include the high degree of variability between member states in national income, in energy policy and in the way that energy is governed. Of particular concern to many governments is how the move towards an integrated energy market can be reconciled with the need to provide affordable energy to the poorer sections of their populations. As a consequence, the approach to building AEMI should be both selective and flexible: selective in that the easier building blocks should be tackled first; and flexible to allow those nations that wish to move forward more rapidly than others to do so.

Finally, any concerted move towards AEMI will require ASEAN to adapt its institutions and modes of governance. Voluntary, non-binding agreements will be insufficient. Binding treaties with dispute resolution mechanisms will be required, and it will also be necessary to enhance the capacity and authority of key ASEAN organisations. Underlying all of this is the need for continuing efforts to build trust and understanding between member states.

The AEMI Forum: Bringing Track I and Track II Together

Whilst the academic teams were preparing these papers, the Chulalongkorn team was active building contacts with officials at the relevant ASEAN organisations in order to apprise them of the AEMI initiative and to encourage them to participate in the Forum. These included the Senior Officials' Meeting on Energy (SOME), the ASEAN Secretariat, the ASEAN Centre for Energy (ACE), the Heads of ASEAN Power Utilities/Authorities (HAPUA) and the ASEAN Council on Petroleum (ACOPE). In addition, individual academics from the ASEAN Group briefed their own national Senior Officials.

The AEMI Forum was held in Bangkok on 27-28 August 2013 and was convened on behalf of the ASEAN Secretariat, the ASEAN Centre for Energy, Chulalongkorn University, as well as the AEMI Group. The Chulalongkorn Team and

the AEMI Advisory Committee coordinated the AEMI Initiative, working closely with AEMI Group members. In addition to the members of the AEMI Group and the AEMI Advisory Committee, participants in the Forum included representatives from: SOE Leaders, Specialized Energy Bodies, Sub-Sector Networks, the ASEAN Secretariat and the ASEAN Center for Energy. Also, a number of government officials as well as representatives from international organisations, research institutes and bilateral donors participated at this event. Altogether, 71 participants attended the AEMI Forum, and nine ASEAN young scholars from Chulalongkorn University joined them as observers.

The purpose of the AEMI Forum was to establish a dialogue between policy-makers (Track I) and academics (Track II) on the vision of AEMI, in order to get feedback and guidance in further developing it. This dialogue was conducted under the Chatham House Rule whereby participants are free to use the information received, but with the stipulation that neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.

The AEMI Group academics presented their papers which addressed the following topics:

- The Rationale for AEMI
- The Benefits of the AEMI
- AEMI and ASEAN Energy Poverty
- Addressing National Constraints, Energy Pricing and Subsidies
- The Institutional and Governance Dimensions of AEMI
- The Pathway to AEMI
- The Political Economy of AEMI

These papers will be published in the very near future by the ASEAN Studies Centre of Chulalongkorn University as a book entitled “AEMI: From Coordination to Integration”.

The Forum achieved its overall objective of forging a consensus on the need to build on the achievements of APAEC and move forward along the path towards AEMI. The participants recognised the benefits that AEMI would bring but also fully appreciated the challenges to be addressed. It was agreed that the topic of AEMI should be placed on the agenda of SOME.

At the conclusion of the first day of the Forum, a short summary of the discussions was circulated to participants for their review and approval. Participants unanimously agreed on the following statement:

(a) Participants agree with the vision for AEMI within the AEC, building on the success and achievements of APAEC and going beyond.

(b) Participants agree that there are key issues not adequately addressed in the current description of AEMI and recommend that they be further developed through:
   (i) A better understanding of national perspectives in joining AEMI, including national energy policies and pricing as well as the underlying political and cultural dimensions;
   (ii) The environmental dimension, including resilience of energy supply, vulnerability assessment of energy infrastructure and disaster preparedness and management;
   (iii) Private sector involvement, in particular to attract investors in developing the energy business and attract needed investment;
   (iv) The identification of concrete mechanisms that need to be employed to deliver AEMI;
   (v) The highlighting of national perspectives in so far as benefits from AEMI and challenges in joining it are concerned, so as to clarify for national governments what needs to be done and when;
   (vi) The identification of the minimum requirements for supporting the implementation of AEMI, both at the policy and institutional levels, starting with understanding the current conditions and identifying the barriers and challenges at both the regional and national levels, as the basis to establish the way forward. Among these minimum requirements, the Forum has already identified three:
      a. The need to design a roadmap identifying the steps and their required key elements, the sequence and the timing for the delivery of AEMI as part of the AEC through 2030, with immediate, short-term as well as medium- and long-term steps;
      b. The need to harmonise the regulatory and legal frameworks across ASEAN, already started in APAEC but not yet sufficient;
      c. The need to enhance cohesion at the institutional and governance levels for decision-making within ASEAN.

(c) Regarding energy pricing, Forum participants more specifically unanimously agreed that:
   (i) AEMI implementation would require more structured energy pricing policies across ASEAN;
   (ii) Energy subsidies rationalisation is important for the functioning of a free market. However, the rationalisation of such subsidies can only be gradual through to 2030, particularly in the context of addressing energy poverty;
   (iii) There is a need to formulate more imaginative pricing and taxation options in the short and medium term. For example, the use of equalisation mechanisms, or the formulation of different instruments to tackle energy poverty and to support the most vulnerable communities;
   (iv) A need to “decouple” energy pricing and welfare objectives, with different price packages offered for the poor population, and different instruments used to target the assistance to the poor.

(d) Forum participants unanimously agreed that AEMI would deliver benefits by promoting better energy efficiency, improving energy access, enhancing economy, reliability and energy security, and achieving higher GDP. However, in order to reap these benefits, the AMS will have to address the challenges that stand in their way. More specifically, this needs to be done within the framework of the AEC:
   (i) Building market infrastructure, in order to capture efficiency gains from an integrated energy market. This requires reforming the existing regulatory and legal frameworks, and harmonisation of standards;
   (ii) Harmonising energy prices and subsidies, in order to allow the integrated market to work. This is a challenge requiring the development of alternative pricing options, taking into account developing countries’ perspectives and the need to address energy poverty;
   (iii) Identifying infrastructure needs in order to allow energy flow between net energy importers and net energy exporters. This will also allow the enhancement of access to energy services and products;

(iv) Enhancing the ability to diversify sources of energy, in order to ensure security of supply. This will require increased technological capacity for the development and deployment of renewable energy sources, and for tapping into energy efficiency and its significant potential savings;

(v) Enhancing public knowledge and acceptability of AEMI, in order to ensure political will as well as sustain policies and actions across different political cycles. This requires providing information, raising awareness and transparency in all transactions and projects.

(e) In addition, Forum participants unanimously suggested additional studies that focus on:

(i) Quantifying AEMI benefits, in terms of energy savings and improved interconnections. This needs to recognise the limitations of quantitative methods in capturing environmental and social dimensions;

(ii) Identifying investment costs that are needed for expanding infrastructure;

(iii) Bringing out benefits and challenges in terms of capacity-building, education, exchange of knowledge and the participation of civil society;

(iv) Highlighting business opportunities within ASEAN, including additional investments for building infrastructure and for developing the new technology industry.

At the conclusion of the AEMI Forum on the second day, a short statement was drafted and circulated to participants for their review and approval. Further to the unanimous first-day statement, Forum participants unanimously agreed on the following statement:

(a) The Forum has expressed strong support for the vision of ASEAN Energy Market Integration (AEMI), within the framework of the ASEAN Economic Community (AEC), aiming for deployment through 2030.

(b) The Forum recommends that its main conclusions be presented to the Senior Officials Meeting on Energy (SOME) to be held in Bali on September 2013.

(c) The Forum further recommends that SOME invites ASEAN Ministers of Energy Meeting (AMEM) in September 2013 to further support AEMI, by tasking SOE and all Specialized Energy Bodies (namely, HAPUA, ASCOPE, AFOC, RE-SSN, EE&C-SSN, NEC-SSN, REPP-SSN), coordinated by the REPP-SSN and supported by the ASEAN Secretariat and the ASEAN Centre for Energy (ACE), to develop a blueprint and a roadmap for AEMI, with appropriate goals and steps for the short term (2015), medium term (2020) and long term (2030).

(d) The Forum also recommends that, in order to deliver this task, the REPP-SSN commission studies, both at the national and ASEAN levels, with technical support from the AEMI Group in delivering these studies.

(e) Finally, the Forum recommends that the REPP-SSN presents a progress report on AEMI to the SOME in June 2014.

Concerning item (b), the combination of short notice and an already full agenda prevented the AEMI Group from being able to present the outcome of the Forum to the September meeting of SOME, but it is hoped that this will be on the agenda for the meeting to be held in December 2013.

The Trans-ASEAN Gas Pipeline: Keeping the Dream Alive

Mr. Beni Suryadi, Programme Officer for Regional Energy and Planning, ASEAN Centre for Energy

During the 31st ASEAN Ministers on Energy Meeting (AMEM), held in Bali on 25 September 2013, ASEAN member countries reaffirmed their commitment to continue strengthening efforts in gas supply cooperation through the signing of the Instrument to Extend the Memorandum of Understanding (MoU) on the Trans-ASEAN Gas Pipeline (TAGP) Project for another term of 10 years until 20 May 2024.[1] Should we keep the dream alive?

The Dream

The idea of having an integrated gas pipeline across the region was first introduced during the meeting of the ASEAN Council on Petroleum (ASCOPE)[2] held in Bangkok in October 1988.[3] ASCOPE realised the importance of all national oil companies to discuss openly their plans for gas pipeline infrastructure. Under the spirit of regional cooperation and regional energy security, producing countries were expected to make it their priority to export to countries in the region. It was also emphasised that there could

A Girl Rides a Bicycle Cart Containing Pieces of Wood to Be Made into Charcoal. Local consumers mostly use charcoal as an alternative for liquefied petroleum gas due to its increasing prices in the world market. According to local media, an 11 kg (24 lbs) tank of LPG costs about 800 pesos (US$19.04) while a sack of coal costs about 320 pesos (US$7.61). REUTERS/Romeo Ranoco, 2 March 2012.

be considerable mutual benefit in working together, such as sharing lessons learned, new technologies, cost information, optimisation of the pipelines themselves and finding potential investors within the Member Countries.[4] The idea was being leveraged to the top level when the Leaders, during the 1995 Bangkok Summit, declared that ASEAN shall ensure greater security and sustainability of energy supply through diversification, development and conservation of resources, the efficient use of energy and the wider application of environmentally sound technologies. Subsequently, at the 1996 ASEAN Ministers on Energy Meeting held in Kuala Lumpur,[5] the Ministers noted the completion of the *Study on the Masterplan on Natural Gas Development and Utilisation in the ASEAN Region* being prepared by the ASEAN-EC Energy Management Training and Research Centre (AEEMTRC).

During the Second Informal ASEAN Summit in Kuala Lumpur, Malaysia in 1997, the Leaders adopted the ASEAN Vision 2020 which called for cooperation, among other measures, to establish interconnecting arrangements for natural gas and call it the Trans-ASEAN Gas Pipeline. Then, through the 1998 Hanoi Plan of Action, ASEAN realised the need to institute the policy framework by 2004 for an early realisation of the Trans-ASEAN Gas Pipeline Project (TGAP) as part of the Trans-ASEAN Energy Network.

The 17th ASEAN Ministers of Energy Meeting, held in Bangkok in 1999, requested ASCOPE to undertake the TAGP project, as well as review and update the Masterplan and determine its feasibility. A conceptual Masterplan was completed in 2000 and received endorsement from the 19th AMEM which was held on 5 July 2001 in Bandar Seri Begawan, Brunei Darussalam. The 19th AMEM also agreed on an ASEAN MoU to provide a broad policy and implementation framework for the realisation of TAGP to help ensure greater energy security.[6] The MoU was signed by all the ASEAN Ministers on Energy on 5 July 2002 in Bali.[7] It set out the cooperative framework for greater public-private partnership and collaboration in the TAGP implementation. Under the TAGP MoU, ASEAN countries should study the regulatory and institutional frameworks for cross-border supply, transportation and distribution of natural gas in the region involving multilateral countries. This MoU came into force in June 2004.

The Pipeline Connections

The spirit at the top level translated into actual implementation. ASEAN's first cross-border gas pipeline, a 5-kilometre gas pipeline from Plentong, Johor, Malaysia to the Senoko Power plant in Singapore was commissioned in late 1991, only three years after the idea was born. When the TAGP Masterplan was finalised in 2001, there were already five cross-border gas pipelines in development and/or operation totalling 1,575 kilometres in length; a 470-kilometre pipeline from Yadana, Myanmar to Ratchaburi, Thailand in 1999; a 340-kilometre pipeline from Yetagun, Myanmar, to Ratchaburi, Thailand in 2000; a 660-kilometre pipeline from West Natuna, Indonesia to Singapore in 2001; and a 100-kilometre pipeline from West Natuna, Indonesia to the Duyong field of Peninsular Malaysia also in 2001.

All interconnections have been constructed on bilateral and purely commercial terms and represent significant progress towards the realisation of the Trans-ASEAN Gas Pipeline Infrastructure Project. Linking together and integrating the existing, planned and possible gas pipeline infrastructure of ASEAN countries, the regional gas pipeline interconnections are already taking shape. These will evolve and subsequently be interconnected as part of the integrated TGAP Infrastructure.

With the *2000-TAGP Masterplan* and the MoU on the table, ASEAN is keen to maximise the effort, especially considering the fact that the demand for gas in the region has grown significantly. Although each ASEAN member country may view the importance of this project from varying perspectives, depending on whether it is a gas producer or gas importer, the willingness to work together and co-operate to foster greater energy security is definitely a shared goal.

The *2000-TAGP Masterplan* identified seven possible new gas pipeline interconnections, with most coming from Indonesia's giant East Natuna field. Assuming that gas production in the East Natuna commenced as scheduled, it foresaw that the region could become self-sufficient in gas.

When the *2008-TAGP Masterplan* was published, five new gas pipelines totalling 1,344 kilometres in length were being operated, in addition to the existing pipelines. This was only a third of the originally planned 4,520 kilometres, and none of the newest pipelines came from the East Natuna. The major pipelines from East Natuna to the ASEAN region had yet to be developed due to pending commercial issues.

Unfortunately, there have been no new significant gas reserve discoveries since year 2000, leaving East Natuna as the single largest gas resource in the region. Furthermore, through the *ASEAN Plan of Action for Energy Cooperation (APAEC) 2010-2015 Program Area No. 2: Trans-ASEAN Gas Pipeline*, ASEAN still proposed not less than 4,400 kilometres of cross-border pipelines from East Natuna to various destinations in the region. These proposed interconnections form part of the backbone of energy security and sustainability objectives for ASEAN to be accelerated by 2015 and serve as a key driver of growth to the various energy consuming sectors of the ASEAN economies.

To date, as shown in Figure 1 below, eleven bilateral connections have been established to date totalling over 3,020 kilometres in length, making possible the transmission of gas molecules to and from ASCOPE Member Countries or Member States.[8] Zawtika (Block M-9), a pipeline project located in Myanmar, will serve as the 12th interconnection project and deliver 240 million standard cubic feet of gas per day to Thailand through a 298-kilometre offshore/onshore pipeline. The project is expected to be operational in May 2014.

No Gas, No Pipe? Keeping the Dream Alive

Despite the long discussion on the common understanding for gas transit cooperation among the countries in the region, there will be great challenges to be overcome if the region's rapidly growing demand for gas is to be met, especially through its TAGP plan. Known gas resources and existing plus planned new production and transportation facilities are simply not adequate to meet the projected rates of growth in gas demand. The case analysis of the updated study from ASCOPE pointed to a widening gap between gas supply and demand, particularly from around 2017 onwards. Even with early commercialisation of the East Natuna field, there is a widening supply gap from 2017 rising to more than 12 billion standard cubic feet per day by 2025.

After being postponed several times, there was good news about Natuna in August 2013. The Government of Indonesia announced that it would provide several incentives to the consortium which consists of Pertamina, an Indonesian state-owned oil and gas company as the team leader (owning a 35 per cent participating interest/PI); Esso Natuna Ltd. (Exxon-Mobil, 35 per cent PI); Total E&P Activities Petrolieres (15 per cent PI) and PTT Exploration and Production (15 per cent PI), to develop East Natuna. These

incentives included extending the period of the contract to 50 years (20 years more than the normal maximum contract in Indonesia); adjust the normal 70 per cent government/ 30 per cent contractor split to 45/55 per cent; and the possibility of later offering a five-year tax holiday.[9] It was felt that a number of incentives or "special treatment" from the government was needed to ensure that the companies could make sufficient returns. Although the project will run as a national priority, under the Producing Sharing Contract (PSC) scheme, the consortium must first finance the project until a commercial discovery is declared.

However, as 2017 is only four years away, it is difficult to see how the project can be on-line by that time. This situation has pushed ASEAN to embrace the *TAGP New Strategic Focus*, among others, to help move gas supplies to the demand centres irrespective of the means, particularly through LNG, in order to satisfy domestic requirements and assure supply availability during shortages through strategic buffer management.

Indeed, many governments, namely, Singapore, Thailand, Malaysia, Vietnam and Indonesia, have recently built LNG receiving terminals to deal with the rapidly growing domestic demand. However, these also present opportunities to support the TAGP. For example, it will be possible for Singapore's new 3-million tons per annum receiving terminal to export gas to Thailand through the existing gas pipeline connection. Thus, by the time that East Natuna is starting to deliver gas to the region, ASEAN will enjoy much greater security of supply.

ASEAN still has much to do in order to effectively embrace its TAGP plan over the next ten years. A multi-strand approach is required: encouraging new exploration and investment in production facilities, processing and transportation infrastructure; ensuring that pricing policies give appropriate incentives to investors and gas users alike; and balancing the requirement to provide gas for local consumption with the need to allow resource developers, and ultimately the governments of the region as the resource owners, to maximises the value of the gas resources. The Extension of the MoU will help provide a broad framework for ASEAN member countries to cooperate towards the realisation of the TAGP Project, at least, for the next ten years.

[1] Joint Ministerial Statement of the 31st ASEAN Ministers on Energy Meeting (AMEM), held in Bali on 25 September 2013.

[2] ASCOPE was established in Jakarta on 15 October 1975 as an instrument for regional cooperation among member countries. See <http://ascope.org/about-ascope.html> [27 September 2013].

[3] Beni Suryadi, *Development of ASEAN Energy Sector: Power Network Interconnection, Natural Gas Infrastructure, and Promotion of Renewable Energy & Energy Efficiency* (Jakarta: ASEAN Centre for Energy, 2013).

[4] Hilmi Ramli and Azureen Abdullah, "Journey of Ten Brothers in Securing Energy within ASEAN: Yesterday, Today and Tomorrow", at <www.igu.org/html/wgc2009/papers/docs/wgcFinal00524.pdf> [8 March 2013].

[5] Joint Press Statement for the 14th ASEAN Ministers on Energy Meeting, Kuala Lumpur, 1 July 1996, at <www.asean.org/news/item/joint-press-statement-for-the-14th-asean-ministers-on-energy-meeting-kuala-lumpur-1-july-1996> [16 September 2013].

[6] Joint Press Statement of the 19th AMEM, 5 July 2001, Brunei Darussalam, at <www.asean.org/news/item/joint-press-statement-nineteenth-asean-ministers-on-energy-meeting-19th-amem-5-july-2001-bandar-seri-begawan-brunei-darussalam> [16 September 2013]. <www.asean.org/news/item/joint-press-statement-20th-asean-ministers-on-energy-meeting> [16 September 2013].

[8] ASCOPE, *Projects & Initiatives: Trans ASEAN Gas Pipeline Project (TAGP)*, at <http://ascope.org/projects.html> [18 September 2013].

[9] "PM Govt to Award PSC to East Natuna Contractors", *The Jakarta Post*, 13 August 2013, at <www. thejakartapost.com/news/2013/08/13/govt-award-psc-east-natuna contractors.html [16 September 2013].

Publications

Internationally Refereed Journals

Philip Andrews-Speed, "Interactions between Renewable Energy Policy and Renewable Energy Industrial Policy: A Critical Analysis of China's Policy Approach to Renewable Energies", *Energy Policy*, 62 (2013): 342-53.

Shiva Susarla and Elmar Friedrich, "The Solar Power Policies and Markets of Asia and Europe", *Asia Europe Journal*, vol. 11, Issue 3, September 2013.

Presentations and Moderating

31 October Elspeth Thomson moderated "Resurgence of Coal: Trends and Challenges Roundtable" organised by ESI and IEA at *Singapore International Energy Week 2013*.

29 October Elspeth Thomson moderated the "Renewable Energy Breakthroughs", "Renewable Energy in Manufacturing and Business Operations" and "Renewable Energy in Transportation" sessions of the *Asia Future Energy Forum* at *Singapore International Energy Week 2013*.

25 October Azha Putra, Anton Finenko and Eulalia Han presented "Singapore's Energy Security" at *World and Me Symposium 2013*, St. Joseph's Institution, Singapore.

9 October Elspeth Thomson moderated the Keynote Presentation, "Creating a Lean Energy Culture with Sustainability" by Aidan Lynam, Area Manager, South Asia / ASEAN, Holcim Group Support Ltd. at the *National Energy Efficiency Conference 2013*.

9 October Elspeth Thomson moderated Plenary Session 1, in which Professor Armin Arbele, CEO of the Solar Energy Research Institute of Singapore (SERIS), presented "Solar Power: Assisting the Driver towards Energy Efficiency" at the *National Energy Efficiency Conference 2013*.

9 October Melissa Low moderated Breakout Track 1C: Energy Efficiency in High Technology Facilities: Laboratories and Cleanrooms, which featured Mr. Gordon Sharp, Chairman and Founder, Aircuity, Inc.; Ms. Danielle Marie Griego and Mr. Barath Seshadri, both Research Associates at the Energy Research Institute @ NTU (ERI@N) at the *National Energy Efficiency Conference 2013*.

10 October Melissa Low moderated Breakout Track 3A: Setting up a Sustainable Energy Management System, which featured Professor Toh Kok Chuan, Chairman, National Technical Committee on Energy Management and Principal Research Scientist, Energy Research Institute @ NTU, Nanyang Technological University and Ms. Joyce Tan, Executive Director and Mr. Joseph Mok, Group Safety Manager & Energy Manager, both from Kim Heng Marine & Oilfield at the *National Energy Efficiency Conference 2013.*

18 October Melissa Low presented "Past Contemporary Proposals on Differentiation and Equity: Shaping the 2015 Climate Agreement" at Shell Business Sharing Session, UE Square, Shell House, Singapore.

29 September Philip Andrews-Speed presented "China's Shale Gas Ambitions" at the Emirates Centre for Strategic

Studies and Research, 19th Annual Energy Conference, Abu Dhabi.

27 September Anton Finenko presented: "Energy Efficiency in Households" at *E3 Energy Efficiency Hackathon* organised by the Energy Market Authority and Singapore Power, held at *SCAPE, Singapore.

26 September Philip Andrews-Speed presented the Keynote/Special Address, "The Long March to a Low-Carbon Economy: Lessons for China from the UK's Renewable Energy Policies" at the *Third China-EU Social Ecological and Legal Forum*, Taiyuan, China.

17 September Philip Andrews-Speed presented "Shale Gas Potential in China" at North China Electric Power University, Beijing.

Media Contributions

Philip Andrews-Speed interviewed by *Phoenix TV Middle East* on China's renewable energy industry, 29 October 2013.

Philip Andrews-Speed interviewed by *Radio Free Asia* on gas shortages in China, 24 October 2013.

Philip Andrews-Speed quoted by *Financier Worldwide Magazine* on clean tech investment in Asia, 11 October 2013.

Philip Andrews-Speed interviewed by *Radio Free Asia* on China's new fuel pricing policy, 25 September 2013.

Shiva Susarla quoted in "HDB Plans to Go Big on Solar Energy", *Straits Times*, 25 September 2013.

Philip Andrews-Speed interviewed by *Novethics* on China's new green energy policies, 11 September 2013.

Philip Andrews-Speed quoted by *Asian Wall Street Journal* on the implications for China's oil industry of the corruption scandals, 9 September 2013.

Philip Andrews-Speed interviewed by *New York Times*, *QQ.com* and *Atlantic Monthly Magazine (Quartz Website)* on the implications for China's oil industry of the corruption scandals, 5-8 September 2013.

Philip Andrews-Speed interviewed by *Radio Free Asia* on Beijing city government's plan to reduce coal use, 5 September 2013.

Three ESI Events at Singapore International Energy Week

Post-Fukushima Nuclear Governance Conference

Jointly organised by the Energy Studies Institute and the Centre for Non-Traditional Security Studies in the S. Rajaratnam School of International Studies at Nanyang Technological University, the underlying goal of this conference held on 31 October 2013 at SIEW 2013 was to analyse the impact of the Fukushima disaster on nuclear energy governance, based on the International Atomic Energy Agency's (IAEA) 3S – Security, Safeguards and Safety. There were three objectives: to identify and articulate critical emerging international and regional trends in energy security policies post-Fukushima; examine the impact of the global nuclear energy developments on the security landscape in Asia; and identify critical areas for future policy research.

The speakers came from various backgrounds and offered insights as academics, legal practitioners and industry specialists. Among the first sessions were "Global Trends in Nuclear Energy Policies and Technology Post-Fukushima", "Global Trends in Nuclear Energy Policies and Their Impact on the Security Landscape in Asia", and "Nuclear Governance and Non-Traditional Security Issues". The final session focused on nuclear energy developments in specific countries, namely, China, Vietnam and Indonesia. New, post-Fukushima nuclear technology designs were discussed. For example, there is now talk of physically separating the components of a nuclear facility whereby there are both on-site and off-site recovery management systems. In terms of governance, it was noted that good nuclear energy governance requires coordination between central and local governments, industry and civil society. National legislation relating to nuclear energy should be constantly reviewed in consultation with international expertise and international agencies such as the IAEA. Emphasis should also be given to disaster prevention and preparedness, and empowering human capacity in the area of nuclear science and technology. In order to maintain the trust and support of the public, governments must be ready to provide detailed information about all aspects of plant construction and operation.

As the focus of the conference was Asia, especially Southeast Asia, the role of the Association of Southeast Asia Nations (ASEAN) in regional nuclear energy governance and cooperation was highlighted. It was noted that ASEAN could be used as a platform to discuss significant issues relating to sustainable nuclear energy cooperation, such as public acceptance, nuclear energy literacy and the harmonisation of nuclear energy law. Several speakers pointed out that educating the public about nuclear energy was important even for countries in this region that do not yet have firm nuclear power development programmes.

One of the obstacles to regional nuclear energy cooperation that was identified, however, was the challenge of allowing governments to determine, or shape, domestic long-term energy strategic plans. For ASEAN, the principles of non-intervention and non-interference in respective countries' domestic affairs are paramount in guiding the diplomacy between member states. It was felt that Singapore could potentially serve as an effective broker in regional nuclear energy cooperation. As the country has no immediate plans to embark on a nuclear energy programme and has no pressing agenda with respect to nuclear energy, it can be perceived as an honest broker.

From left, Dr. Carlos Fernàndez Alvarez, Mr. Mark Gresswell, Dr. John Kunkel, Dr. Gatut S.Adisoma, Dr. Andrew Minchener and Dr. Elspeth Thomson.

The Resurgence of Coal: Trends and Challenges Roundtable

Organized by ESI and the International Energy Agency, the five speakers at this event held on 31 October at SIEW 2013, shared their views on the future role of coal in the future energy landscape in light of evolving global energy trends. As the use of coal in power generation continues to expand, it is crucial to further improve power plant efficiencies and reduce the particulate matter and greenhouse gas emissions simultaneously.

Dr. Carlos Fernández Alvarez, Senior Energy Analyst (Coal) at the International Energy Agency, discussed the IEA's expectations about future trends in global coal use. Today coal remains a cheap and abundant resource with a very diversified market consisting of more than 40 exporting countries. The IEA contends that the recent surge in coal consumption has been driven mostly by the high demand in China. Globally, after peaking in 2013, the reliance on coal to generate electricity may gradually begin to shrink. Speaking about clean coal technologies, Dr. Alvarez noted that their transfer to developing countries is generally very limited due to the lack of expertise and infrastructure.

Mr. Mark Gresswell, Director and Chief Analyst at Salva Resources Pte Ltd, spoke about the facts and drivers behind the recent coal resurgence. From his point of view, the steady economic growth in Asia coupled with urbanisation, industrialisation and population growth is driving energy consumption, including coal consumption. Mr. Gresswell was asked if India has enough import capacity to cover its rising resource needs. He replied that India currently has 140 million tons of thermal coal and 45 million tons of coking coal capacity which is more than enough to serve the country's needs in the near future. However, transporting the coal inland is a problem due to insufficient inter-land connectivity.

Dr. Gatut S. Adisoma, Deputy Chairman–International Affairs at APBI-ICMA (Indonesian Coal Mining Association), presented Indonesia's coal production situation in detail. Indonesia is the world's largest exporter of steam coal. In order to maintain this position, it must overcome several infrastructural and regulatory challenges. Dr. Adisoma was asked about commission dates and carrying capacity of the railway development project in Kalimantan (Borneo). He explained that the purpose of the project could be extended beyond pure resources and freight transport to include the needs of passenger transport, as has been done on Sumatra. As such, the entire railway project needs to be carefully reviewed before any information about carrying capacity and commission dates can be released.

Dr. John Kunkel, Deputy CEO of the Minerals Council of Australia, was asked about the reasons for high capital costs in the Australian mining industry. For example in Canada, mines are heavily unionised and the society does not favour bringing in cheap foreign labour. He responded that the same drivers are at play on the other side of the globe in Australia. Since 2005, the Australian government has gradually reformed its domestic labour laws, moving to a more centralised system and refusing to bring in low skilled migrant workers. Together with the strong position of the mining unions, labour costs have risen to 50 per cent of the project costs in the Australian mining industry.

Dr. Andrew Minchener, General Manager of the International Energy Agency's Clean Coal Centre, spoke about the challenges and opportunities of carbon capture and storage technology in the coal industry. He noted that modern technologies like supercritical coal power plants may have a higher capital costs but they have lower generation and operation costs. This results in lower electricity costs which make the technology self-incentivised. He also added that CCS is a key part of any lowest-cost mitigation scenario where long-term global average temperature increases are limited to significantly less than 4^0C and that it should be prioritised over underground goal gasification. Speaking on behalf of IEA, he regretted the lack of confidence on the part of the international banking industry regarding coal resurgence as it is preventing the technology from being widely adopted.

Unconventional Gas in East Asia Roundtable

The three panel members for this event held on 1 November at SIEW 2013, were Mr. Milo Sjardin, Head of Asia Pacific, Bloomberg News Energy Finance; Professor Peter Hartley, George and Cynthia Mitchell Chair in Sustainable Development and Environmental Economics, Professor of Economics at Rice University in Houston, Texas; and Mr. David Hewitt, Managing Director of Credit Suisse, Equity Research Division.

Mr. Sjardin provided an overview of unconventional gas development in China. He noted that the growth in China's natural gas supply in recent years came primarily from tight gas, coalbed methane/coal mine methane (CBM/CMM), and through LNG and pipeline imports. In particular, the development of tight gas in China is "an unsung revolution" increasing from 2.5 per cent of China's total domestic gas production in 2005 to 32 per cent in 2012. While CBM/CMM production has grown, it continues to fall short of the government's target. This indicates that there are challenges that have not been fully addressed by the government. Mr Sjardin believes that the development of shale gas will partly depend on gas pricing reform and additional subsidies from the government. Its full production potential will however be impeded by the China National Petroleum Corporation's monopolisation of the domestic gas market, the lack of adequate gas infrastructure and the expected high development cost of shale gas in China. Another factor is whether the government would compel companies sitting on resource blocks to develop them by imposing an expiry date on unutilised blocks.

The second speaker, Professor Hartley, discussed the implications of shale gas development in North America. He argued that the "shale revolution" could spread to other parts of the world in the coming decades but that it will take more time than most people expect, and it cannot happen unless the right policy changes occur. With more LNG exporters, including from North America, and more importers entering the market, he foresees that the natural gas market will evolve towards more international linkages, more short term and flexible trading, more gas-on-gas pricing, and greater use of formal options and futures markets. Nevertheless, long-term contracts will persist as they are required for financing large, capital-intensive projects. However, there will be more short-term trading with greater flexibility in terms of destination and pricing.

Mr. David Hewitt, Mr. Milo Sjardin, Dr. Philip Andrews-Speed and Professor Peter Hartley

The last speaker, Mr. Hewitt spoke on US and global shale gas developments and discussed the US shale effect on Asian LNG markets. He noted that since 2006, US companies have successfully attained "manufacturing efficiency" whereby improved techniques have enabled lower cost and scalability in shale production. Compared to the US, he noted that European countries are all at very early stages of shale gas development. As for China, he pointed to the slow start in its shale developments as reflected in the low capital expenditure in this sector. As for US LNG exports to Asia, he noted that a potential marketing opportunity could open up for aggregators like BG and end users in Asia, namely, through a new provision of increased flexibility (interruptible), in place of the traditional 100 per cent "take or pay" contract that Asian LNG buyers are currently subject to.

Recent Events at ESI

24 October, "Nuclear Power Developments: Could Small Modular Reactor Power Plants be a "Game Changer"? Seminar

Dr. John Bauly, a Consultant and Corporate Trainer operating mainly in Europe and Southeast Asia on technical, business and financial subjects, presented the case for small modular reactors (SMRs). He argued that nuclear power is clean, cost-effective,could be made safe, and that it should be expanded fast, world-wide, to combat the rise in carbon emissions. He opined that objections to nuclear power arise from concerns about security, construction cost overruns, outages, as well as negative views from the public. He envisaged that the renewed interest in and potential switch to SMRs could be seen as a "game changer" for many countries looking to nuclear power for their current and future energy needs. Dr. Bauly noted that what is missing from the nuclear debates in Singapore and ASEAN is a top down philosophical debate on what a "tolerable" accident would be, i.e., the specific maximum allowed impacts. He recommended that the various impacts of a potential accident, no matter its cause, be very precisely spelled out and examined such that a consensus can be reached over what types and scale of impacts pose no threat whatsoever to the safety of the public or environment and can be easily be resolved by the authorities. He recommended that public awareness and education be stepped up to correct views on nuclear energy deployment.

7 October, "Liberalised Electricity Markets and Long-term Capacity Adequacy" Seminar

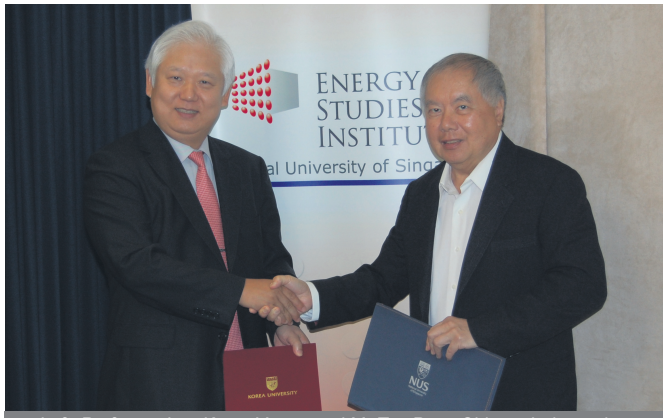
Tony Owen, Professor of Energy Economics in the International Energy Policy Institute, UCL Australia, questioned if liberalised "energy-only" electricity markets

impede the effectiveness of energy sector policies designed to mitigate climate change through long-term investments in low carbon technologies. He argued that because bids by generators are usually based on short-run marginal cost (SRMC) curves, the large gap between the SRMC and the average cost of low carbon technologies such as nuclear power and large scale renewables gives rise to a high level of risk that full cost recovery will not be achieved within a commercial timeframe. He suggested that the solution lies in complementing long-term market arrangements with technology-specific policies that encourage investment in low carbon technologies.

13 September, "IEA's 2013 Medium-Term Gas Market Report" Seminar

Mr. Laszlo Varro, Head of the Gas, Coal and Power Division at the International Energy Agency, presented the findings of the IEA's *2013 Medium-Term Gas Market Report*. The report follows through with the IEA's forecast of the "Golden Age of Gas" and sees gas production growing at 100 billion cubic metres per year, amounting to Russia's entire supply in five years' time. Mr. Varro noted that at 2.4 per cent growth per year, gas is growing faster than oil or overall energy use but continues to fall behind coal. In IEA's projections to 2018, transportation emerges as a major demand driver, accounting for 10 per cent of gas demand growth, driven by China and the United States. He addressed the prospect of the United States becoming a major gas exporter, the challenges of securing enough gas to meet China's growth, and the ability of Russian gas – spurred both by weak EU demand and resurgent domestic production – to find its manifest destiny in Asia.

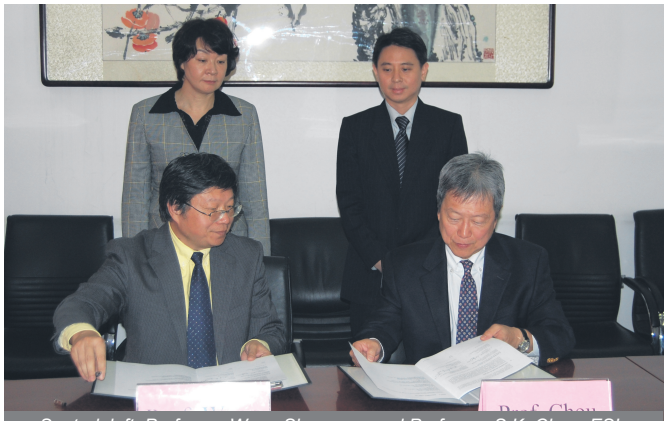
MOUs



Left, Professor Lee Kwan-Young and Mr Tan Puay Chiang, Independent Director, Keppel Corporation and ESI Management Board Member.

ESI Signs an MOU with the Graduate School of Energy and Environment (Green School), Korea University, at ESI on 5 July 2013

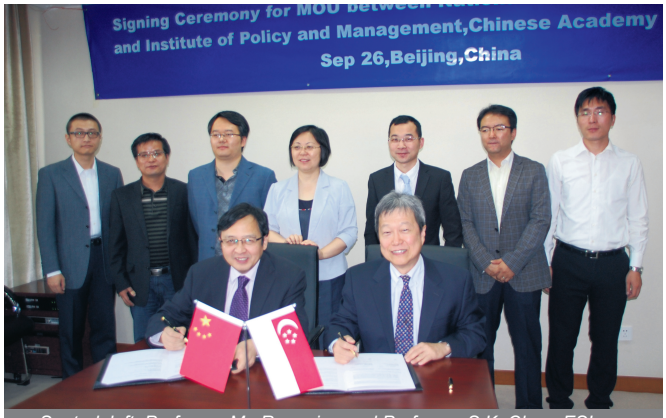
ESI signed an MOU with the Graduate School of Energy and Environment (Green School), Korea University in order to facilitate increased collaboration, cooperation and interaction between the two sides. The delegation from Korea University consisted of Professor Lee Kwan-Young, Vice Dean of the Green School, Professor Bang Ki-Yual of the Green School, and Professor Lee Jae-Seung, Division of International Studies.



Seated, left, Professor Wang Shouyang and Professor S.K. Chou, ESI Executive Director

ESI Signs an MOU with the School of Management, University of Chinese Academy of Sciences (UCAS), Beijing, 26 September 2013

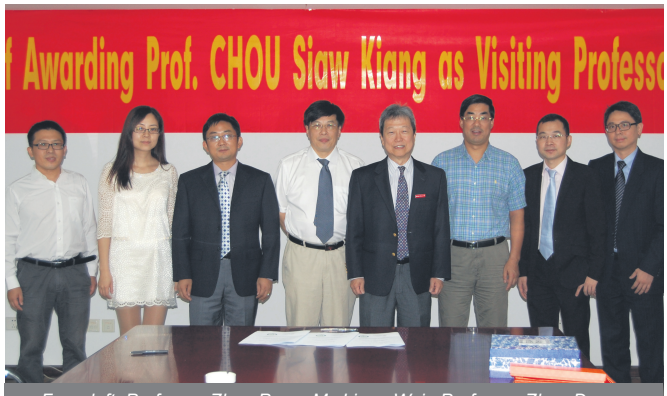
The ESI delegation was welcomed by UCAS Professor Wang Shouyang who is Executive Dean of the School of Management and Vice Dean of the Academy of Mathematics and Systems Science, together with Professor Zhao Hong (Vice Dean) and other UCAS colleagues. The two sides updated each other on their respective research interests. Professor Chou and Professor Wang also signed an MOU to explore the development of executive development courses on energy for professionals.



Seated, left, Professor Mu Rongping and Professor S.K. Chou, ESI Executive Director

ESI Signs an MOU with the Institute of Policy and Management, Chinese Academy of Sciences (IPM-CAS), Beijing, 26 September 2013

The ESI delegation was welcomed by IPM's General Director, Professor Mu Rongping and Professor Fan Ying who is the Director of the Center for Energy & Environmental Policy Research, IPM-CAS. Both sides proposed ways to improve ties between the two organisations, such as through joint conferences and joint research on energy and climate change modelling. Following modelling discussions, Professor Chou and Professor Mu signed an MOU as commitment to deepen relations between ESI and IPM-CAS.



From left, Professor Zhou Peng, Ms Liang Wei, Professor Zhou Dequn, Professor Xiong Ke, Professor S.K. Chou, ESI Executive Director, Professor Jin Quanyuan, Dr. Su Bin and Dr. Christopher Len

ESI Signs an MOU with the College of Economics and Management, Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, 27 September 2013

ESI staff were welcomed by the Dean of the College of Economics and Management, and Director of the Research Center for Soft Energy Sciences, Professor Zhou Dequn and his colleagues. The two sides exchanged views on the latest energy research trends and spoke about their respective current research priorities. During this visit, Professor Chou was also awarded a Visiting Professorship by the hosts. The professors also signed an MOU as a further step to deepen cooperation on energy policy research between the two sides.

New Staff

Hari M. P., Research Associate

Hari joined ESI in October 2013. He holds an MSc in Financial Engineering from the National University of Singapore, an MBA from the Faculty of Management Studies at Delhi University and a BTech in Electronics and Communication Engineering from the National Institute of Technology, Calicut. His research interests include mathematical modelling, goal oriented optimisation and risk management related to energy commodities and renewable energy. Previously, he worked in the financial services sector in India.

Li Yingzhu, Research Associate

Li Yingzhu joined ESI in October 2013 after completing her PhD in Economics at Nanyang Technological University in Singapore. In 2012, she attended a summer course on the methodology and application of cointegrated VAR models at the University of Copenhagen. She received her Bachelor's degree in Economics (1st class honours), with minors in Business and Public Administration from NTU in 2009. As a sophomore, she did one semester at the University of Limerick, Ireland. Her main research interests are theoretical modelling and also empirical analysis of energy and environmental issues, with particular emphasis on policy implications.

Yao Lixia, Research Associate

Yao Lixia joined ESI in October 2013. She did her PhD at the S. Rajaratnam School of International Studies, Nanyang Technological University in Singapore. She has a Bachelor's degree from Dalian Maritime University, China, and a Master's degree from Vrije Universiteit Brussel in Belgium. She has done research on the quantitative measurement of energy security, the impacts of China's macroeconomic reforms on its energy sector, and the energy security and energy policies of Southeast Asia. Her current research focuses on China's energy security and energy policies.

Contact

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

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The *ESI Bulletin on Energy Trends and Development* seeks to inform its readers about energy-related issues through articles on current developments. Our contributors come from ESI's pool of researchers, local and overseas research institutes, local government agencies and companies in the private sector. You can download past issues from www.esi.edu.sg.

We welcome your feedback, comments and suggestions. The views expressed in each issue are solely those of the individual contributors.

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