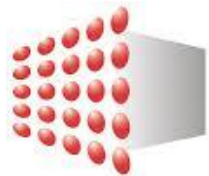


Energy in ASEAN and Implications for Myanmar



ENERGY
STUDIES
INSTITUTE



SK Chou

International Symposium – Energy Policy Development in Myanmar:

Current Situation, Prospect & Policy Proposals

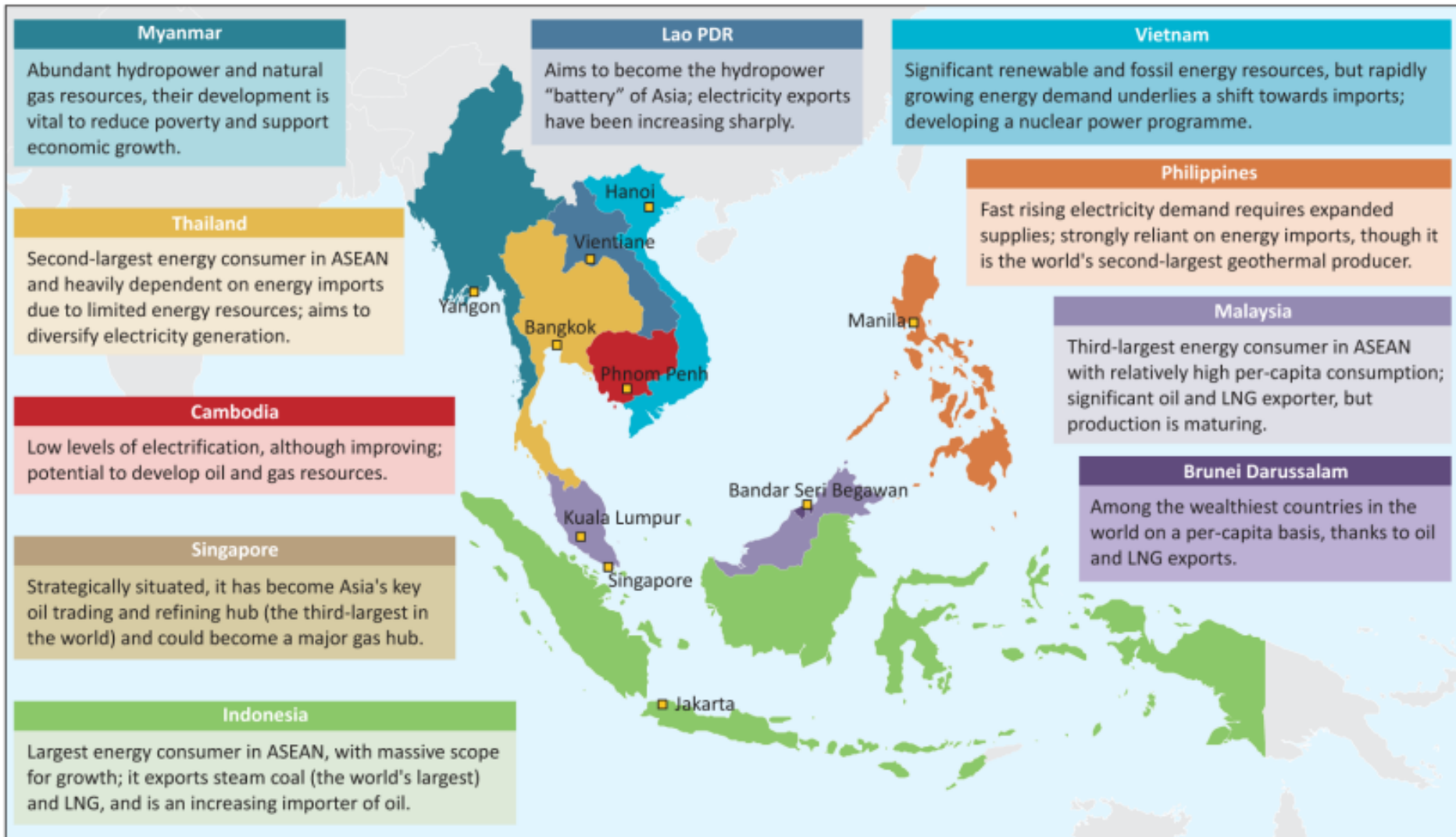
NayPyiTaw, Myanmar

6 February 2015

Presentation Overview

1. ASEAN Economic Community 2015
2. AEC Opportunities for Myanmar
3. AEC Challenges for Myanmar
4. Concluding Remarks
5. Potential for Collaboration on Energy Studies

Energy in ASEAN



This map is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Source: International Energy Agency (IEA)
Southeast Asia Energy Outlook 2013

ASEAN Economic Community (AEC)

The ASEAN Economic Community (AEC) aims to transform ASEAN into a **stable, secure, prosperous, rules-based, competitive, resilient, and integrated economic community** by 2015 (ASEAN Plan of Action on Energy Cooperation (APAEC) 2010-2015)

- Heads of States adopted the AEC Blueprint in November 2007 for implementation in 2015
- Key energy policy agenda to ensure a secure and reliable supply of energy and to optimize regional energy resources and ensure sustainable energy development by mitigating GHG emissions and strengthen renewable energy development and cooperation

AEC and the Energy Sector

Energy is closely related to three of the four pillars under the AEC:

Energy commodities are products that will be freely moved in the “single market and production base” (Pillar 1);

A competitive energy sector is an indispensable part of “the competitive ASEAN” (Pillar 2); and

Access to electricity is a key towards “equitable economic development” (Pillar 3)

AEC Opportunities for Myanmar

ASEAN is moving towards a more integrated and liberalized energy sector, which requires lots of domestic reforms (open, transparent, consistent with regional practice and effective markets etc.)

There are opportunities for Myanmar to alleviate energy poverty, increase access to electricity, harness greater benefits from hydropower resources. The AEC will help provide:

- ✓ More available financial, technical and human resources
- ✓ Momentum to domestic reforms which might be controversial otherwise
- ✓ Regional collaboration that will be more institutionalized and convenient for countries like Myanmar to join

AEC Challenges faced by Myanmar

There remain challenges for all ASEAN member states when it comes to energy market integration, including financial constraints, the lack of fiscal arrangements, and the technical and regulatory differences between countries.

Moreover, Myanmar will have to focus attention on the socio-environmental impact that changes will bring, and mitigate any risks through anticipatory planning. The country is likely to face challenges in:

- ✓ Ensuring the institutional system is transparent and open
- ✓ Improvement of regulatory, legal and policy framework
- ✓ Managing technological efficiency
- ✓ Energy pricing mechanisms and the phase out of fossil fuel subsidies
- ✓ Increasing competition from other ASEAN member states

Broader Challenges faced by Myanmar

Access to Energy

- ✓ Technical roadmap for rural electrification: What are the best strategies considering technical, economic constraints and feasibility
- ✓ Affordability: For both government and consumers
- ✓ Sustainability: Challenges and their solutions

Management of Resource Development

- ✓ Revenue
- ✓ Social impact
- ✓ Environmental impact

ASEAN and ASEAN+3's role in energy cooperation and integration among member states

1. Coordinate national energy policies and regulations on project development, and monitor ASEAN Member States (AMSs) on the fulfilment of their commitments;
2. Strengthen the institutional infrastructure and cooperation;
3. Effectively mobilize resources for infrastructure projects by leveraging public funds and the participation of the private sector;
4. Expedite the implementation of priority actions; and
5. Human capital development through regional centres of excellence for training and capacity building, leveraging on cooperation funds within ASEAN and with ASEAN Dialogue Partners

Going Forward

Renewables

- Investment in potential growth areas like hydro, biofuels, solar and wind power
- Overcome high upfront costs by seeking out strategic public-private partnerships

Energy Access

- Continue to seek out innovative and strategic off-grid solutions for primarily rural applications
- Implement effective utilization of discovered crude oil and natural gas resources in the interest of the entire nation, including regions where discovery was made
- Maintaining a balance between energy export and domestic demand for energy i.e. recognizing that expanding domestic provisions may mean forgoing some export revenue
- Financing development of domestic infrastructure will require deep initial investment, necessitating public-private partnerships

Going Forward

Removing subsidies

- Electricity and utility subsidies comprise considerable government expenditure and contribute to the failure to incentivize the development of a leaner energy sector
- Will result in increased efficiency but will also increase prices
- Will require public consultation so as to ensure high acceptability

Liberalizing the energy market, promoting public-private-partnerships

- Will require transparent legal system for foreign investment
- Foreign direct investment will help bridge gap between domestic supply and demand and allow competition to drive down prices

Going Forward

Consider environmental challenges from the outset

- Low adaptive capacity and vulnerability to environmental shocks such as droughts, floods and extreme weather (expected to increase in frequency and intensity as a result of climate change)
- A global vulnerability index (GermanWatch, 2012) marks Myanmar among the top 30 countries at “extreme risk” of climate change impact when considering constant exposure to climate-related natural disasters, sea level rise, human sensitivity, available infrastructure and the adaptive capacity of the government

Invest in building capacity and enhance cooperation for talent mobility

- Creation of centres of excellence for research, development, design, and dissemination
- Build Energy-Environment-Economy (E3) modeling capabilities to better address global challenges e.g. UNFCCC submission requirements (data collection included)
- Increase exchange and flow of talent and information with special attention to energy and energy markets

Concluding Remarks

The AEC and energy market integration within ASEAN have a positive impact on energy utilization and development in Myanmar.

As the AEC matures, Myanmar has a great potential to attract increasing investment in energy extraction, market development and liberalization.

Challenges should be overcome through **greater transparency, coordination and cooperation** among state agencies and ASEAN member states.

Myanmar has good potential to “leapfrog” to the highest level of energy efficiency by employing best practices.

Potential for Collaboration on Energy Studies

1. Energy Efficiency and Conservation

- Energy efficiency in the industrial and commercial sectors
- Energy efficiency in the land and sea transport sectors
- Energy efficiency in households
- Regulatory reforms and pricing to promote energy efficiency and conservation

2. Energy and Climate Change

- Input-output analysis of energy consumption and carbon emissions
- Climate change finance, carbon pricing and emission trading schemes
- Emissions reduction and mitigation potential benchmarking
- Climate change negotiations research and analysis

Research Tracks (cont.)

3. Energy for Power Generation

- The economics and environmental implications of fossil fuel use in power generation
- The economics of solar PV
- Intelligent energy systems and smart grids
- Cyber Security of power plants

4. Energy for Transport

- Electric vehicle cost benefit analysis
- Biofuels
- Optimal fuel stockpiling
- Effects of taxes and rebates on car ownership and driving behaviour

Research Tracks (cont.)

5. Energy Geopolitics

- ASEAN energy market integration
- Political and economic implications of transnational investment in energy and mineral resources
- Energy security and geopolitics in the Arctic
- The governance of nuclear energy post-Fukushima

6. Energy and Competitiveness

- Regional natural gas trade in Southeast Asia
- ASEAN Energy market integration
- Non-Geological constraints to unconventional gas production in East Asia
- International outlook for unconventional gas and implications for global gas markets

INTRODUCTION

Energy efficiency refers to efficient energy use while energy conservation refers to using less energy service to reduce energy consumption. Both are important strategies for energy savings and carbon mitigation.

Energy efficiency is often regarded as a “fifth fuel”, and multiple benefits can be achieved through energy efficiency improvements. Many countries have given high priority to energy efficiency. The ASEAN region has significant saving potentials in primary energy from energy efficiency improvements in future.

Energy efficiency and conservation research require cross-disciplinary work, including engineering, economics, politics, sociology, etc. ESI intends to work closely with its partners to deepen the understanding of the issues for Singapore and the region.

KEY ESI PUBLICATIONS

- Ang Beng Wah, Xu Xiaoyan and Su Bin (2014) “Multi-country Comparisons of Energy Performance: The Index Decomposition Analysis Approach”, *Energy Economics (in press)*, doi:10.1016/j.eneco.2014.10.011.
- Su Bin and Ang Beng Wah (2014) “Attribution of Changes in the Generalized Fisher Index with Application to Embodied Emission Studies”, *Energy* 69, 778-786.
- S. Kamal, Ho Hiang Kwee, Su Bin (2014) “Sankey Diagram Framework for Energy and Exergy Flows”, *Applied Energy* 136, 1035-1042.

OUR RESEARCH

ESI has been working with technical tools to analysis the performance, identify the potential and evaluate the impacts of energy efficiency and conservation in Singapore and the region.

ENERGY EFFICIENCY INDEX | ENERGY EFFICIENCY POTENTIAL | ENERGY CONSERVATION | BENCHMARKING | BEHAVIOR CHANGE

KEY EXAMPLES

Development of the Singapore MARKAL Model

- What are the carbon emission reduction potentials and costs of mitigation?
- What are the implications at the sectoral level under carbon emission reduction targets?
- What are the relevant mitigation technologies in the long term?

Project period: January 2014 – December 2014

Research Sponsors: National Climate Change Secretariat, Ministry of Trade and Industry, and National Research Foundation

Input-Output Analysis of Singapore’s Energy Consumption and Carbon Emissions

- Has Singapore been a net importer or exporter of embodied energy and carbon emissions through trade?
- What have been the main determinants of growth in Singapore’s economy-wide energy use and emissions?
- What have been the key developments in energy use and emissions over the past decade?

Project period: September 2011 – February 2013

Research Sponsor: Ministry of the Environment and Water Resources

EVENTS

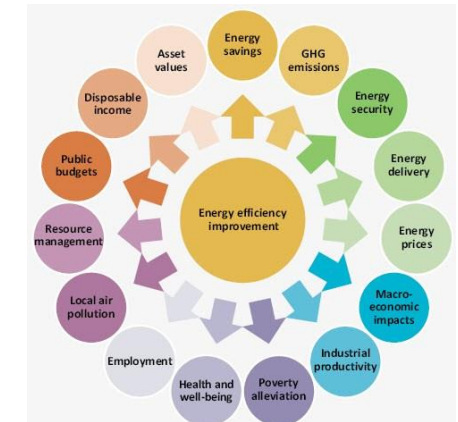
Conferences:

Opportunities and Challenges in China’s Energy Development – Energy Efficiency and Conservation
28-29 November 2013

Conference on Energy Efficiency
27-28 March 2008

Workshop:

E3 System Modeling and Analysis of Energy and Environmental Policy Reforms in Asia
14 February 2014



Multiple Benefits of Energy Efficiency (IEA, 2014).

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27 November 2014 Version

Energy and Climate Change

INTRODUCTION

Our region remains highly vulnerable to the adverse effects of climate change and will remain so for the foreseeable future. There is an urgent need for us to update our understanding of our climate systems and how they will impact our future livelihoods and security.

As a low-lying and densely populated island city-state, Singapore is acutely aware of its vulnerabilities to climate change.

ESI is the designated contact point for the National University of Singapore, which is now provisionally admitted as a Research & Independent Non-governmental Observer Organization with the UN Framework Convention on Climate Change.

ESI plans to coordinate meetings with interested parties within the university to attend the climate talks as accredited observers.

KEY ESI PUBLICATIONS

Melissa Low, "Compliance for Intended Nationally Determined Contributions in the 2015 Climate Change Agreement", *ESI Policy Brief 3*, November 2014.

Su Bin, Ang Beng Wah and Melissa Low (2013) "Input-Output Analysis of CO₂ Emissions Embodied in Trade and the Driving Forces: Processing and Normal Exports" *Ecological Economics* 88, pp. 119-125.

Melissa Low, "Life in the 450ppm World", *Envision Issue 4*, May/June 2013, National Environment Agency, pp. 5-9

OUR RESEARCH

ESI has been working towards having more advanced and sophisticated projection models to allow for better appreciation and understanding of the complex dynamics related to climate change.

INPUT-OUTPUT ANALYSIS | CLIMATE CHANGE FINANCE | EMISSIONS REDUCTION AND MITIGATION POTENTIAL | CLIMATE NEGOTIATIONS

KEY EXAMPLES

Analysis of Proposals on Burden Sharing of Emissions Reductions

- What common threads and trends have been conveyed in various Party submissions to the Ad hoc Group on the Berlin Mandate vis-à-vis the current Durban Platform?
- How have proposals or formulas influenced UNFCCC negotiations in determining the burden sharing of global GHG reductions?

Project period: March – October 2013

Research Sponsors and Collaborators: Ministry of Foreign Affairs, Ministry of Trade and Industry

Mitigation Potential Benchmarking Study

- Which nation-wide factors and indicators can be used for benchmarking the mitigation potential of countries?
- Which sectors in Singapore show the highest and lowest mitigation potentials?
- How can we reconcile differing datasets for greater accuracy in information and analysis?

Project period: March – December 2012

Research Sponsors and Collaborators: Ministry of Foreign Affairs, Ministry of Trade and Industry, National Climate Change Secretariat

EVENTS

Conference:
Opportunities and Challenges in China's Energy Development – Energy and Carbon Markets
2-3 October 2014

Workshops:
Energy Econometric Model Building and Forecasting with Eviews
18-21 February 2013

Integrated MARKAL-EFOM System (TIMES) Modeling and Analysis
14-17 January 2013



DOHA 2012
UN CLIMATE CHANGE CONFERENCE
COP18·CMP8

Photos taken by Melissa Low

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27 November 2014 Version

Energy for Power Generation

INTRODUCTION

Government policies in the electricity sector in many nations include a focus on programmes to support the development and deployment of low-carbon technologies in order to reduce their cost and thus reduce the long-term cost of de-carbonising the sector. Simultaneously, harnessing the multiple benefits of energy efficiency has revealed a "hidden fuel" that supports not only economic growth but also energy security, competitiveness, and environmental sustainability.

Opportunities provided by the proposed ASEAN integrated power grid could result in economic and environmental benefits for the entire region. It has the potential to enhance electricity trade across borders, promote competition, reduce total system costs, provide greater grid security, and reduce regional greenhouse gas emissions.

OUR RESEARCH

ESI research is focused on power market design and regulation, the integration of power grids, the cost of power generation technologies and their environmental impact, and energy efficiency initiatives.

ELECTRICITY MARKET DESIGN | LEVELIZED COST OF ELECTRICITY | LOW-CARBON GENERATION TECHNOLOGIES | ENERGY EFFICIENCY

KEY EXAMPLES

Market Design, Regulatory, and Environmental Issues for the Interconnection of ASEAN Regional Electricity Markets

- What are the costs and benefits of ASEAN electricity sector interconnections?
- Analysis of current electricity market designs in ASEAN countries
- What are the energy security and greenhouse gas emissions implications of regional electricity trading markets?

Project period: 2015

Levelized Cost of Electricity (LCOE) Analysis of Flexible Solar Deployment Types for Singapore

- What is the LCOE for each of rooftop, offshore islets, floating and building-integrated PV deployment types for Singapore?
- How are the costs of PV likely to decline in the future?
- When will the cost of PV achieve grid parity with gas-fired combined cycle technology?

Project period: July – December 2014

Research Sponsor: Ministry of Trade and Industry

EVENTS

Market Design Issues in the Presence of Low Carbon Technologies, Electricity Market Reform in Asia – Opportunities and Challenges, IEEJ Roundtable, Singapore International Energy Week
30 October 2014

Workshop:
IEA Expert Workshop on Market Design and Deep De-carbonisation
4 October 2014

Conference presentation:
Feasibility of ETS for ASEAN: Viewpoint from the Power Sector
IAEE Asia Conference, 19-21 September Beijing, 2014



KEY ESI PUBLICATIONS

Anthony D Owen (2014), 'Do Liberalized Electricity Markets Discourage Investment in Renewable Energy Technologies?', *The Electricity Journal*, 27, pp. 53-59.

Anthony D Owen, Anton Finenko, and Kamal Soundararajan (2014), 'LCOE Analysis of Flexible Solar Deployment Types for Singapore', ESI Research Report number ESI/PG/04/2014-11.

CONTACT

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27 November 2014 Version

Energy for Transport

INTRODUCTION

Vehicles emit pollutants and greenhouse gases that damage the environment. Cleaner and more fuel-efficient transport alternatives can improve our quality of life.

Emission standards for road vehicles have been tightened progressively. Recent initiatives include the Carbon Emissions-based Vehicle Scheme and electric vehicle (EV) test-bed, a project that ESI is also involved in. More green vehicle trials will also be launched.

As a major shipping port, Singapore has implemented the Maritime Singapore Green Initiative, and will start a pilot programme for LNG bunkering by 2017 to reduce emissions from the Maritime sector.

The aviation sector is exploring the feasibility of airlines using alternative fuels like biofuels, which cause less pollution.

OUR RESEARCH

Our Cost-Benefit Analysis Report for Phase 1 of the EV Test-bed has been endorsed by the EV Taskforce. We are looking to expand our expertise into different areas of the transport sector.

ALTERNATIVE FUEL VEHICLES | BIOFUELS | COST-BENEFIT ANALYSIS | EMISSION STANDARDS |

KEY EXAMPLES

Electric Vehicle Cost-Benefit Analysis

- Will individuals find EVs cost-competitive? Is EV adoption justified for society?
- In what ways could oil prices, charging patterns, and government policies influence the affordability of EVs?
- Under what conditions will EVs reach cost parity with conventional internal combustion engine vehicles (ICEVs)?

Project period: February 2011 – December 2014

Research Sponsors and Collaborators: EV Taskforce (co-led by EMA & LTA)

Reducing Emissions in the Marine Sector

- How will future International Maritime Organisation (IMO) regulations on energy efficiency impact the container shipping industry?
- How does the uncertainty over future fuel prices, LNG bunkering infrastructure and regulations impact the shipping sector's selection of marine fuels?
- What challenges does the shipping sector face in overcoming energy efficiency barriers?

EVENTS

Conferences:
Transition towards Low Carbon Transport: Asian and European Perspectives (2nd Annual Conference of Asian-European Energy Policy Research Network)
14-16 November 2013

Electric Vehicles: Lessons, Challenges and Opportunities
6 March 2012

Presentation: "Cost-effectiveness analysis of electric vehicles in Singapore" at the 4th *International Association for Energy Economics (IAEE) Asian Conference*
19 – 21 September 2013

Workshop:
How Much is Clean Air Worth?
11-15 March 2013



Domino's Pizza electric scooter and electric car in the Netherlands (Photos by KH Yuen)

KEY ESI PUBLICATIONS

- Yuen, Kah Hung. (2013, April 4), "Clearing Roadblocks to Adoption of EVs." *The Business Times*.
- Chua, Wen Hao. (2011, September 9), "What Drives Electric Vehicles Here?" *The Business Times*.
- D'Souza, Neil Sebastian. (2011). "The Energy Saving Potential of Singapore's Road Transportation Sector: Analysis of Energy Saving Potential in East Asia", Jakarta: Economic Research Institute for ASEAN and East Asia (ERIA).

CONTACT

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INTRODUCTION

Energy geopolitics refers to the study of national security and international politics in the context of the global energy scene.

The world today is marked by a number of factors affecting the international energy market. Key factors include instability in oil-producing regions due to domestic, regional and international factors, the rise of national oil companies, resource nationalism, reserve depletion among traditional suppliers, and the opening of new sea routes, to name a few.

Energy security is regarded as an integral part of a state's political and economic survival. It is important for policy-makers to understand how energy diplomacy, resource competition and unfolding developments in the energy markets will shape the behavior of states with implications for the international system and regional orders.

KEY ESI PUBLICATIONS

Philip Andrews-Speed, Christopher Len, "The Political Economy of AEMI", in *ASEAN Energy Market Integration (AEMI): From Coordination to Integration*, Bangkok, ASEAN Studies Centre, pp.197-214, 2013;
 Christopher Len, "Reed Bank : Next Flashpoint for China and the Philippines in the South China Sea?", *ISDP Policy Brief*, No. 153, May 26 2014.

OUR RESEARCH

This research track examines the intersection between international politics and global energy issues to assess how such developments affect Singapore and the Asian region.

ASEAN ENERGY MARKET INTEGRATION | TRANSNATIONAL INVESTMENTS IN ENERGY & MINERAL RESOURCES | ENERGY SECURITY AND GEOPOLITICS IN THE ARCTIC | GOVERNANCE OF NUCLEAR ENERGY POST-FUKUSHIMA | CHINA MARITIME ENERGY STRATEGIES
 KEY EXAMPLES

ASEAN Energy Market Integration (AEMI)

- What are the national and regional benefits and barriers to ASEAN Energy Market Integration?
- What are the conditions and policies required to encourage ASEAN member states to work towards ASEAN Energy Market Integration?

Project period: April 2013 — January 2015 (Phases 1 & 2).

Research Sponsors and Collaborators: School of Economics, Chulalongkorn University, Thailand

Transnational Investments in Energy and Mineral Resources by Northeast Asian Companies in Southeast Asian Countries

- What are the economic and politics motivations for Northeast Asian companies to invest in Southeast Asia's resource sectors?
- How may these investments affect economic and political relations between Northeast Asian and Southeast Asia governments?
- How do such investments support East Asian integration and do they undermine regional cohesion in Southeast Asia?

Project period: April 2013 – February 2015

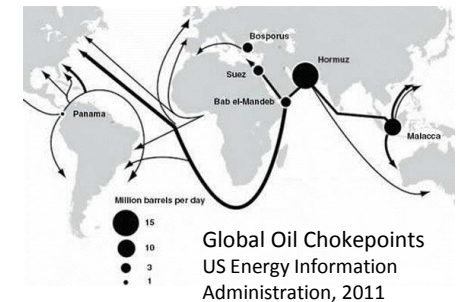
EVENTS

Conference:
Perspectives on China's Maritime Energy Resource Strategies
 Forthcoming 2015

Workshop:
ESI-Chatham House Asia Oil Security Meeting
 16-17 January 2014

Seminars:
Nuclear after Fukushima: Lessons Learned
 19 November 2014

ASEAN Energy Market Integration: From Coordination to Integration
 11 December 2013



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Energy and Economic Competitiveness

INTRODUCTION

Singapore's economic competitiveness is highly dependent on international energy markets for three reasons: it relies on imports for most of its energy consumption; it is a major hub for processing and trading of energy commodities such as oil and gas, and many international energy companies have regional offices here.

Natural gas is playing a growing role in Singapore, as reflected in the new LNG terminal and plans to develop a gas trading hub.

Two international trends are of particular importance: the rise of unconventional gas production, especially in the USA, and the growing quantity of gas trade in Asia.

For this reason, ESI has been carrying out research into the behavior of international gas markets and implications for Singapore.

KEY ESI PUBLICATIONS

C. Len, "Indonesia Coalbed Methane: Bountiful Promise Held Up By Institutional Paralysis", *ESI Policy Brief*, No. 1, 1 September 2014.
P. Andrews-Speed & C. Len, "The Legal and Commercial Determinants of Unconventional Gas Production in East Asia," *Journal of World Energy Law & Business*, Vol. 7, Issue 5 (2014): 408-422.

OUR RESEARCH

ESI has been assessing the likely production of unconventional gas in different parts of the world, evaluating different scenarios for global gas trade and assessing the implications for Singapore.

NATURAL GAS | LNG | INTERNATIONAL TRADE FLOWS | MODELLING
GAS TRADING HUB NEGOTIATIONS | UNCONVENTIONAL GAS

KEY EXAMPLES

Asian Gas Trade Model

- What are the implications of the increase in US shale gas supplies for Singapore?
- What is the magnitude of trans-Pacific flows of LNG in the coming decade?
- What is the potential role for Singapore as a regional LNG hub?

Project period: October 2010 – March 2015

International Outlook for Unconventional Gas and Implications for Singapore

- What is the outlook for unconventional gas production in key countries?
- What are the implications for global gas trade flows and prices?
- What are the implications for Singapore as an LNG hub, a petrochemical base and an oilfield services center?

Project period: January – October 2014

Research Sponsors : Ministry of Trade and Industry

Research Collaborator: Tri-Zen International Pte Co

EVENTS

Conferences:

Non-Geological Constraints to Unconventional Gas Production in East Asia. 27 February 2014

Unconventional Gas in East Asia
1 November 2013 (SIEW Roundtable)

Seminars:

Long-term LNG Contracts Relative to Spot Trading. 4 November 2013

IEA's 2013 Mid-Term Gas Market Report. 13 September 2014

Governance of Unconventional Gas outside the USA. 2-3 June 2014.
Workshop at World Bank Institute, Andrews-Speed as co-convenor



Photos taken by ESI



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Thank you!

