



Conference Indefinitely Postponed, March 2020, re COVID



Overcoming the Challenges of Continuity of Supply in ASEAN's Renewables Centred Power Systems

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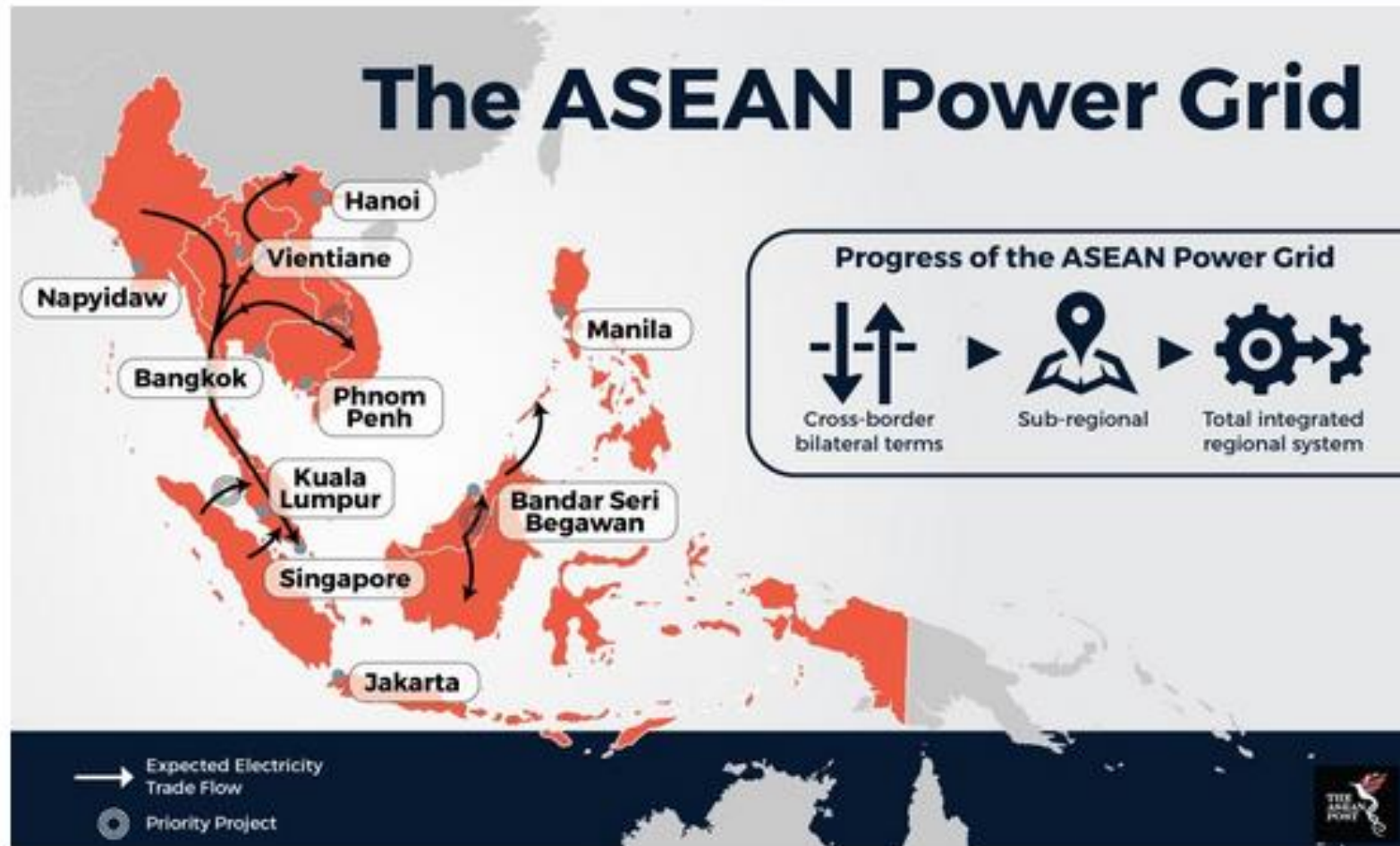
Australia

**2020 Asia Conference on Renewable Energy and Environmental
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Bangkok, Thailand

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The Core of the Approach



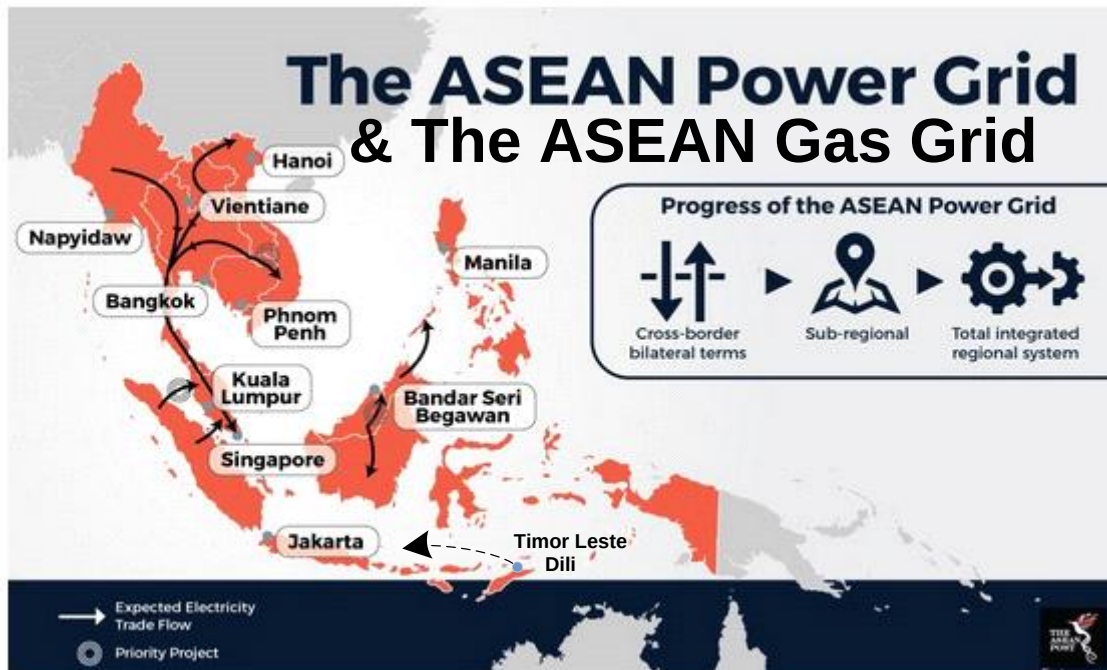
Source: ASEAN Centre for Energy (ACE)

The Core of the Approach – 2

with Timor-Leste (Dili)

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Additions: METTS 2020

Timor-Leste has received control over the Greater Sunrise Gasfield, being part of the North West Shelf petroleum province.

The field is estimated to have recoverable 7.7 TCF of natural gas (as well as 16 BCF of helium).

As to other major gas finds and prospects in the ASEAN region, many of those that are located in the South China Sea (SCS) and are under claim (with some occupied) by China.

Gas discoveries in Myanmar and other Indian Ocean areas are likely to be more secure than those abutting the SCS.

Renewables need non-renewables backup

- The Non-renewables backup are required to:
 - Reduce (remove) the intermittent nature of many renewables,
 - Provide dispatchable electricity with minimal outages, especially those associated with load shedding resulting from rapid variation in the supply sourced from renewables,
 - Provide liquid transport fuels where Electric Vehicle (EV) options are not viable, existent or available (e.g. for medium to heavy freight haulage), and
 - Provide energy for growth, poverty reduction and regional stability.

Renewable Energy for what?

- Replacing Fossil Fuel Electricity Generation,
- Replacing Fossil Transport Fuels with ZERO carbon hydrogen,
- Preplacing Non-renewable District heating (and cooling) systems,
- Replacing Industrial Heat Resources (e.g. sources that produce steam for waste paper recycling), and
- Maintaining our non-lavish lifestyles and allow the greater population to enjoy those same lifestyles:

There is no way of stopping the steady (and occasionally rushed) movement of people away from the countryside into the cities, or postponing the lifestyle improvement demanded by those staying on the land.

Renewable Energy Sources – Power

- Renewable Energy Sources are generally of a diverse and unconcentrated nature, this applies to wind, wave, solar, tidal, ocean current, small hydro, low temperature artesian geothermal, deep ocean thermal energy (OTEC [1]), and biomass,
- Large Hydro generation is highly geographically regional and concentrated as is volcanic geo-thermal,
- Hot Rock Geothermal (where heat is sourced from the earth's mantle and derived from uranium and thorium decay) is 'nearly renewable', &
- Nuclear Energy (fission) that uses uranium and thorium is also a near renewable energy resource that would last for as long as modern human beings have been on earth.

The Offerings of the International Energy Agency (IEA)

- The International Energy Agency (IEA) has produced three publications in 2019 that discuss the possibilities and challenges of having renewable energy as a major part of the ASEAN generation mix:
 - S-E Asia Energy Outlook,
 - ASEAN Integration of Renewable Energy, and
 - The Future of Cooling (Airconditioning) in S-E Asia.

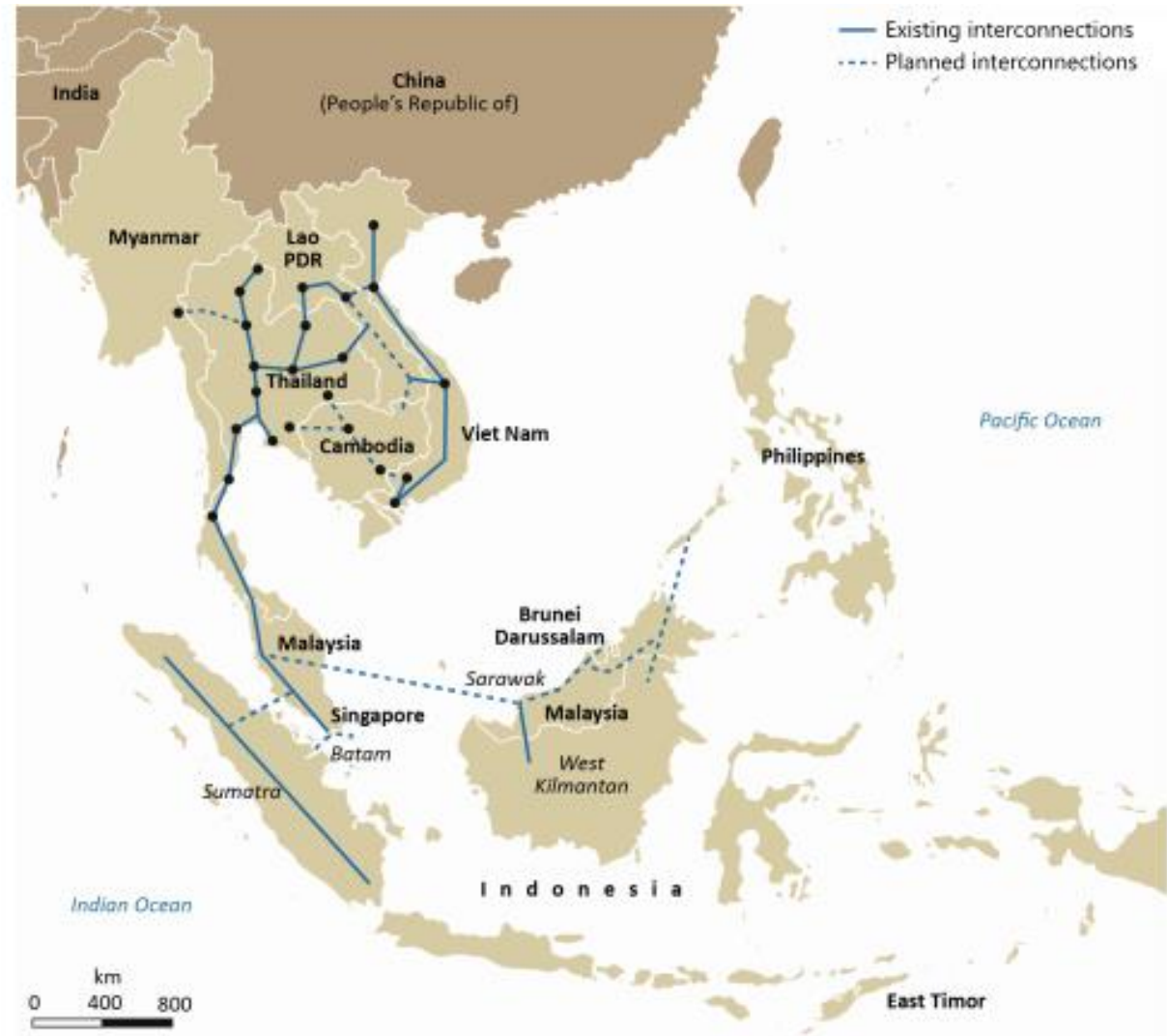
These documents can be downloaded from the IEA website GRATIS: www.iea.org

Trans-ASEAN Power Grid, Present & Future

TAPG

An old concept partially achieved; in its new form, it will be able to ensure that power system instability caused by the introduction of significant percentages (say > 33% of load) of renewable sourced electricity is moderated or removed.

It is possible that major fossil fuel energy introduced from Indonesia and Timor Leste will provide the security of dispatchable power as expected and required by the off-takers of ASEAN and beyond.

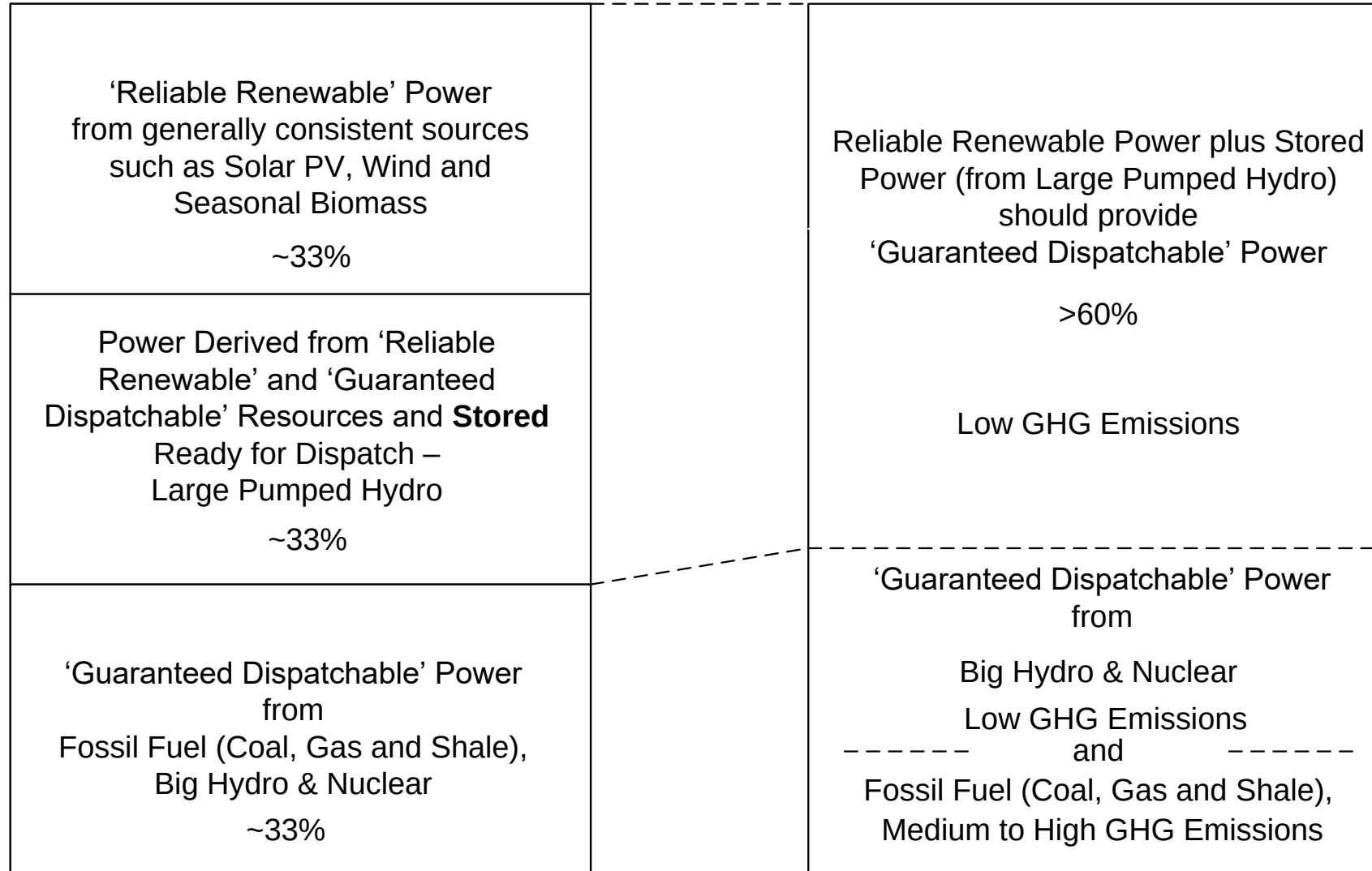


New Fossil Fuels for Backing-up Renewables in ASEAN

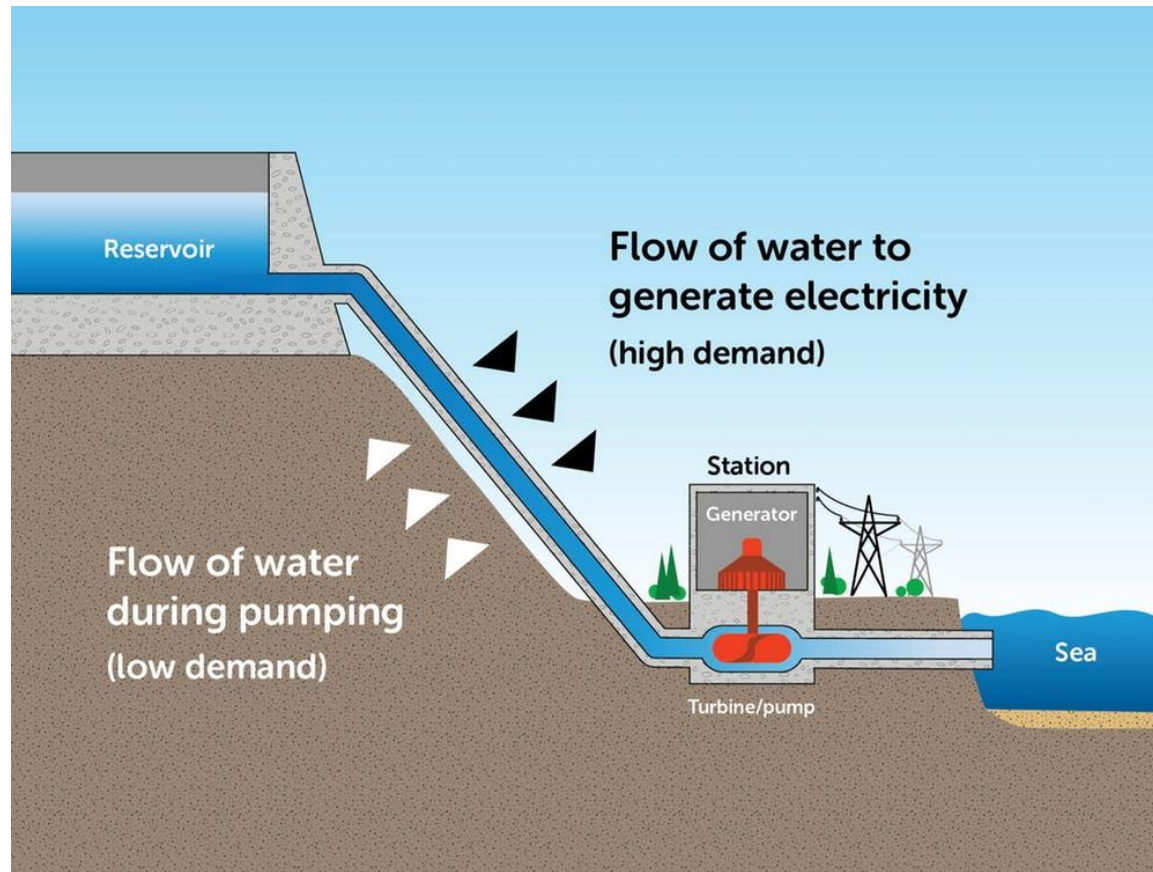
- Indonesian Potential – Huge Shale-gas & Shale-oil Potential!
 - South/East Kalimantan, Sumatra, Indonesian Papua, Natuna
 - ADB Staff Consultancy: *Shale-gas in Asia, 2013, Dr. Michael Clarke, Consultant to the ADB*
- East Timor and the N W Shelf,
 - Greater Sunrise Reserve, Gas, Condensate and Helium
- Myanmar, Off-shore potential resources.

Gas and other fuels to provide backup for renewables

Renewables and Non-renewables, the best match



What is Pumped (Energy) Storage?



An Australian Example is the Wivenhoe Power Station,
Hydraulic height: ~60m,
Output: 2 x 250 MWe,
Energy Stored: 5000 MWh,
Cycle: 14 hours pumping,
10 hours generation
Source: CS Energy

← As Proposed for Cultana,
Spencers Gulf, South Australia

Web sourced: <https://theconversation.com/snowy-hydro-gets-a-boost-but-seawater-hydro-could-help-south-australia-74442>

Stabilising Power from Renewables

- Maintenance of dispatchability – No Brown Outs,
 - Maintenance of AC supply in terms of frequency, wave form and voltage,
 - The incorporation of reliable energy storage facilities – i.e. pumped storage,
 - The creation of strong Grids (generation, poles and wires), where losses are minimised,
 - Rapid response from backup units, being batteries, diesel sets, hydro, and
 - Good grid interaction with meteorologists, dispatch engineers and backup system operators.

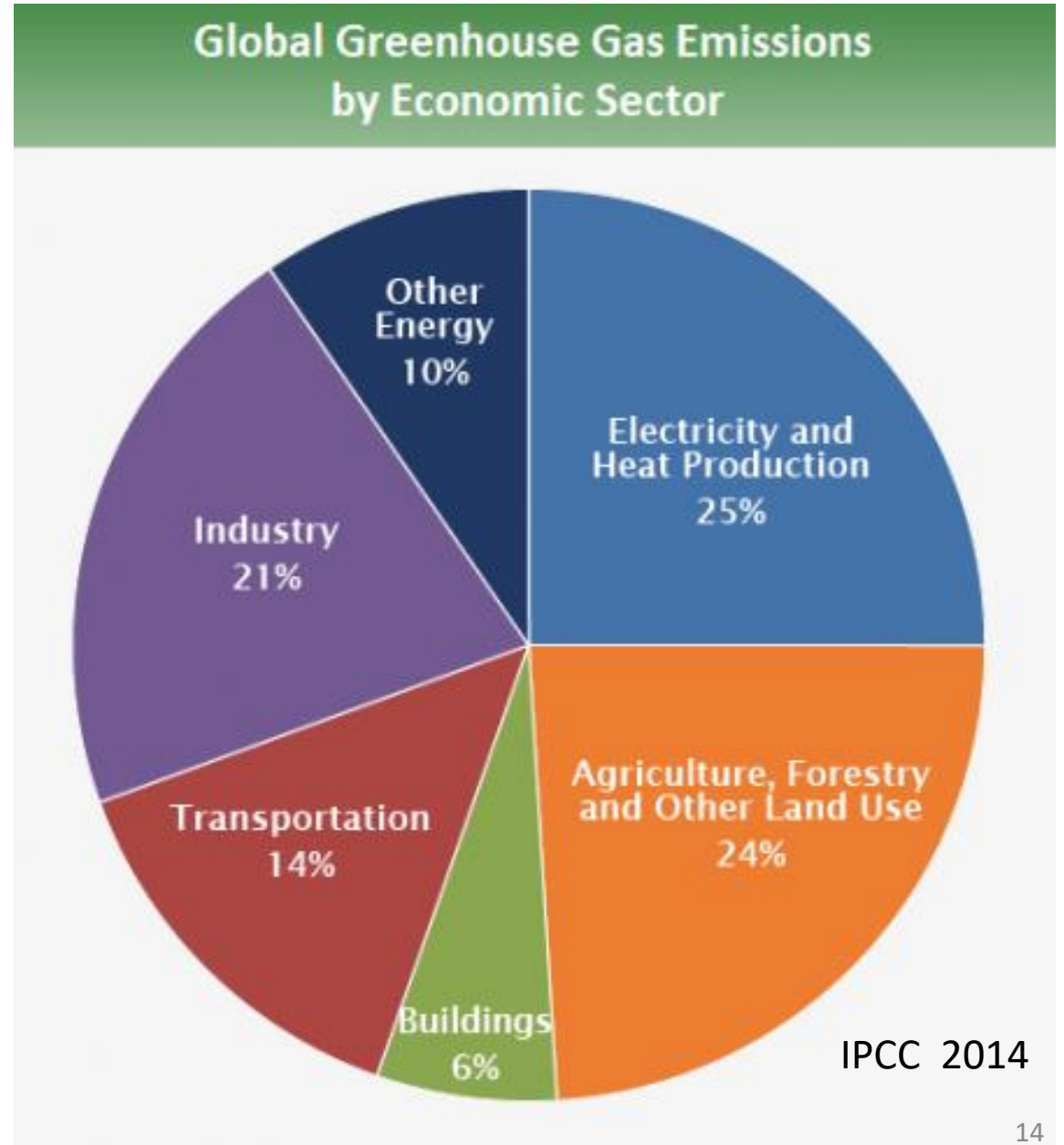
Where to get ASEAN indigenous fossil fuels and large hydro that will be required for Energy Security?

- First Pick, Indonesia, for Gas, Coal (and Lignite) and Shale; Sumatra, West Papua and Kalimantan,
- Second Pick, Timore Leste, their share of the N-W Shelf off the Australian coast for gas and condensate,
- Thence: Myanmar, Petroleum/Gas and Potentially Oil-shale,
- Laos, Coal/Lignite and Large Hydro,
- Vietnam and Cambodia, Off-shore gas, and
- Malaysia, Sarawak, Large Hydro; Sabah, potentially coal/lignite, and
- The Philippines, potentially Oil and Gas off-shore.

Please offer your suggestions!

TRANSPORT FUELS, can we do without petroleum?

No or at least NOT yet



Transport Fuels: how, where and why

- Electricity is not yet a viable transport fuel; batteries are expensive, liable to fail from cascading and case fracture, and have poor weight to energy ratios (although improving over the last ten years),
- Oil (as petrol, diesel, LPG and HFO) will remain expensive, and probably get more expensive,
- Gas will also be relative expensive and the LNG trade will see an increase (and regional spread) of demand,
- Converting gas into liquid (GTL) will occur but the product will be more expensive, so
- The CONVERSION of low grade coal, coal wastes and oil-shale into raw and finished petroleum will be required.

The Balance Between Raw Fuel Types and Energy Continuity

- Fossil Fuels will have a significant role in Transport, Manufacturing, Power Generation, Defence and Services, including heating and cooling, for the foreseeable future,
- Electricity from Renewables will require major fossil fuel (or otherwise nuclear) for stability also for the foreseeable future,
- Nuclear energy supplying essentially reliable electricity will be an advantage to transport if battery improvements continue and the world moves towards an increasing electricity powered future, and
- Adequate and Stable Electricity supply will increase human wellbeing and general prosperity.

Thank you for your attendance

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