



**WATER FOR OUR FUTURE:
POST 7th WORLD WATER FORUM SEMINAR
Putrajaya**



WATER FOR ENERGY SECURITY

6 October 2015

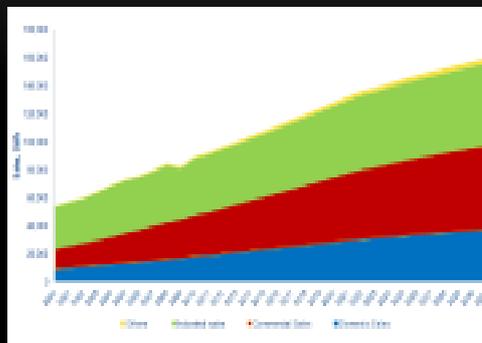
Dams and reservoirs are constructed primarily to function as multipurpose functions including as flood control, drinking water, irrigation, hydropower, recreation and others functions.



HYDROPOWER - NEED FOR ENERGY

New peak demand of 16,901MW was recorded in June 2014 which marked a 2.0% increase from 16,562 MW in May 2013, with a 2.5% growth of electricity consumption (TNB, 2014).

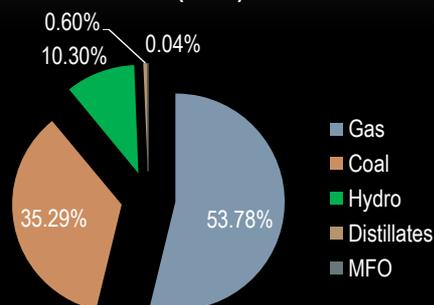
It is projected that future sales of electricity will increase by an average of 3.1% per year (EC, 2014).



Source: TNB - MNC-CIGRE (2013)

ENERGY SECURITY

Energy Production by TNB (2014)



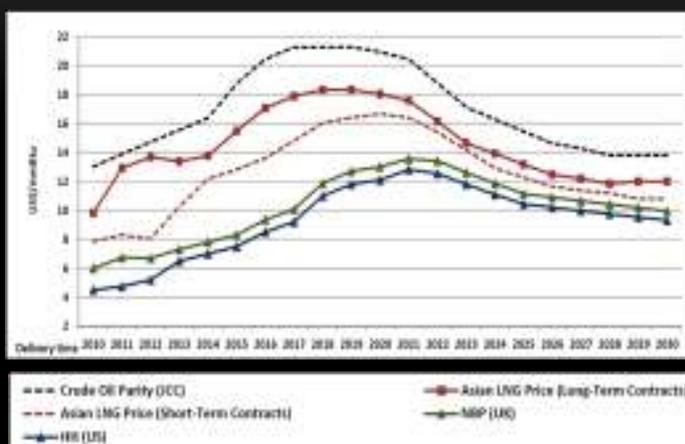
IEA defines energy security as “the uninterrupted availability of energy sources at an affordable price” while addressing the environmental concerns.

2020: Malaysia would be adopting an indicator of voluntary reduction of up to 40% in terms of emissions intensity of GDP (Gross Domestic Product) as compared with 2005 levels.

Future energy outlook has shown that even though fossil fuel dominates the future energy supply well into the 21st century, alternative fuels such as hydropower projects are expected to play an important role in the energy mix.

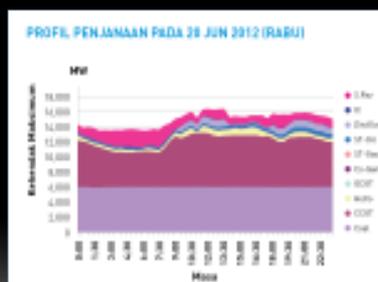
Dependence solely on fossil fuels such as oil, coal and natural gas possess economic and security risks.

WATER FOR ENERGY SECURITY



Source: Projected Asian LNG Price by FACTS GLOBAL ENERGY – Australia and World LNG, November 2010

- The implementation of the hydropower will reduce the impact of tariff hike as it is not dependent on the fluctuation global market price of fossil fuel and depletion fossil fuel resources.
- The effort of developing and implementing hydroelectric projects are in line with the Government's plan to reduce dependency on fossil fuel sources by exploiting the indigenous / domestic hydropower and renewable energy.
- Hydropower plants are capable for peaking demand due to very fast start-up.



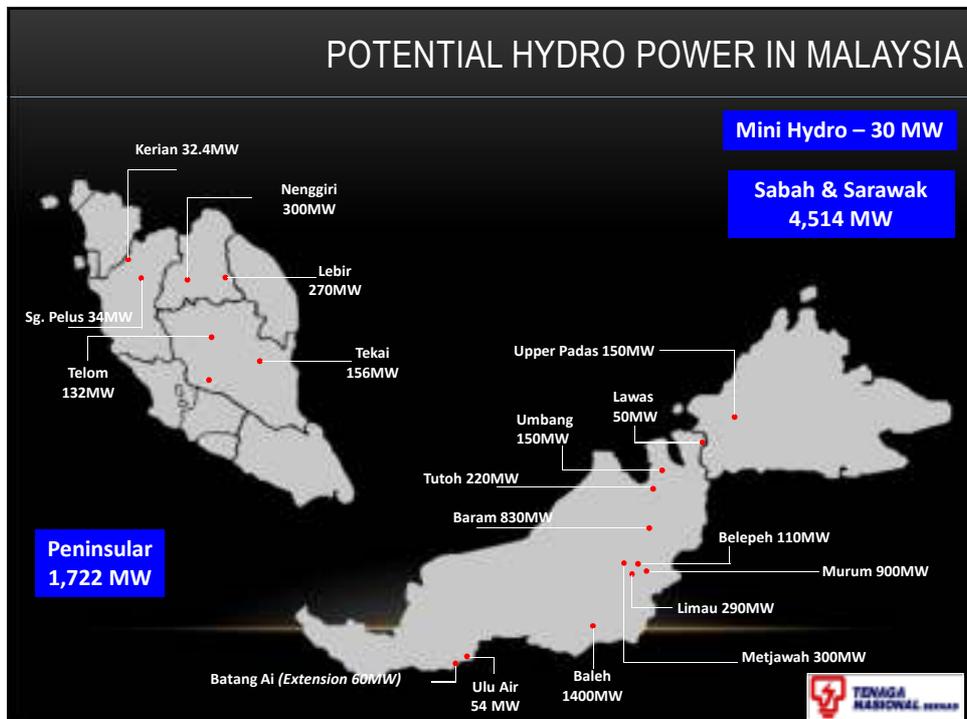
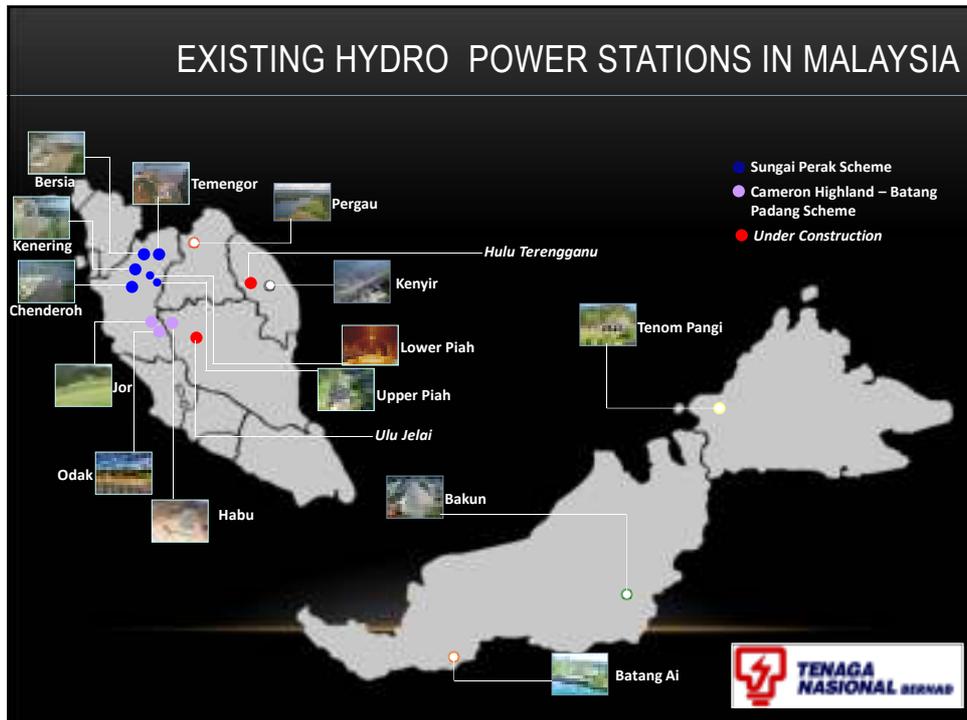
Source: Energy Commission 2012 Annual Report

WATER FOR ENERGY SECURITY

Hydropower Benefits:

- Clean Energy
- Flood Storage & Control
- Controlled Water Flows
- Supply Peak Demand
- Water Supply & Irrigation
- Recreation Activities
- Aqua Tourism & Aquaculture





RENEWABLE ENERGY

2011 - Every (1.0%) RM 100 / RM 1.00 contributed to RE

2014 - Every (1.6%) RM 100 / RM 1.60 contributed to RE

What RE available in Malaysia?

SOLAR – 63.5% (207.72 MW)

BIOMASS – 25.6% (83.8 MW)

BIOGAS – 5.3% (17.24 MW)

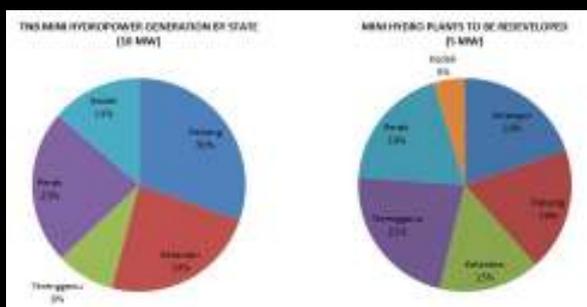
MINI HYDRO – 5.6% (18.3 MW)

TOTAL = 327.06 MW (1.6%)

Source: www.seda.gov.my

The government through Sustainable Energy Development Authority of Malaysia (SEDA) has been implementing a series of policies to promote small hydropower in rural area in Malaysia.

In Malaysia, a total of 149 sites with estimated potential of 28.9 MW were identified (Raman, 2010).



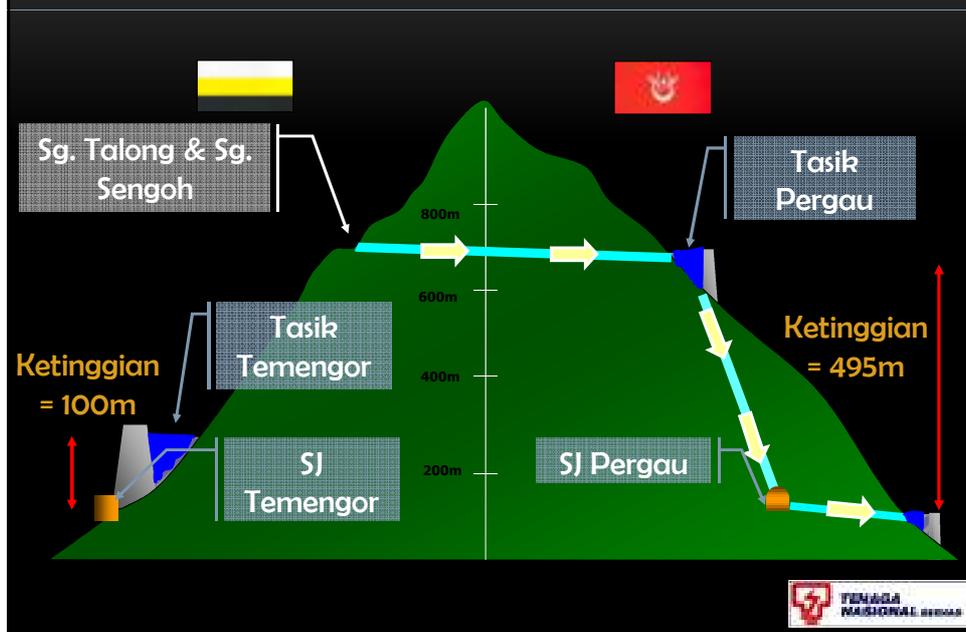
Source: TNB (TNBES, 2011)

Hydropower is an important, cost effective and sustainable renewable energy



POTENTIAL HYDROPOWER PROJECTS

TALONG – SENGOH DIVERSION TUNNEL PROJECT



- This project was studied in 2008, which would see water diverted through a 20 km underground tunnel from upper reaches of Sg Talong and Sg Sengoh in Temengor catchment in Perak to Pergau reservoir in Kelantan.
- The project would increase the storage capacity in Pergau reservoir by almost 50% which could be used for peak demand power generation.
- Once implemented, the project is expected to produce more than 200 GWh/year of energy using the renewable source.

ULU JELAI PUMP STORAGE SCHEME (1050 MW)



THE CHALLENGE

CLIMATE CHANGE

The 7th World Water Forum executive summary provides several actions needed in managing water and natural disasters. It cites the need to address climate change which has a direct impact on water management.

Though some study has been done to observe the climate change in Malaysia, to date no major studies had been conducted to study the link between climate change and energy security.



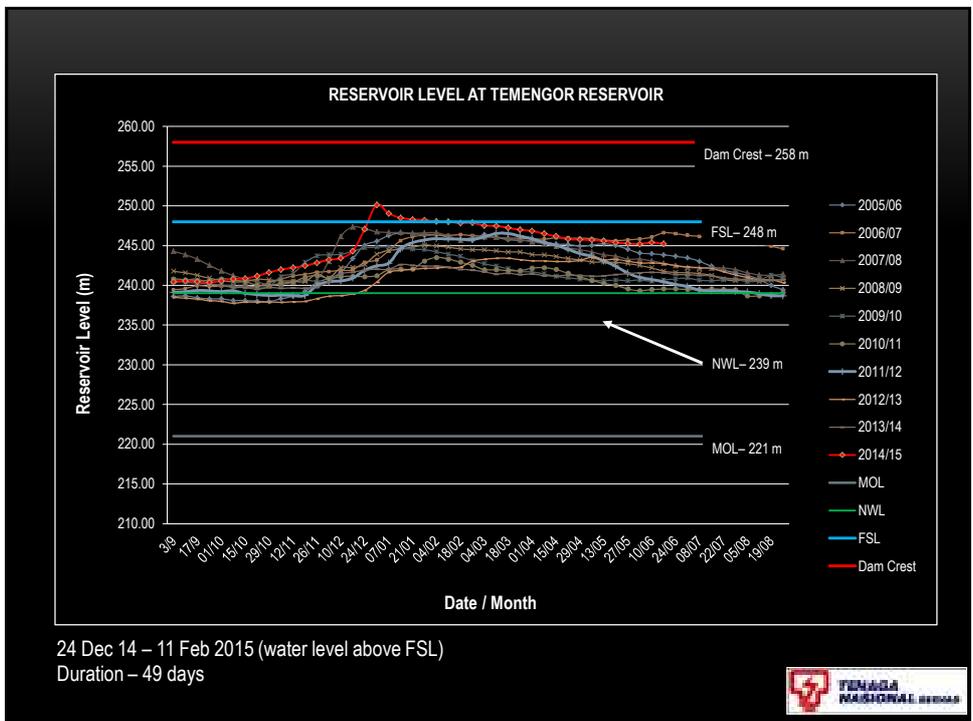
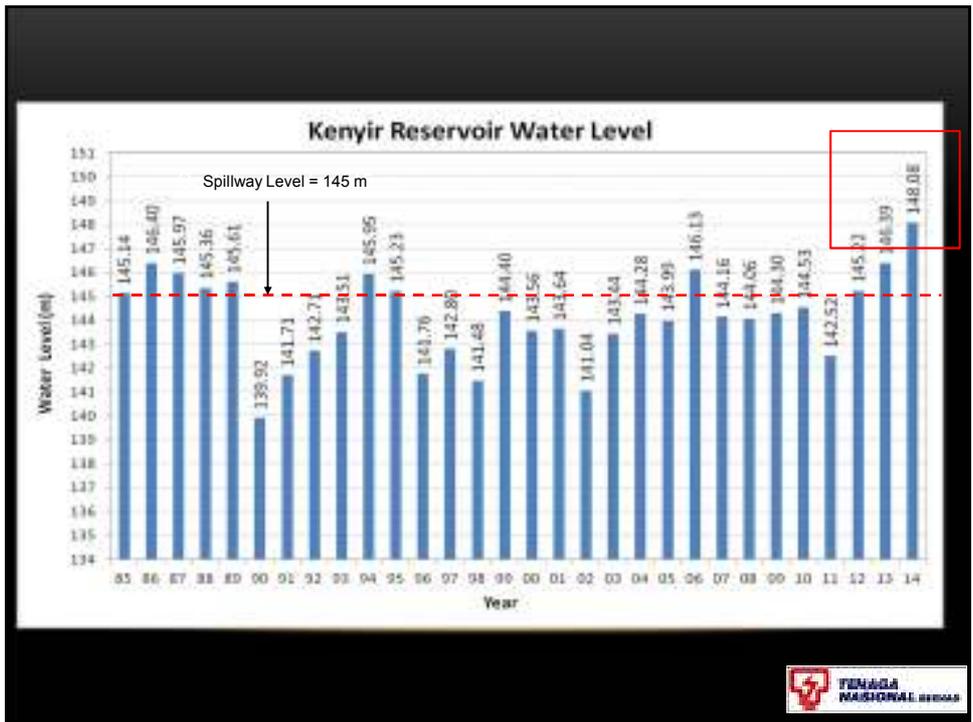
CLIMATE CHANGE IMPACTS

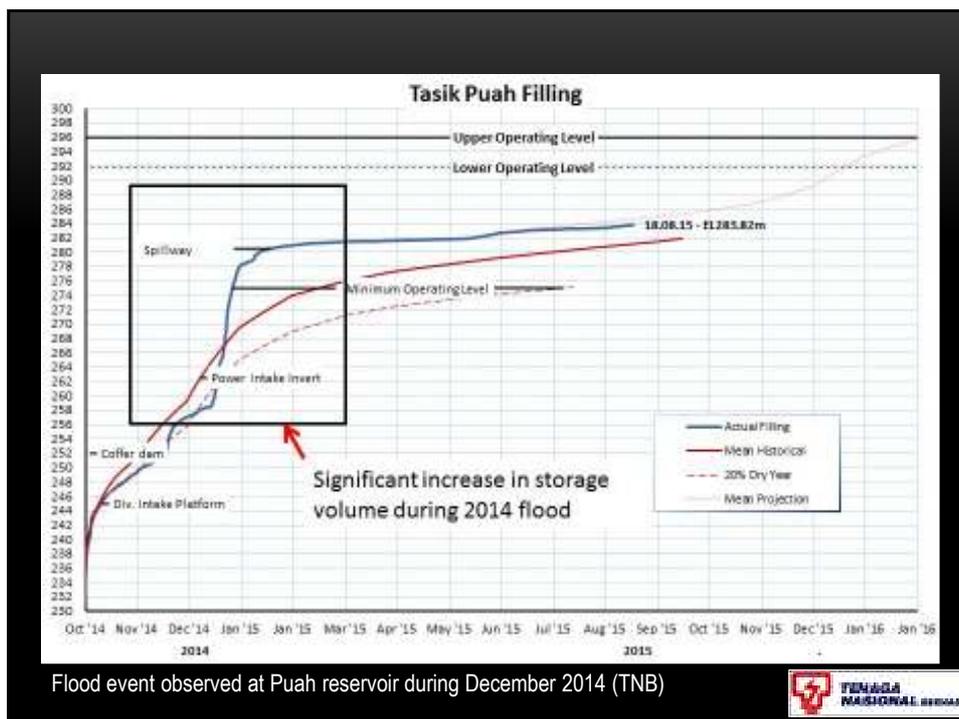
- Increase in drought could affect the duration of hydropower operation due to limited water inflows from major rivers;
- Increase in extreme flood inflows especially during monsoon seasons introduces rapid reservoir sedimentation in storage reservoir especially at hilly terrain such as in Cameron Highlands which can cause operational difficulties and frequent downstream flood release;
- Higher maintenance and replacement cost for transmission and distribution assets due to damages and prolonged outages caused by extreme climate events as seen in Johor 2006/2007 and Kelantan in 2014.
- An increase in flooding incidences as a result of sporadic and excess rainfall have been experienced in Malaysia during the past years. In Dec 2014, Majlis Keselamatan Negara (MKN) reported that 101,702 people from Kelantan, Terengganu, Pahang, Johor and Perak have been placed at flood relief centres due to major flood incidents.



ROLE OF HYDROPOWER RESERVOIR

- It is expected that the role of hydropower dams in flood control and water flow management is becoming more important.
- Apart from energy the water stored in the reservoir if properly designed and planned can also be used for other purposes such as irrigation, water supply, aquaculture and aqua tourism.
- Over the years hydropower reservoir has successfully managed to contain large floods which would have led to catastrophic flooding downstream should the dam do not exist.
- **Case Study for 2014 flooding: Kenyir, Temenggor and Puah**





Flood event observed at Puah reservoir during December 2014 (TNB)

FUTURE HYDROPOWER PROJECTS

- In line with the EC (2014), Generation Development Plan up to 2024 it was approved that several major hydropower projects would be developed to meet Malaysia's future energy demand and to compliment the sustainable energy requirements.
- The new major hydroelectric plants would have a total estimated capacity of 1,480 MW or an additional of 44% will be developed and commissioned in stages from 2015 right up to 2024 to add to 1,899 MW capacities already in operation.

Project	Capacity (MW)	Design Requirement	Commercial Operation Date (COD)
Hulu Terengganu	250	Hydropower	2015/2016
Ulu Jelai	372	Hydropower	2015/2016
Tekai	156	Hydropower	2020
Telom	132	Hydropower	2022
Nenggiri	300	Multipurpose	2024
Lebir	270	Multipurpose	TBC

ENERGY EFFICIENCY

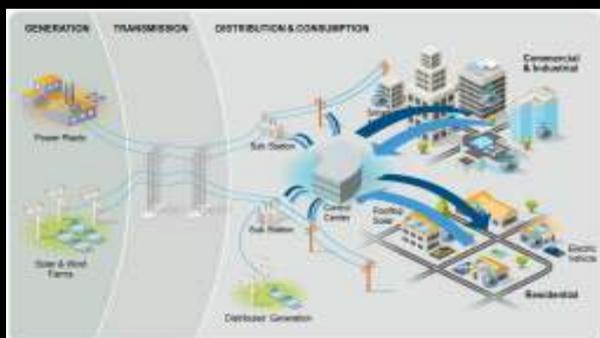
Apart from building new dams for hydropower, another area that was highlighted in the 7th World Water Forum is the need for efficiency in water utilization.

“Smart System” is highlighted as a means to use technology to manage consumption and indirectly manages to reduce operational cost and improve efficiency.

ENERGY EFFICIENCY

TNB has embarked on a holistic smart grid system.

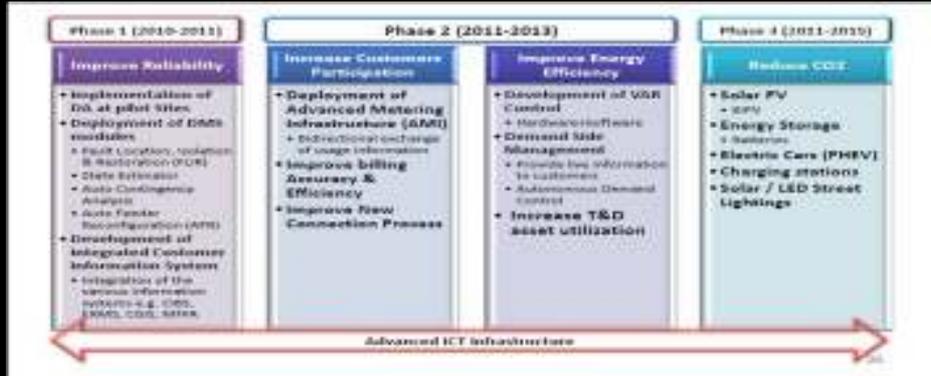
The smart grid is an electricity network utilising digital technology and connects suppliers, distributors and consumers. It is expected to address key area such as optimization of energy assets which includes hydropower, energy security and environmental sustainability.



Source: <http://blogs.terrapinn.com>

TNB SMART GRID IMPLEMENTATION INITIATIVES

TNB has defined Smart Grid as “Use of communications and modern computing to upgrade the current electric power grid so that it can operate more efficiently and reliably and offer additional services to consumers to save money and reduce CO₂ emissions” – TNB Smart Grid Steering Committee. (Sept 2010)



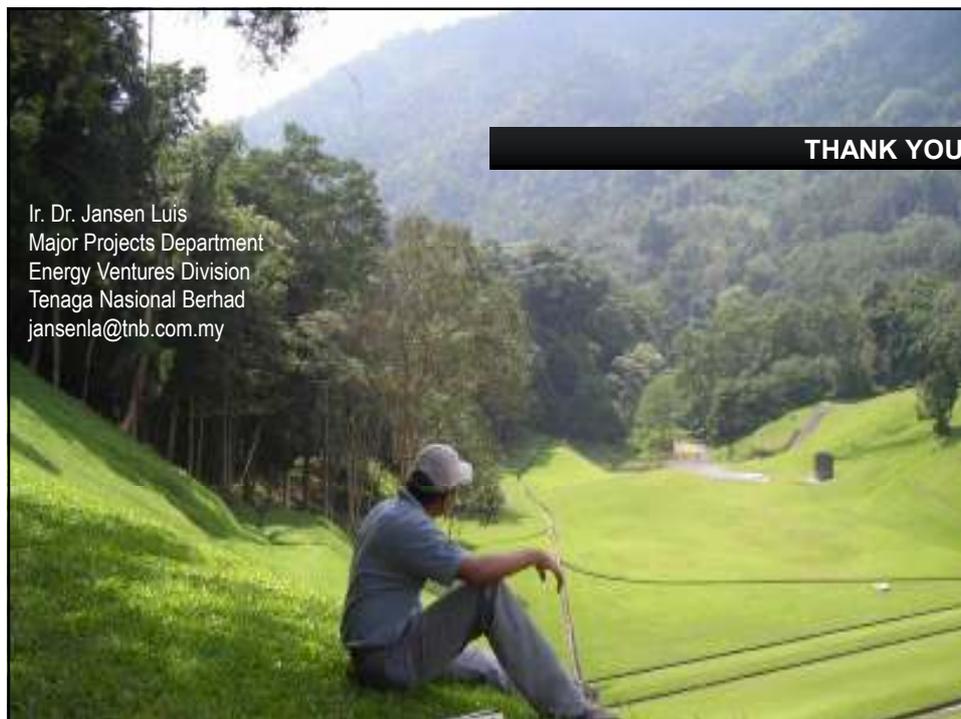
WAY FORWARD

- Hydroelectric generation do not use fuel so they produce little to no air pollution in comparison with fossil fuel plants and therefore should be developed to the fullest to realize its full potential.
- Energy efficiency and demand management by using technologies and altering consumer behaviour is a environmentally friendly way and should be optimized.
- Advance research should be conducted in relation to climate change and energy security in Malaysia.
- While renewable energy sources such as wind and solar have clear environmental benefits compared to conventional sources, they are not free of consequences. This should be researched further.

CONCLUSION

- The demand for water and energy security on a global scale is predicted to increase greatly in future.
- Many international forum and meets has come to an agreement that renewable energy technologies and resources should be expanded. This includes hydropower which is required to be substantially increased with a sense of urgency.
- Great challenge to manage climate change which will probably lead to changes in the hydrological regime including increased variability and more frequent hydrological extremes (floods and droughts).

- Creating reservoirs would be the only way to capture uneven distribution of water due to the natural environmental process and especially during floods.
- There is also a growing need for thorough use of water resources such as domestic water, irrigation, industrial water and of course for hydropower. Multipurpose hydropower development can also be expected in Malaysia for the coming years.



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THANK YOU