ASIA LEADERSHIP PROGRAM

Energy Group Discussions:

Business As Usual or Institute Changes

HOW?

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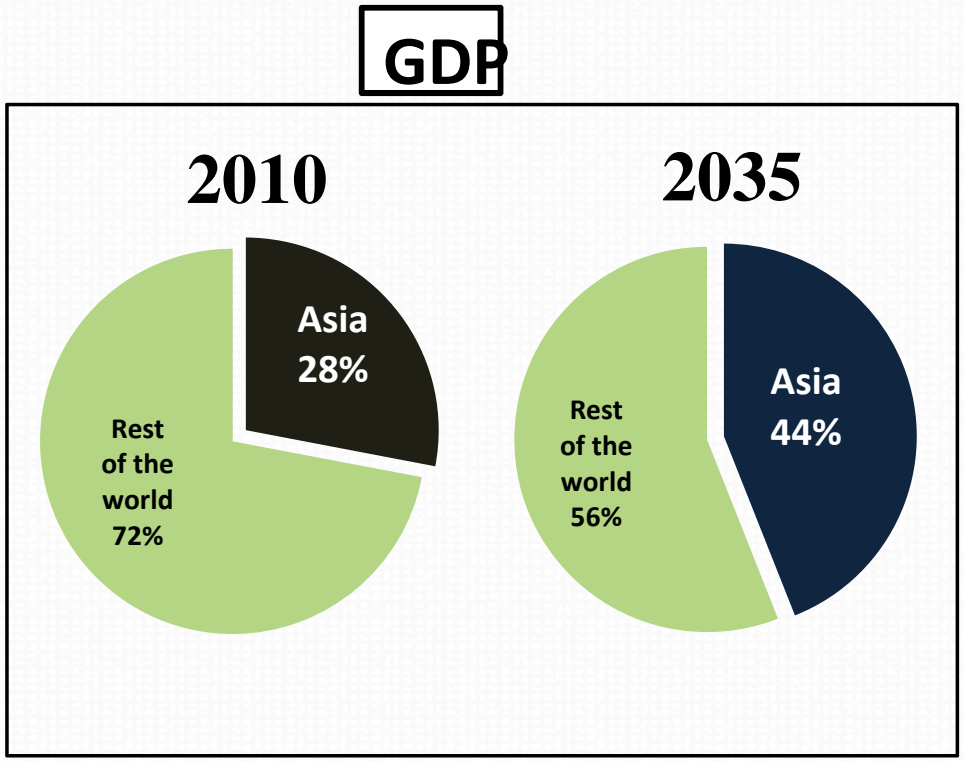
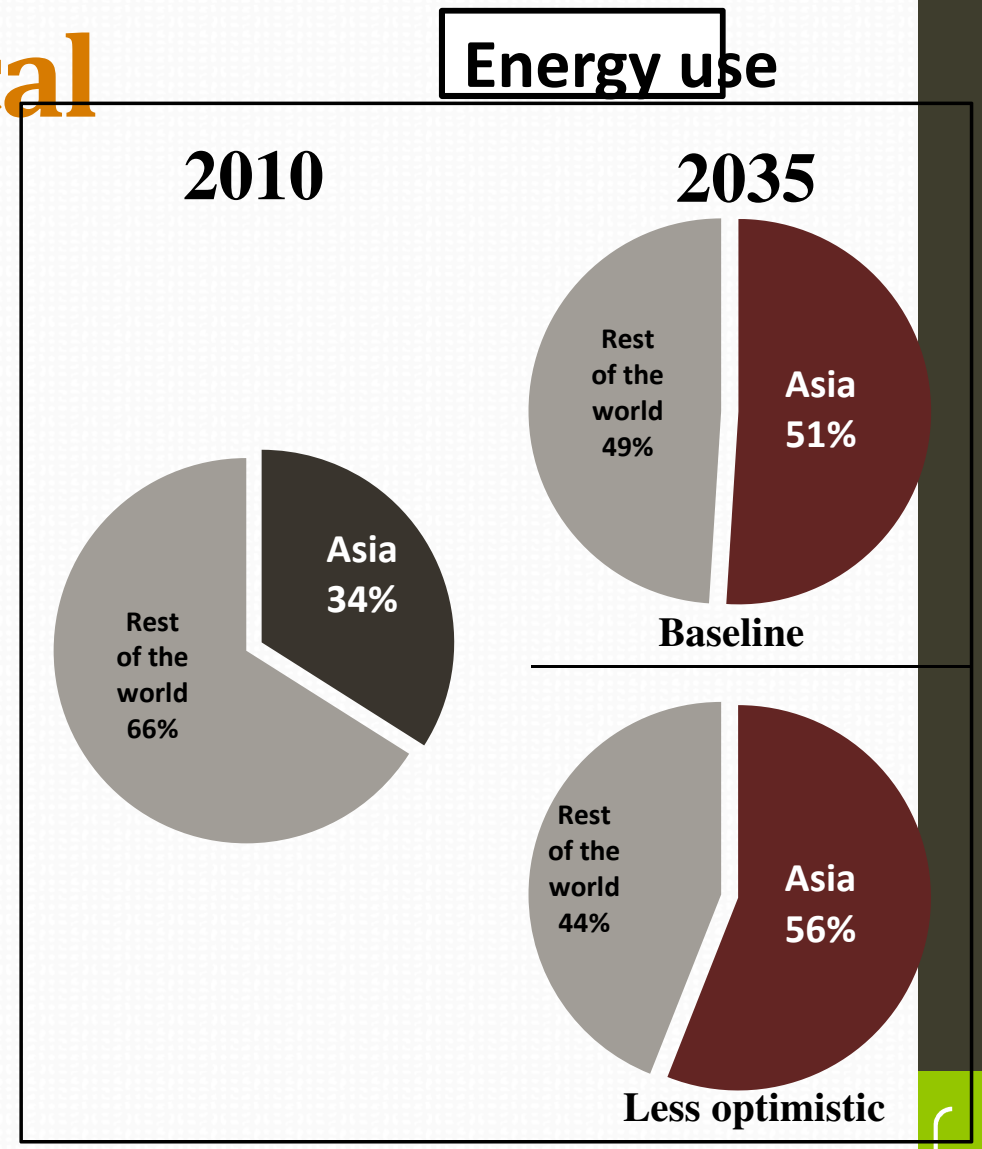
ADB

Energy needs for the Asian Century are critical





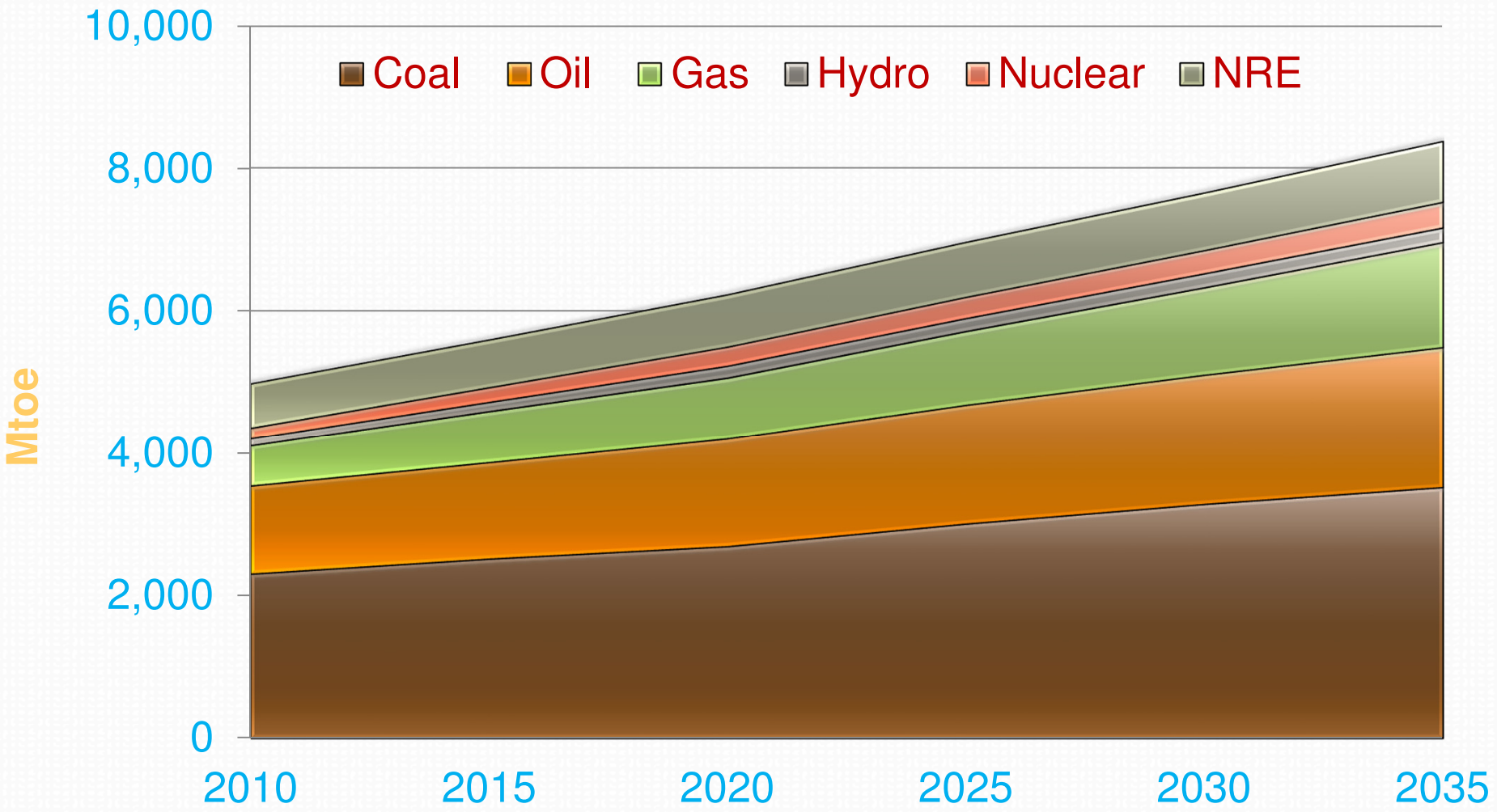
⇨ *Is this energy future realistic?*

Energy Issues & Challenges

- Finding energy resources is not an issue but consuming them at an **"acceptable rate".**
- **"Develop first, clean up later"** is not valid as costs of clean up far exceeds the benefits of development.
- **"Coal"** to be a predominate fuel source for power generation within developing Asia and in ASEAN. If so, how to use it efficiently by adopting cleaner technologies
- Sustaining Asia's economic growth requires diversification of its energy mix – **"coal", "natural gas"; "hydropower"; and "renewable energy" development to meet demand.**
- **National Policies:**
  - What policies measures to be put in place to curb GHG emissions;
  - Can Asia source the energy it needs and from where?
  - Energy infrastructure expansion?
  - Energy Efficiency?
  - Energy Security?
  - Modal shifts in transportation – Can this happen sooner and how?
  - Carbon capture, utilization and storage!

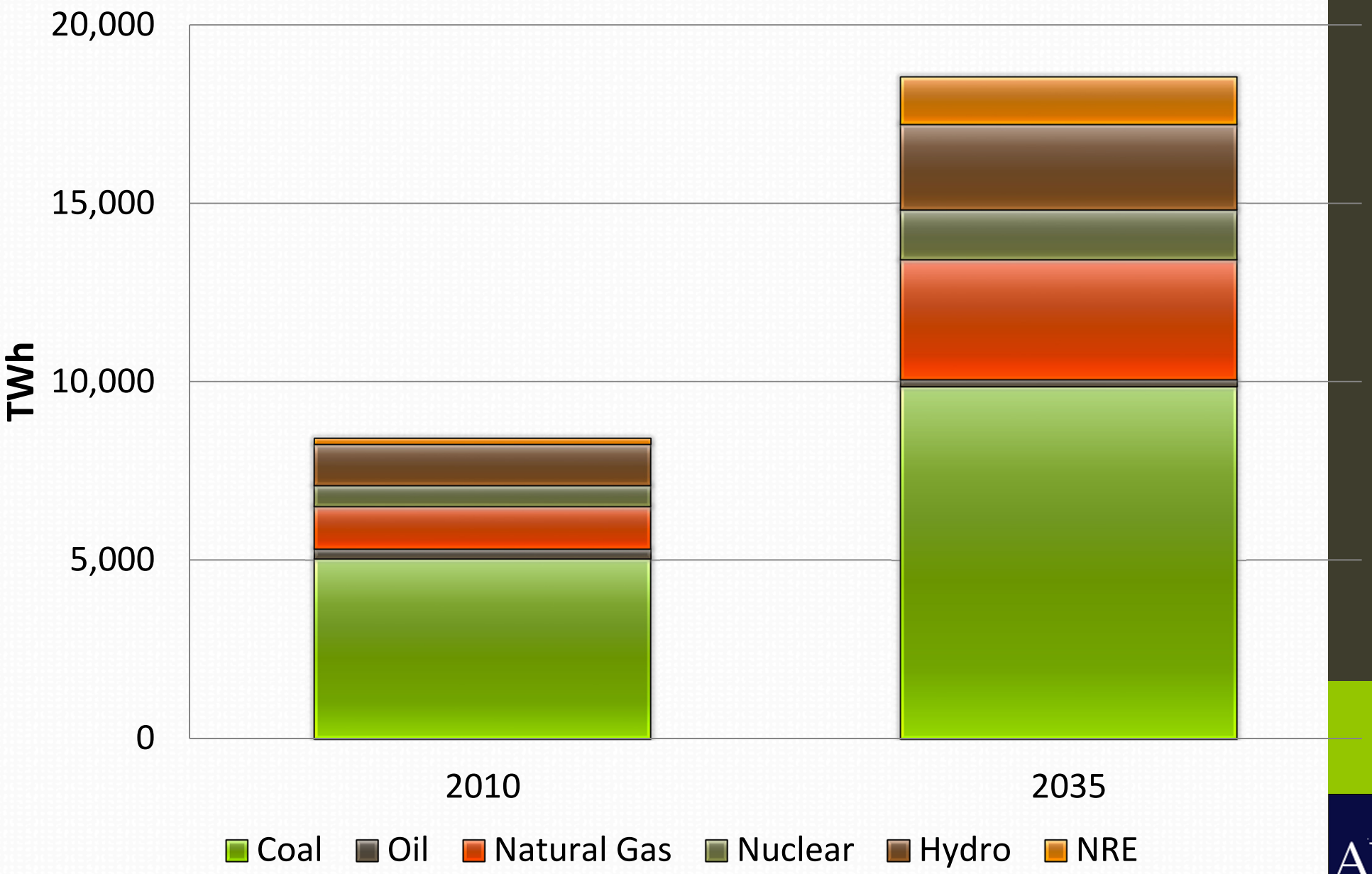
Fossil Fuels Will Continue to Dominate

Primary Energy Demand in the Asia-Pacific



Source: ADB, APERC 2013

Fossil Fuels Still Dominates Electricity Mix



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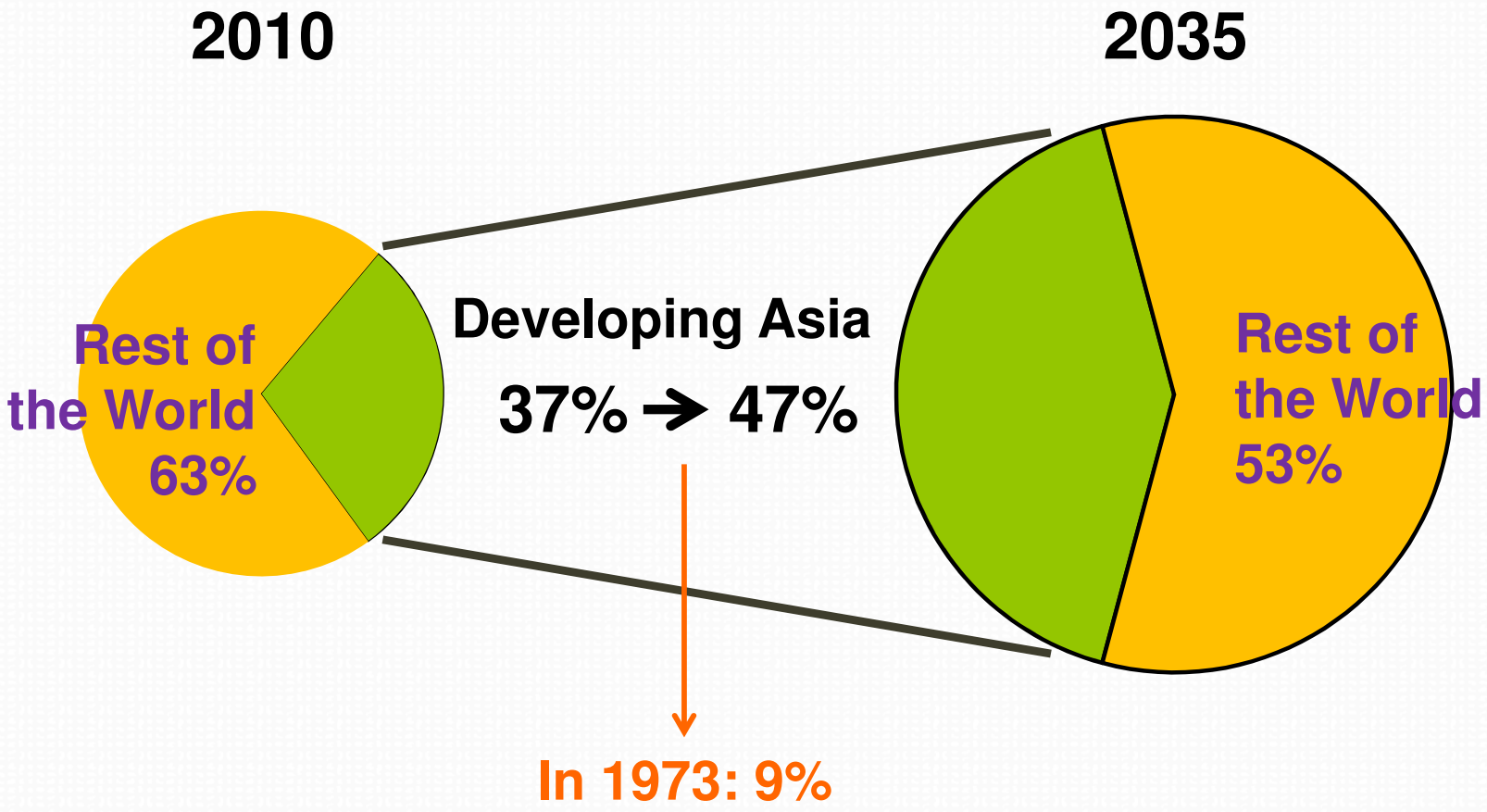
Developing Asia's Share in Global CO_2 Emissions from Energy Consumption



Source: ADB, APERC 2013

Lessons Learned During Field Visits

- Environmental Damage caused in Kitakyushu during 1960s when Japan pursued its economic growth.
  - Clean up costs were too high including health costs.
- Can we phase out fossil fuels?
  - If not possible, what choices do we have to curb GHG emissions?
  - **"Renewable Energy"** – hydropower, solar, wind, biomass, geothermal, and waste to energy?
- Can we utilize energy more efficiently?
  - Energy Efficiency programs – Building, lighting and appliances
- Clean Coal Technologies
- Smart Meters, Smart Grids and Smart Cities

What Changes You Can Initiate In Your Country

- **RENEWABLE ENERGY:**
  - Why renewable energy (RE) – Energy security concerns?
  - Are there RE potential in your country, if so, what are these resources? Define the resource potential.
  - If solar is the choice, state what solar and the choice of technology.
    - If hydropower – state if it s run-of-river schemes, large hydropower projects or mini-hydropower
  - Renewable energy is expensive in some countries compared to fossil fuels so state what policies will be put in place.
    - Will a RE Bill be enacted?
    - Will there be feed-in tariffs?

What Changes You Can Initiate In Your Country

- **RENEWABLE ENERGY:**
  - **If so, how long will these feed-in tariffs will be put in place managed?**
  - **Will it be on a declining scale?**
  - **Will you set a RE target for the country? If so, how much? 10% or 20% of total generation and by when?**
  - **What are grid integration challenges as RE % grows? How will you manage it?**
  - **What about energy storage systems as seen in Kitakyushu?**
  - **Can we explore decentralized RE systems instead of extending the grid?**
  - **How about developing a master plan or road map for RE deployment>**

What Changes You Can Initiate In Your Country

- **ENERGY EFFICIENCY (EE):**
  - **Is your country dependent on energy imports - >80%?**
  - **Then, EE can help reduces energy imports by making energy use more efficient.**
  - **Need to examine both supply side and demand side efficiency measures.**
  - **Enact an Energy Conservation Law to support the EE programs.**
  - **The law needs to be supported with technical skills and knowledge about EE programs.**
  - **Establish minimum efficiency standards for power plants and appliances being used in country.**
  - **Institute an EE awareness program for the public.**

What Changes You Can Initiate In Your Country

- **ENERGY EFFICIENCY (EE):**
  - **Efficiency standards need to be monitored. Hence, an appliance testing lab and monitoring and verification program need to be put in place.**
  - **Violators of standards need to be fined or other measures such as publishing their names and products in major papers and media.**
  - **Encourage and support Energy Service Companies (ESCOs).**
  - **Build capacity of banks and financial institutions on EE program.**
  - **Establish building codes that incorporate EE measures and standards.**
  - **Establish national targets for achieving EE in industry, buildings, lightings, etc and monitors the acheivements**

What Changes You Can Initiate In Your Country - How?

- **CLEAN ENERGY TECHNOLOGIES:**
  - **If your country goes the coal path, then adopt**
    - **Super-critical and ultra-super critical or advanced ultra-super critical boiler technology when appropriate;**
    - **For most DMCs - Super-critical and ultra-super critical boiler technologies would be the best option. Advanced ultra-super critical boiler technology is new and best for utilities to gain experience in operating super-critical power plants;**
  - **Ensure pollution control equipment such as flue gas desluphurization scrubbers (Sox); selective catalytic converters (Nox) are installed including electrostatic precipitators (ESP) for air quality**
  - **Mercury, nickel and Chromium are also produce by a coal power as particulates.**
  - **Setting stringent emission standards that is in compliance with best practices is not sufficient if this is not monitored on a daily basis like in Japan.**

What Changes You Can Initiate In Your Country

- **CLEAN ENERGY TECHNOLOGIES:**
  - **Develop ash disposal plans including plans for ash utilization in cement manufacture, road pavements and building construction.**
  - **If you country choses the gas path, then adopt:**
    - **High efficiency combine cycle power plants – F-Class gas turbines have 55% to 59% efficiency;**
    - **New C- class turbines can result in 63% efficiency but still in pilot stage. Recommend DMCs to adopt and gain operational experience with F-class turbines before moving to C class turbines;**
  - **If domestic gas is available then use gas turbines for power generation.**
  - **If gas needs to be imported because of government policy, then LNG regasification terminals may be needed or explore the floating LNG regas facilities as this option is cheaper and more appropriate in some countries.**

What Changes You Can Initiate In Your Country

- **CLEAN ENERGY TECHNOLOGIES:**
  - **LNG terminals need a power plant as anchor for demand but the gas can also be use for other applications – LPG production, industrial use, etc**
  - **For gas to be a viable supply option, countries need to address energy pricing as gas prices fluatuate;**
  - **Can you consider a roadmap for adopting cleaner technologies?**

What Changes You Can Initiate In Your Country

- **SMART GRID, SMART METERS, & SMART CITIES:**
  - First determine if you country is ready for these technologies?
  - If so, which will you adopt and why?
  - Adopting the smart meter concept as in Kitakyushu Hydrogen enclave may not be an option for most DMCs now.
  - However, DMCs can consider smart meters such as advance metering infrastructure (AMI) in the power sector.
  - Electricity theft is high in most DMCs.
  - AMI an help identify the losses in feeders and substations and alert power dispatch centers of unusual consumptions
  - This helps in curtailing theft and enabling the directing of power saved to other areas where there is a shortage.
  - Establish a roadmap for adopting AMI metering as it will improve billing and collection. On a wider scale set the infrastructure in place such as grid reinforcement and IT facilities. Internet facilities of higher speeds as in Japan and Korea will be needed.

THANK YOU

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