ASEAN Centre for Energy
One Community for Sustainable Energy

REmap
A Renewable Energy Roadmap

IRENA
International Renewable Energy Agency

#REmap

RENEWABLE ENERGY OUTLOOK FOR ASEAN

A REMAP ANALYSIS

With financial support from
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

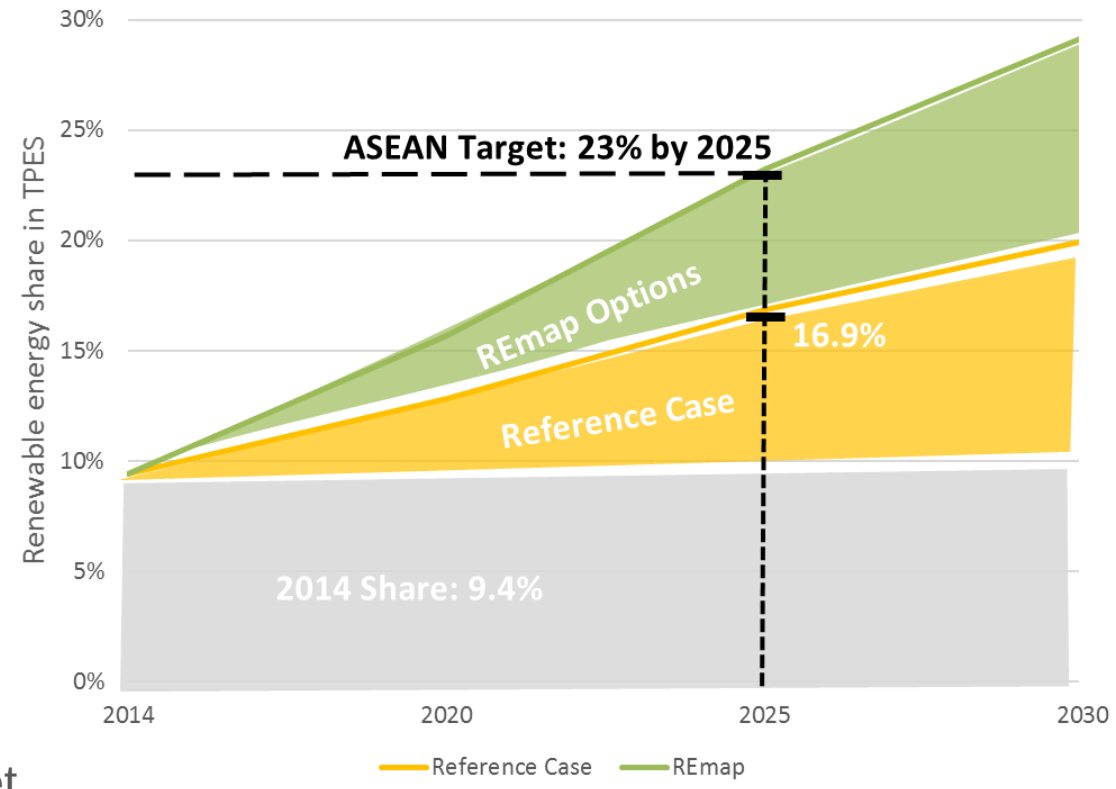
23 September, 34th AMEM, Myanmar

Dolf Gielen, Director, IRENA Innovation and Technology Centre

ASEAN's 23% aspirational renewables target

October 2015 as part of ASEAN Plan of Action for Energy Cooperation

- 23% renewable energy share[1)] in total primary energy supply (TPES) by 2025
- ACE Energy Outlook (2015):
  - **2014 – 9.4%**
  - 2025 BAU – 10%
  - 2025 Advanced Policy Scenario (APS) – 15.4%
- IRENA Reference Case – **16.9%** (APS + latest country updates)
- **6%** point gap to the 23% target



1) excluding traditional uses of bioenergy, including all hydropower

Please note that results are preliminary and may be revised ahead of the final report release

Approach and country engagement

- IRENA's REmap renewable energy technology assessment tool and approach
- ACE's close working relationship with the 10 ASEAN Member States

Country engagement as the cornerstone of REmap

IRENA and ACE have engaged all ASEAN countries and +60 experts throughout 2016

- Two in-depth **technical workshops**:
  - March workshop in Manila
  - June workshop in Bangkok
- Three review **webinars** (April, May, September)
- 34th AMEM final **Ministerial consultative meeting**
- Report finalized by end of 2016

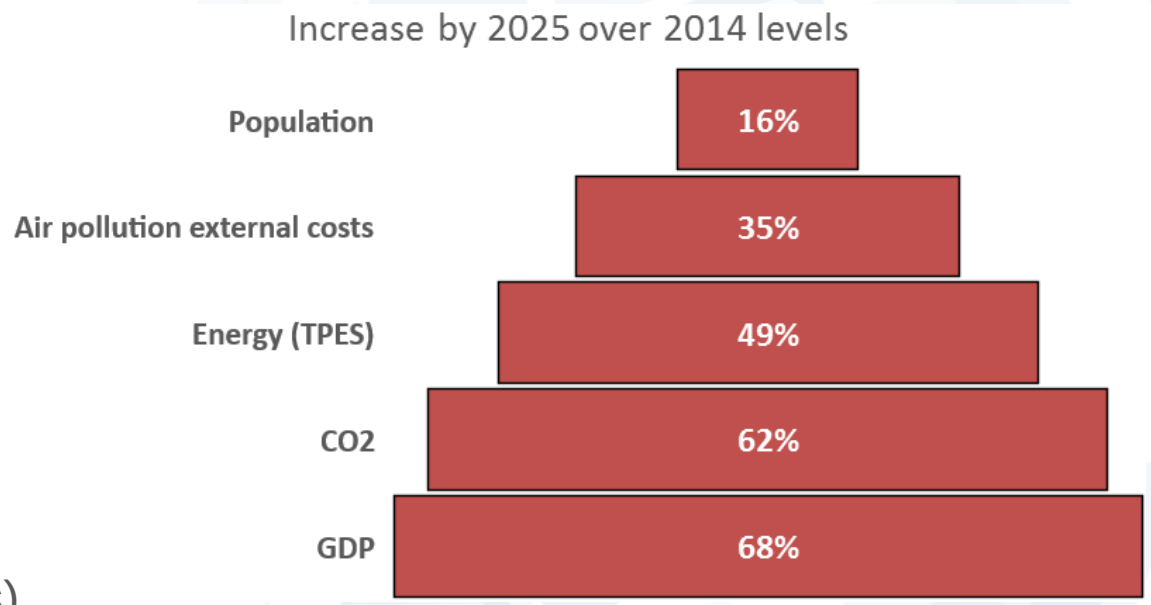
Rapid growth, pollution, CO_2 and imports

The effects of rapid economic and industrialized growth result in the largest growth in GDP with almost a 70% increase

Energy demand soars 50%, with most demand covered by fossil fuels

With this growth comes the impacts of increasing use of fossil fuels:

- **USD 225 billion per year** air pollution associated health and environmental costs
- **Energy-related CO_2 emissions 2.2 Gt/yr** (~5% of all global emissions)
- **Rising imports** of oil and gas



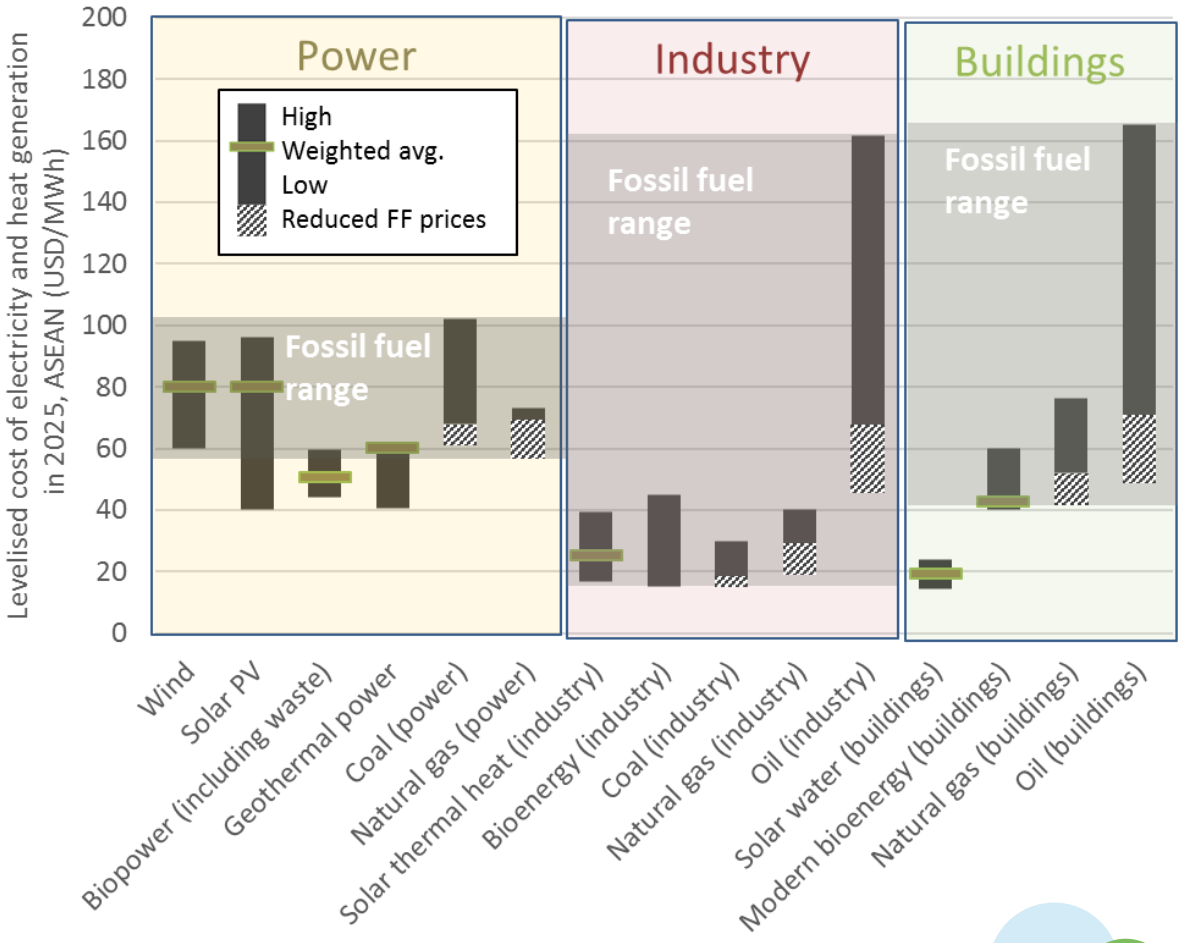
Note: For ASEAN region, based on the Reference Case in 2025

Note: Energy efficiency improvements are only assumed to take place in the Reference Case. REmap did not assess additional options to improve energy efficiency which would result in lower overall energy demand.

Please note that results are preliminary and may be revised ahead of the final report release

Drivers for a renewable revolution in the region

- The region has some of the best renewable energy resources in the world
- Renewable energy is becoming increasingly cost-competitive:
  - Declines in the costs of renewable energy technologies
  - Increasing costs from import price volatility
- Health benefits, improved wealth distribution, especially in rural areas
- Renewable energy drives economic activity & creates employment



Note: reduced fossil fuel (FF) prices assumes lower average commodity prices for fossil fuels for coal (-10%), natural gas (-20%) and oil (-30%)

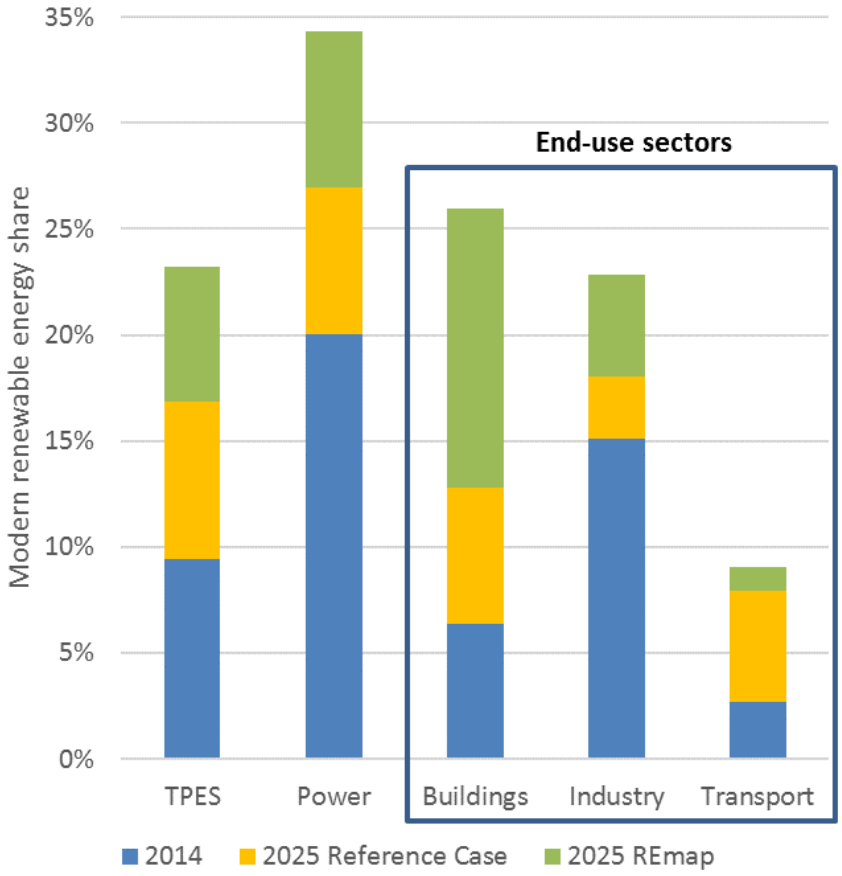
Please note that results are preliminary and may be revised ahead of the final report release

Renewable energy share by sector 2014-2025

REmap
A Renewable Energy Roadmap

Renewable shares increase in all sectors, but mostly in end-use sectors

- Power sector – highest share of renewable energy at 34%
- Buildings –largest increase in share due to the substitution of traditional uses of bioenergy
- Industry – large untapped potential compared to the Reference Case
- Transport – largest growth in renewable energy use according to the Reference Case



Note: End-use sectors include the consumption of electricity sourced from renewables. Shares presented in figure exclude traditional uses of bioenergy.

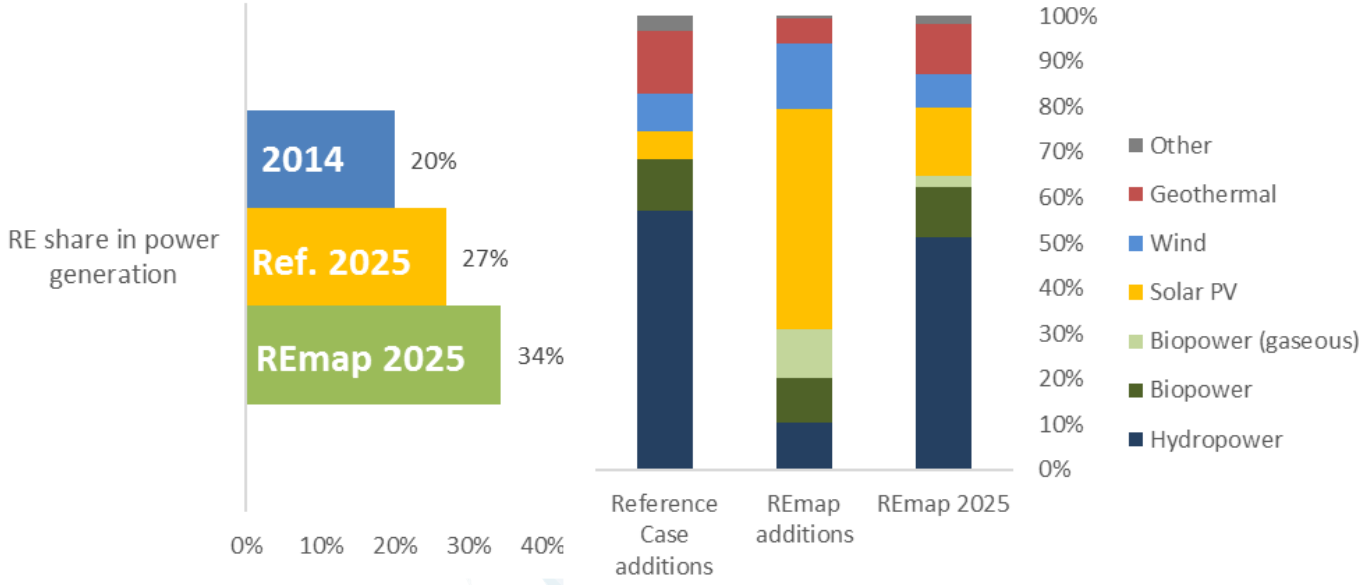
Please note that results are preliminary and may be revised ahead of the final report release

Closing the gap: power sector

Electricity generation will almost double from 2014 to 2025

The renewable energy technology mix differs significantly between the Reference Case and REmap

- RE power additions include more than 50% hydropower in the Reference Case
- REmap Options
  - 50% solar PV
  - 20% biopower (incl. biogas)
  - 12% wind

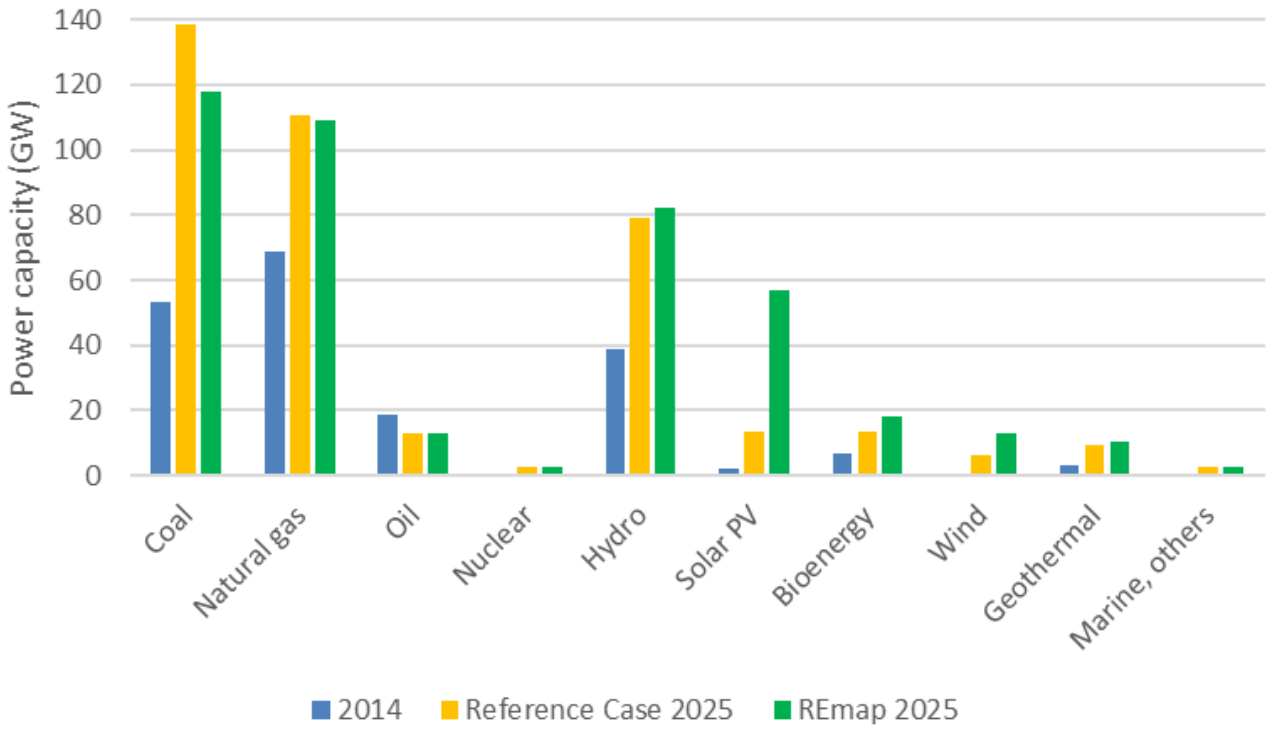


Please note that results are preliminary and may be revised ahead of the final report release

Closing the gap: power sector

In REmap, power generation capacity grows almost by 240 GW to more than 400 GW

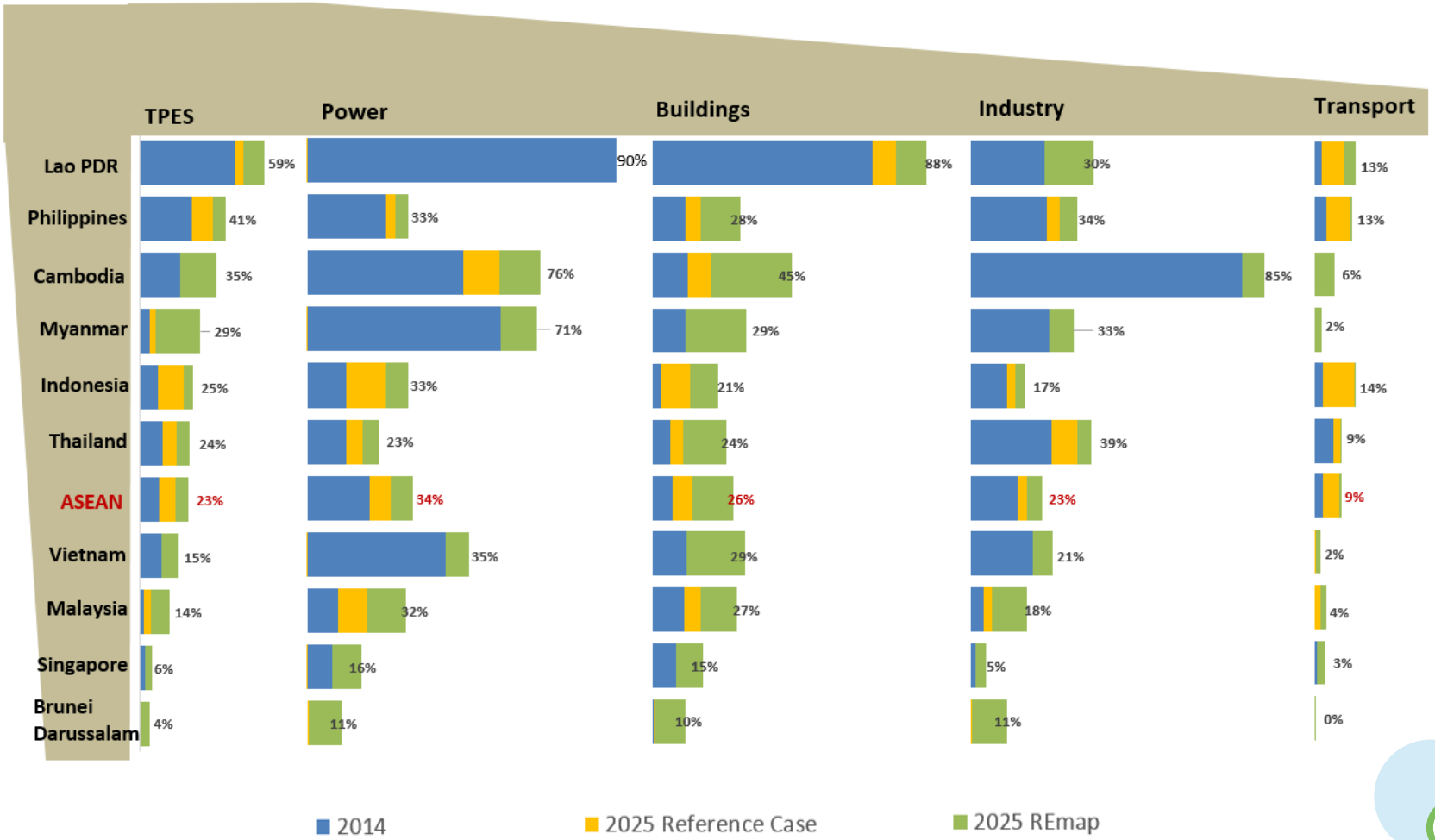
- Coal and natural gas will have the largest installed capacity
- Hydropower increases significantly in the Reference Case
- Largest growth in REmap is for solar PV



Please note that results are preliminary and may be revised ahead of the final report release

Renewable energy share by country 2014-2025

The distribution of renewable energy use varies significantly by country with the renewables share ranging from 4% to 59% across the ASEAN

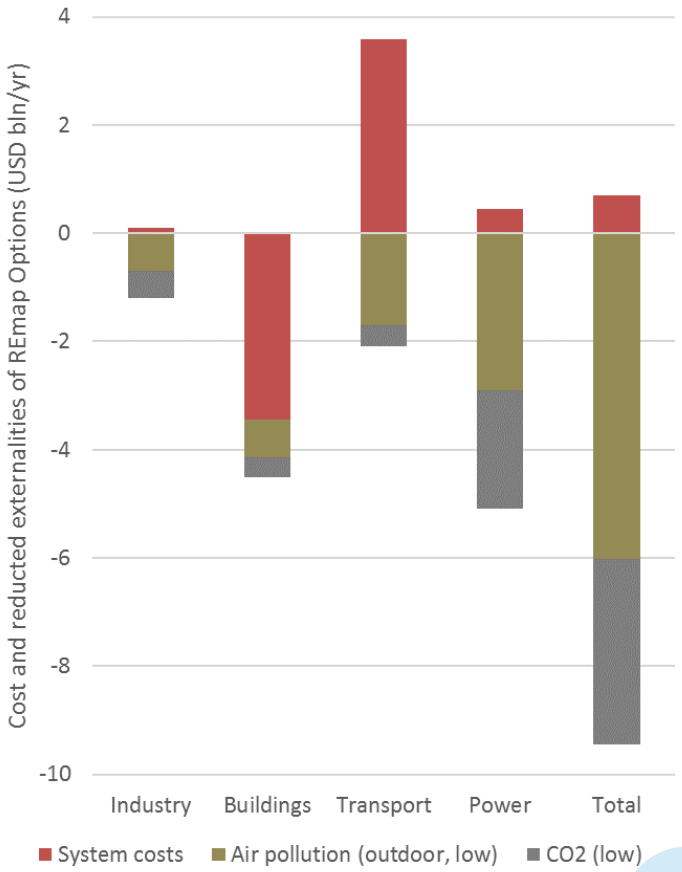


Please note that results are preliminary and may be revised ahead of the final report release

Costs and savings of closing the gap

The REmap Options for closing the gap to 23% are represented by an incremental cost of USD 1.9 per MWh by 2025

- The REmap Options would result in slight incremental costs of USD 1.9/MWh or USD 0.7 billion per year in absolute terms
- Reduced externalities would outweigh costs. Savings exceed the cost:
  - 10x for outdoor air pollution
  - 6x for climate change
  - 38x for indoor air pollution (not shown in figure)
- ASEAN's fossil fuel expenditures would be lowered by USD 40 billion per year by 2025



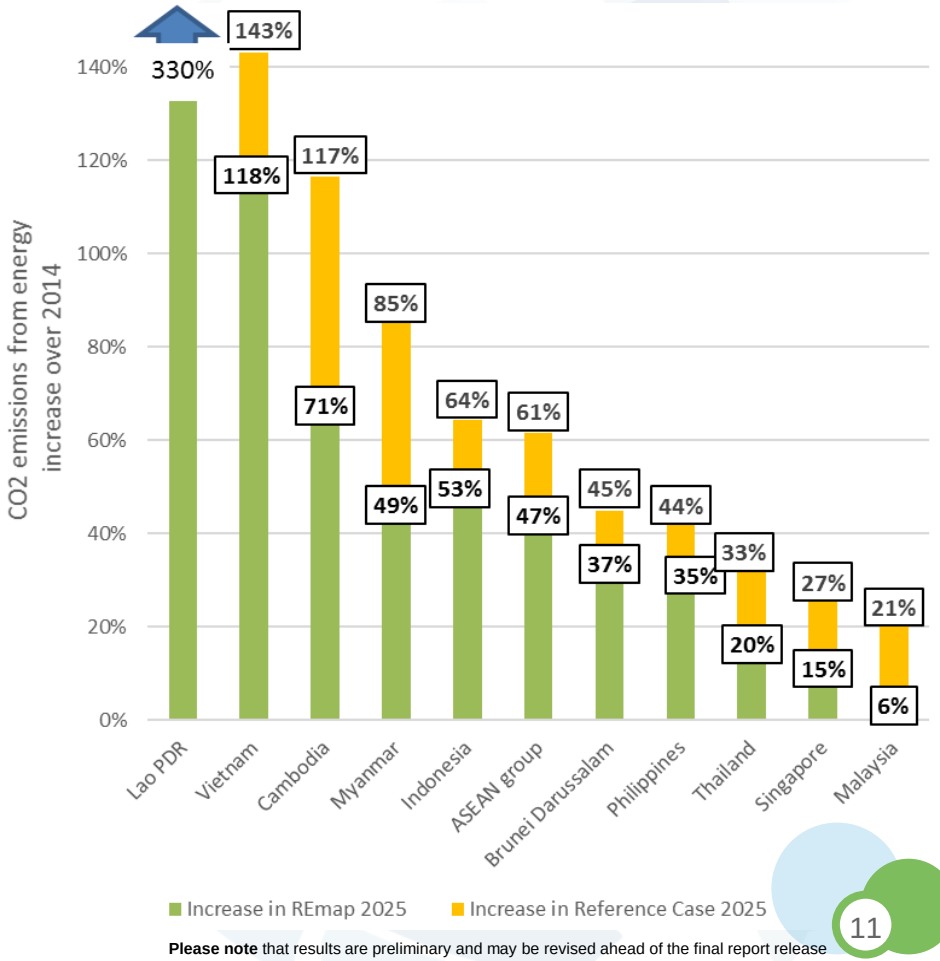
Note: Reduced externalities resulting from lower levels of indoor air pollution are excluded from the figure.

Please note that results are preliminary and may be revised ahead of the final report release

Carbon dioxide emissions from energy

Energy-related CO_2 emissions will rise by 60% in the Reference Case. With the renewable energy target reached, growth is restrained to 47%

- Due to soaring energy demand many countries see significant growth in energy-related CO_2
- Realising the ASEAN renewable energy target can reduce this growth by one-fifth
- Besides renewables, energy efficiency plays a key role
- Energy intensity improvements are consistent with the region's target of a reduction of 30% over 2005 levels by 2025

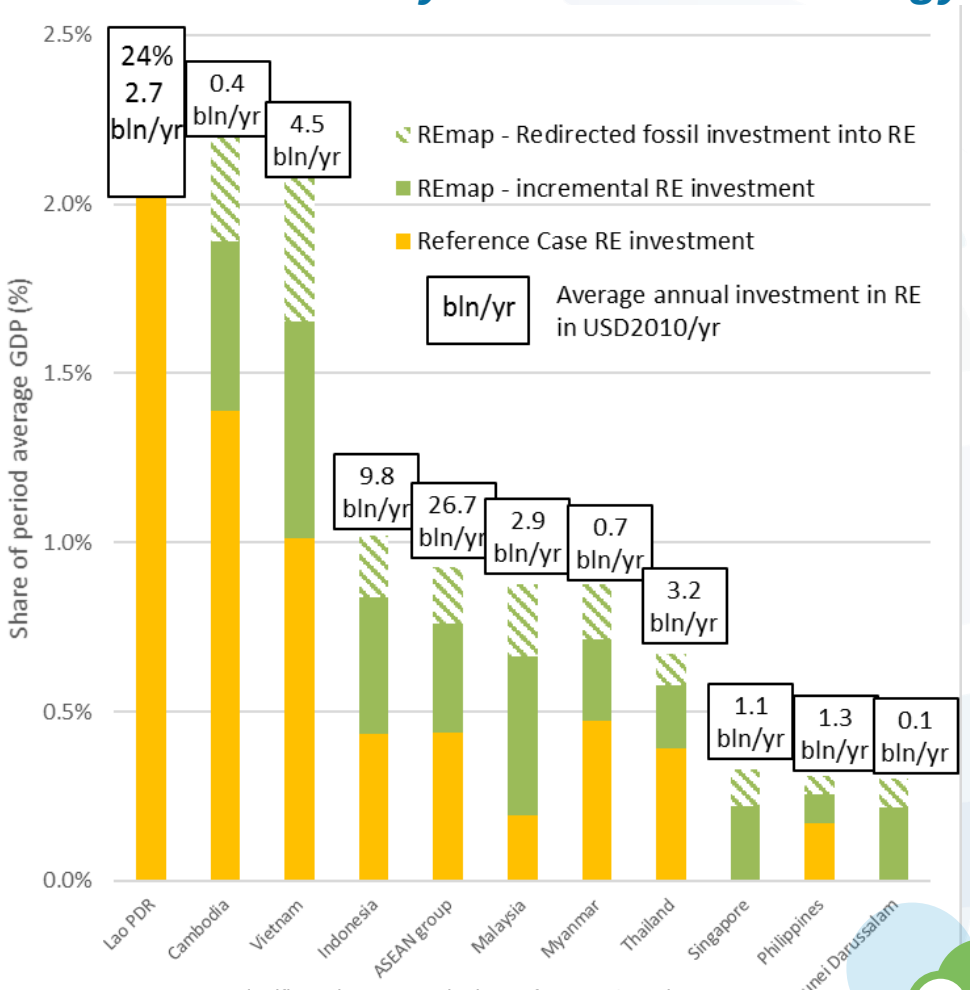


Please note that results are preliminary and may be revised ahead of the final report release

Investment needs for realizing the target

The region will need to invest 1% of its GDP annually into renewable energy capacity to reach its 23% target

- Average annual investment would total USD 27 billion
- This is split equally between the Reference Case and REmap Options for closing the gap
- One-third of the additional investment needed for REmap Options will be redirected from fossil fuels
- Three-quarters of all renewable energy investment is for power sector



Note: Lao PDR sees significant investment in the Reference Case in hydropower, much of it meant for export

Please note that results are preliminary and may be revised ahead of the final report release

Key Conclusions and areas for further work

- The regional target of 23% renewable energy is achievable **with concerted efforts by all ASEAN countries**
- Savings related to reduced externalities resulting from increased renewables far exceed additional costs of those renewables
- **Investment in renewable capacity will need to double**, and mobilizing finance will be key to achieving the target
- Synergies between strengthened energy efficiency and renewable energy efforts should be explored further
- Transmission and distribution grids across the region must be **expanded and strengthened**
- Efforts need to be expanded for **renewable energy uptake in the heating, cooking and transport sectors,** with special attention for the potential of bioenergy and solar thermal

REmap

IRENA
International Renewable Energy Agency

RENEWABLE ENERGY OUTLOOK FOR ASEAN