



ASEAN Centre for Energy  
One Community for Sustainable Energy



IRENA  
International Renewable Energy Agency

# RENEWABLE ENERGY OUTLOOK FOR ASEAN

#REmap

With financial support from

**giz** Deutsche Gesellschaft  
für Internationale  
Zusammenarbeit (GIZ) GmbH

REmap 2030  
A Renewable Energy Roadmap



A REMAP ANALYSIS

27 October, Singapore International Energy Week  
Sakari Oksanen, Deputy Director-General, IRENA

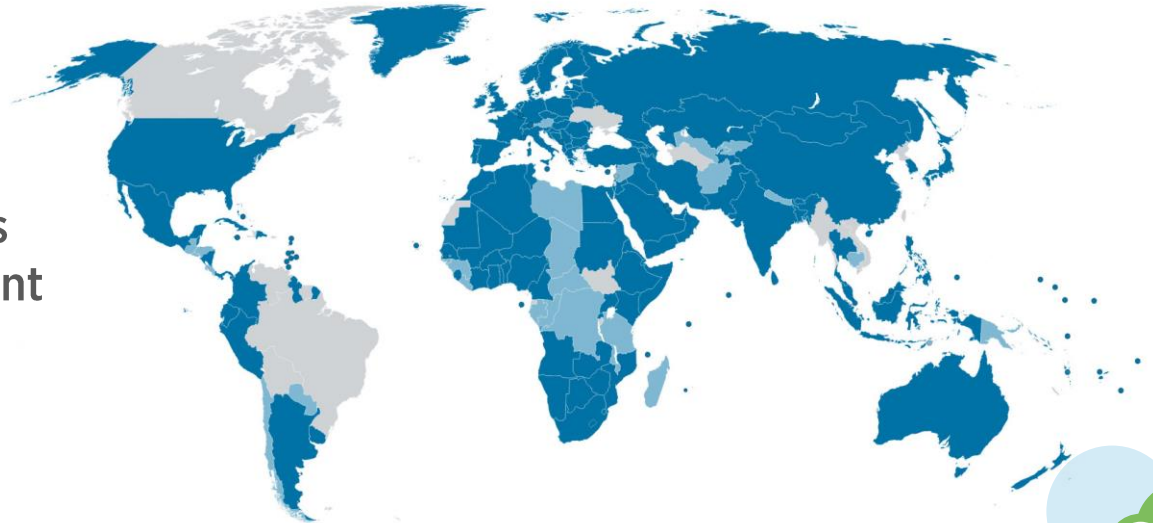
## Key Facts about IRENA

- » Established in 2011
- » Headquarters in Abu Dhabi, UAE
- » IRENA Innovation and Technology Centre – Bonn, Germany
- » Permanent Observer to the United Nations – New York



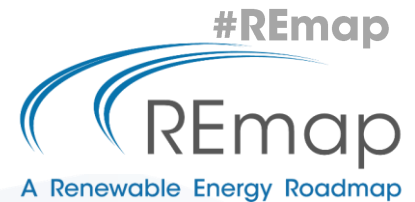
**149 Members**  
**27 States in Accession**

**Mandate: Assist countries  
to accelerate RE deployment**



# REmap

- » IRENA's **Global Renewable Energy Roadmap**
- » Shows feasible, cost-effective ways to **increase renewable energy deployment** in world's energy mix by 2030 **in line with SDG7**
- » Identifies concrete **technology options** for countries and sectors
- » Assesses policy and investment **implications**
- » Outlines **benefits** (economic, social, environmental)
- » In cooperation with 50 countries
- » 30 publications to date



Today we are highlighting the REmap regional report for ASEAN, a collaboration between IRENA and the ASEAN Centre for Energy

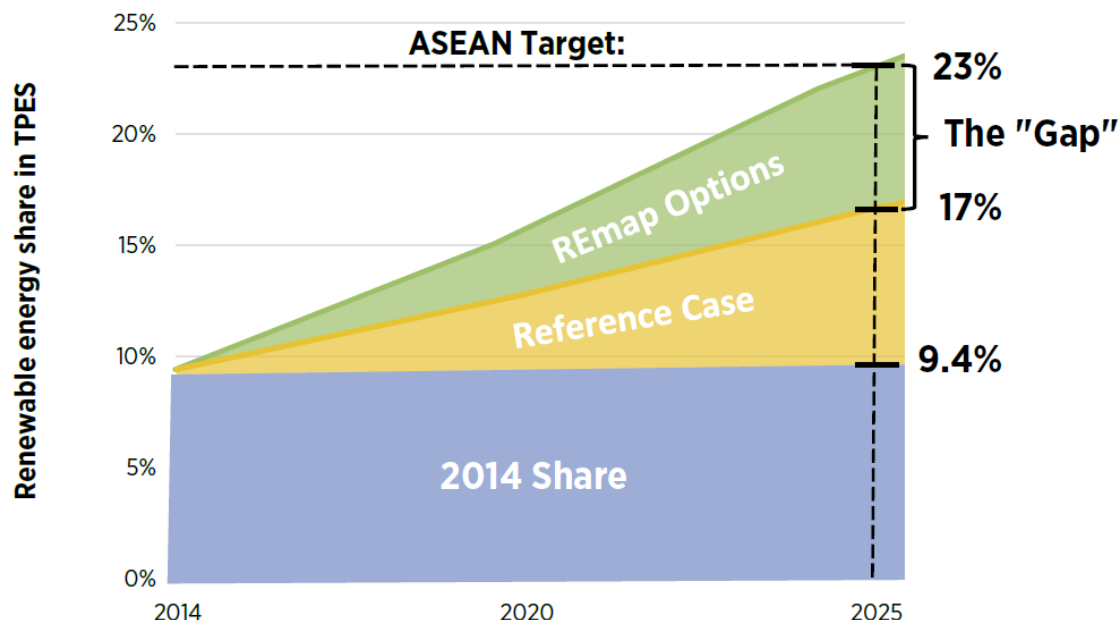




# ASEAN's 23% aspirational renewables target

*Set forth in October 2015 as part of ASEAN Plan of Action for Energy Cooperation*

- 23% renewable energy share<sup>1)</sup> 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

# 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)
- 34<sup>th</sup> AMEM final **Ministerial consultative meeting**
- SIEW launch



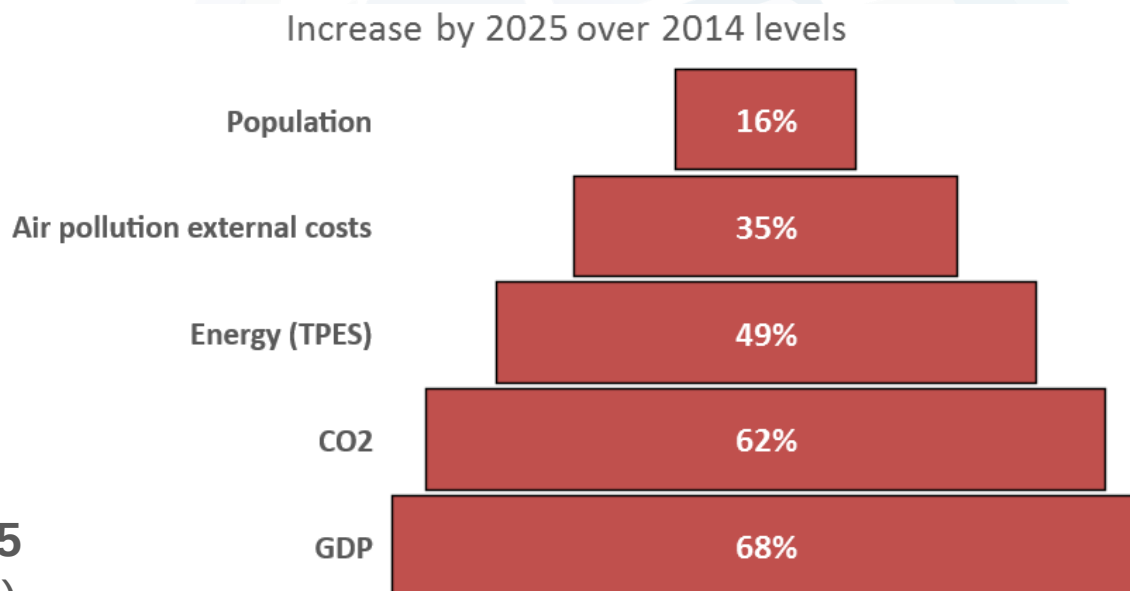
# Rapid growth, pollution, CO<sub>2</sub> and imports

*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<sub>2</sub> emissions 2.2 Gt/yr in 2025** (~5% of all global emissions)
- **Rising imports** of oil and gas

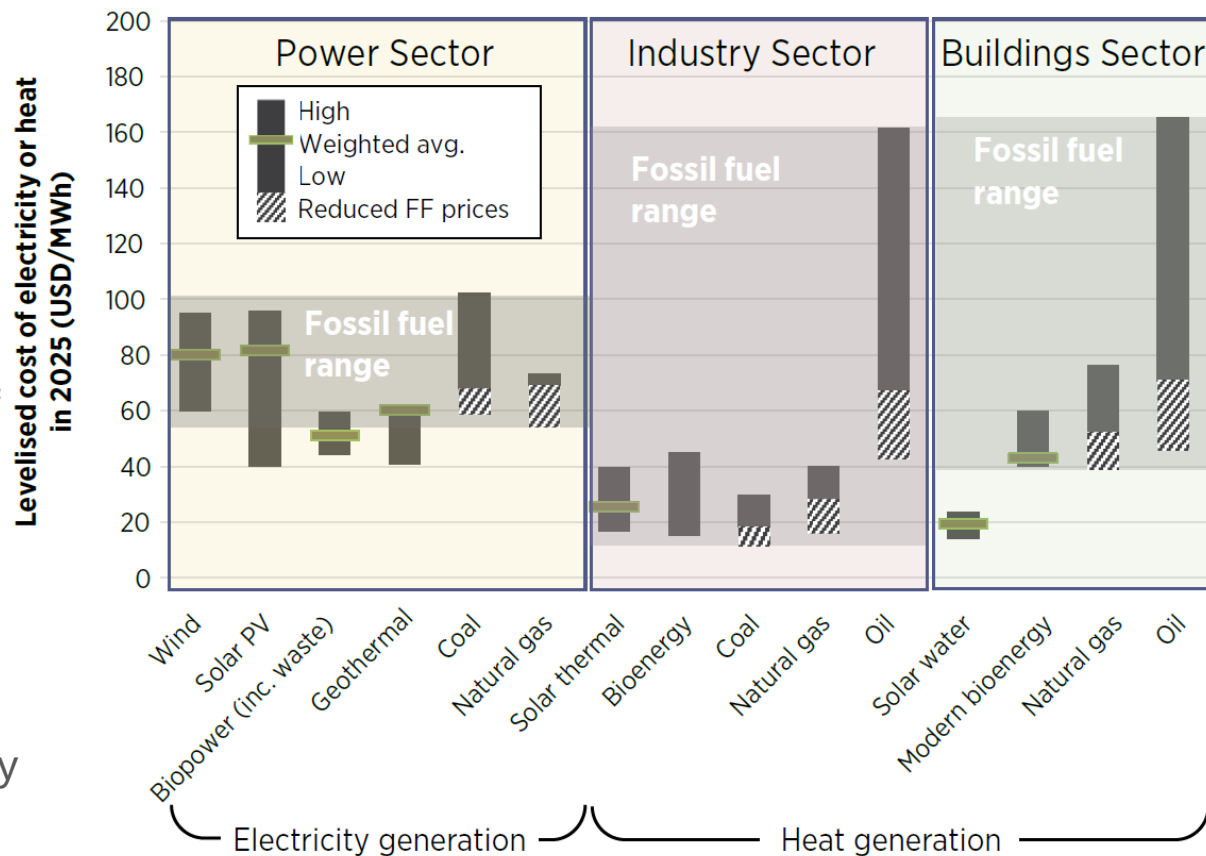


Note: For ASEAN region, based on the Reference Case in 2025

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.

# 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

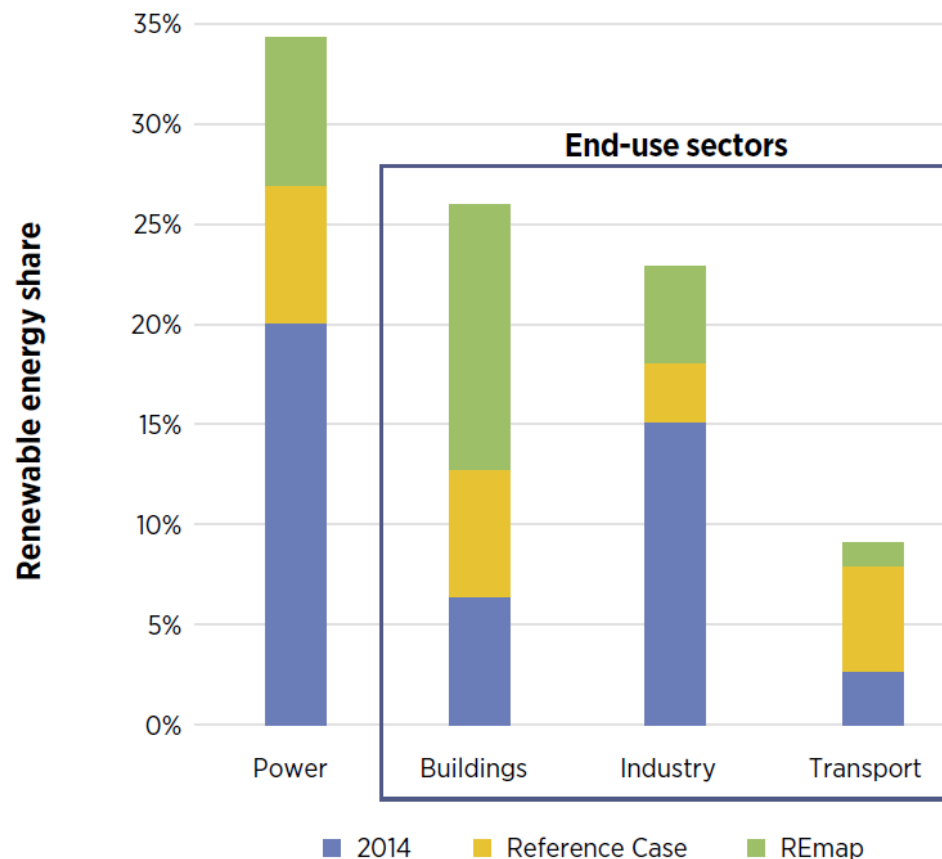


Note: reduced fossil fuel (FF) prices assumes lower average commodity prices for fossil fuels for coal (-10%), natural gas (-20%) and oil (-30%)

# Renewable energy share by sector 2014-2025

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

- Power sector – highest share of renewable energy
- 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



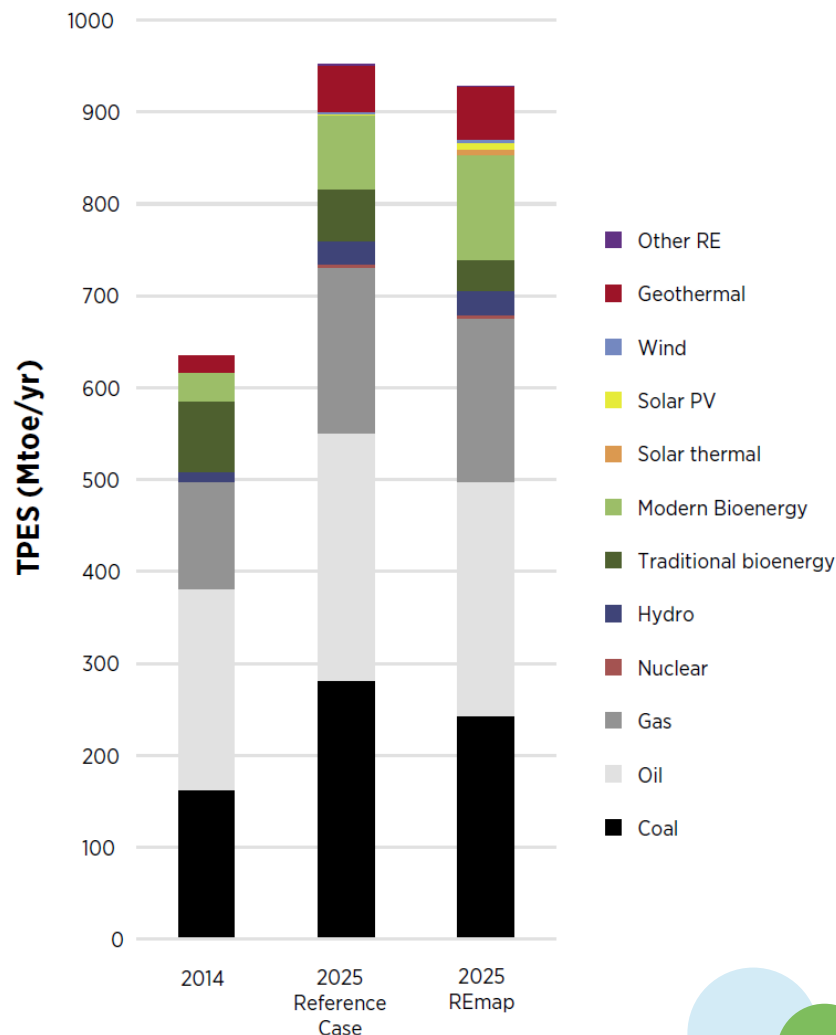
Note: End-use sectors include the consumption of electricity sourced from renewables. Shares presented in figure exclude traditional uses of bioenergy.



## Overall picture in TPES

***TPES energy demand increases almost 50%; adding renewables not just increases RE shares, but also slightly reduces overall energy demand***

- Coal, oil and natural gas all grow, with coal and gas the largest
- Traditional use of bioenergy declines by a little under half in the Reference Case, and further in REmap
- Modern bioenergy, hydropower and geothermal increase in the Reference Case
- REmap sees strong growth in Solar PV and some wind



# Closing the gap: power sector

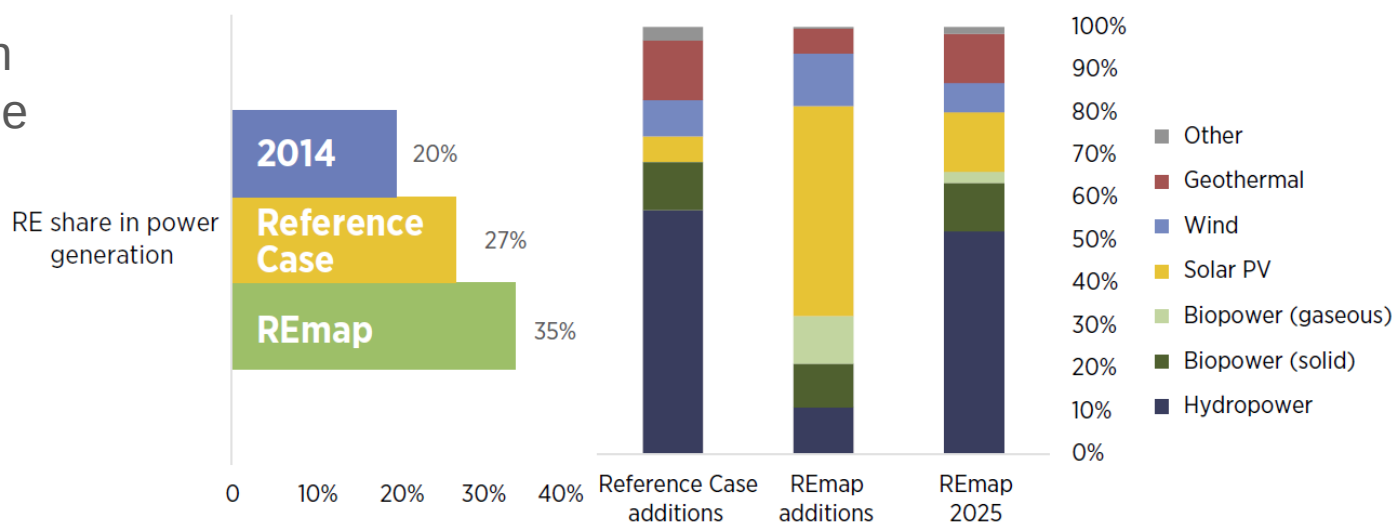
*Electricity generation will almost double from 2014 to 2025*

*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

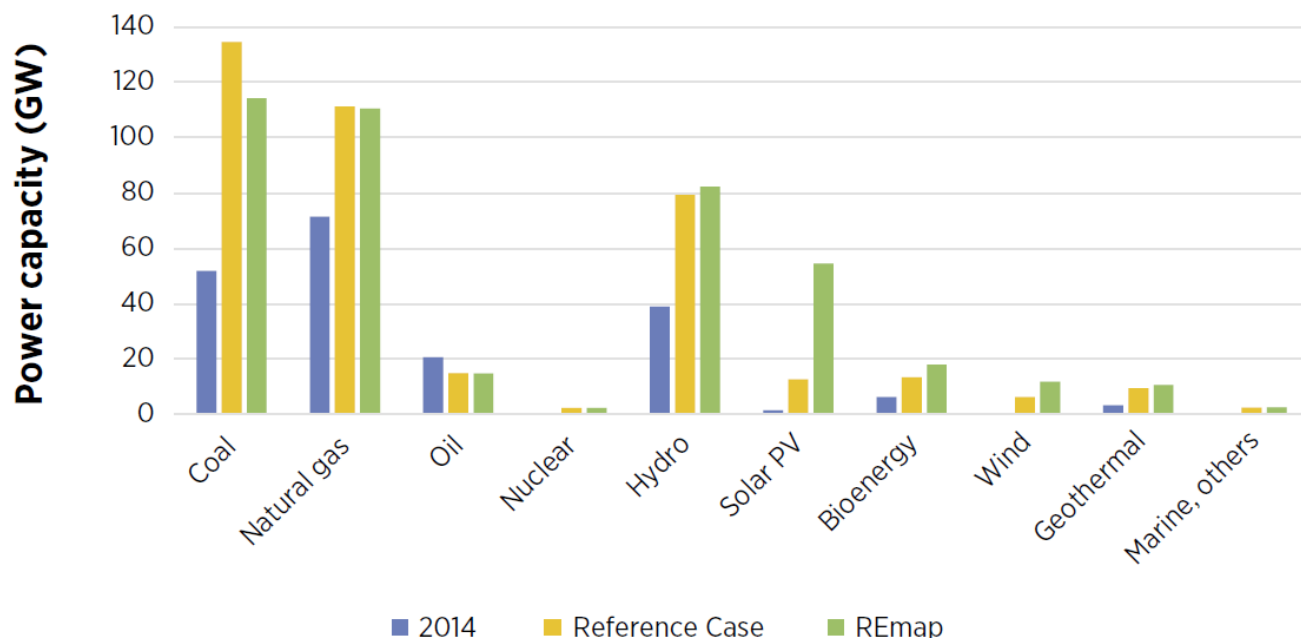
- 50% solar PV
- 20% biopower (incl. biogas)
- 12% wind



# Closing the gap: power sector

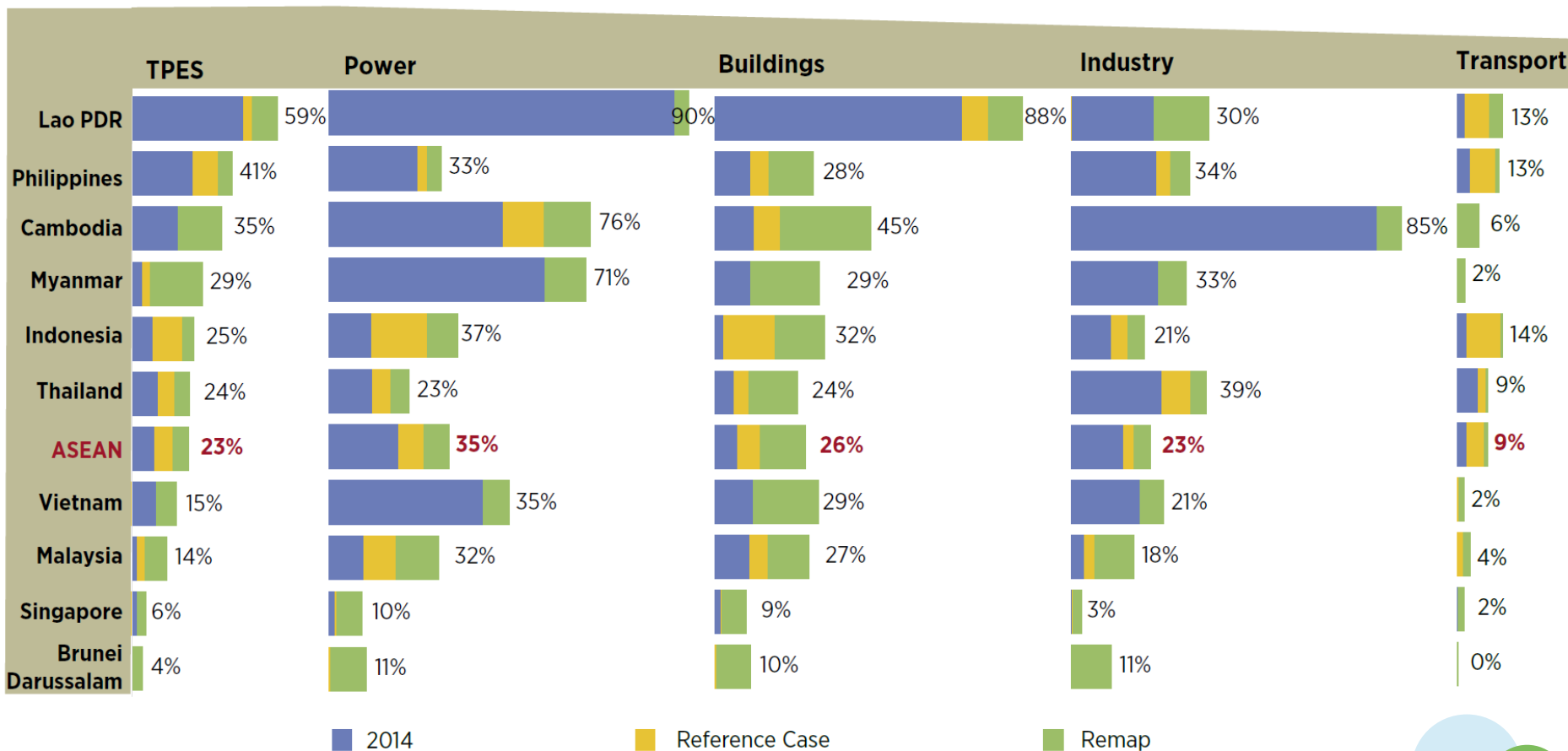
*In REmap, power generation capacity grows almost by 240 GW to more than 400 GW*

- 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



# 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*

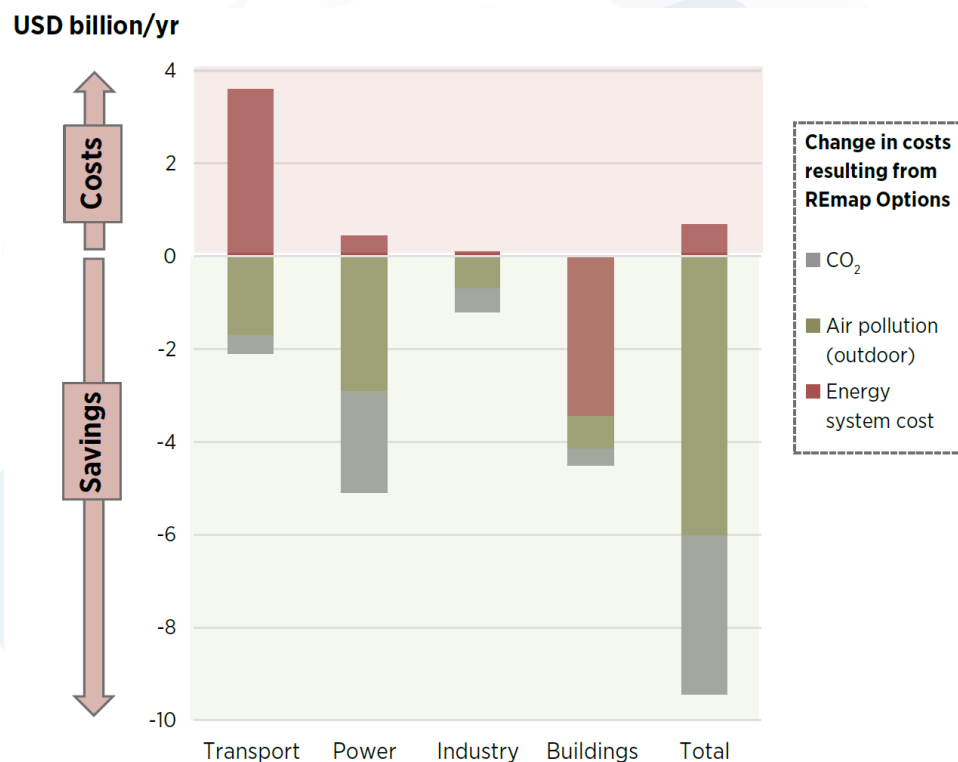




# Costs and savings of closing the gap

*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

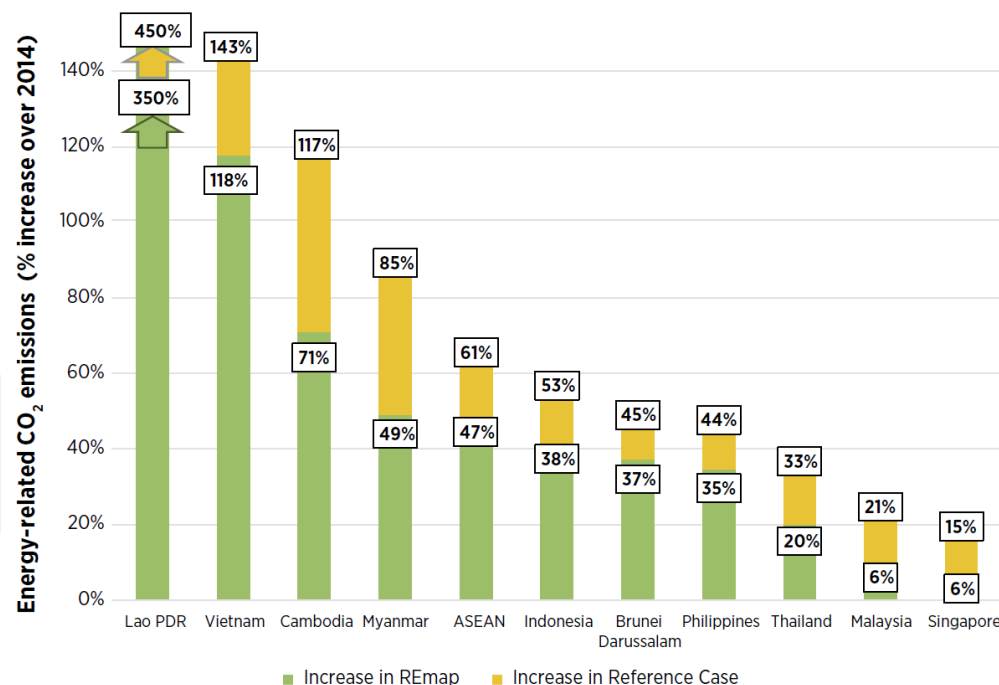


Note: Assumes low-end estimates for externalities for outdoor air pollution and CO<sub>2</sub>, indoor air pollution excluded from figure

# Carbon dioxide emissions from energy

**Energy-related CO<sub>2</sub> emissions will rise by just over 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<sub>2</sub>
- 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

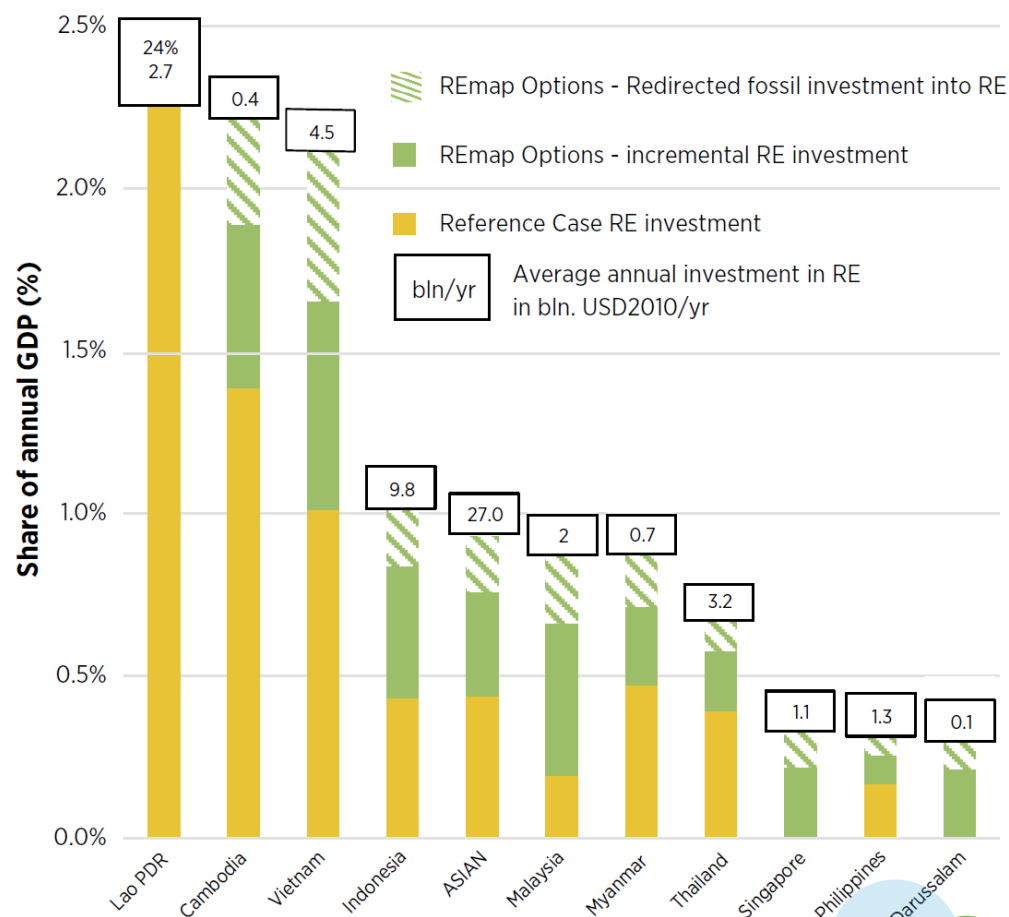


Note: The figure has been scaled for presentation purposes. Lao PDR emission growth is 450% in the Reference Case, and 350% in REmap.

# 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

# High-level action areas

## ACTION AREAS FOR ENABLING ASEAN'S RENEWABLE ENERGY POTENTIAL

Accelerating the deployment of renewable energy technologies must take national circumstances into account. There is therefore no single set of solutions suited to the needs of the entire ASEAN region. Suggestions can, however, be grouped broadly into four areas:

**1 Action area 1:**  
increase power system flexibility in the ASEAN region while using renewables to provide modern energy access for all



**2 Action area 2:**  
expand efforts for renewable energy uptake for the power sector and for heating, cooking and transport sectors



**3 Action area 3:**  
create a sustainable, affordable and reliable regional bioenergy market



**4 Action area 4:**  
address the information challenge by increasing the availability of up-to-date renewable energy data and the sharing of best practice for renewable energy technologies



## 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





RENEWABLE  
ENERGY  
OUTLOOK  
**FOR ASEAN**