Towards a Sustainable and Clean Energy Future

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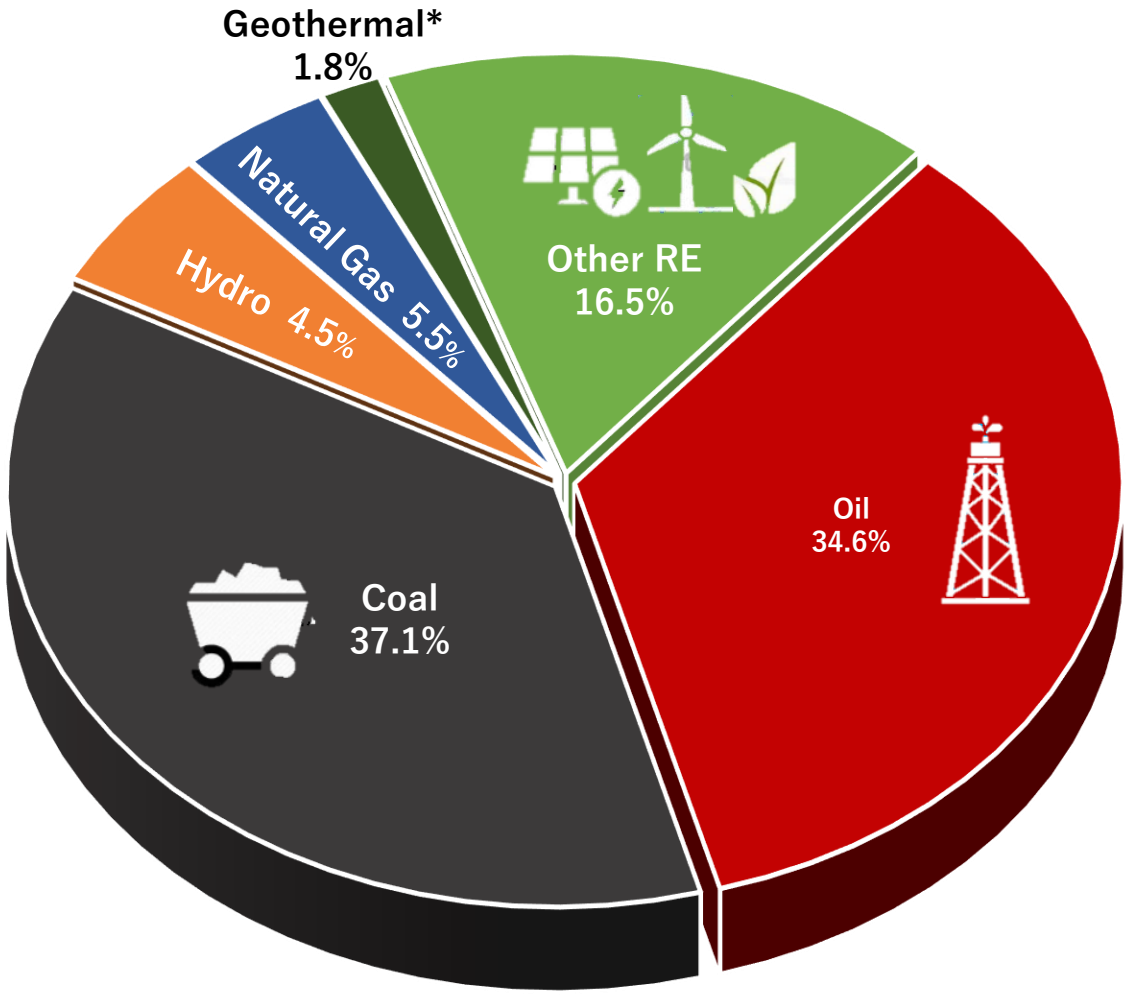
PRESENTATION OUTLINE

1. Where Are We Right Now?
2. Where Do We Want To Be In The Future?
3. How Do We Get There?
4. Path Towards the Clean Energy Scenario

WHERE ARE WE RIGHT NOW?

- Energy Mix
- Total Final Energy Consumption
- Power Capacity and Generation Mix

TOTAL PRIMARY ENERGY SUPPLY 2021



50.9 MTOE

2021 TOTAL PRIMARY ENERGY SUPPLY

43.2%
(22.0 MTOE)
INDIGENOUS

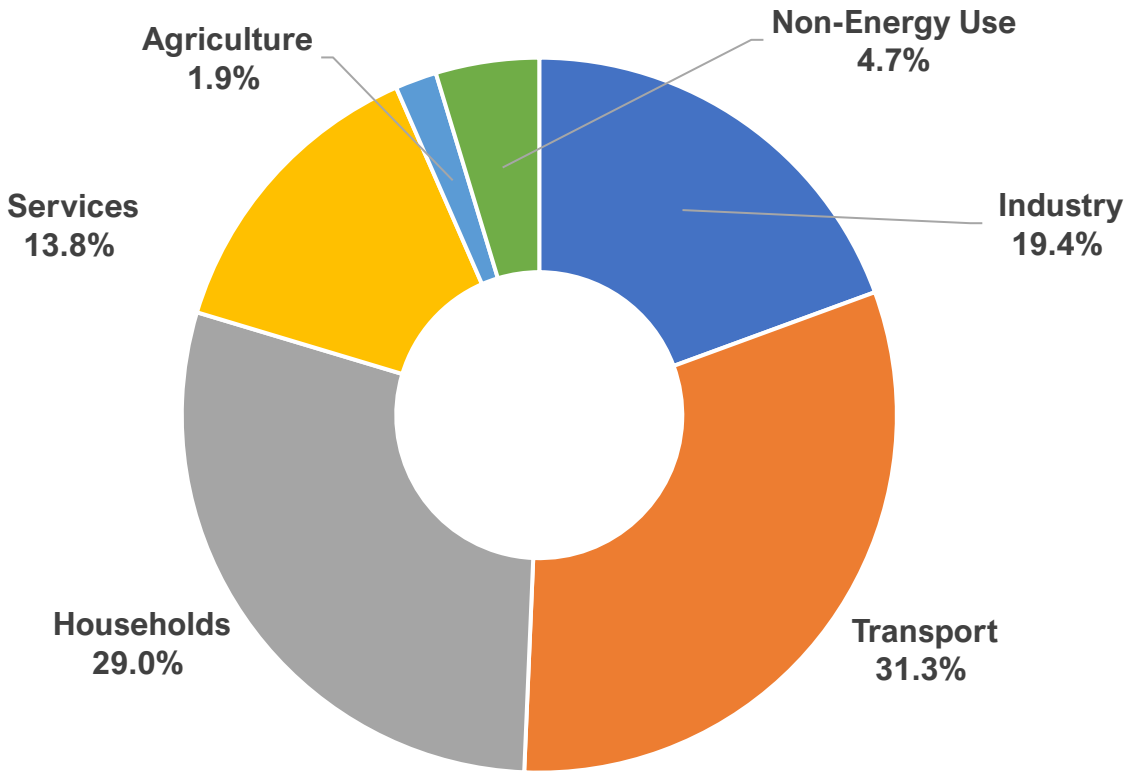
56.8%
(28.9 MTOE)
NET IMPORTED

**Considering the actual output of geothermal for power generation*

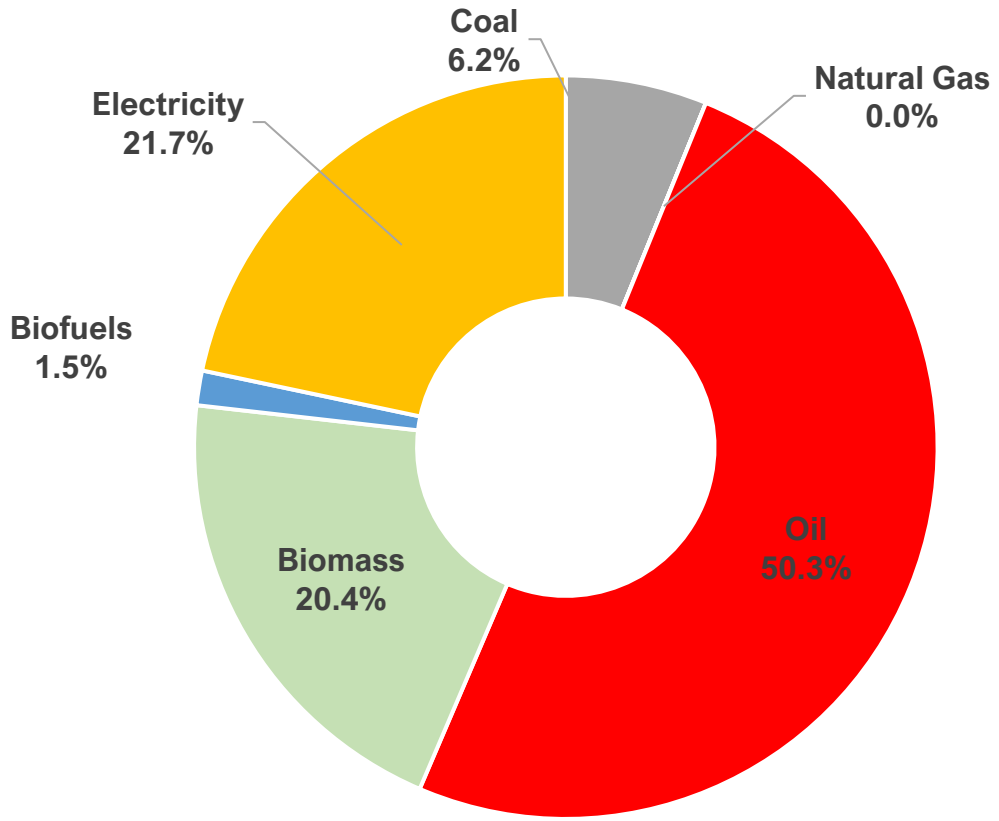
TOTAL FINAL ENERGY CONSUMPTION 2021

35.1 MTOE*
2021 TFEC

By Sector



By Fuel



*Preliminary data for 2021

On-Grid Power Capacity and Generation Mix 2021

COAL

43%
11,669 MW
INSTALLED CAPACITY

46%
10,913 MW
DEPENDABLE CAPACITY

58%
62,052 GWh
POWER GENERATION

RENEWABLE ENERGY

29%
7,914 MW
INSTALLED CAPACITY

29%
7,005 MW
DEPENDABLE CAPACITY

22%
23,771 GWh
POWER GENERATION

OIL-BASED

14%
3,847 MW
INSTALLED CAPACITY

11%
2,650 MW
DEPENDABLE CAPACITY

2%
1,616 GWh
POWER GENERATION

NATURAL GAS

13%
3,453 MW
INSTALLED CAPACITY

14%
3,286 MW
DEPENDABLE CAPACITY

18%
18,675 GWh
POWER GENERATION

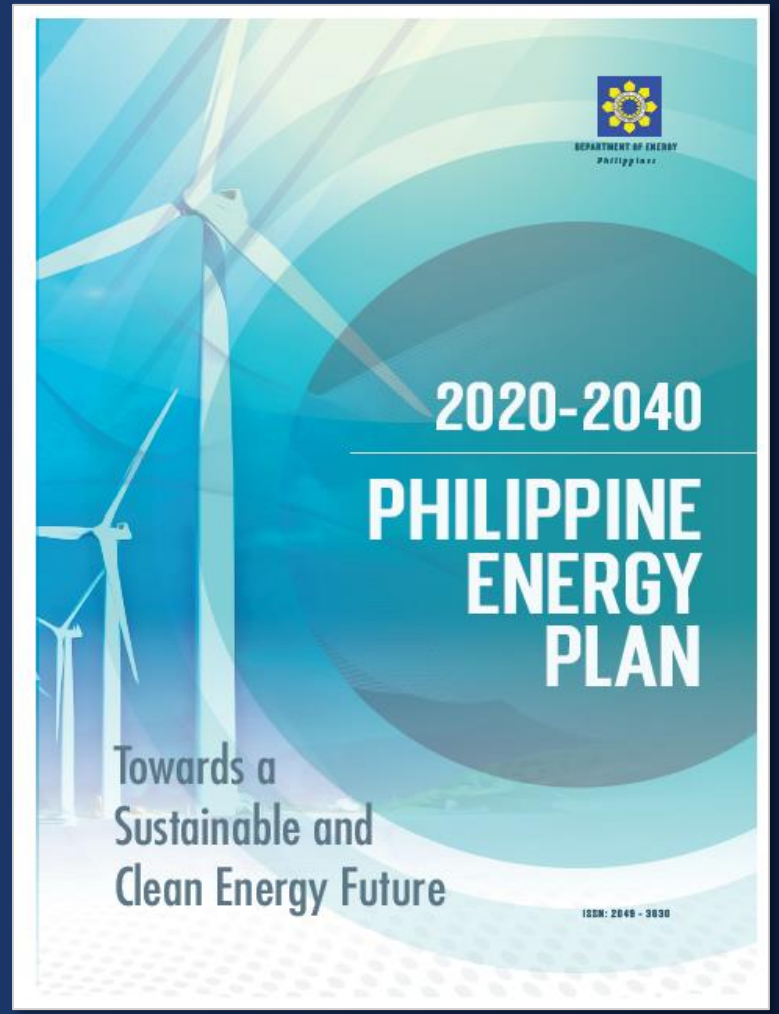
PEAK DEMAND
16,036 MW

LUZON : 11,640 MW
VISAYAS : 2,252 MW
MINDANAO : 2,144 MW

TOTAL: 106,114 GWh
Indigenous: 45.1%
Imported: 54.9%

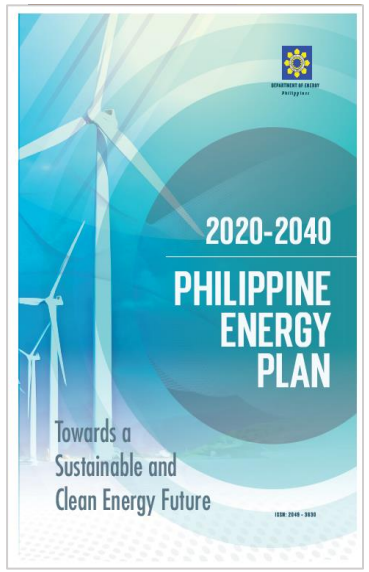
RE Share: 22%
Fossil Share: 78%

WHERE DO WE WANT TO BE IN THE FUTURE?



PHILIPPINE ENERGY PLAN 2020-2040 TARGETS

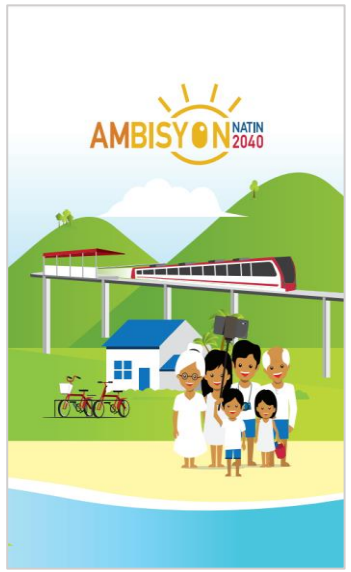
"Sustainable Path Towards Clean Energy"



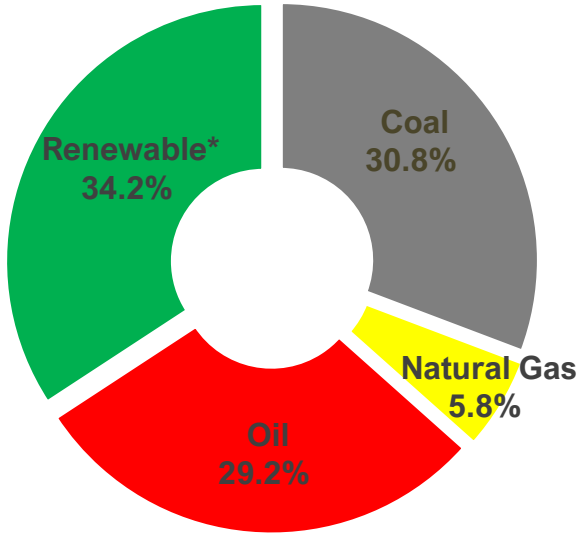
Reference Scenario
+ RE
+ EE and C
+ Other Energy Technologies
+ ICT
+ Resiliency

Clean Energy Scenario

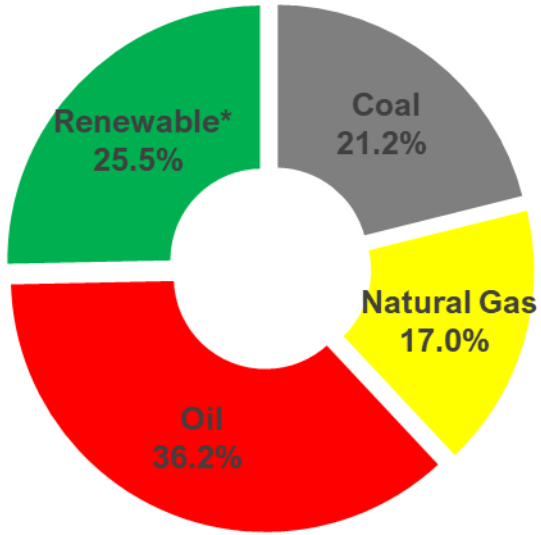
Energy Security
Sustainable Energy
Resilient Infrastructure
Competitive Energy Sector
Smart Homes and Cities
Empowered Consumers



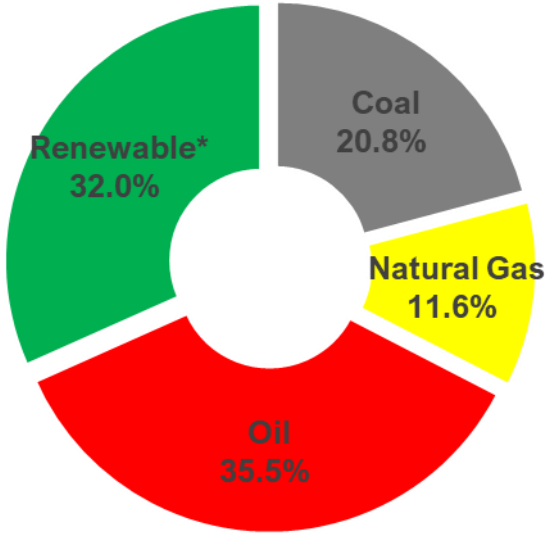
TOTAL PRIMARY ENERGY SUPPLY, BY FUEL



2020 Actual: 56.4 MTOE
Self-Sufficiency: 52.6%



2040 REF: 155.6 MTOE
Self-Sufficiency: 51.1%



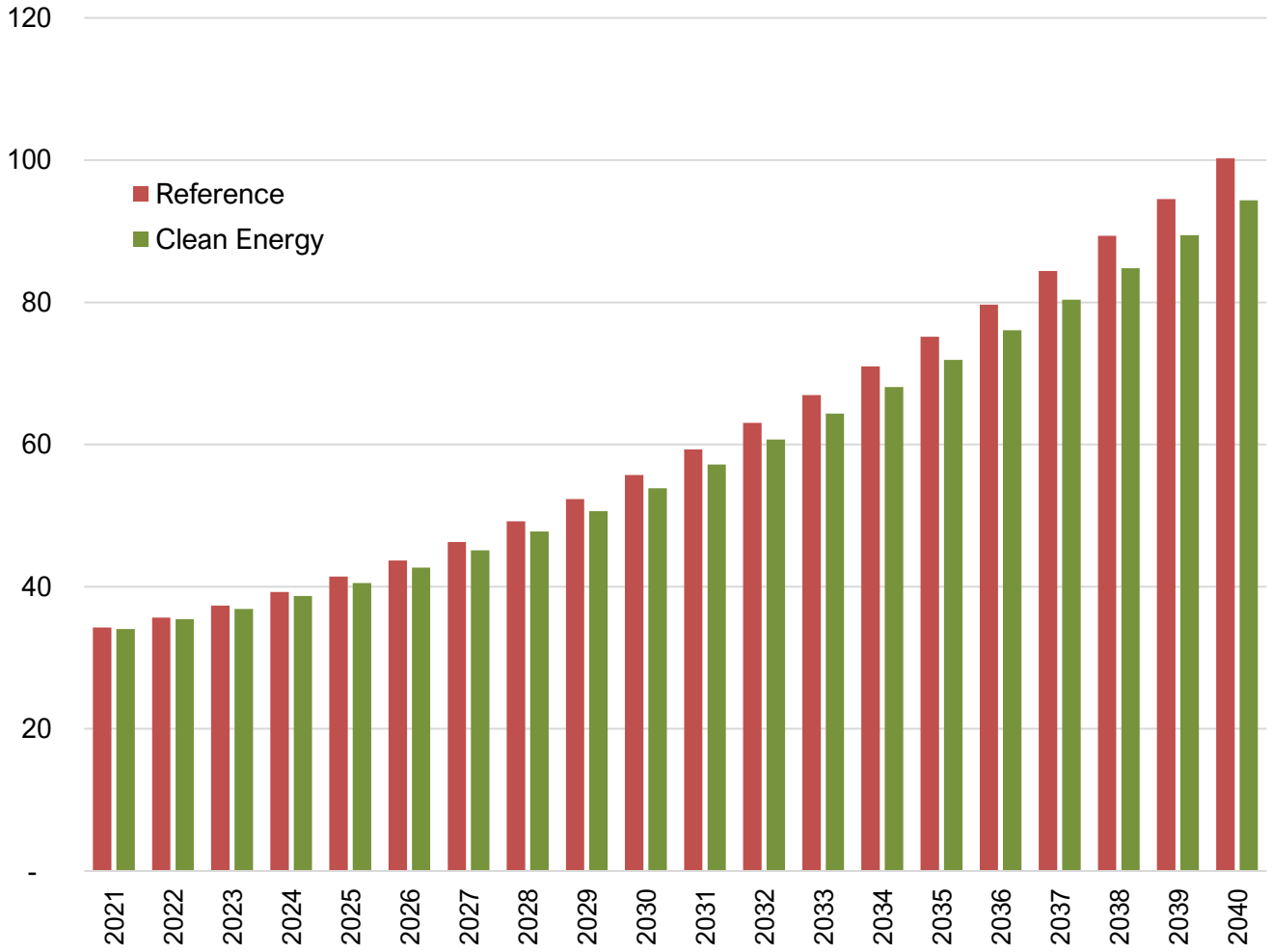
2040 CES: 144.8 MTOE
Self-Sufficiency: 59.9%

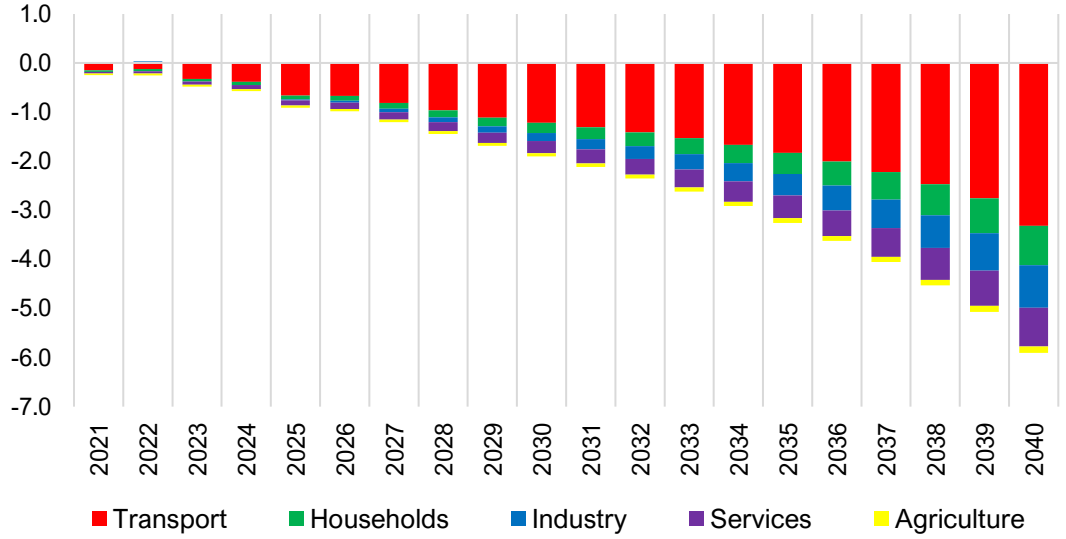
Fuel Type (TWh)	2020		2040				AAGR 2020-2040	
	Actual	% Shares	REF	% Shares	CES	% Shares	REF	CES
Coal	17.3	30.8	33.1	21.2	30.1	20.8	3.3%	2.8%
Natural Gas	3.3	5.8	26.5	17.0	16.8	11.6	11.0%	8.5%
Oil-based	16.5	29.2	56.4	36.2	51.5	35.5	6.4%	5.9%
Renewable*	19.3	34.2	39.7	25.5	46.4	32.0	3.7%	4.5%
Total	**56.4**	**100.0**	**155.6**	**100.0**	**144.8**	**100.0**	**5.2%**	**4.8%**

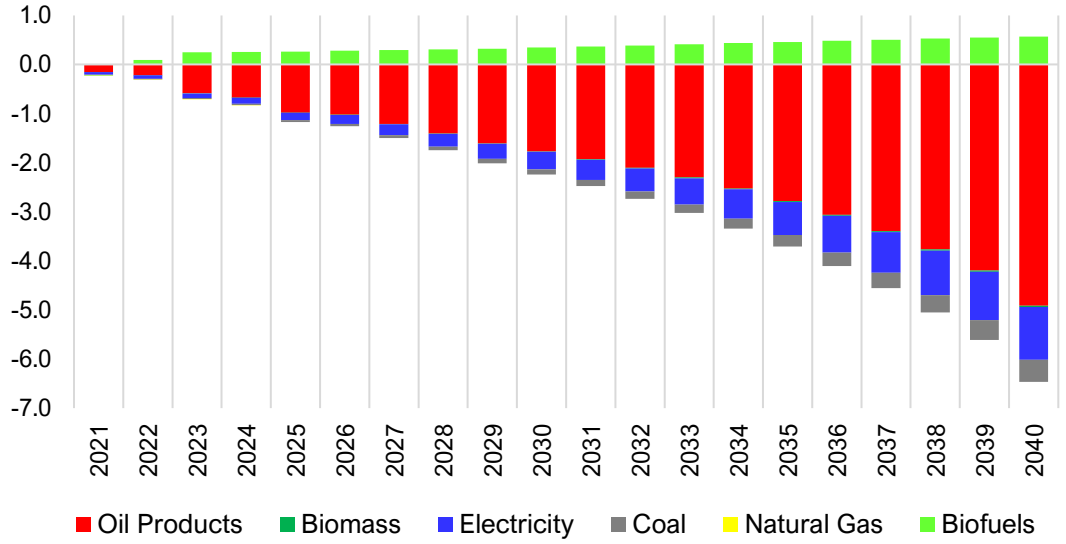
*includes geothermal, hydro, wind, solar and biomass

2040 ENERGY OUTLOOK: IMPACT OF CLEAN ENERGY SCENARIO (CES)

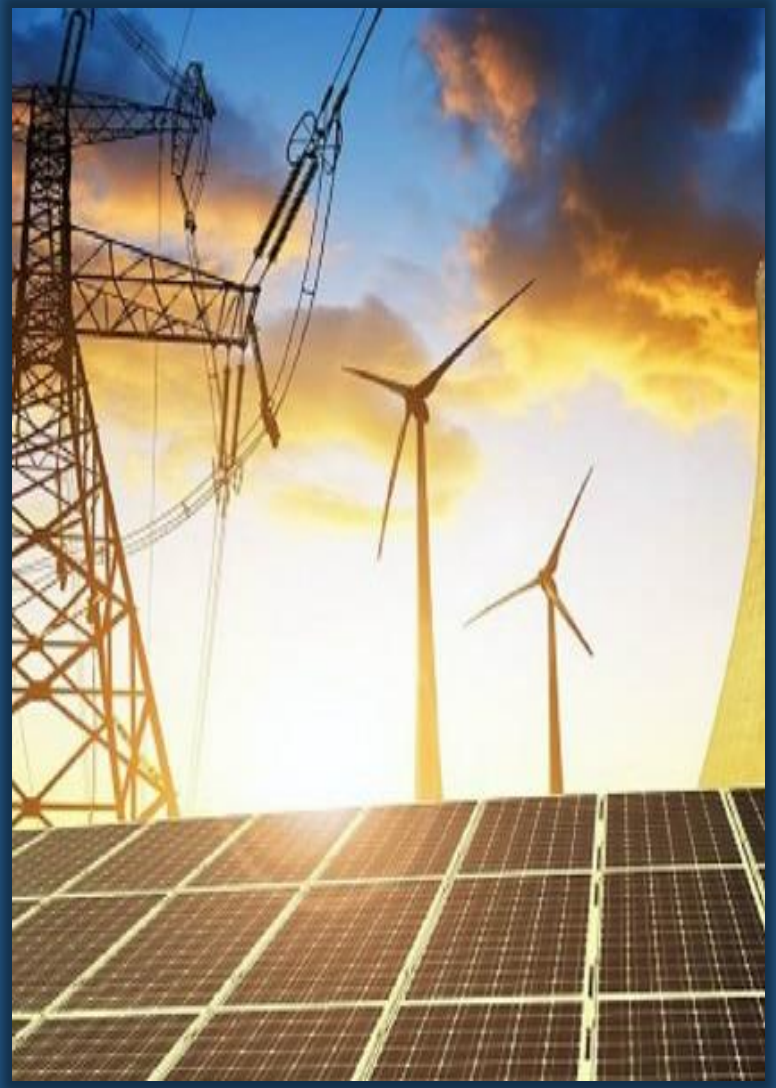
Changes in TFEC by Sector and By Fuel in MTOE (CES minus REF)

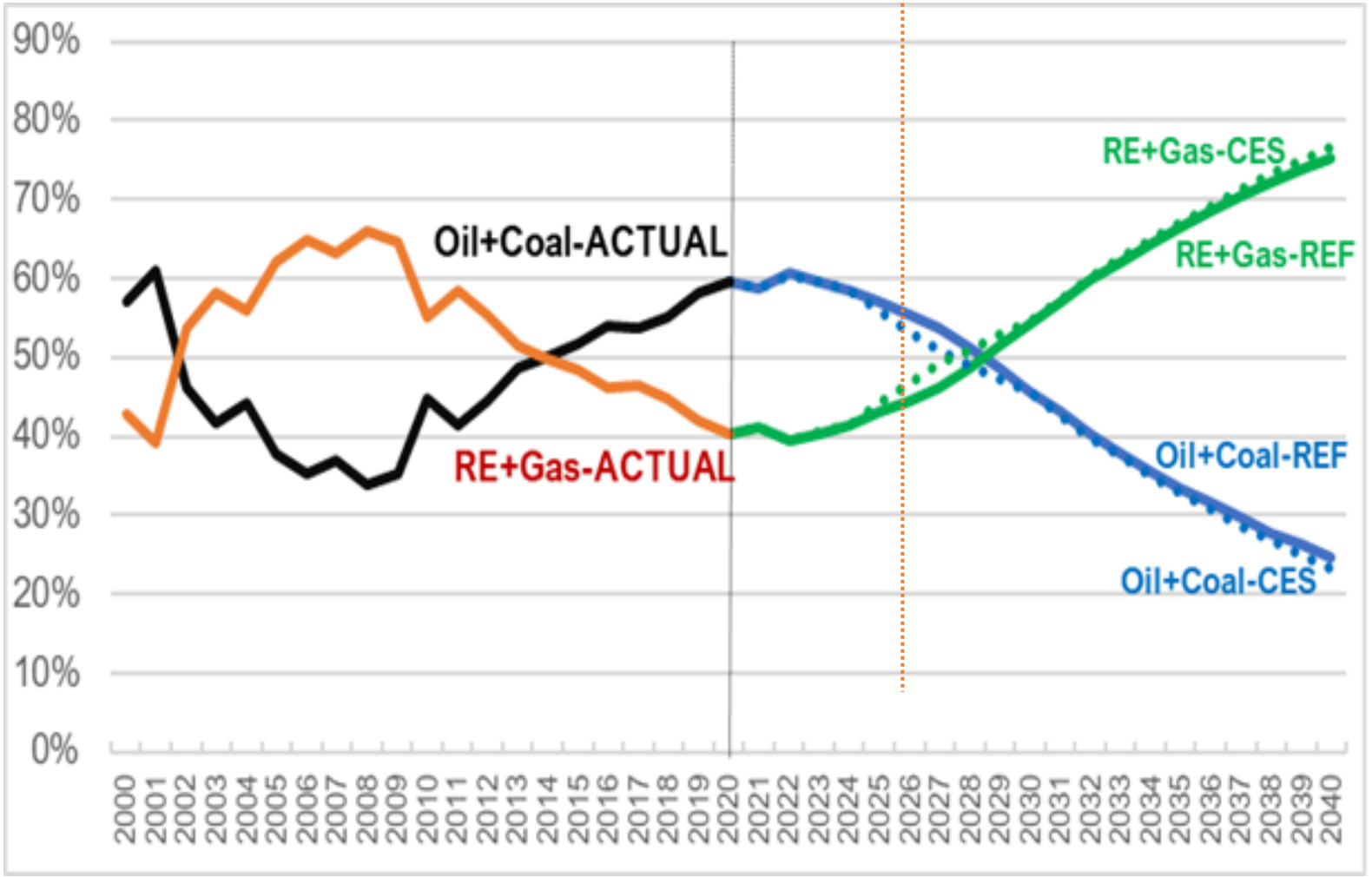




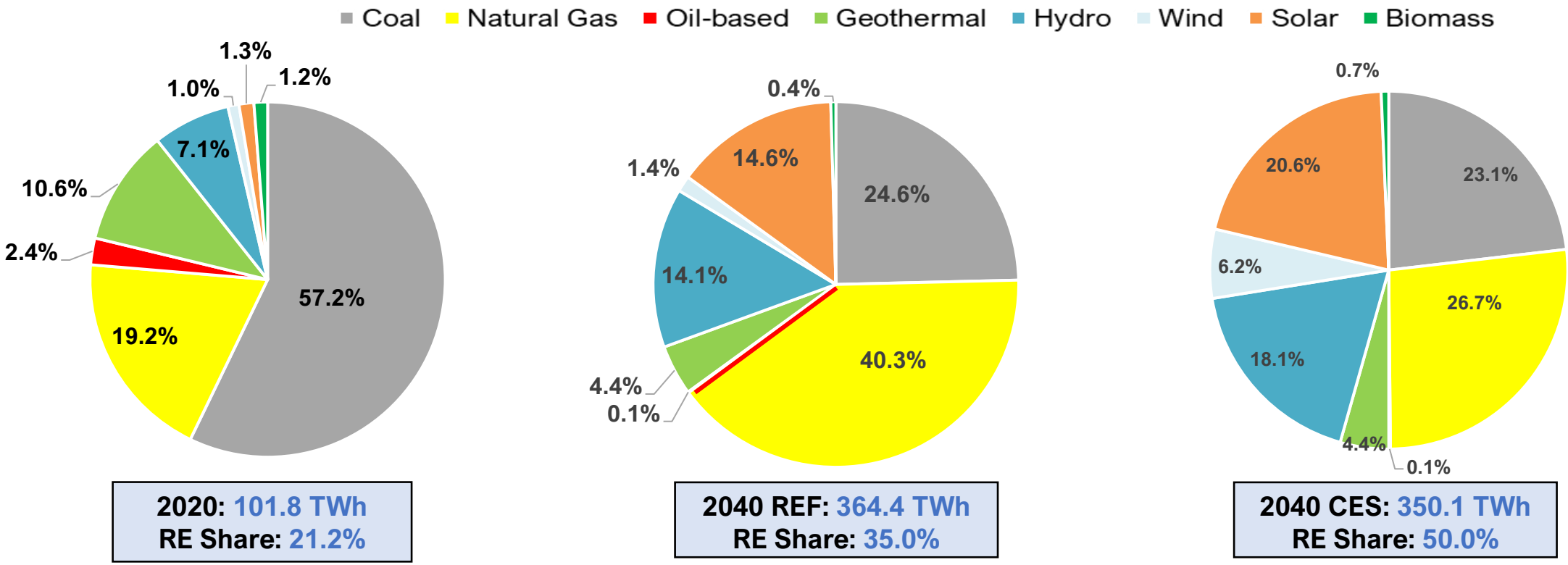


ENERGY TRANSITION:
CLEAN FUELS AND TECHNOLOGIES DOMINATING THE POWER MIX





POWER GENERATION, BY FUEL



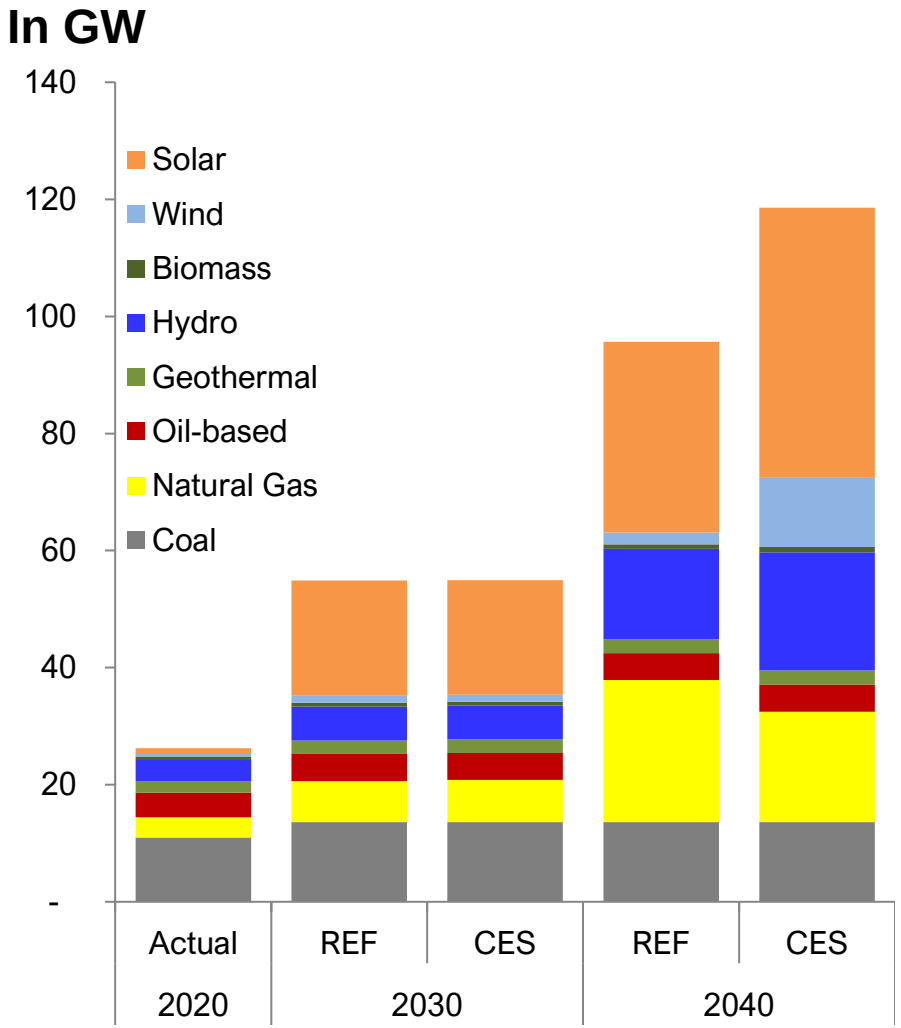
2020: 101.8 TWh
RE Share: 21.2%

2040 REF: 364.4 TWh
RE Share: 35.0%

2040 CES: 350.1 TWh
RE Share: 50.0%

Fuel Type (TWh)	2020		2040				AAGR 2020-2040	
	Actual	% Shares	REF	% Shares	CES	% Shares	REF	CES
Coal	58.2	57.2	89.7	24.6	80.8	23.1	2.2%	1.7%
Natural Gas	19.5	19.2	146.9	40.3	93.2	26.6	10.6%	8.1%
Oil-based	2.5	2.4	0.3	0.1	0.5	0.1	-10.4%	-7.5%
Renewable	**21.6**	**21.2**	**127.5**	**35.0**	**175.5**	**50.1**	**9.3%**	**11.0%**
Total	**101.8**	**100.0**	**364.4**	**100.0**	**350.1**	**100.0**	**6.6%**	**6.4%**

INSTALLED GENERATING CAPACITY



Capacities by Source: 2020, 2030 and 2040

Fuel Type (MW)	2020		2040				Total Additions by 2040	
	Actual	% Shares	REF	% Shares	CES	% Shares	REF	CES
Coal	10,944	41.7	13,585	14.2	13,585	11.5	2,641	2,641
Natural Gas	3,453	13.2	24,263	25.4	18,883	15.9	20,810	15,430
Oil-based	4,237	16.1	4,618	4.8	4,618	3.9	381	381
Renewable	**7,617**	**29.0**	**53,205**	**55.6**	**81,485**	**68.7**	**45,588**	**73,868**
Geothermal	*1,928*	*7.3*	*2,408*	*2.5*	*2,408*	*2.0*	*480*	*480*
Hydro	*3,779*	*14.4*	*15,426*	*16.1*	*20,176*	*17.0*	*11,647*	*16,397*
Wind	*443*	*1.7*	*2,027*	*2.1*	*11,830*	*10.0*	*1,584*	*11,387*
Solar	*1,019*	*3.9*	*32,590*	*34.1*	*46,137*	*38.9*	*31,571*	*45,118*
Biomass	*447*	*1.7*	*753*	*0.8*	*933*	*0.8*	*306*	*486*
TOTAL	**26,250**	**100.0**	**95,670**	**100.0**	**118,570**	**100.0**	**69,420**	**92,320**

HOW DO WE GET THERE?

- Policies, Plans and Programs
- Opportunities in the Philippine Energy Sector
- Investment Requirements

2040 OBJECTIVES

"Sustainable, stable, secure, sufficient, accessible and reasonably-priced energy"

Upstream Sector	Increased indigenous petroleum and coal reserve and production
Downstream Sector	Improved policies governing the downstream oil industry and establishment of a world-class, investment driven, and efficient natural gas industry
Renewable Energy	Attain the target of at least 35% RE share in the power generation mix by 2030 and 50% by 2040
Power Sector	▪ Energy Security, Resiliency, Affordability, and Sustainability ▪ Transparent and Fair Playing Field in the Power Industry ▪ Electricity Access for All
Energy Efficiency	Measurable reduction in energy intensity and consumption per year versus Business-As-Usual
Alternative Fuels and Emerging Technologies	Secured and Stable supply of energy through Technology Responsive Energy Sector

RENEWABLE ENERGY PLANS AND PROGRAMS

1 RENEWABLE PORTFOLIO STANDARDS

Requires electricity suppliers to source an agreed portion of their supply from eligible RE facilities

2 GREEN ENERGY AUCTION PROGRAM

Sets the framework for the facilitation of immediate and timely investment for new and additional RE capacities to ensure provision of adequate supply under a competitive process

3 GREEN ENERGY OPTION PROGRAM

Provides end-users the option to choose RE resources as their source of energy

4 RE MARKET RULES

Establishes the market for the trading of RE Certificates between and among trade participants

5 OPEN AND COMPETITIVE SELECTION PROCESS

Facilitates project development by offering well-characterized RE sites to project developers

6 RENEWABLE ENERGY TRUST FUND

To finance research, development, demonstration, and promotion of the widespread and productive use of RE systems

7 NET-METERING PROGRAM

End-users can install up to 100-kW RE systems to reduce their electricity bills and sell the surplus to the grid

8 COMPETITIVE RE ZONES

Covers the upgrade and expansion of transmission facilities through policy initiatives and activities that shall enable the optimal use of RE in the country

RENEWABLE ENERGY PLANS AND PROGRAMS

Energy Security

Accelerate exploration and development of RE resources to achieve energy self-reliance and reduce dependenceon fossil fuels.

Sustainable Development

- Contribute to the SGD Goals
- Balance economic growth with protection of health and environment

Climate Change Mitigation

Reduce Greenhouse Gas and other harmful emissions.

Capacity Building

Institutionalize the development of capabilities in the use of RE systems.

Inclusive Growth

Catalyze solutions to cross-cutting social issues including poverty, gender, and access to basic needs.

National Renewable Energy Program (NREP) 2020 – 2040

NREP sets a target of at least

35% RE Share

in the power generation mix (MWh) by 2030

NREP works to drive

RE share to greater than 50% by 2040,

dominating the mix

RENEWABLE ENERGY PLANS AND PROGRAMS

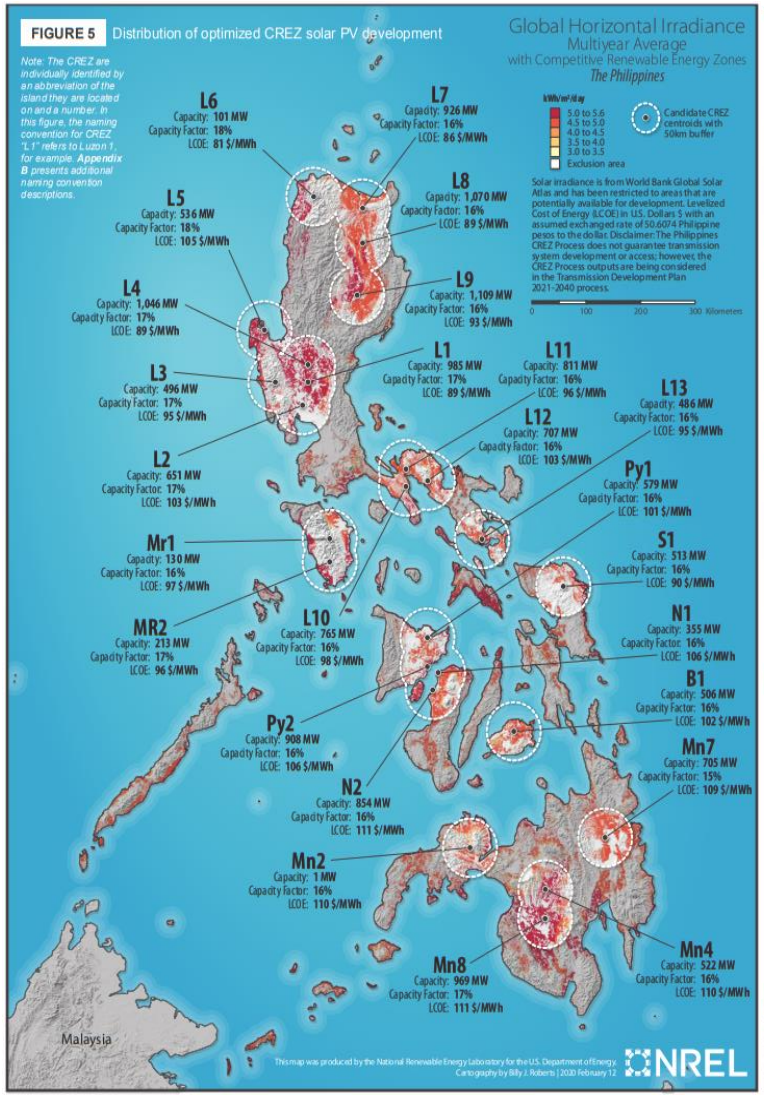
Strengthen partnerships with RE Development Partners

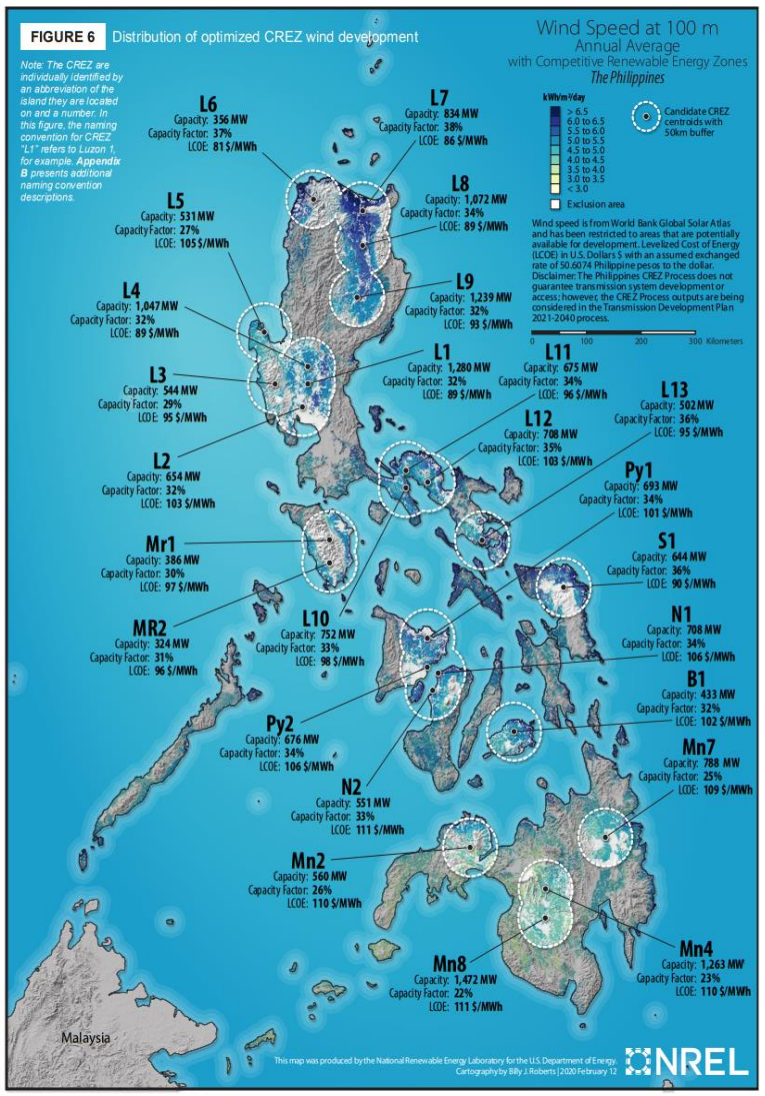
- Development of **Philippine Offshore Wind Roadmap** Project through WBG-ESMAP
- **Productive Uses of RE (PURE)** with EU-ASEP
- **Support Facility for RE (SF4RE)** under DREAMS project
- Implement the 2nd Phase **CREZs** project
- Partnerships with **Government Agencies (GAs)** to widen coverage of RE implementation – with **DA, DTI, CHED, DEPED, TESDA and DOLE**

Establish a reliable and efficient Infrastructure

- Implement RESHERR Code of Practice
- Develop standards for Solar Technology
- Issue Dam Safety Guidelines
- Ensure compliance of RE Developers with DOE's Resiliency Policies
- Ensure compliance of RE facilities in their approved Work Programs and Project Design

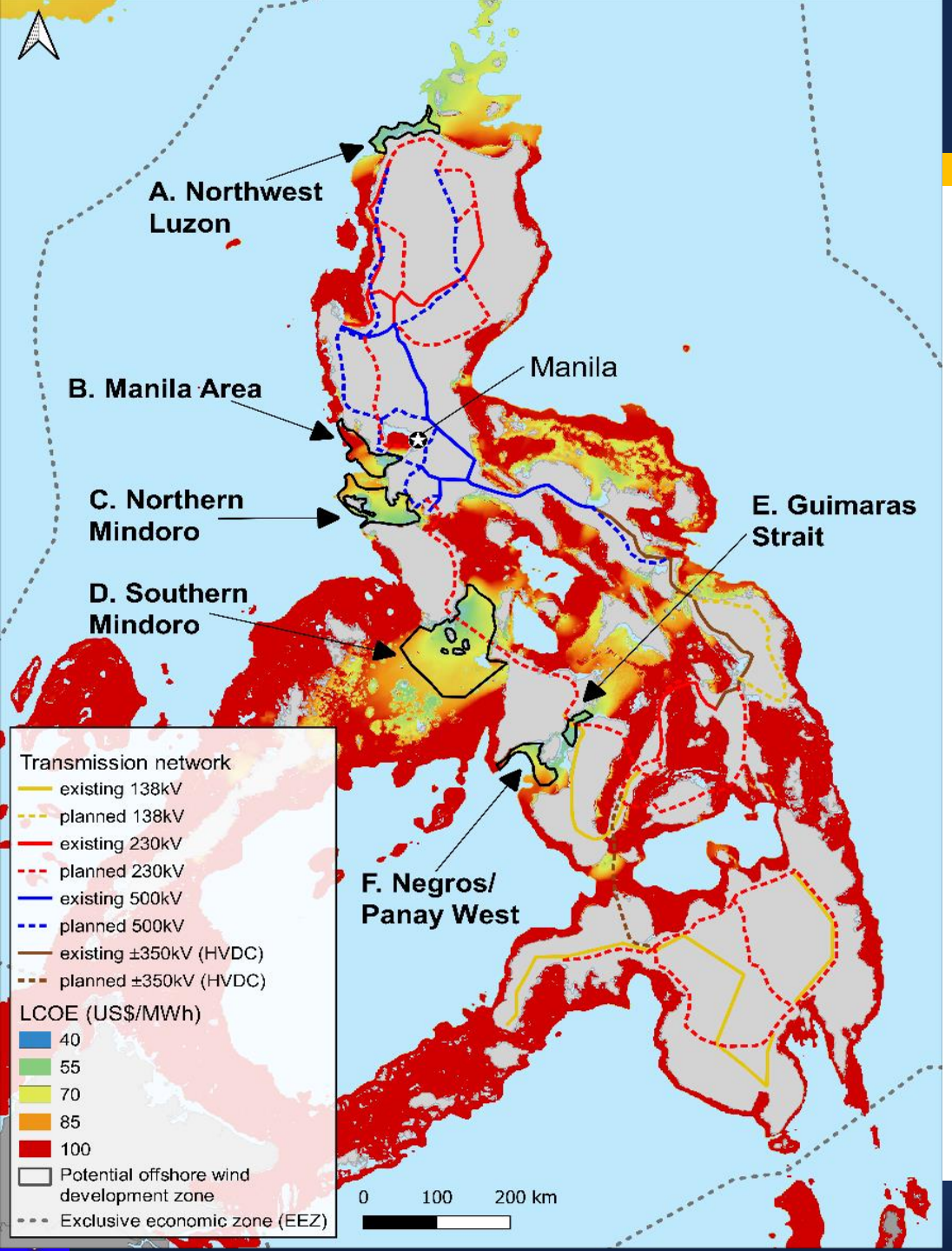
CREZ SOLAR PV AND WIND POTENTIAL





- **DOE** initiated the Competitive Renewable Energy Zones (CREZ) Project in 2018
- Identified **25 Strategic Areas** with high concentration of **solar and wind resources** throughout the country
- **15,944 MW** Solar and **18,692 MW** Wind potential capacities

OFFSHORE WIND ENERGY



Total of 178 GW of OSW potential

Offshore wind in the Philippines

2022:
Set the vision
- 2050 vision
- 2030 and 2040 targets
- Transmission network vision

2022-23:
Evolve the frameworks
- Marine Spatial Plan
- Offshore wind development zones
- Leasing and permitting (including ESIA)
- Auction arrangements
- Capacity building in stakeholders
- Government-industry task force

2022-2028:
Develop and install first projects
- Design
- Permitting
- Auction
- Construction

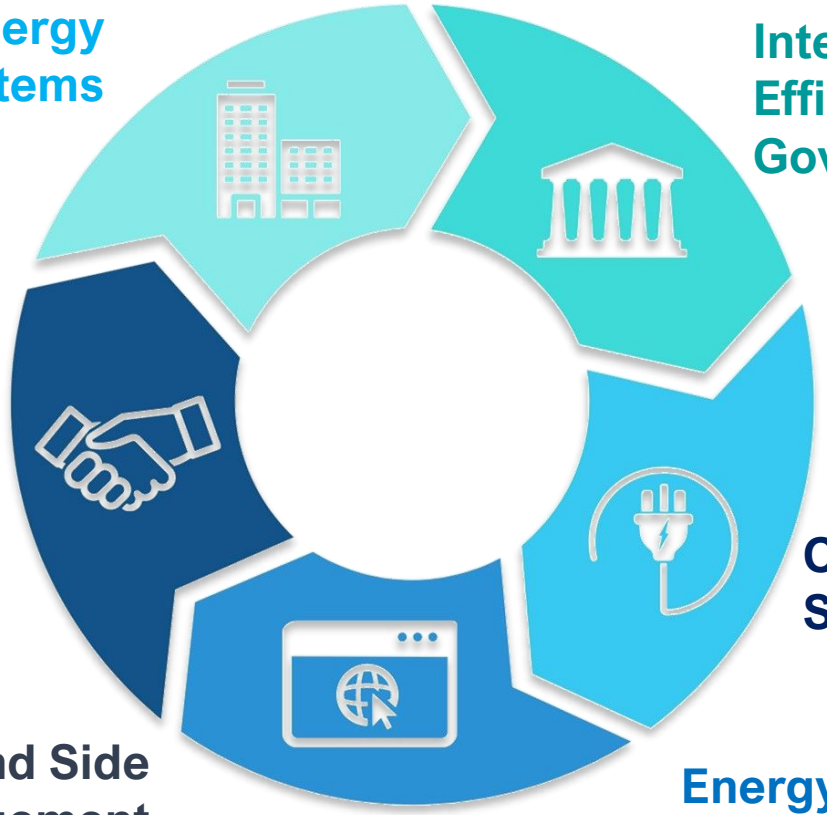
2025-2035:
Develop the long-term infrastructure
- Transmission, ports
- Supply chain
- Pipeline of offshore wind projects

ENERGY EFFICIENCY & CONSERVATION

Republic Act No. 11285: Energy Efficiency and Conservation Act

Establish cross-sectoral energy performance and rating systems

Integrate and mainstream Energy Efficiency and Conservation at Local Government Units



Cross-sectoral policy development

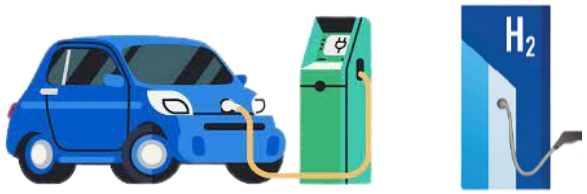
Collaboration with stakeholders for expanded financing

Create business tool kit for Energy Service Companies

Enhanced Demand Side Management

Energy Database Monitoring System

ALTERNATIVE FUELS & EMERGING TECHNOLOGIES



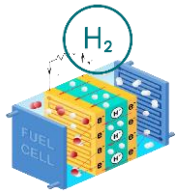
Deployment of Alternative Fuels and Technologies for Transport

- Electric Vehicles (EVs)
- Hybrid Electric Vehicles (HEVs)
- Hydrogen Fuel Cells

Establish Necessary Infrastructure and Regulatory Support

- EV Charging Stations
- Adoption of single EV charging protocol
- R&D on EV parts and components
- Establishment of testing laboratories, service shops, and training modules
- Household / home solar storage batteries

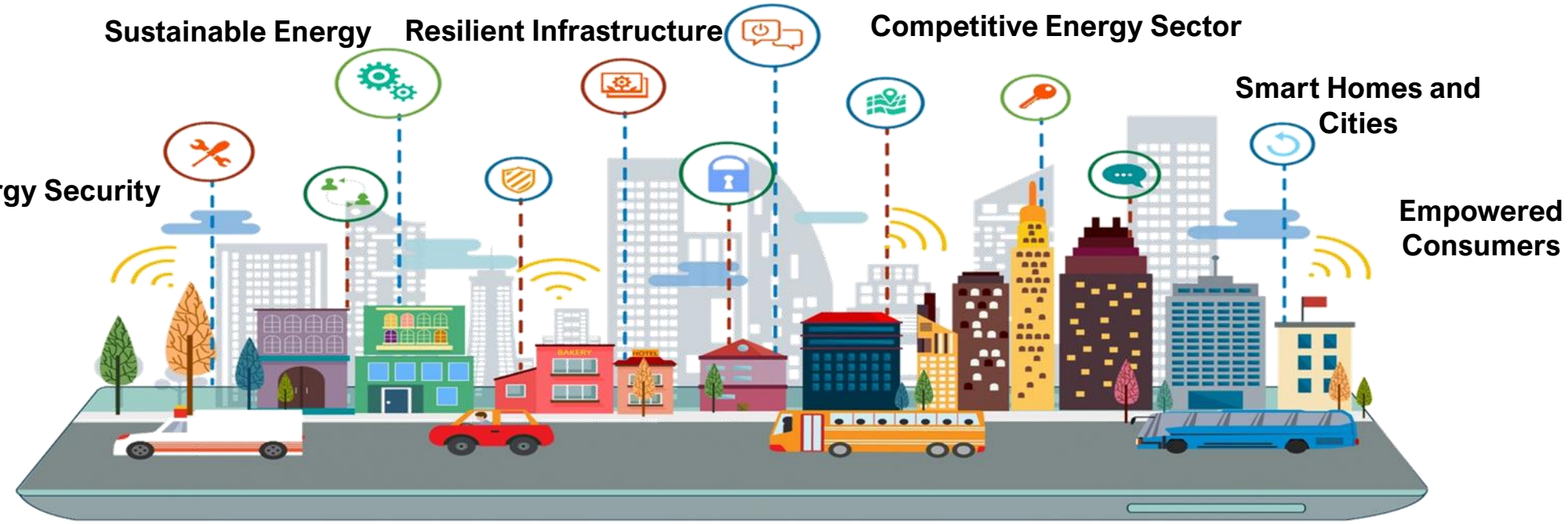
Pursue Other Cleaner Source of Energy and Support Technologies



HYDROGEN

NUCLEAR

FUTURE ENERGY SCENARIO IN CAPSULE



Renewable Energy

35% of power generation mix by 2030; and 50% by 2040

+

Energy Efficiency and Conservation

5% energy savings on oil products and electricity by 2040

+

Emerging and Innovative Technologies

10% EV penetration rate in road transport by 2040; Exploring new and efficient technologies

+

Information and Communications Technology

Adopting advanced and interoperable ICT in the energy chain

+

Energy Resiliency

Resilient and climate-proof energy infrastructure

INVESTMENT REQUIREMENTS

USD 153 Billion

Total Required Energy Investments

UPSTREAM

USD 10.05 Billion
Oil and Gas Exploration and Development

USD 13.12 Billion
Coal Exploration and Production

USD 510 Million
Renewable Energy (Pre-Development Activities)

DOWNSTREAM

USD 2.94 Billion
Oil Distribution Depots and Import Terminals

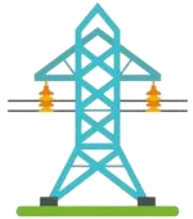
USD 1.78 Billion
Liquefied Natural Gas (LNG) Terminals

USD 2.38 Billion
Biofuels Production

POWER

USD 115.3 Billion
Construction of New Power Plants

Conventional: USD 21.0 Billion
Renewable Energy: USD 94.3 Billion



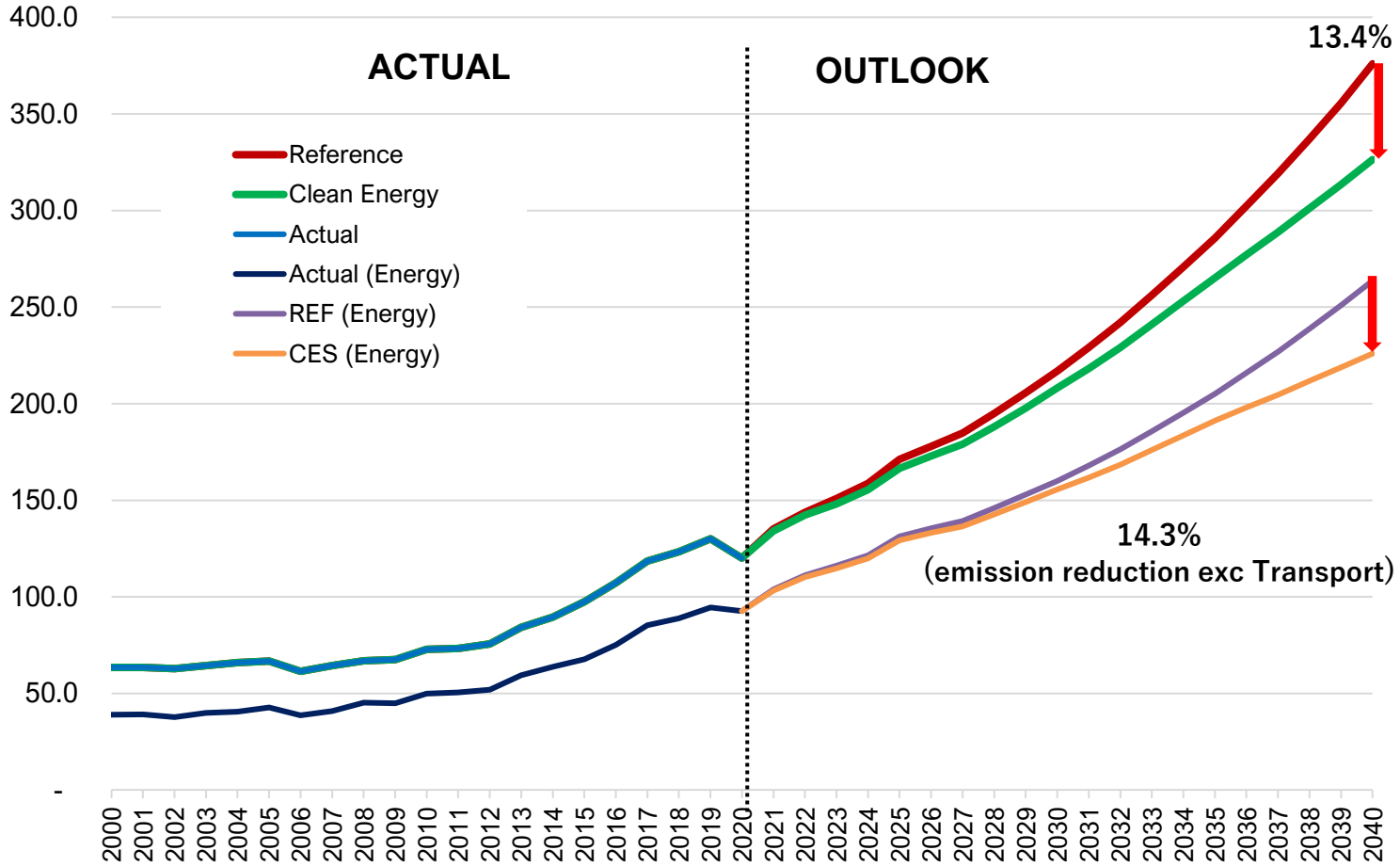
USD 6.97 Billion
Transmission Projects

PATH TOWARDS THE CLEAN ENERGY SCENARIO

- GHG in Energy Sector
- GHG Emission by Sector and Fuels

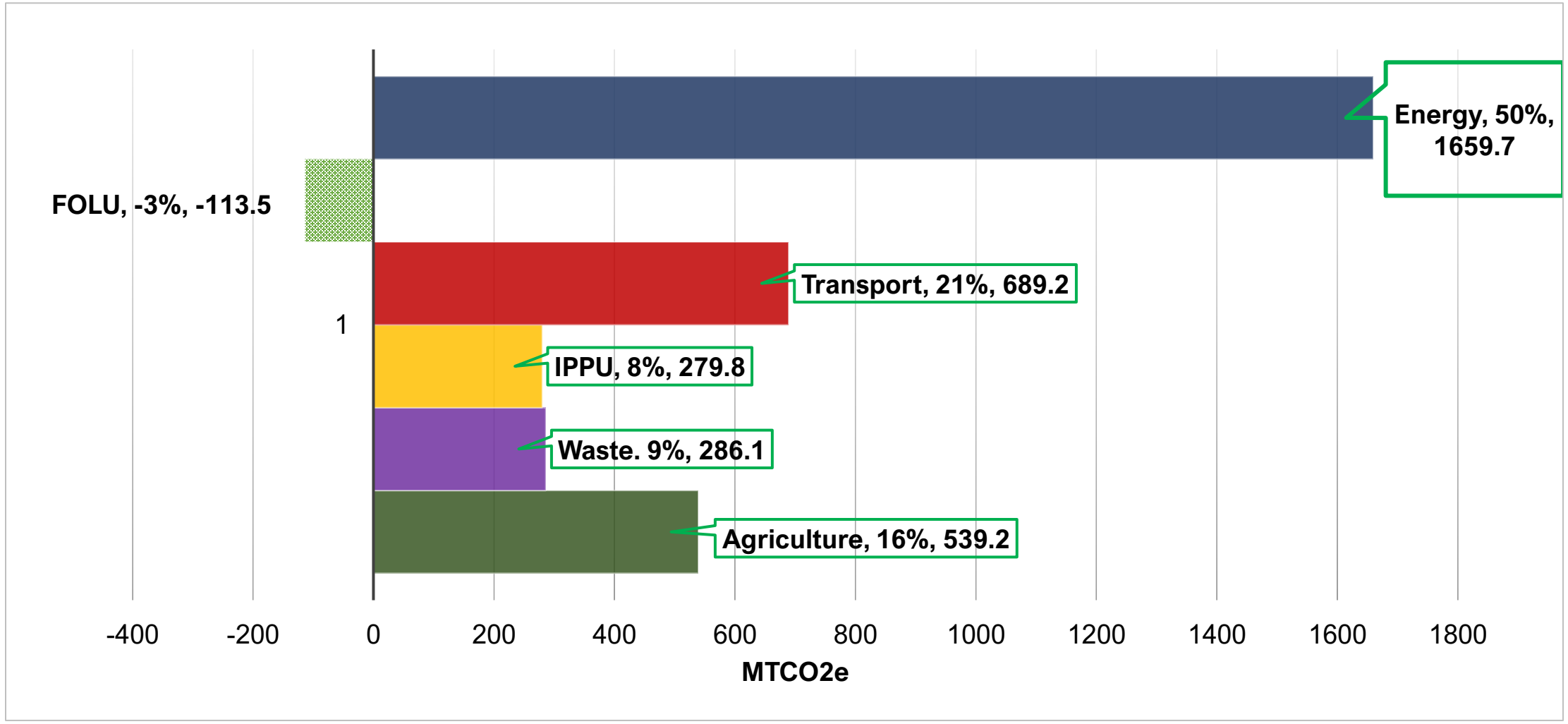
GHG EMISSION, BY SECTOR AND BY FUEL

GHG Emission, in $MTCO_2e$

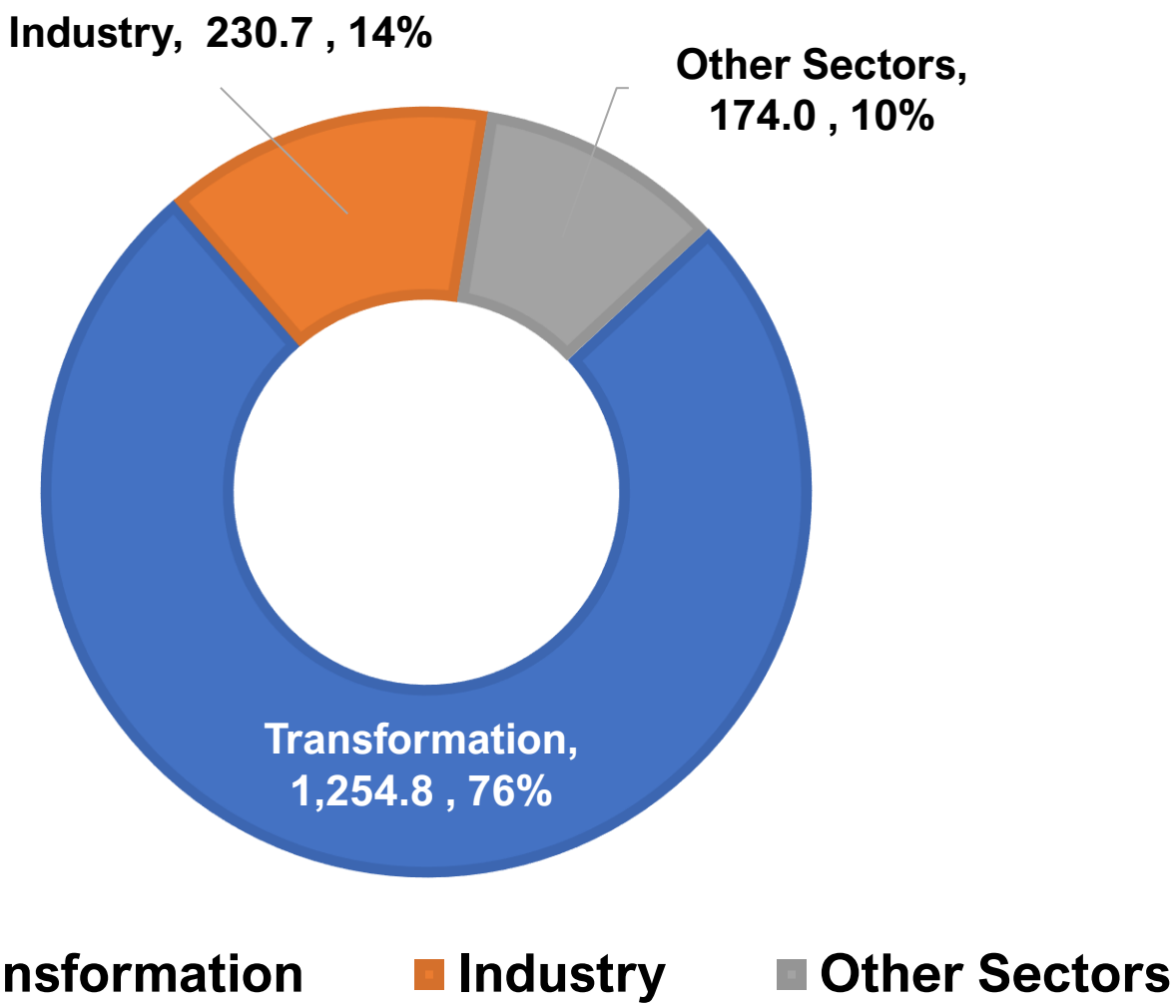


Sector	2020	2040		AAGR 2020-2040	
	Actual	REF	CES	REF	CES
Transformation	70.8	156.9	124.6	4.1%	2.9%
Industry	10.6	47.5	45.1	7.8%	7.5%
Transport	27.4	112.3	100.5	7.3%	6.7%
Others	11.2	54.2	51.1	8.2%	7.9%
Total	**120.0**	**370.9**	**321.2**	**5.8%**	**5.0%**
Less Transport	**92.6**	**258.6**	**220.8**	**5.3%**	**4.4%**

NDC BASELINE, 2020-2030, BY SECTOR

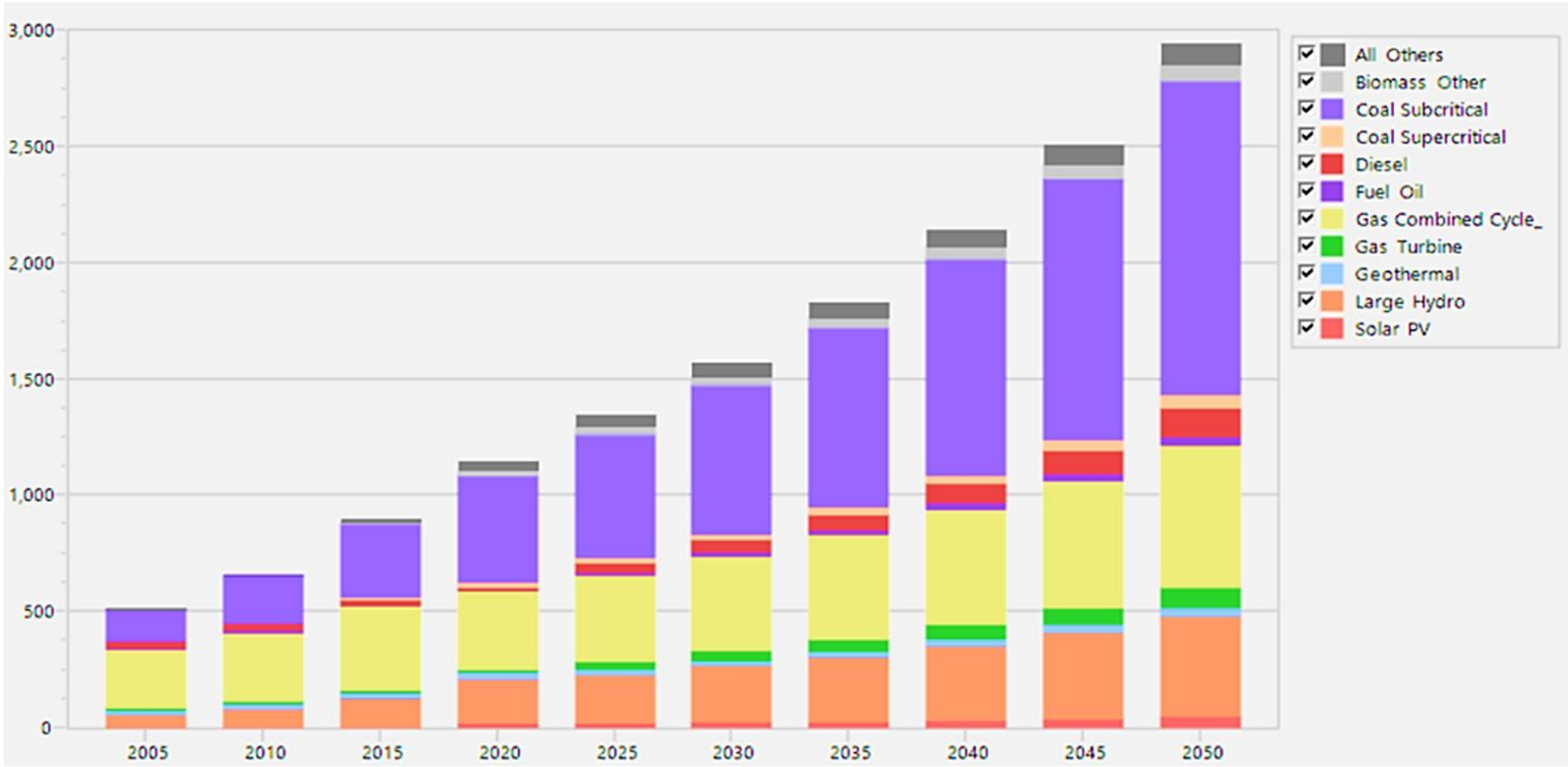


ENERGY SECTOR'S BASELINE, 2020-2030



ASEAN ELECTRICITY GENERATION (Baseline Scenario), 2005-2050

ASEAN Electricity Generation in TWh



Source: AEO7 from the ASEAN Centre for Energy (ACE)

ASEAN NATIONAL RE POLICY AND TARGET (ASEAN Target Scenario)

Brunei Darussalam

30% RE share of total capacity in the power generation mix by 2035
Brunei Darussalam's NDC 2020

Cambodia

25% share of RE in the energy mix (solar, wind, hydro, biomass) by 2030
Cambodia's NDC 2020

35% share of RE in the generation mix by 2050, of which 12% is from solar
Long-Term Strategy for Carbon Neutrality 2021

Indonesia

23% RE in primary energy supply by 2025, including 45.2 GW RE in installed capacity; and 31% RE in primary energy supply by 2050, including 167.7 GW RE in installed capacity
2017 National Energy General Plan (RUEN)

Biodiesel blending ratio target 30% by 2025; Bioethanol blending ratio target 20% by 2025 and 50% by 2050
Ministry of Energy Regulation 12 /2015 –Mandatory Biofuel

19.6% share of RE in electricity production in 2030
Indonesia's NDC 2021

Source: AEO7 from the ASEAN Centre for Energy (ACE)

ASEAN NATIONAL RE POLICY AND TARGET (ASEAN Target Scenario)

Lao PDR

30% share of RE in total energy consumption by 2025, including 20% renewable electricity share (excluding large-scale hydro) and 10% biofuel share (blending ratio 5-10%)
The 6th ASEAN Energy Outlook

13GW total hydropower capacity (domestic and export use) in the country by 2030
Lao PDR's NDC 2021

Malaysia

RE target 31% or 12,916 MW in its power capacity mix by year 2025 and 40% or 17,996 MW by year 2035
Malaysia Renewable Energy Roadmap 2021

Myanmar

12% share of RE in total primary energy supply by 2030 (including 11% hydro and 1.2% solar PV & wind)
National Energy Master Plan (2015)

39% share of RE in electricity generation by 2030 (28% hydro or 5156 MW, and 11% other RE or 2000MW)
Myanmar's NDC 2021

Philippines

35% of RE in the power generation mix by 2030 and 50% share by 2040; and 5% blending for biodiesel starting 2022
PEP 2020-2040

Source: AEO7 from the ASEAN Centre for Energy (ACE)

ASEAN NATIONAL RE POLICY AND TARGET (ASEAN Target Scenario)

Singapore

Increase solar energy deployment by five-fold in 2030 to at least 2 GWp (1.5 GWp by 2025); 200 MW of energy storage systems deployment beyond 2025

Singapore Green Plan 2030

Thailand

30% RE share in TFEC by 2037, including 15–20% renewable electricity in total generation; 30–35% of consumed heat from renewables; and a 20–25% biofuel share in TFEC

Alternative Energy Development Plan (AEDP) 2015-2036

Vietnam

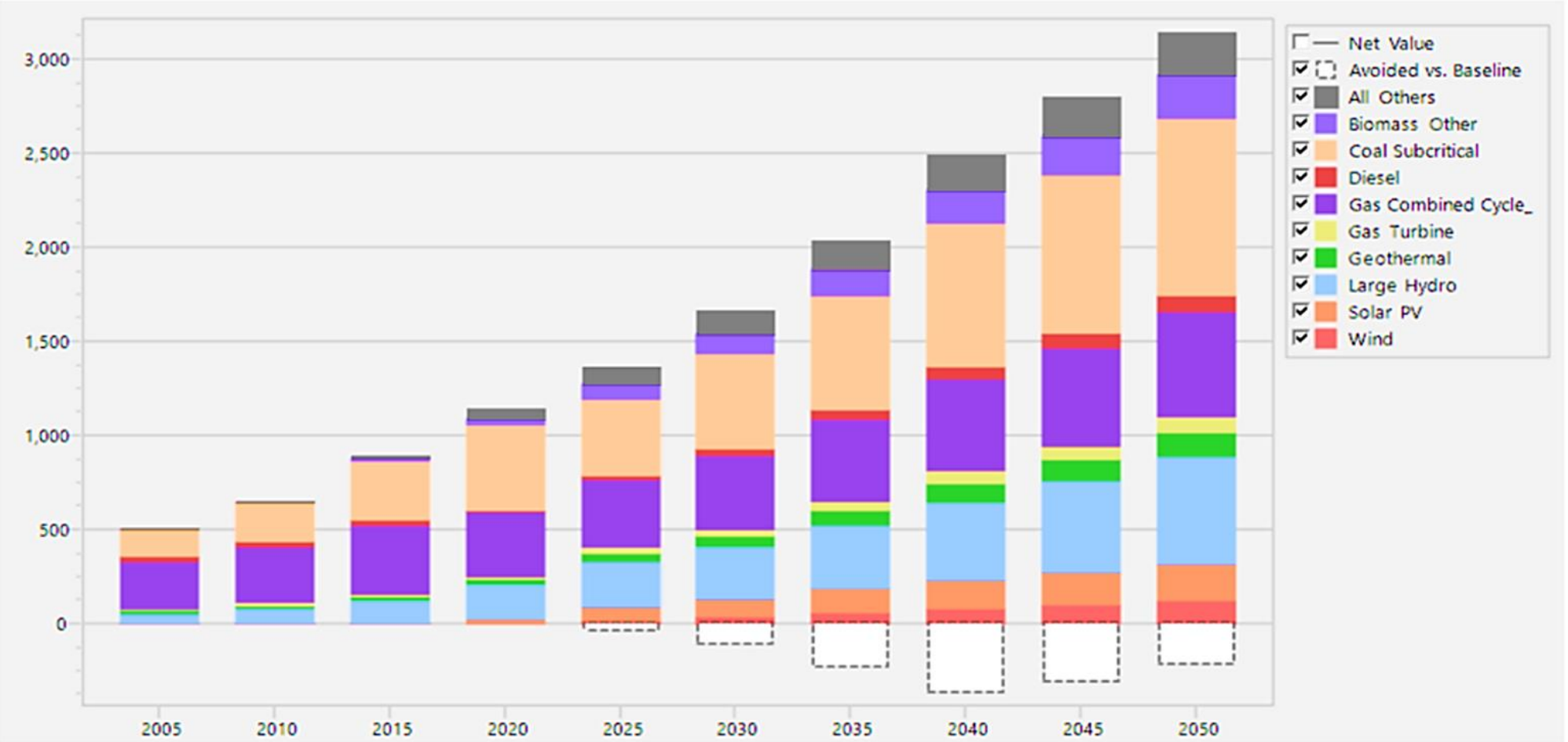
- RE share in TFEC: 32.3% by 2030, 44% by 2050
- RE share in power generation: 32% by 2030 and 43% by 2050

Viet Nam's Renewable Energy Development Strategy up to 2030 with an outlook to 2050 (Decision2068/QD)

Source: AEO7 from the ASEAN Centre for Energy (ACE)

ASEAN ELECTRICITY GENERATION (Target Scenario), 2005-2050

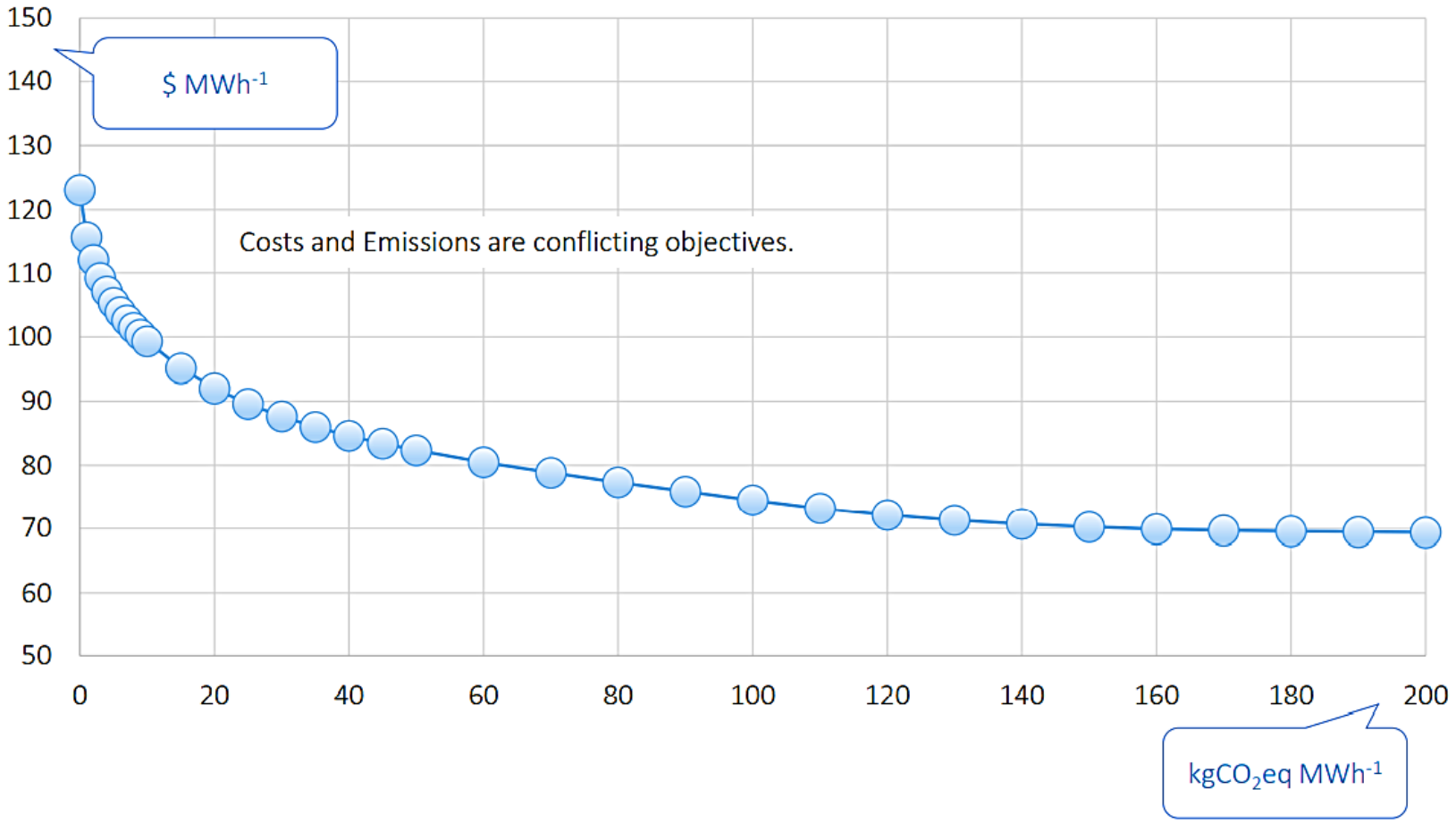
ASEAN Electricity Generation in TWh



Source: AEO7 from the ASEAN Centre for Energy (ACE)

MINIMUM GENERATION COST vs. CARBON CONSTRAINT

'Level Playing Field'
Same discount rate (5%)
for all technologies



Source: Dr. Saied Dardour of IAEA, presented during the "Workshop on Economic Competitiveness, Marketability, and Bankability of Micro and Small Modular Reactor Technologies" held in Vienna, August 15-18, 2022.

Thank You!

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