

*Presented by: **GANGUBAI**
HUYNH HAI NGAN & NGUYEN TRUNG HIEU*



Green Energy Sharing

***Decentralized Energy Production and Consumption for
Resilient & Sustainable Energy Communities***



World Bank

Power outages have cost
Vietnam \$1.4 billion
without ELECTRICITY
0.3% of its GDP

Aug 10, 2023

ASEAN's **growing energy demand** has outpaced the centralized energy market, increasing the vulnerability to **power grid failures**

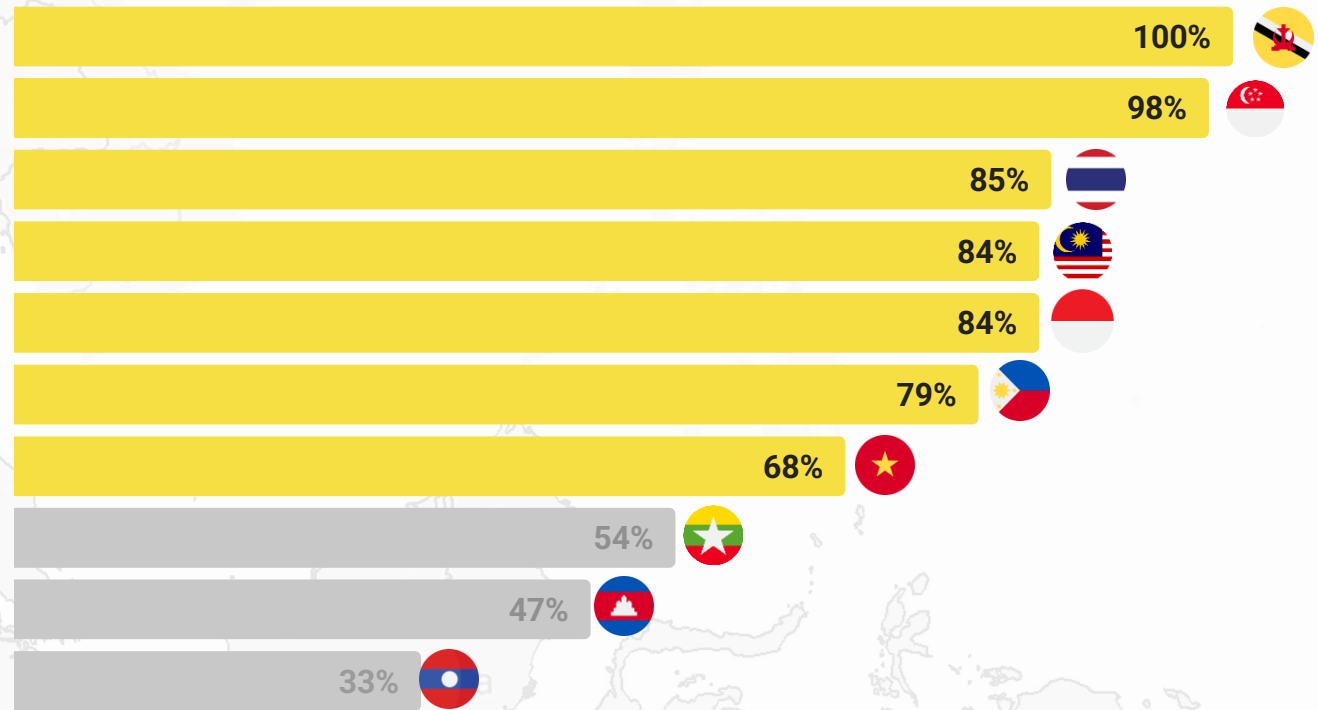


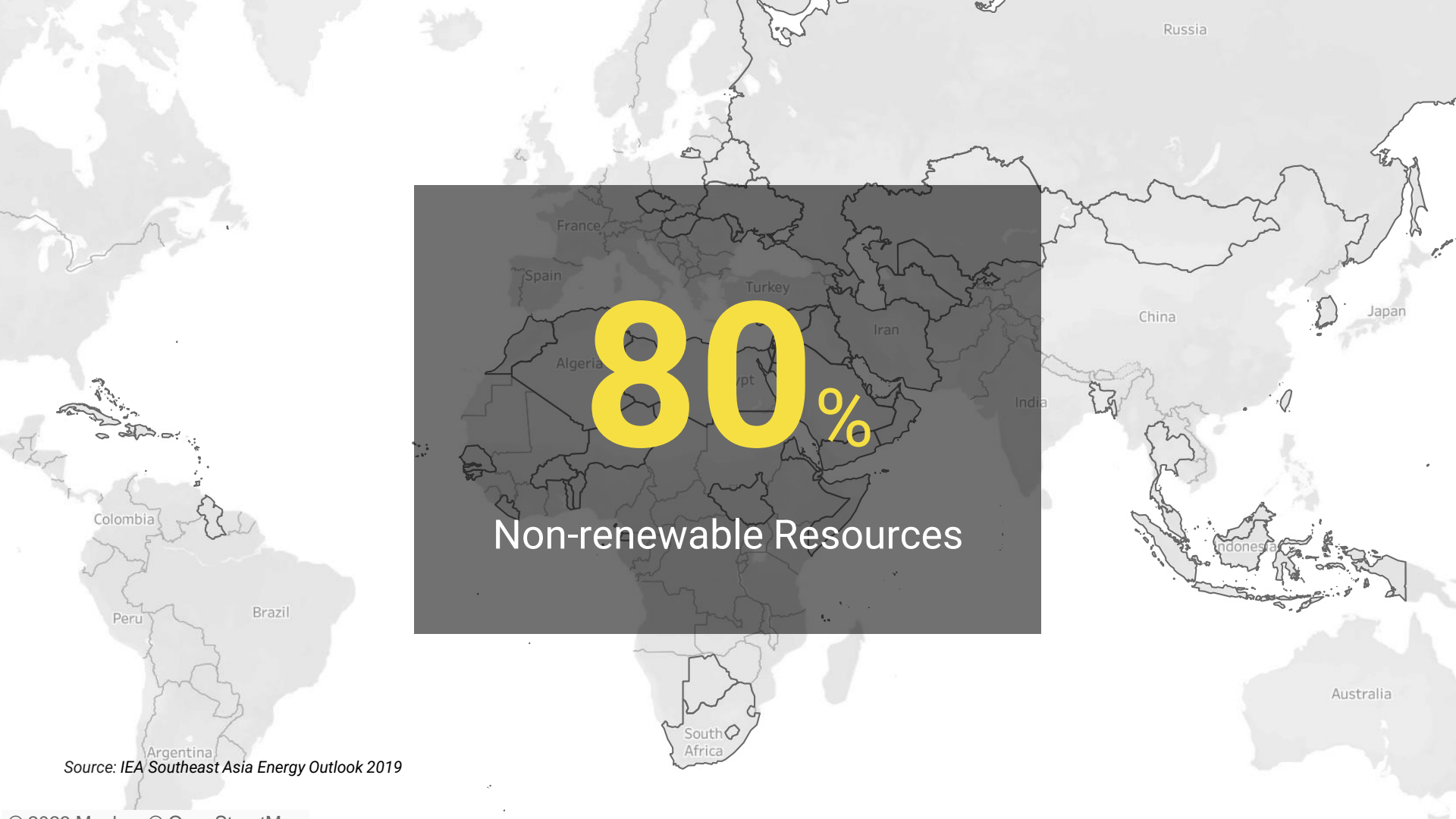
ASEAN's Total Primary Energy Consumption (TWh)

Indonesia

7/10
ASEAN
countries
heavily
rely on
fossil fuels

Fossil Fuels Shares in Primary Consumption (%)





80%

Non-renewable Resources

Source: IEA Southeast Asia Energy Outlook 2019



IMPLICATIONS

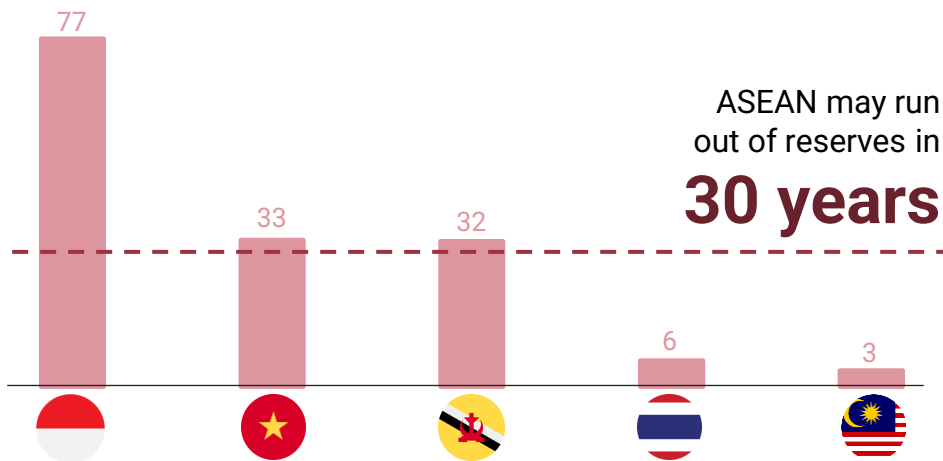
IMPLICA I VINI

Looming Energy Crisis Threatens

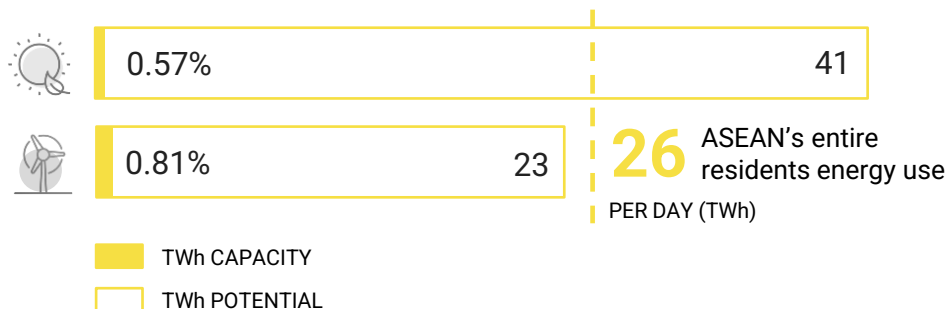
26M+

ASEAN Residents

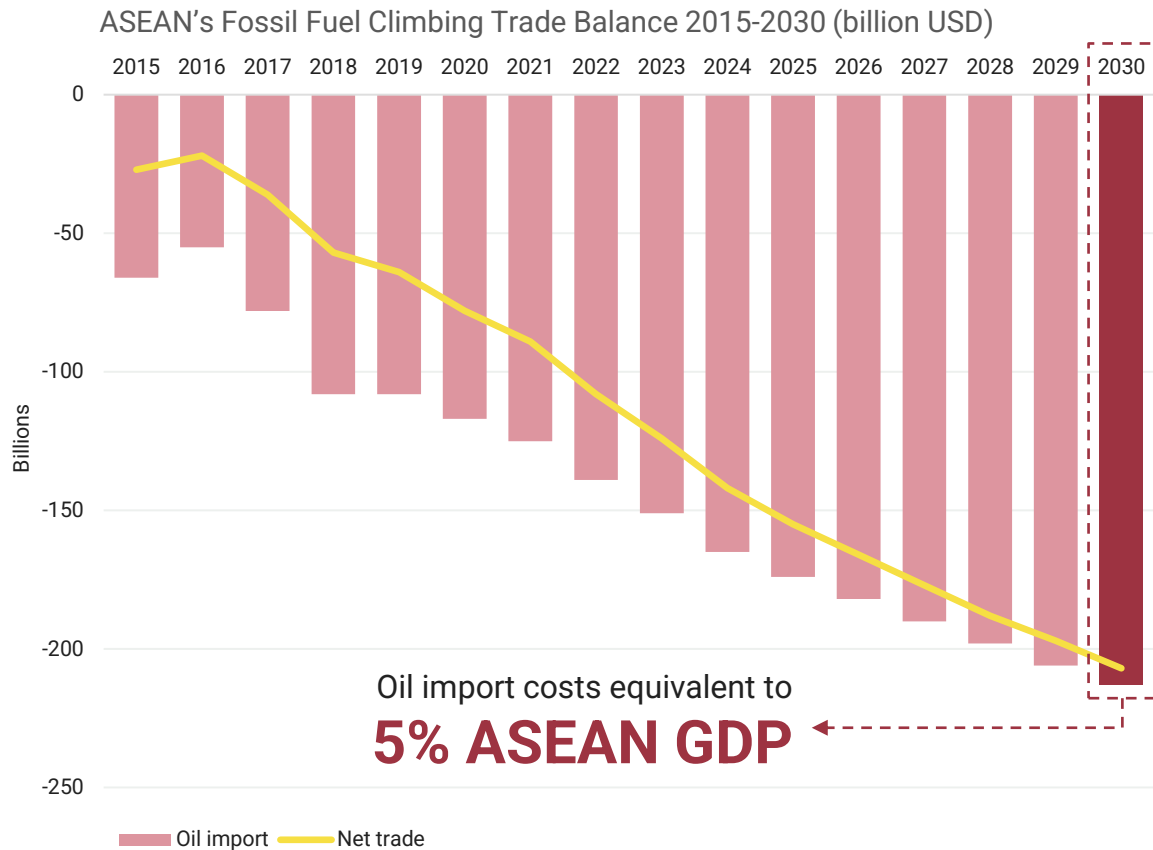
ASEAN's Fossil Fuel Reserves Are Running Out (year until depletion)



ASEAN Is Slow to Capture Its Potential Renewable Energy Resource (TWh)

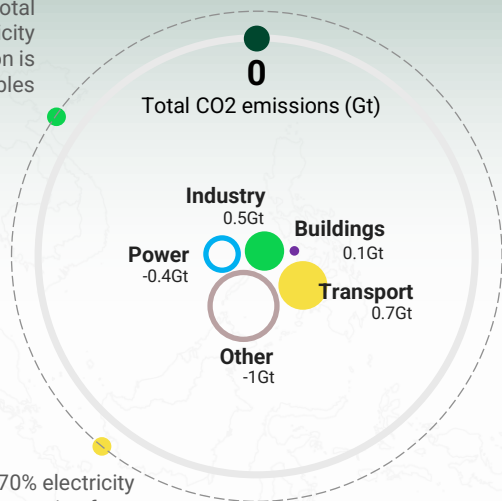


Fossil Fuel Subsidy Reaching **40B USD** by 2030



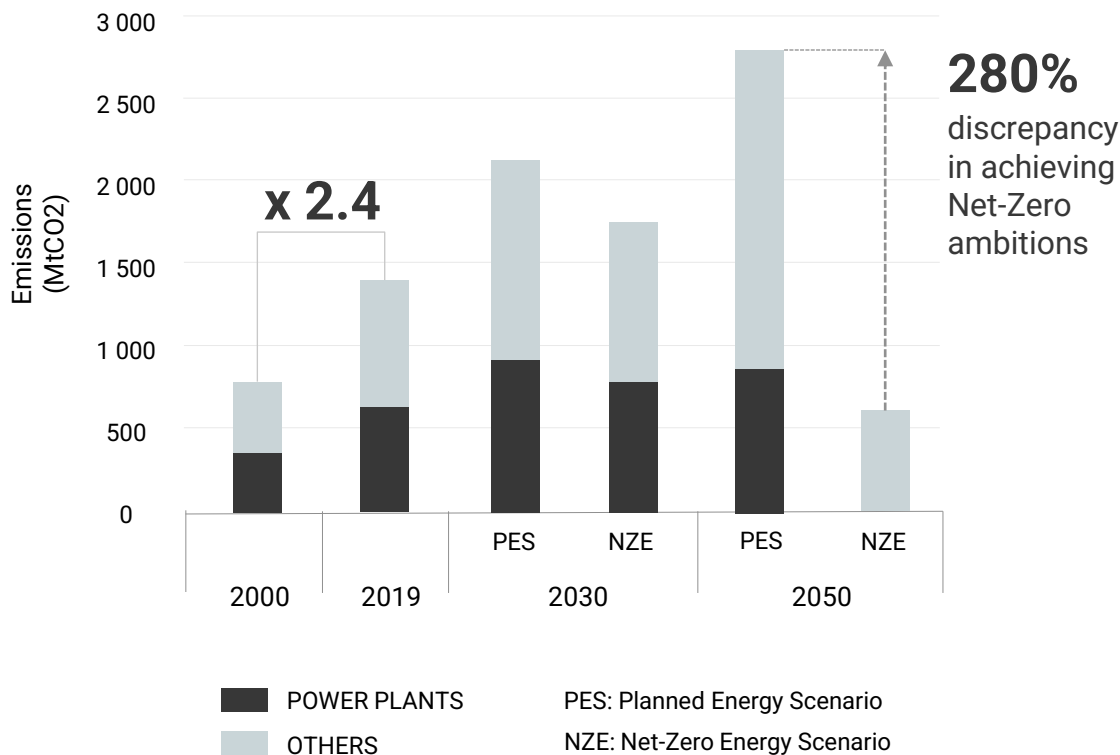
Challenge to Achieve Net-Zero

90% total
electricity
generation is
renewables



70% electricity
generation from
solar PV and wind

Total Energy-Related CO2 Emissions, by Scenario, 2000 - 2050



SITUATION 

COMPLICATION 

QUESTION 

ANSWER 



To address the challenges of high fossil fuel dependence, we need to **transition to renewable energy**, which is currently underutilized.

COMPLICATION 

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Centralized renewable energy systems are **economically unviable** due to high investment cost.

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ANSWER 



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How can ASEAN **overcome** these barriers and **accelerate** the transition to renewable energy?

ANSWER

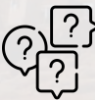




To address the challenges of high fossil fuel dependence, we need to **transition to renewable energy**, which is currently underutilized.



Centralized renewable energy systems are **economically unviable** due to high investment cost.



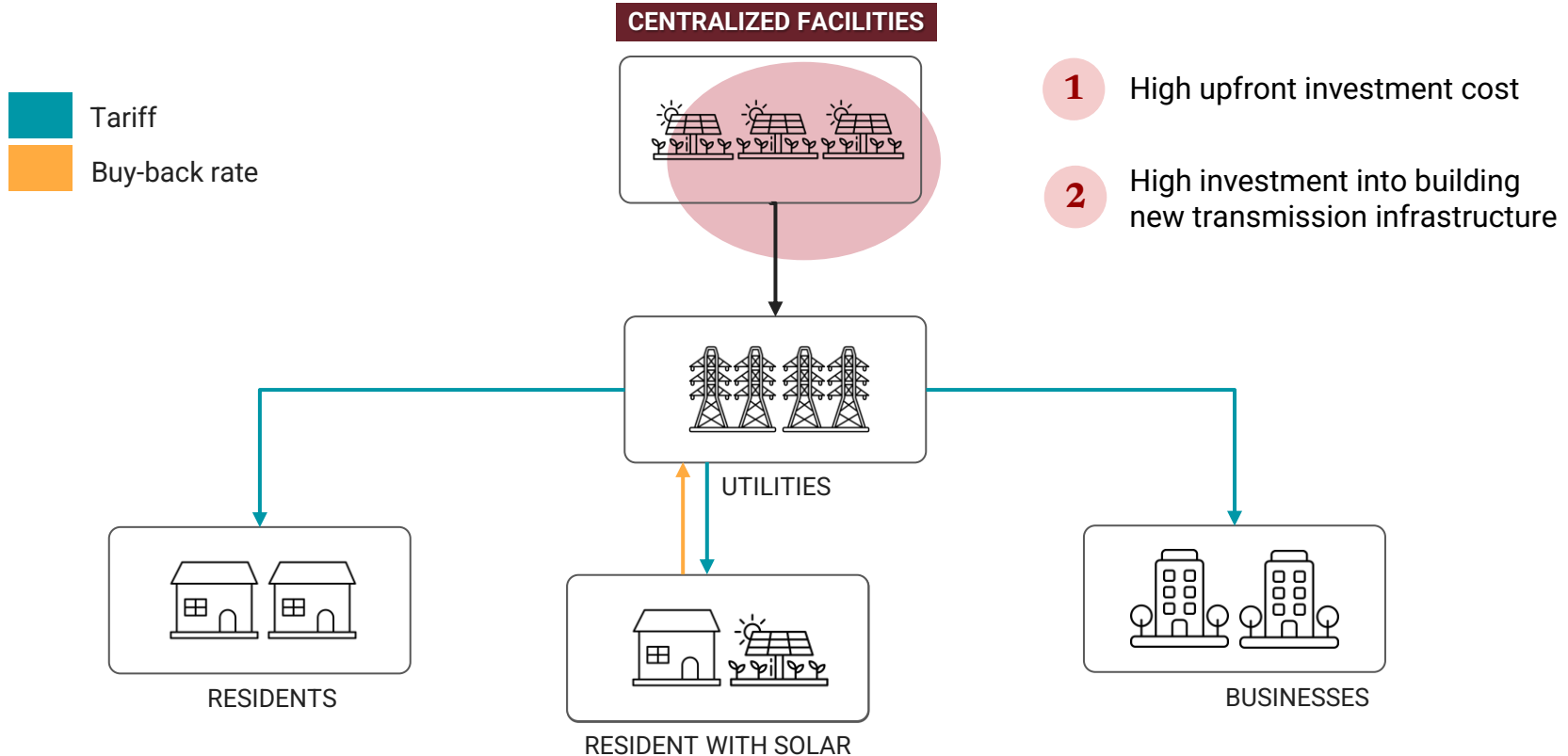
How can ASEAN **overcome** these barriers and **accelerate** the transition to renewable energy?



Decentralize energy production & consumption

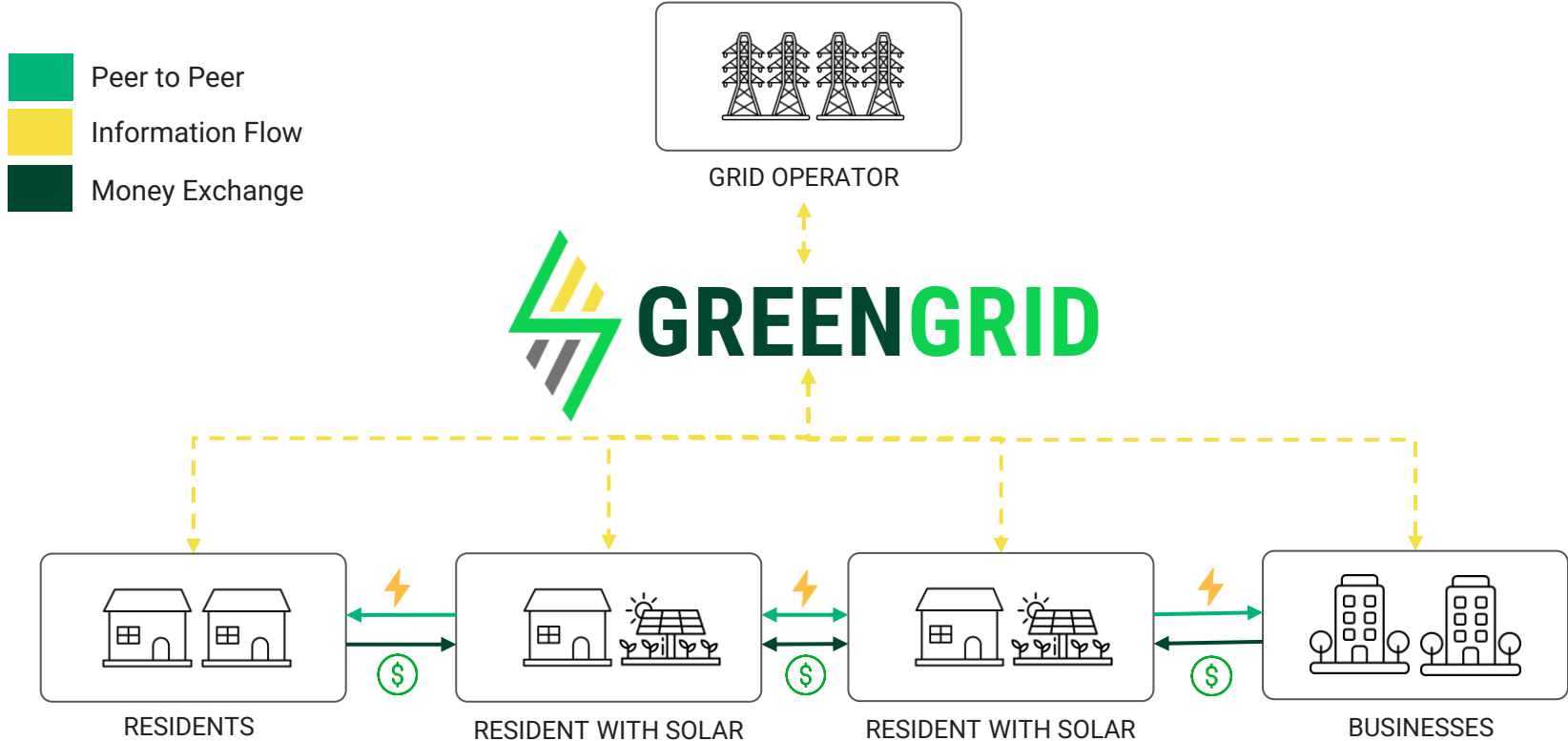
Share the cost of renewables to the public & enable faster adoption of renewable energy.

Traditional Model with Centralized Generation of Electricity

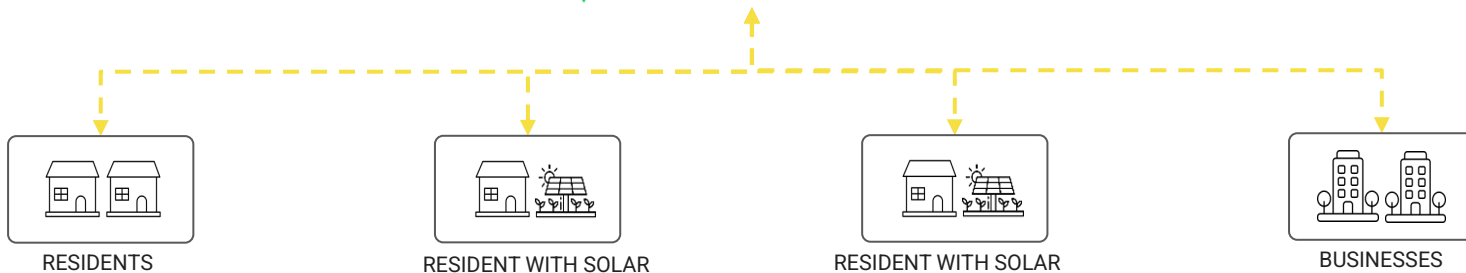


GreenGrid Model with Decentralized Generation of Electricity

Enables individuals and businesses to buy and sell renewable electricity from one another



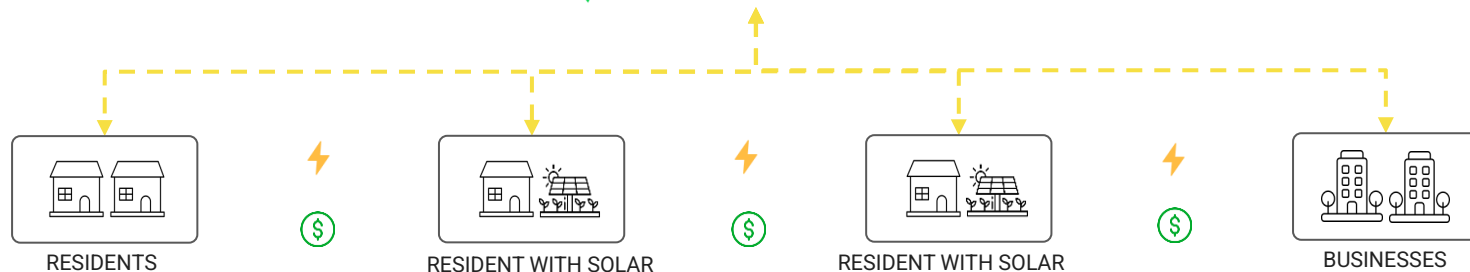
- Peer to Peer
- Information Flow
- Money Exchange



Sign up

Register as sellers,
buyers & we install
smart meters to
monitor your energy

- Peer to Peer
- Information Flow
- Money Exchange



Sign up

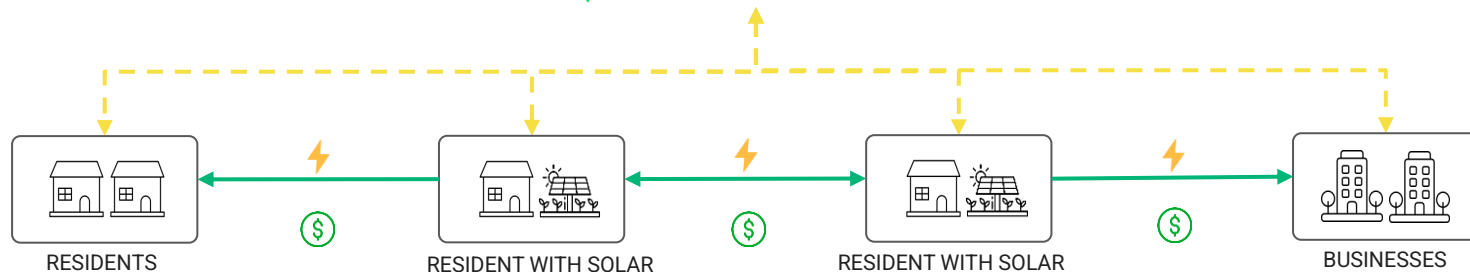
Register as sellers, buyers & we install smart meters to monitor your energy



Set price

Set your desired electricity volume and price range for selling or buying.

- Peer to Peer
- Information Flow
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Set price

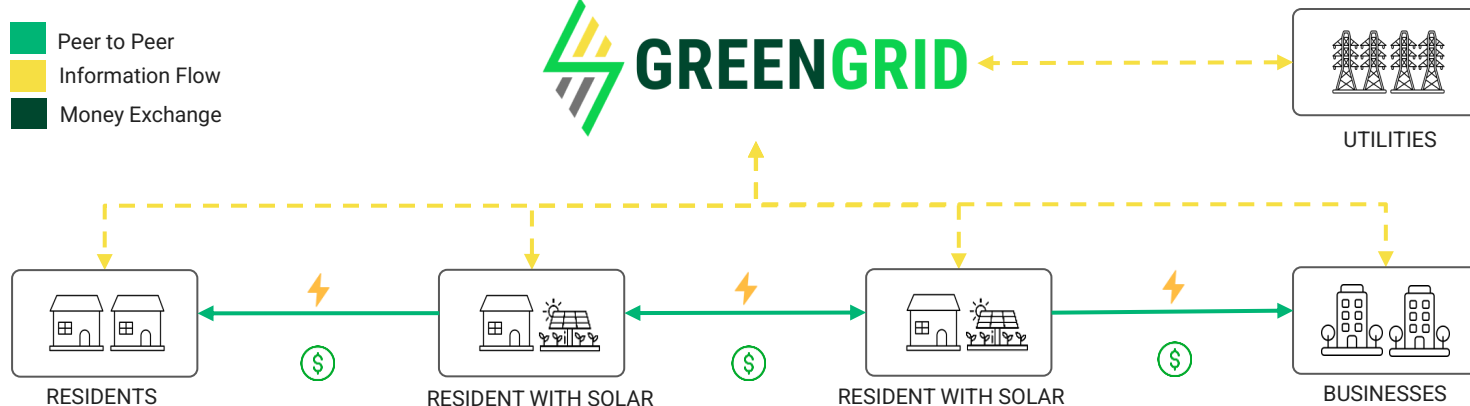
Set your desired electricity volume and price range for selling or buying.



Auto-matching

We use real-time data to match sellers and buyers at desired prices

- Peer to Peer
- Information Flow
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Auto-matching

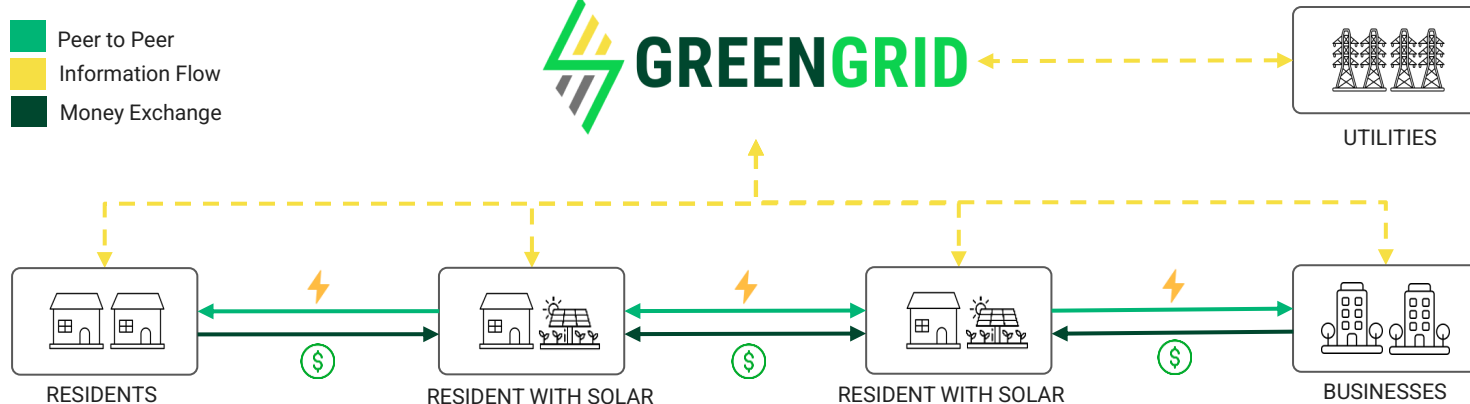
We use real-time data to match sellers and buyers at desired prices



Integrate

We coordinate with local utilities to deliver electricity via grid to your home

- Peer to Peer
- Information Flow
- Money Exchange



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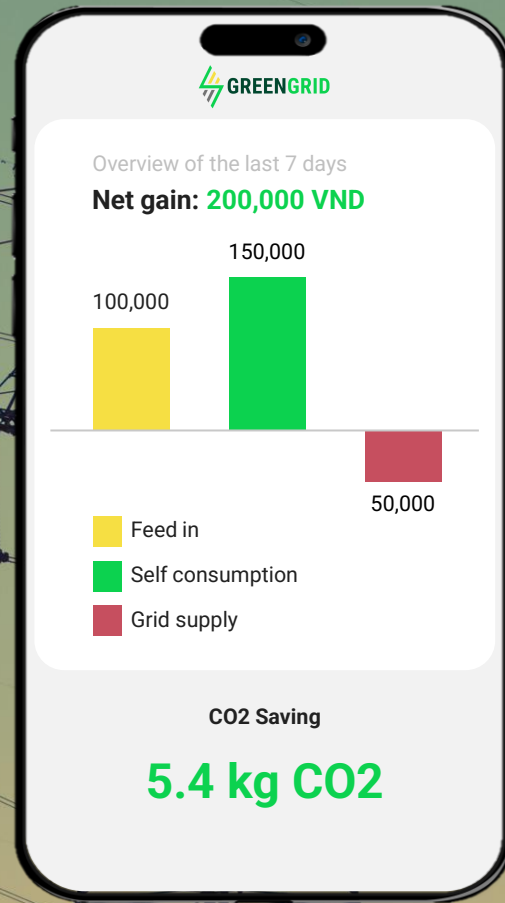
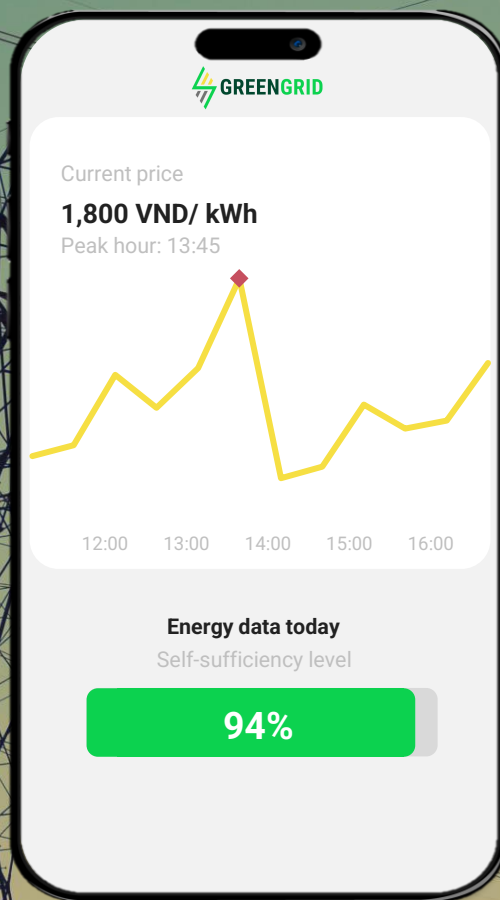
We coordinate with local utilities to deliver electricity via grid to your home



Payment

We record all transactions and manage billing for seamless trading

Product Demo



Democratizing Clean, Affordable Energy for All



Save up to 40% energy bill



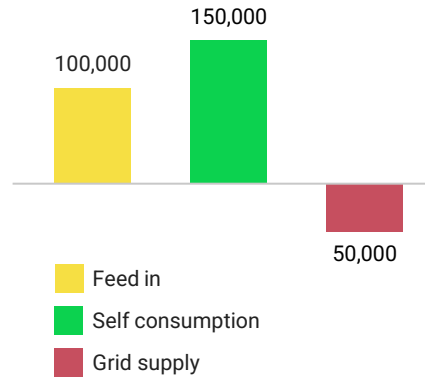
Localized electricity production, consumption,
and minimize loss



Accelerate renewable energy adoption

Overview of the last 7 days

Net gain: 200,000 VND



C02 Saving

5.4 kg C02

Building Resilient and Sustainable Communities



Enhance grid management through data and analytics capabilities



Enhance grid resilience and efficiency



Relieve energy demand pressure on grid

Current price

1,800 VND/ kWh

Peak hour: 13:45



Energy data today

Self-sufficiency level

94%

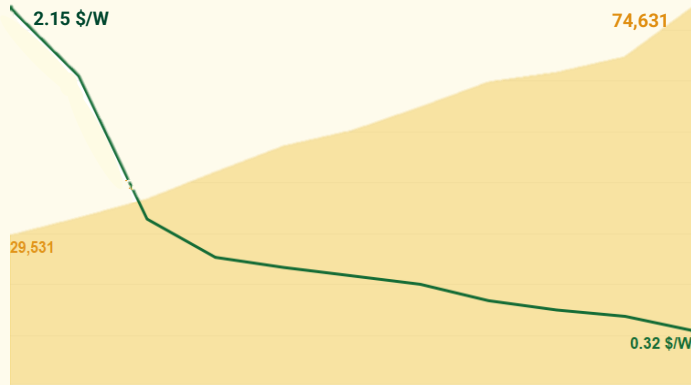
GREENGRID is Timely



GREENGRID is Timely

TECHNOLOGY MATURITY

PV Price vs Renewable Capacity




 **85%**

Cost of Solar Energy
since 2009

 **x2.5**

Installed Renewable
Electricity Capacity in ASEAN

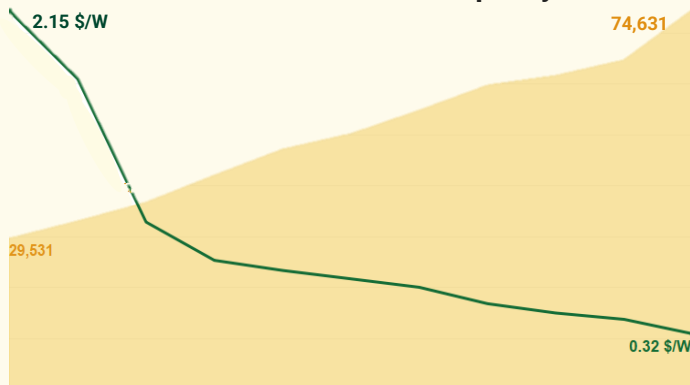
POLITICAL TAILWINDS



GREENGRID is Timely

TECHNOLOGY MATURITY

PV Price vs Renewable Capacity



 **85%**

Cost of Solar Energy
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 **x2.5**

Installed Renewable
Electricity Capacity in ASEAN

POLITICAL TAILWINDS

ASEAN Plan of Action Energy Cooperation Phase II committed to achieving a 35% renewable share in energy production by 2025.



Singapore's 1.4 billion USD investment in renewable energy projects.










Vietnam's **tax incentives** (10% tax reduction for renewable energy businesses)



Thailand's 25-year **Feed-in-Tariffs scheme** for solar PV systems

GREENGRID's Implementation Plan

	1 st phase (2023 – 2025) Pilot project in ASEAN	2 nd phase (2025 – 2030) Expansion across SEA	3 rd phase (2030 – 2030) Completed circular economy
Goal	Feasibility study	Expansion	Circular Energy Economy
Key actions	Formulate regulatory frameworks for pricing, grid integration, data exchange, communication protocols, consumer protections	Expand the scale to national level to improve scalability and reliability of the platform.	Integrate complimentary solutions (EV, storage, greenCoin) for ease of P2P trading & cross-border energy transaction.
Project scale	100K households HCM, Singapore, Bangkok	300M households across ASEAN	+500M households across ASEAN
Partnership	   	+20 partnership with Government Agencies, Industry Partners, Financial Institutes, NGO	+50 partnership with Government Agencies, Industry Partners, Financial Institutes, NGO
Renewable shares	 14%	 45%	 70%

Navigating Our Pilot Program Across SEA



Singapore



Vietnam



Thailand



Infrastructure Readiness

No. households with smart meters

1.4 million

1.5 million

0.2 million



Level of PV adoption

No. households

6,000

800,000

200,000



Regulatory Support

Fully liberalized

Feed-in-Tariffs

Feed-in-Tariffs



Power Your Green Future



160B USD
reduction in energy cost



1.5T USD
avoided costs related to
health and environmental
damage by fossil fuel





WE
ALIGN
WITH

ASEAN
SOCIO-CULTURAL COMMUNITY
BLUEPRINT 2025

ASEAN
ECONOMIC COMMUNITY
BLUEPRINT 2025

D.5. Enhanced and Optimised Energy Availability by making Resources more Available, Accessible, Affordable and Sustainable

C.4. Sustainable Consumption and Production Enhance capacity of relevant stakeholders to implement energy efficiency

D.1. A Disaster Resilient ASEAN that is able to Anticipate, Respond, Cope, Adapt, and Build Back Better, Smarter

B.8. Sustainable Economic Development
Developing a sustainable growth agenda that promotes the use of clean energy

C.1. Transport - C. Enhanced Connectivity and Sectoral Cooperation

C.4. Energy - Enhancing energy connectivity and market integration in ASEAN to achieve energy security, accessibility, affordability



GREENGRID

Power Your Green Future

References

World Economic Outlook. (n.d.). IMF. Retrieved May 30, 2023, from https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/SEQ?year=2020

Hannah Ritchie, Max Roser and Pablo Rosado (2022) - "Energy". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/energy' [Online Resource]

IEA (2019), Southeast Asia Energy Outlook 2019, IEA, Paris <https://www.iea.org/reports/southeast-asia-energy-outlook-2019>, License: CC BY 4.0

Pump price for fuels . (n.d.). World Bank. Retrieved May 30, 2023, from <https://data.worldbank.org/indicator/EP.PMP.SGAS.CD>

Renewable Energy Outlook for ASEAN: Towards a Regional Energy Transition (2nd Edition). (2022). In IRENA. Retrieved May 30, 2023, from <https://www.irena.org/publications/2022/Sep/Renewable-Energy-Outlook-for-ASEAN-2nd-edition>

Peer to Peer Energy Trading. (2023). PowerLedger. Retrieved May 30, 2023, from <https://www.powerledger.io/solutions/need/p2p>

Development of Solar Energy in Vietnam. (2022, June 22). Innolab Asia. Retrieved May 30, 2023, from <https://innolab.asia/2022/09/06/the-development-of-solar-energy-in-vietnam/>

Indonesia: Investment in renewable power 2021. (2021). Statista . Retrieved May 30, 2023, from <https://www.statista.com/statistics/992956/indonesia-investment-in-renewable-energy/#:~:text=In%202021%2C%20the%20value%20of,increase%20from%20the%20previous%20year.>

Vietnam ranks highest as an investment destination for renewables in ASEAN. (2022, November). Nhip Song Doanh Nghiệp. Retrieved May 30, 2023, from <https://nhipsongdoanhnghiep.laodongcongdan.vn/vietnam-ranks-highest-as-an-investment-destination-for-renewables-in-asean-89187.html>

Green Infrastructure Investment Opportunities. (2021). In Asian Development Bank. Retrieved May 30, 2023, from <https://www.adb.org/sites/default/files/publication/767486/green-infrastructure-investment-thailand-2021.pdf>

Solar Industry Research Data. (2022). Solar Energy Industries Association. Retrieved May 30, 2023, from <https://www.seia.org/solar-industry-research-data>

Peer to Peer Energy Trading. (n.d.). 100 Percent Renewables. Retrieved May 30, 2023, from <https://100percentrenewables.com.au/peer-to-peer-energy-trading/>

SolarShare. (n.d.). Senoko Energy. Retrieved May 30, 2023, from <https://www.senokoenergy.com/solarshare>

Peer to Peer Energy Trading. (n.d.). In Deloitte. Retrieved May 30, 2023, from <https://www2.deloitte.com/nl/nl/pages/energy-resources-industrials/articles/peer-to-peer-energy-trading.html>

References

Energy Institute. (2023). *Statistical Review of World Energy*. Retrieved from <https://OurWorldInData.org/fossil-fuels/>

International Renewable Energy Agency [IRENA]. (2018). *Renewable Energy Outlook for ASEAN*. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Sep/IRENA_Renewable_energy_outlook_ASEAN_2022.pdf?rev=ef7557c64c3b4750be08f9590601634c

Vietnam News Agency. (2023, October 12). EVNHCMC to complete installation of electronic meters for all customers next year. *Vietnam News*. <https://vietnamnews.vn/society/793097/evnhcmc-to-complete-installation-of-electronic-meters-for-all-customers-next-year.html>

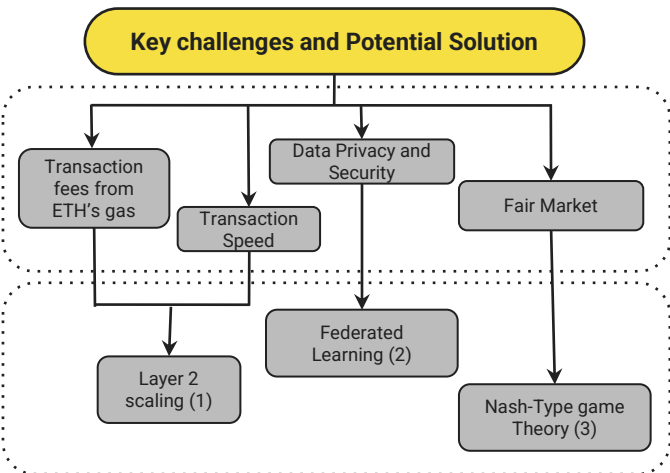
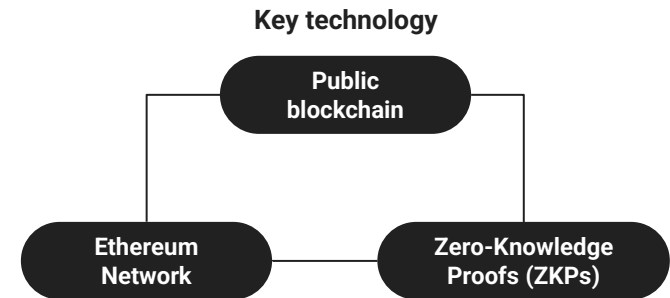
International Renewable Energy Agency (IRENA). (2022, September 26). ASEAN can cover two-thirds of energy demand with renewables. *IRENA News Room*. <https://www.irena.org/News/pressreleases/2022/Sep/ASEAN-Can-Cover-Two-Thirds-of-Energy-Demand-with-Renewables>

Energy Market Authority of Singapore (EMA). (2023). Singapore energy statistics 2022 (Chapter 6). <https://www.ema.gov.sg/resources/singapore-energy-statistics/chapter6#:~:text=There%20was%20a%20total%20of,13.0%25%20or%20707%20installations>

Smart Energy. (2023). Thailand: Lessons from a 116,000 smart meter rollout. <https://www.smart-energy.com/industry-sectors/smart-meters/thailand-lessons-from-a-116000-smart-meter-rollout/>

Appendix

Trading platform is powered by blockchain



(1): This solution enable the processing of a large number of transactions off-chain, with only the final outcome being settled on the Ethereum mainnet.

(2): A machine learning approach that enables training models on decentralized data without directly sharing the raw data itself.

(3): A game theory refers to study and analyze the interactions between peers in a P2P network.



Public blockchain

Description

A decentralized and transparent ledger where transactions are recorded by a distributed network.



Ethereum Network

A public blockchain-based platform, enables smart contracts and decentralized applications.



ZKPs model

Cryptographic protocols, enable verification of information without revealing the actual data. EV's 3rd gen.

Advantage

- **Decentralization:** Enables P2P energy trading without intermediaries
- **Transparency:** Provides visibility into transactions, without centralized oversight
- **Security:** Offers robust protection against data manipulation and fraud

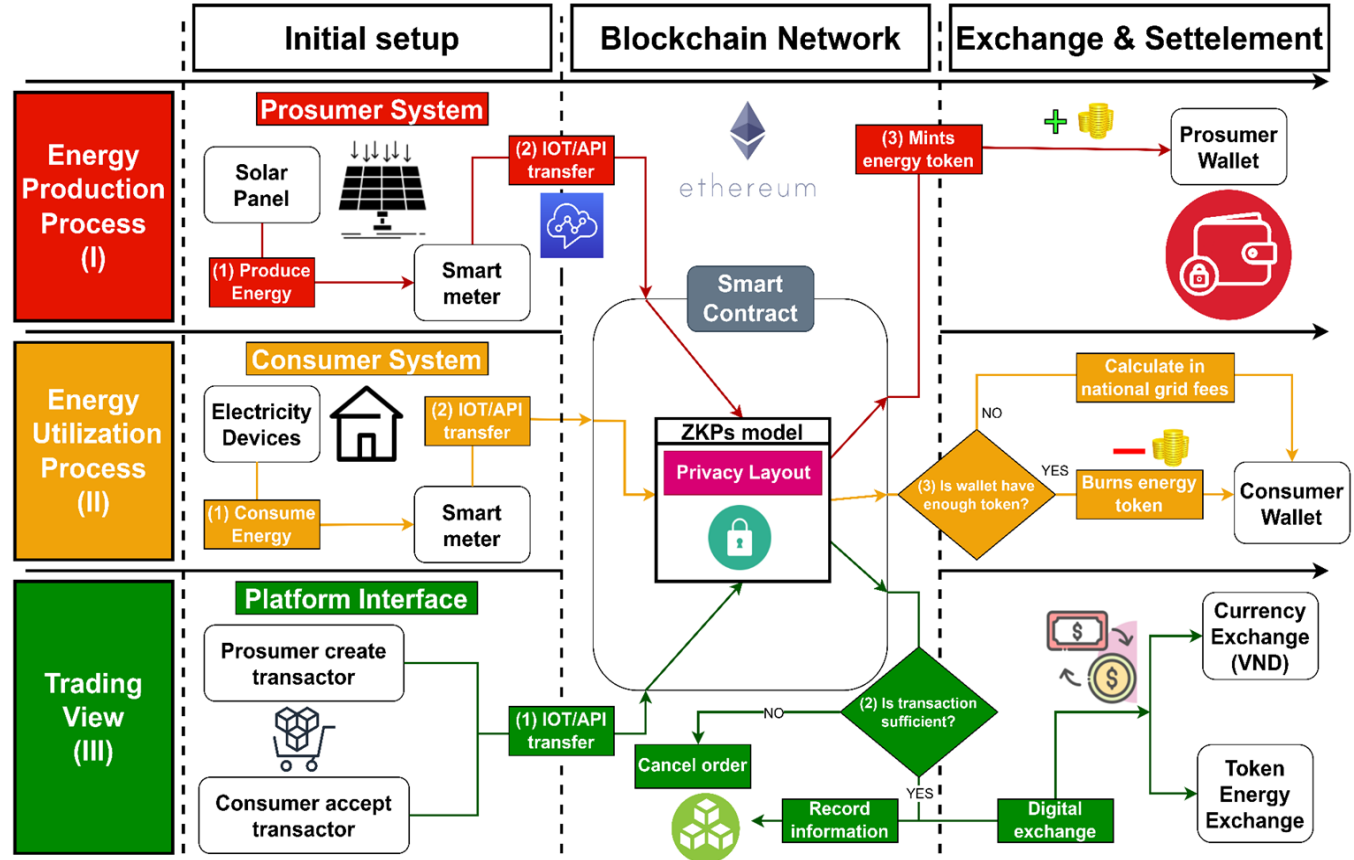
- **Smart Contracts:** Automates energy trading, reducing errors and intermediaries.
- **Interoperability:** Allowing seamless integration with existing infrastructure
- **Efficiency Growth:** Leverages the established Ethereum ecosystem for resource savings

- **Privacy:** Protects sensitive transaction details, ensuring confidentiality
- **Scalability:** Improves efficiency and scalability by reducing data storage needs
- **Security:** Minimizes transaction exposure, reducing the risk of data breaches and unauthorized access

Appendix

Trading platform's technical mechanism involves 3 processes

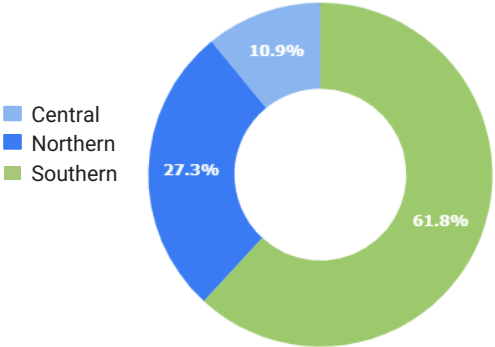
- The flow chart represent for how energy works with our system through 3 key perspectives (I), (II) and (III)
- Central to the entire system is the **blockchain network**, which serves as the **underlying infrastructure** for secure and transparent transactions
- **Smart contract** play a crucial role in **automating and executing energy trading processes**. While **ZKPs** act as a **privacy layer**, ensuring that customer data remains confidential while still enabling transaction verification
- We use a **digital token** to represent for **unit energy** (Ex: 1 token = 1 kWh)
- After successful the transactor will record in the blockchain network



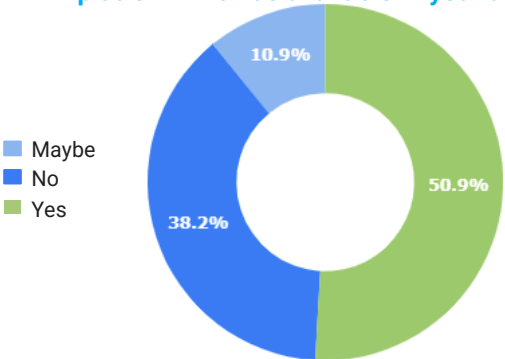
Appendix

Solution receives positive feedback and endorsement from direct power direct consumers

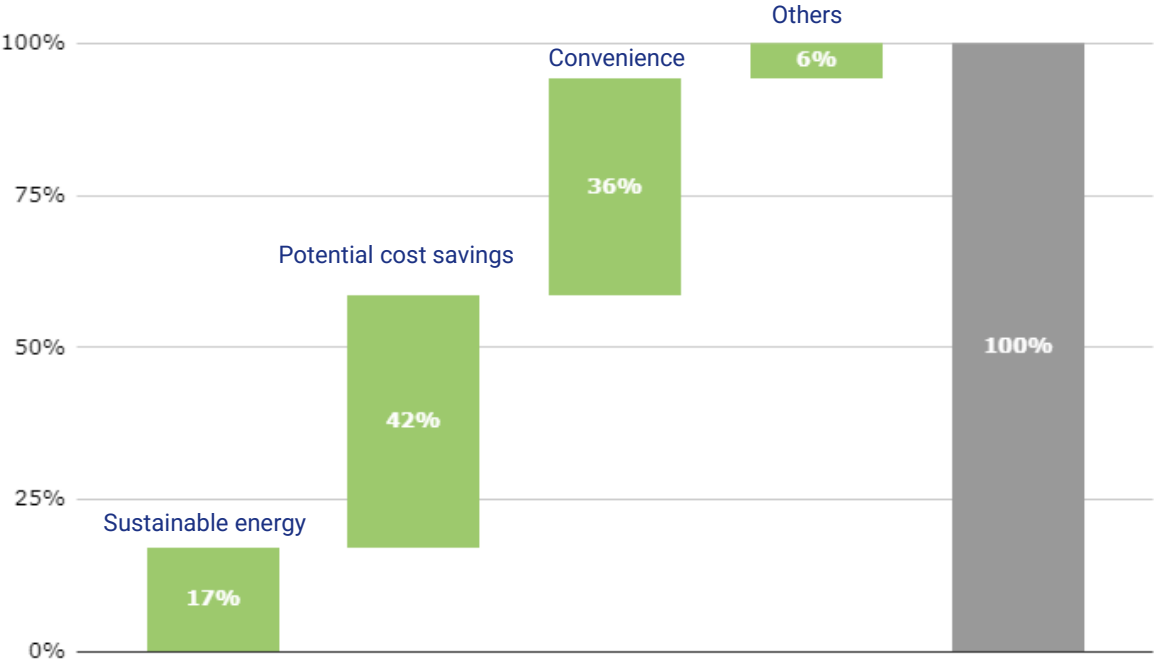
Geographic Distribution of Participants



How likely are you to adopt a P2P energy platform if it was available in your area?



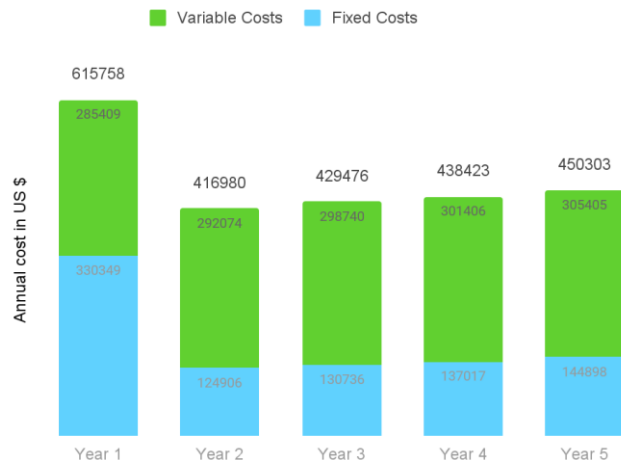
What factor would motivate you to join a P2P energy platform?



Sample size: 35

Appendix

Five-year cost projection



Public Blockchain (ZKP) Cost Forecasting:






	Year 1	Year 2	Year 3	Year 4	Year 5
Fixed Costs	\$330,349	\$124,906	\$130,736	\$137,017	\$144,898
Initial Platform Build	50,000	-	-	-	-
Training Costs for EVN	160,000	-	-	-	-
Sales and Marketing	100,000	105,000	111,300	117,978	126,236
Cloud Costs	8,799	8,359	7,941	7,544	7,167
On-Going Maintenance Costs	10,000	10,000	10,000	10,000	10,000
Monitoring Costs	1,550	1,547	1,495	1,495	1,495
Variable Costs	\$285,409	\$292,074	\$298,740	\$301,406	\$305,405
Overhead	\$133,313	\$139,979	\$146,644	\$149,311	\$153,310
Other Variable Costs	152,096	152,096	152,096	152,096	152,096
Total Costs	\$615,757	\$416,980	\$429,476	\$438,423	\$450,304

Note:

- Our cost model is built based on EY's report titled "Total cost of ownership for blockchain solutions", which provides various possible cost models associated with a typical blockchain project.
- Specifically, EY presented 3 cost models for 3 types of blockchain network - (i) private, (ii) public ZKP current state, (iii) public ZKP future state. Since the report's publication in 2019, the network type (iii) has been achieved.
- As our technology is rather similar to the third network type, we referenced its cost model and derive our own based on the Vietnam market and our project's context.

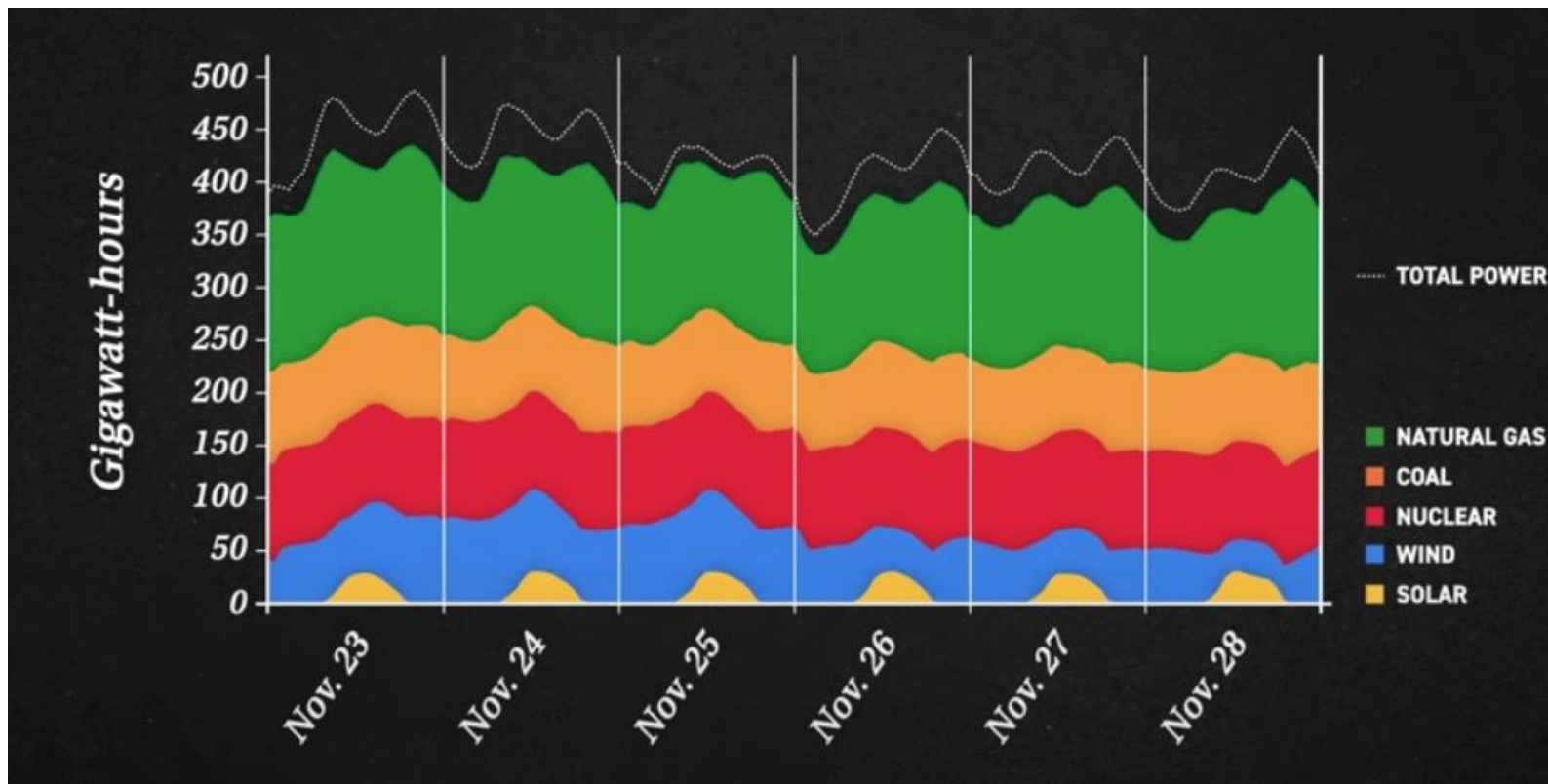
Appendix

greenGrid to learn from successful cases

P2P Solution	Countries Examples	Impacts
 Powerledger Mission: Distribute affordable electricity to populations where there is no electricity grid, and so improve economic welfare.		80% reduction in grid energy use, corresponding to 80% self-sufficiency \$424 average annual saving on electricity bill for solar system owners, equivalent to a 25% cost savings.
	 The Uttar Pradesh government's modified regulatory framework to facilitate P2P energy trading.	43% lower than the retail tariff for the P2P market purchase price. 27GW total installed renewable electricity capacity, more than 4 times ASEAN average.
 greenGrid Power The Future		Resilient and Sustainable Community Interconnected ASEAN energy unit Democratization of access to clean energy

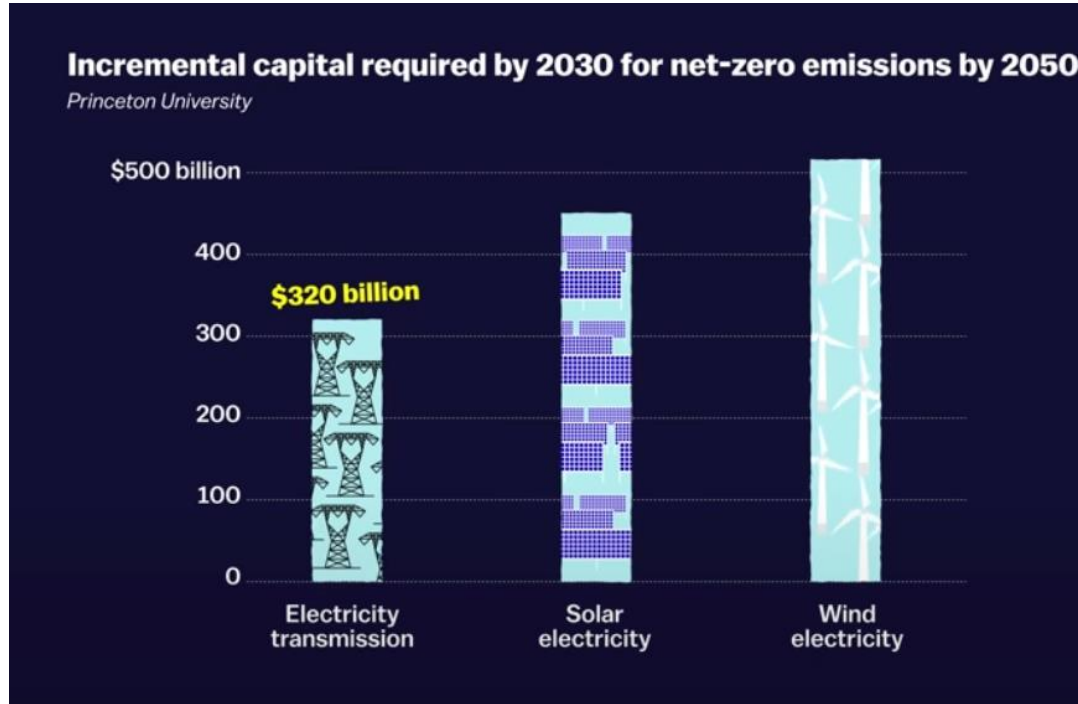
Appendix

Base Load and Peaker Plants



Appendix

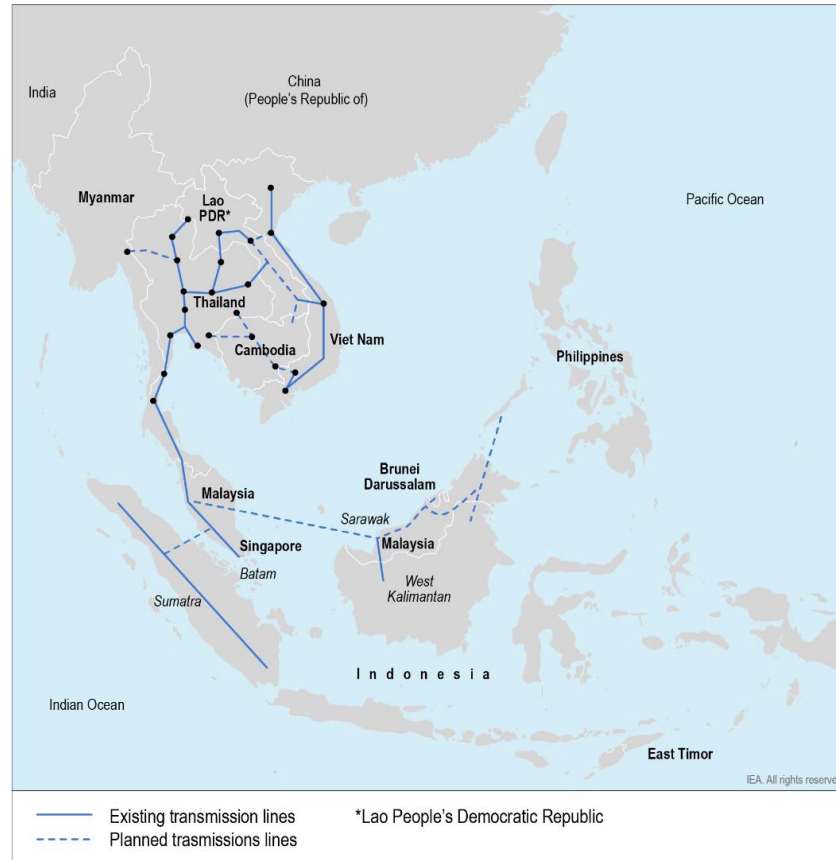
Centralized renewable energy projects are costly



It is estimated that the US would need to invest roughly **1 trillion \$** into solar and wind electricity and another **320\$ billion** into building new transmission infrastructure, totaling an investment of **1.3 trillion \$** to reach net-zero by 2050, which is **6 times** the current US spending on renewable energy.

Appendix

ASEAN Cross-border Energy Trading






Appendix

ASEAN Grid Modernisation

Are Southeast Asian power systems ready for the rise of renewables?



Readiness category		Readiness subcategory	Indonesia	Malaysia	Philippines	Thailand	Vietnam
 Grid readiness		Grid ability to accommodate current renewables	Low	High	High	High	Low
		Grid upgrades and renewable addition plans aligned	Low	High	High	High	Medium
 Policy and regulation readiness		Grid impact studies/power system studies required to approve new intermittent renewable projects	Low	High	High	High	Medium
		Plans to increase flexible generation (gas and/or batteries)	Low	Medium	High	Low	High
		Consistency in plans	Low	High	Medium	Medium	Medium
 Technology readiness		Battery adoption readiness	Low	Medium	High	Low	Medium
		Flexible gas generation adoption readiness	Low	Medium	Medium	Medium	Medium

Low

Medium

High