

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**

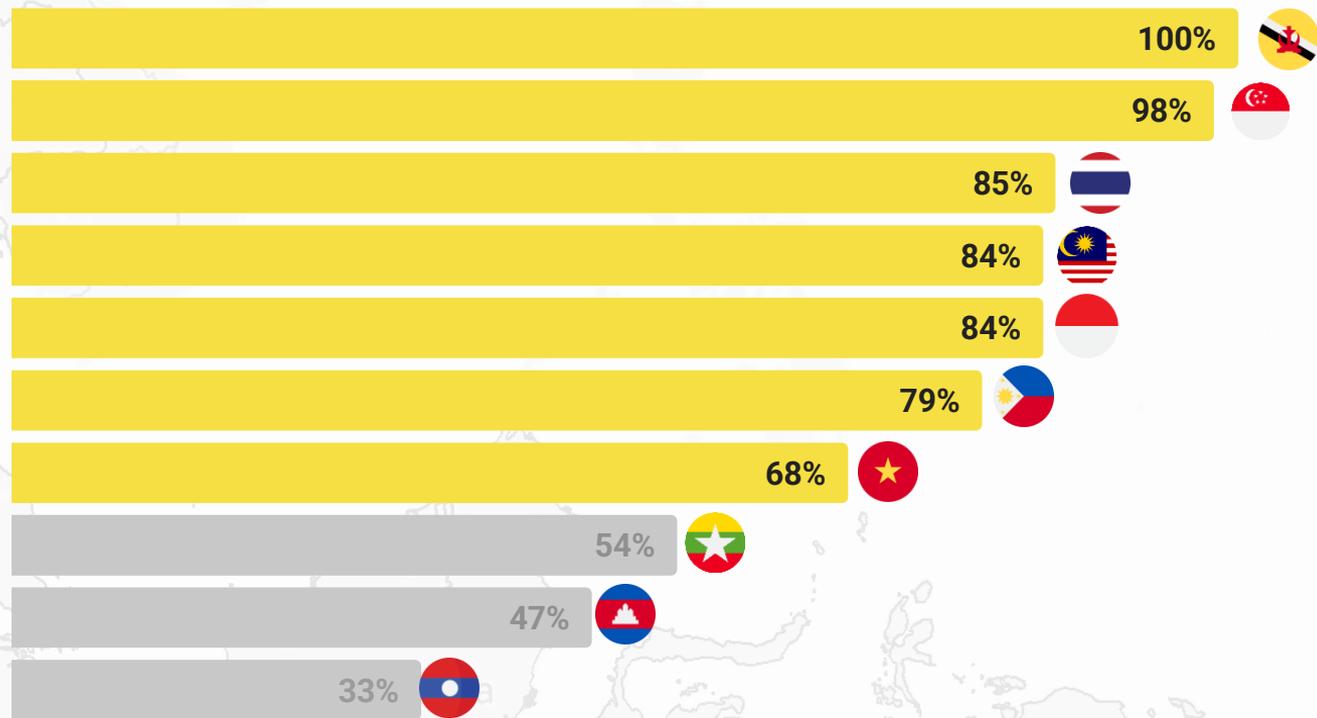


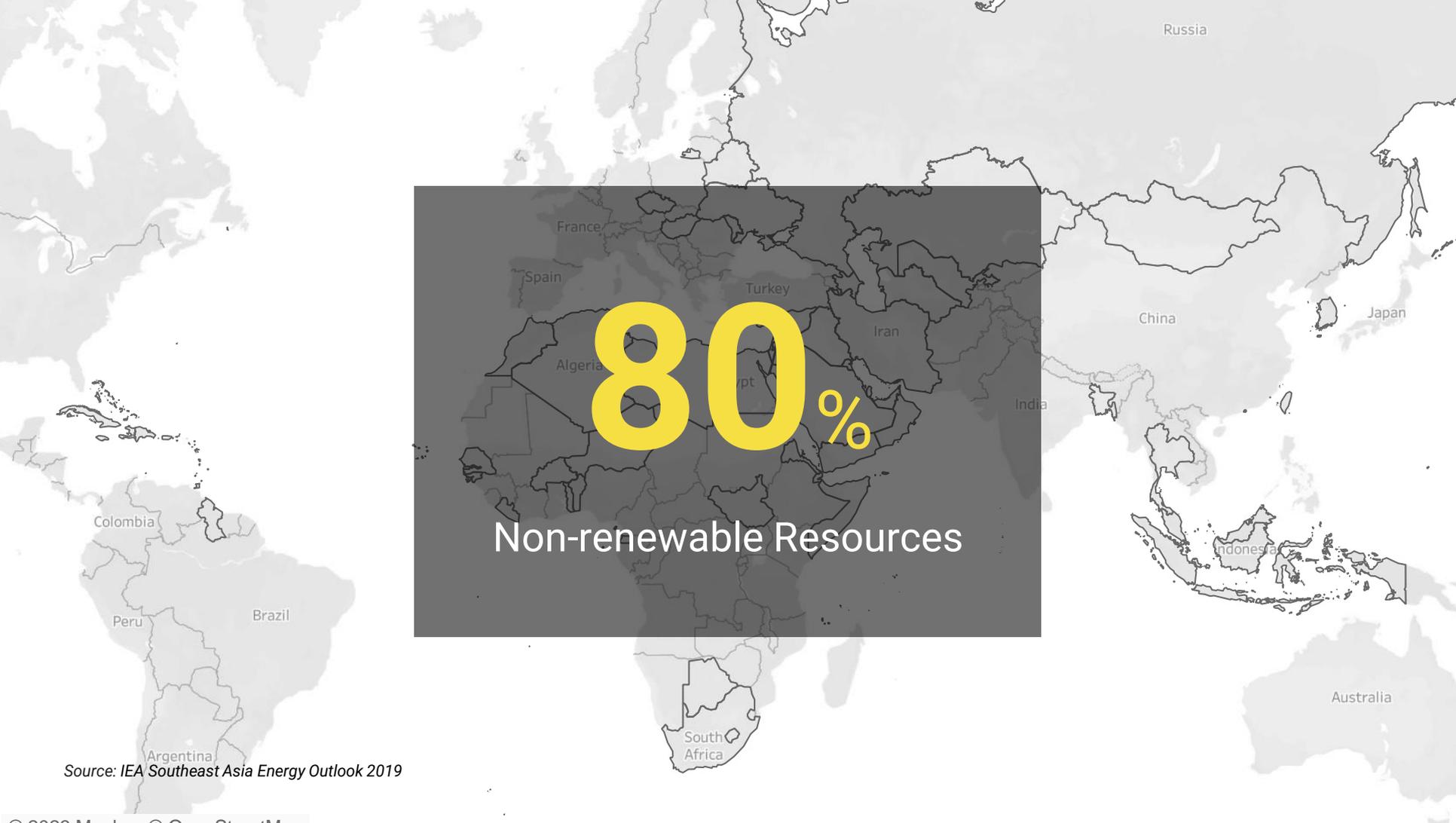
ASEAN's Total Primary Energy Consumption (TWh)

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



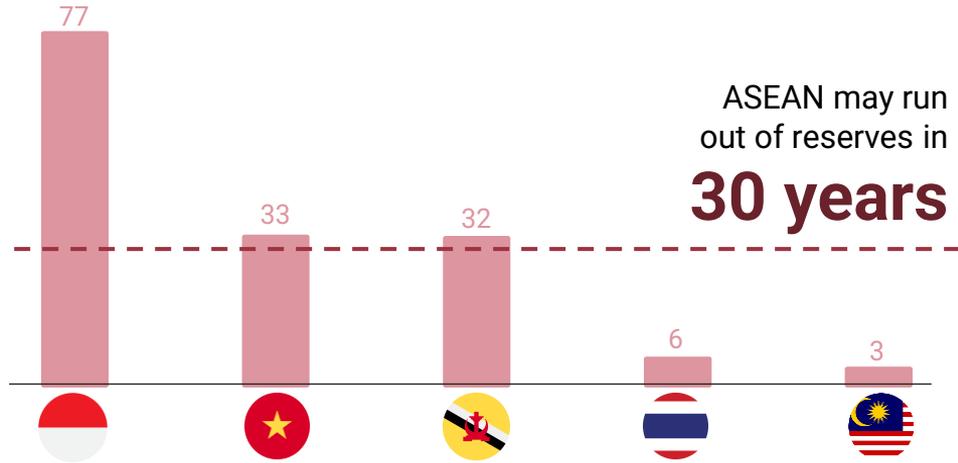
# IMPLICATIONS

# INDICATORS

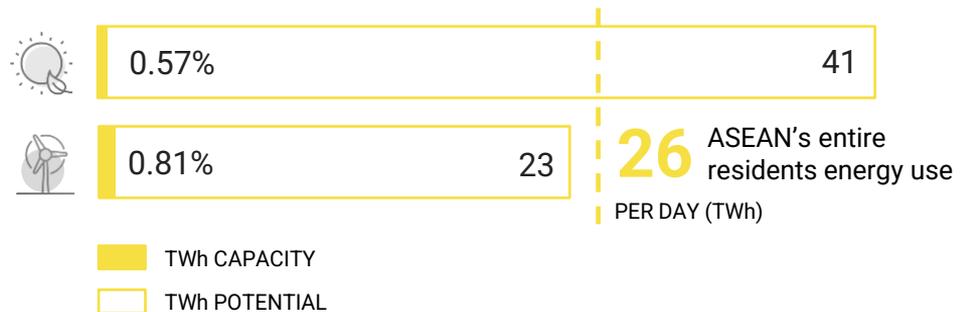


# IMPLICATIONS

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



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



# Looming Energy Crisis Threatens

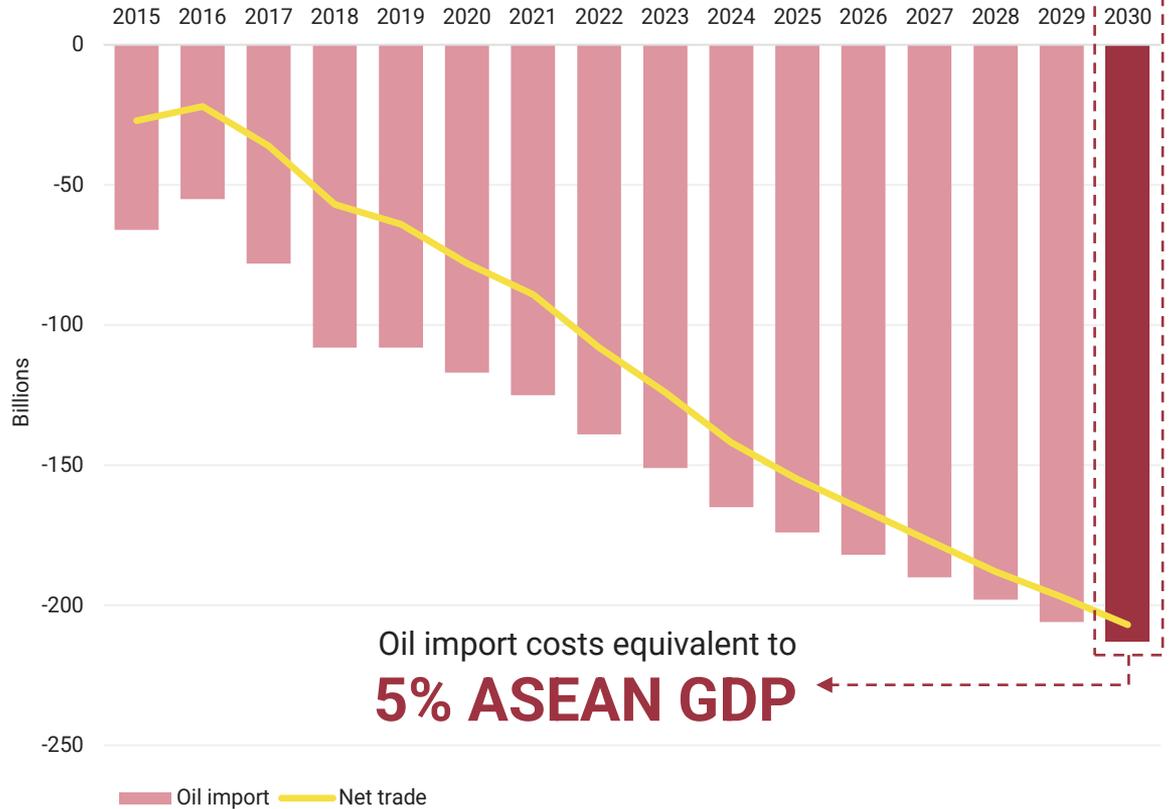
# 26M+

# ASEAN Residents

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



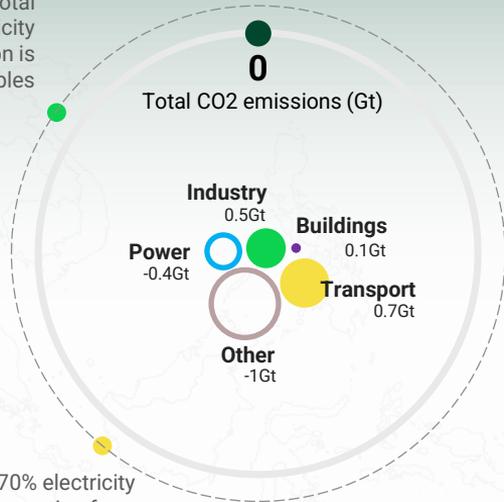
ASEAN's Fossil Fuel Climbing Trade Balance 2015-2030 (billion USD)



Oil import costs equivalent to  
**5% ASEAN GDP**

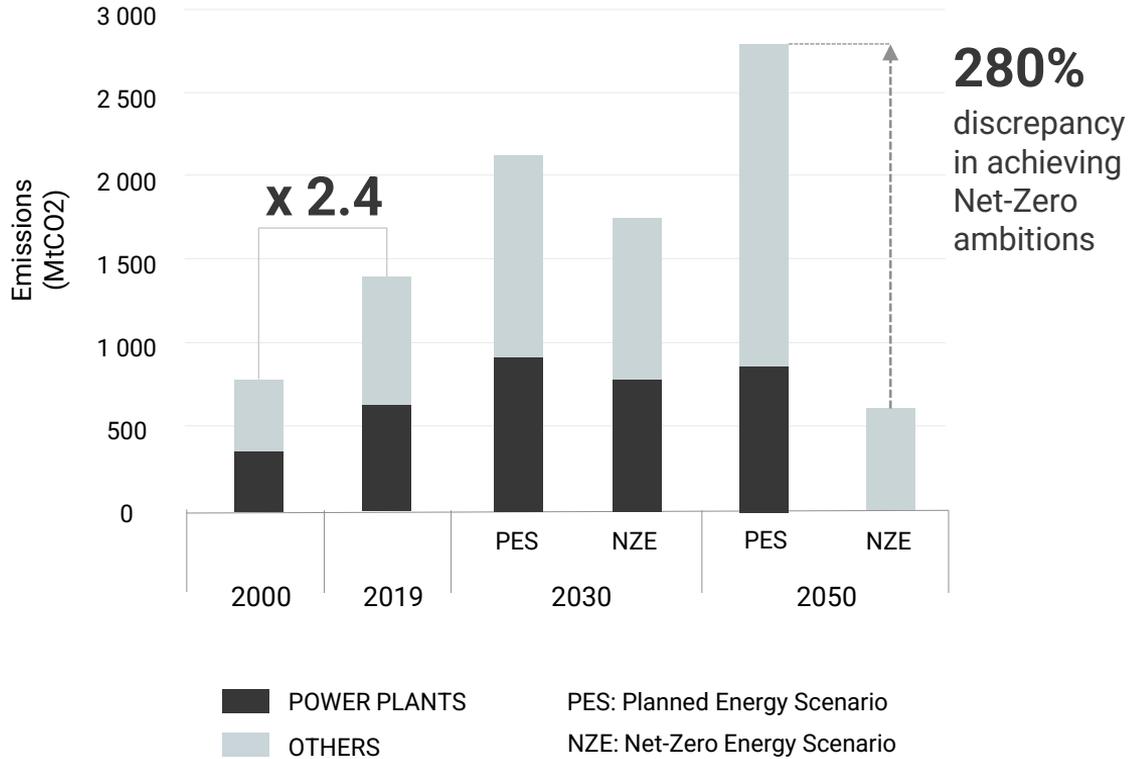
# Challenge to Achieve Net-Zero

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 

QUESTION 

ANSWER 



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

QUESTION



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?



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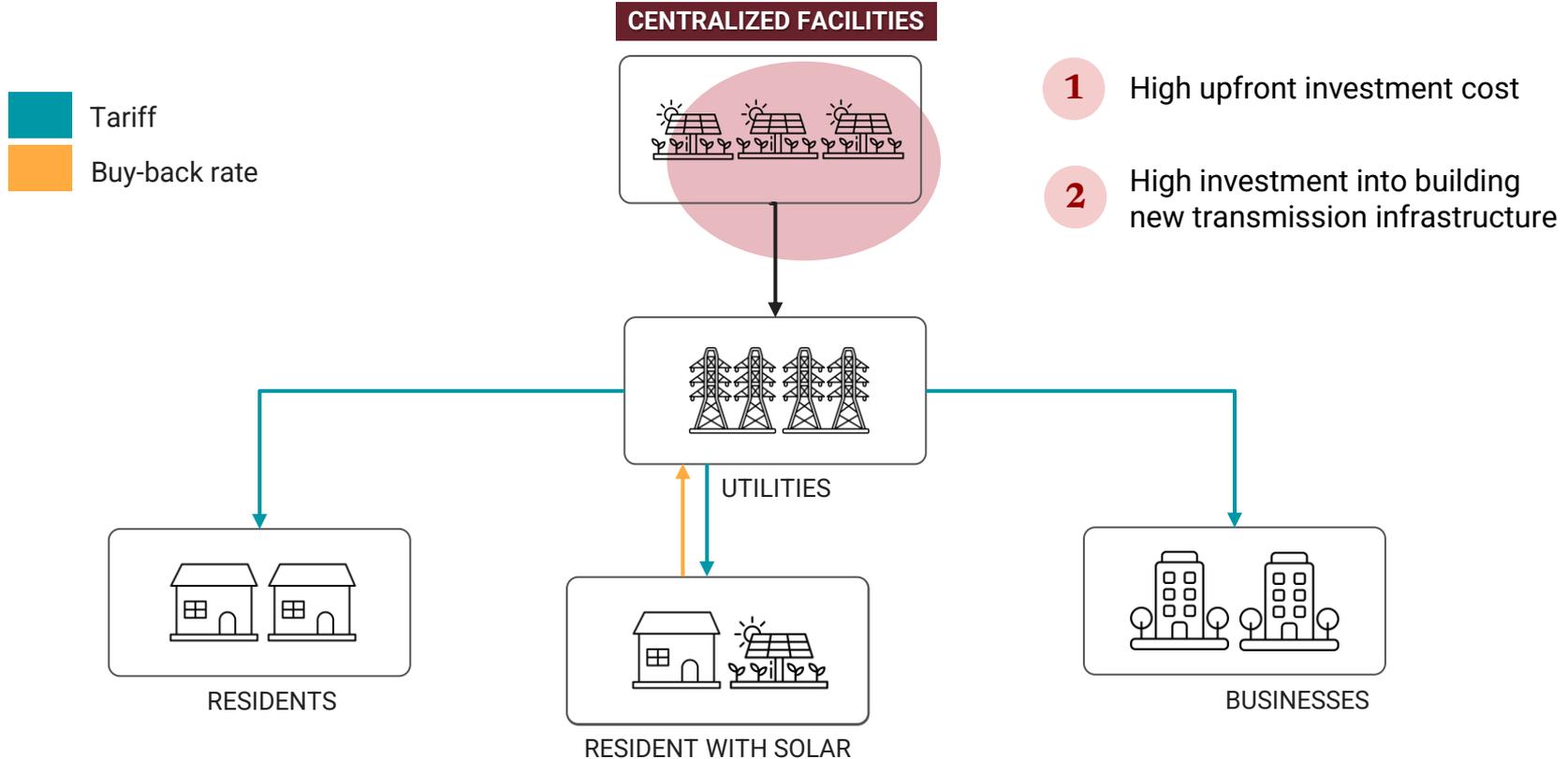
How can ASEAN **overcome** these barriers and **accelerate** the transition to renewable energy?



## **Decentralize energy production & consumption**

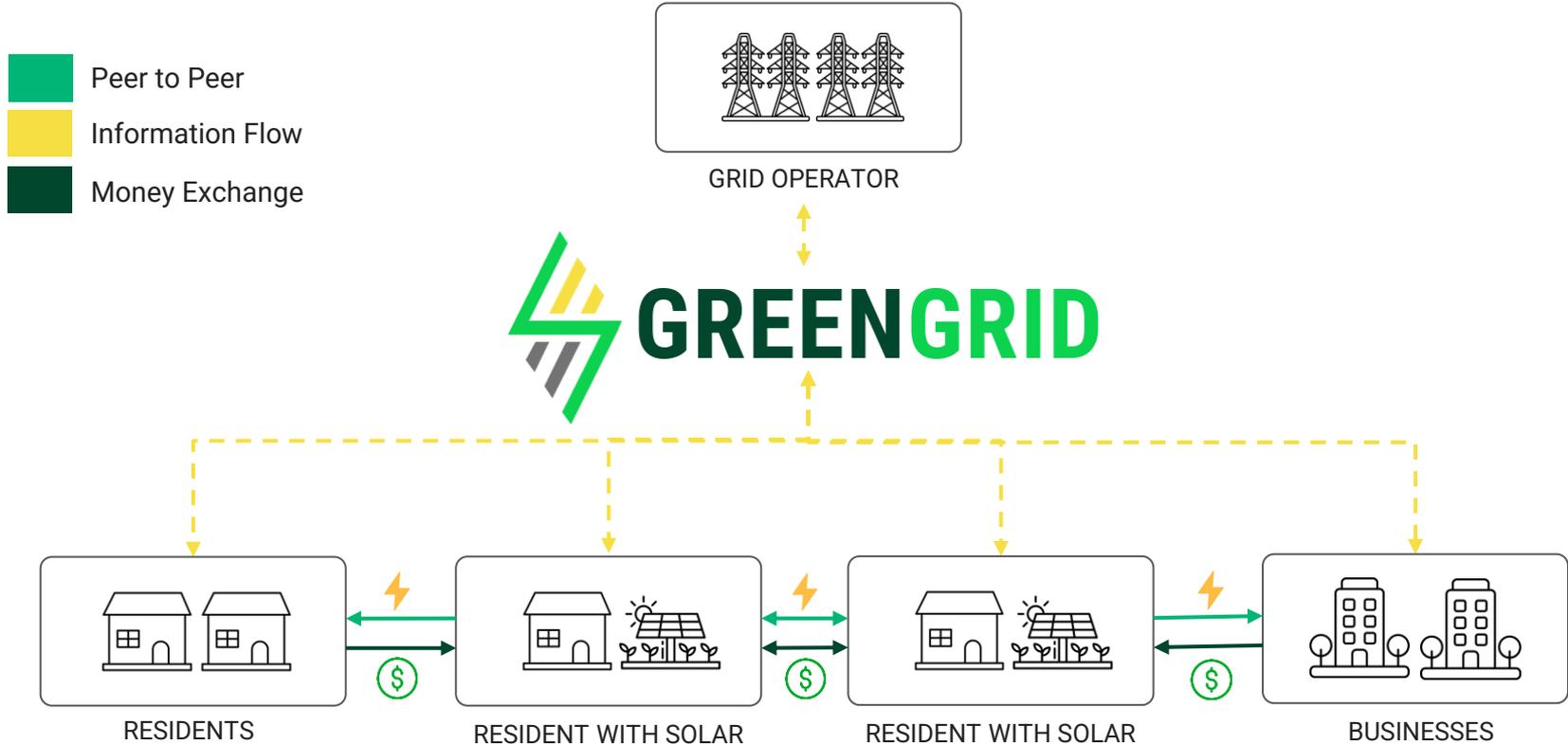
Share the cost of renewables to the public & enable faster adoption of renewable energy.

# Traditional Model with Centralized Generation of Electricity

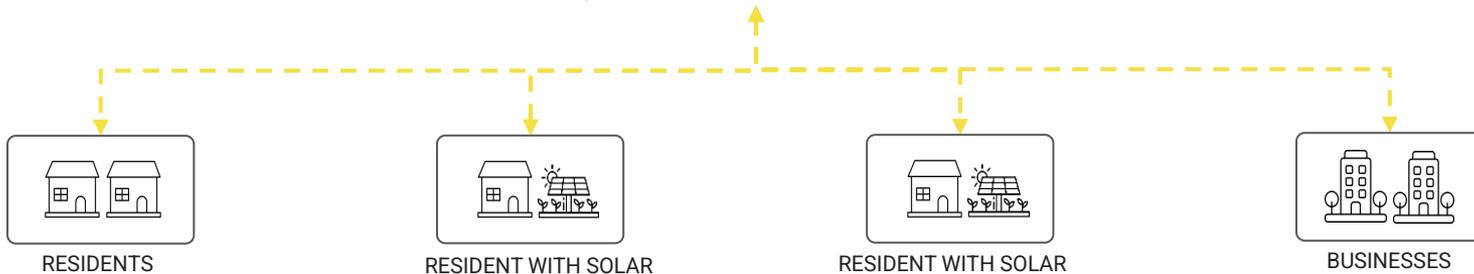


# GreenGrid Model with Decentralized Generation of Electricity

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



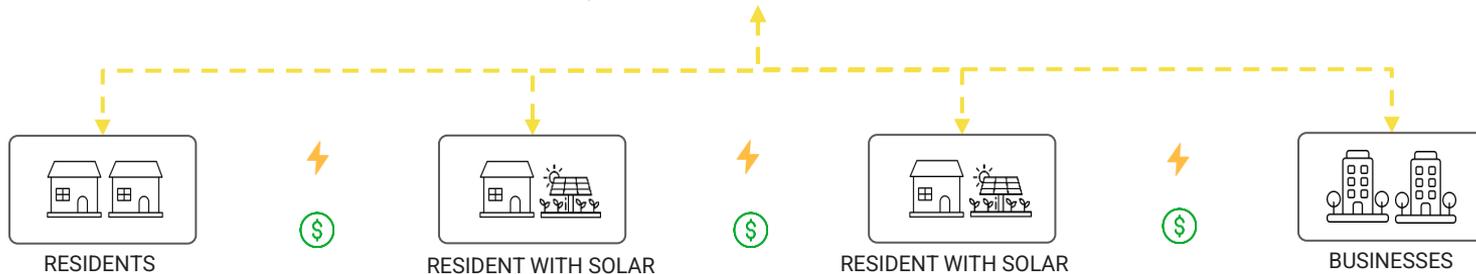
- Peer to Peer
- Information Flow
- Money Exchange



## Sign up

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

- Peer to Peer
- Information Flow
- Money Exchange



## Sign up

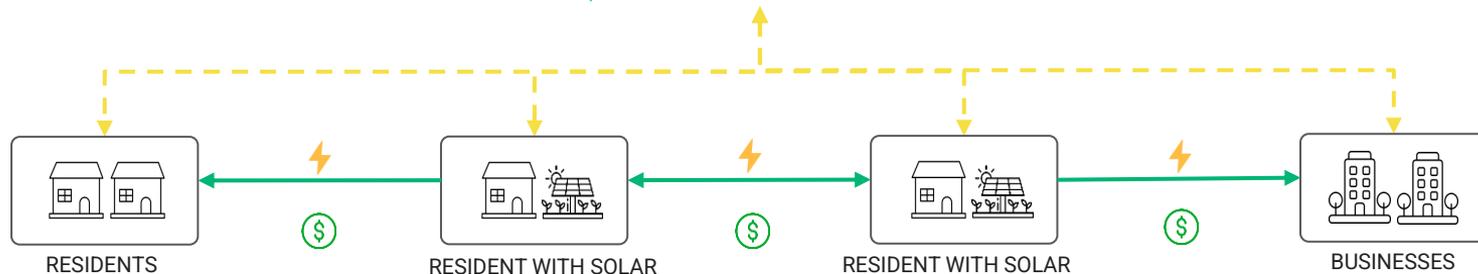
Register as sellers, buyers & we install smart meters to monitor your energy



## Set price

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

- Peer to Peer
- Information Flow
- Money Exchange



## Sign up

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



## Set price

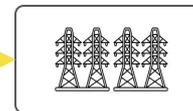
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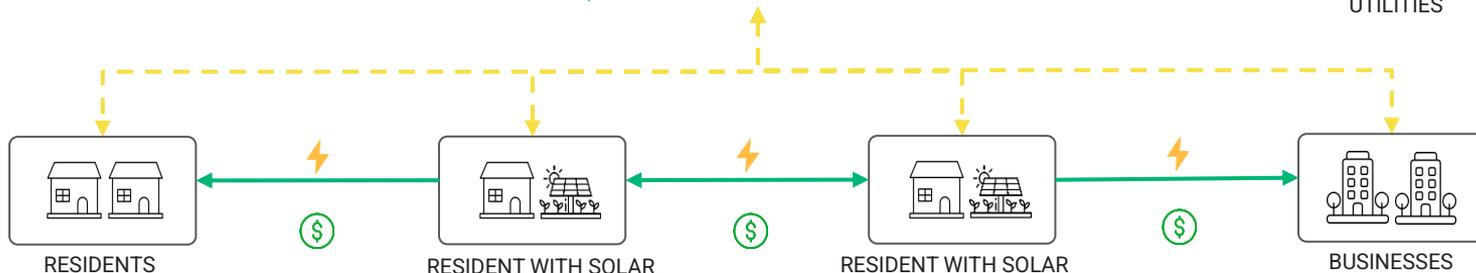
## Auto-matching

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

- Peer to Peer
- Information Flow
- Money Exchange



UTILITIES



### 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.



### Auto-matching

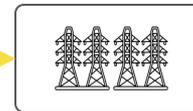
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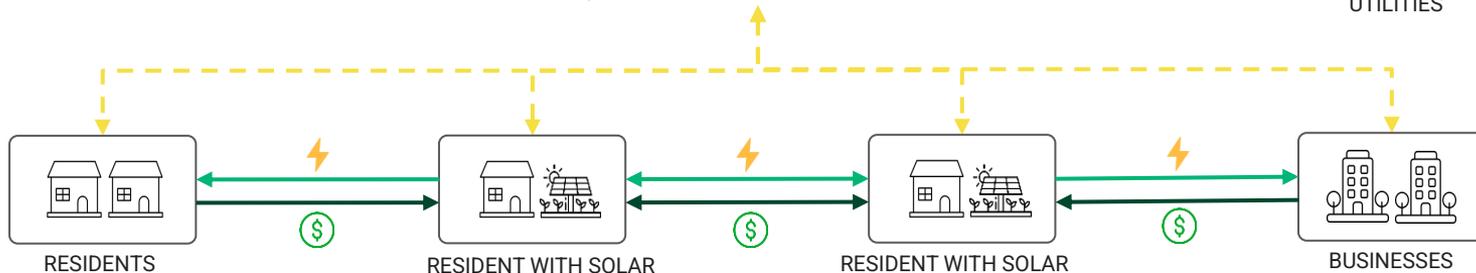
### Integrate

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

- Peer to Peer
- Information Flow
- Money Exchange



UTILITIES



## Sign up

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



## Set price

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## Integrate

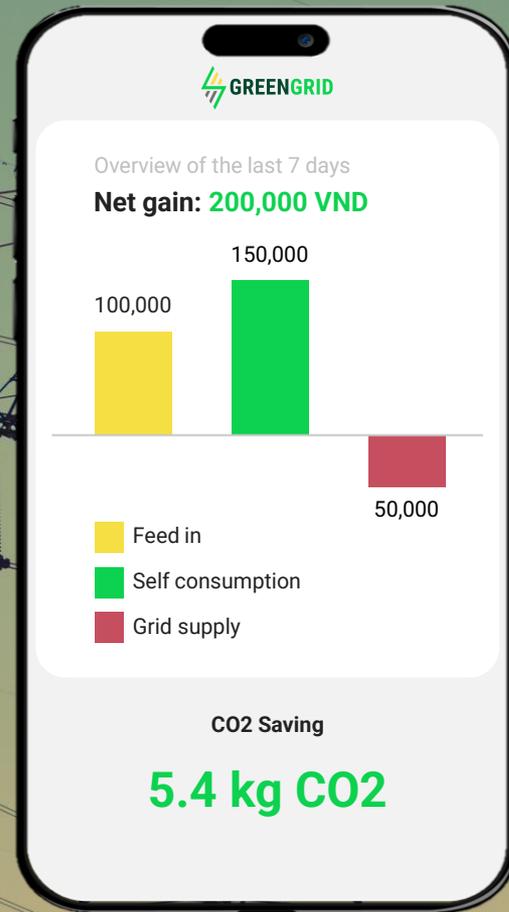
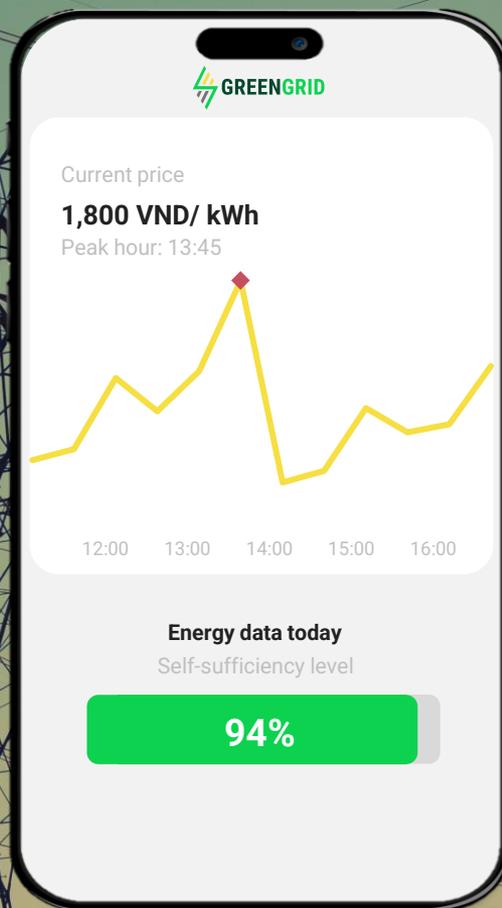
We coordinate with local utilities to deliver electricity via grid to your home



## 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



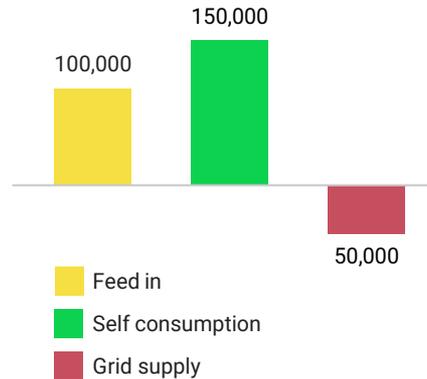
Localized electricity production, consumption,  
and minimize loss



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**

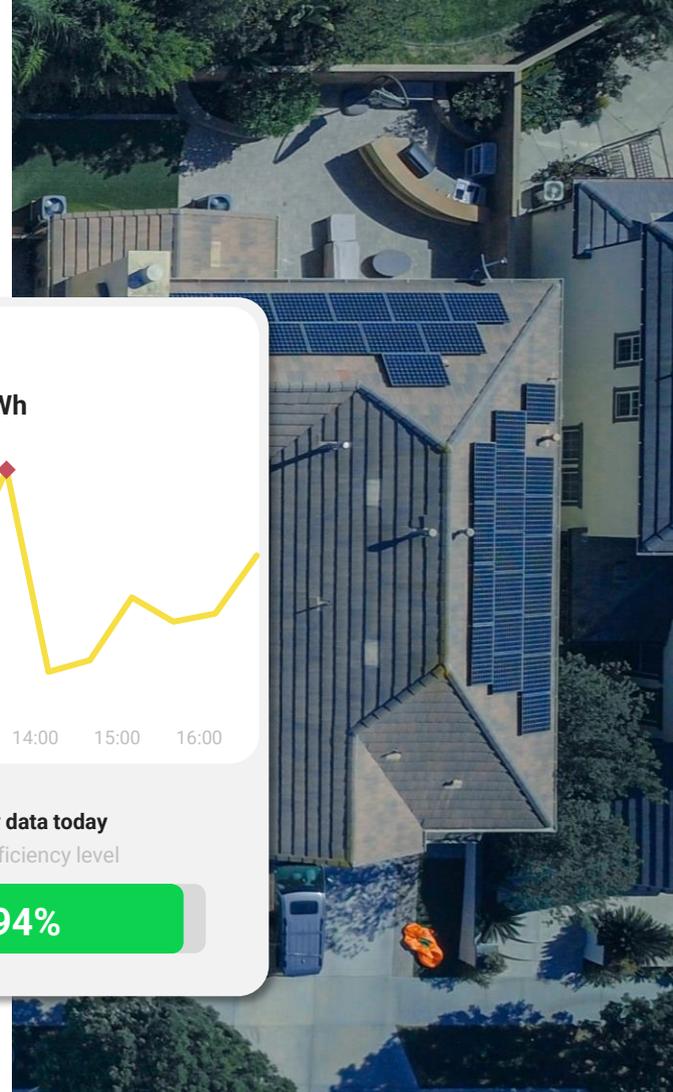
Peak hour: 13:45



**Energy data today**

Self-sufficiency level

**94%**



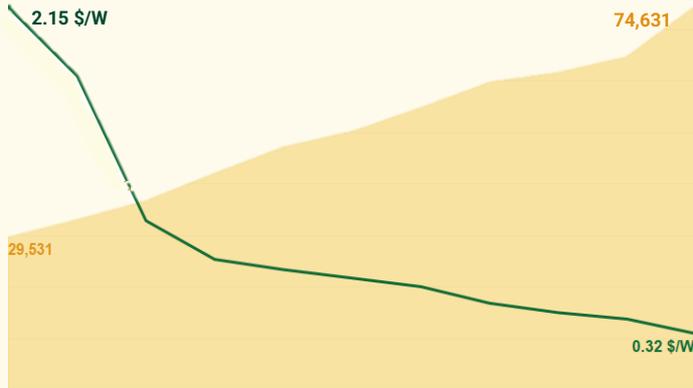
# GREENGRID is Timely



# GREENGRID is Timely

## TECHNOLOGY MATURITY

### PV Price vs Renewable Capacity



**↓ 85%**

Cost of Solar Energy  
since 2009

**↑ x2.5**

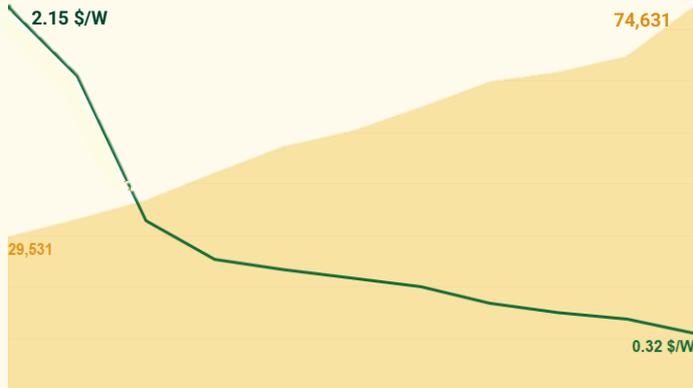
Installed Renewable  
Electricity Capacity in ASEAN

## POLITICAL TAILWINDS

# GREENGRID is Timely

## TECHNOLOGY MATURITY

### PV Price vs Renewable Capacity



 **85%**

Cost of Solar Energy  
since 2009

 **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 <sup>st</sup> phase (2023 – 2025) Pilot project in ASEAN	2 <sup>nd</sup> phase (2025 – 2030) Expansion across SEA	3 <sup>rd</sup> phase (2030 – 2030) Completed circular economy
Goal	Feasibility study	Expansion	Circular Energy Economy
Key actions	Formulate <b>regulatory frameworks</b> for pricing, grid integration, data exchange, communication protocols, consumer protections	Expand the scale to national level to improve <b>scalability</b> and <b>reliability</b> of the platform.	Integrate <b>complimentary solutions</b> (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](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](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>

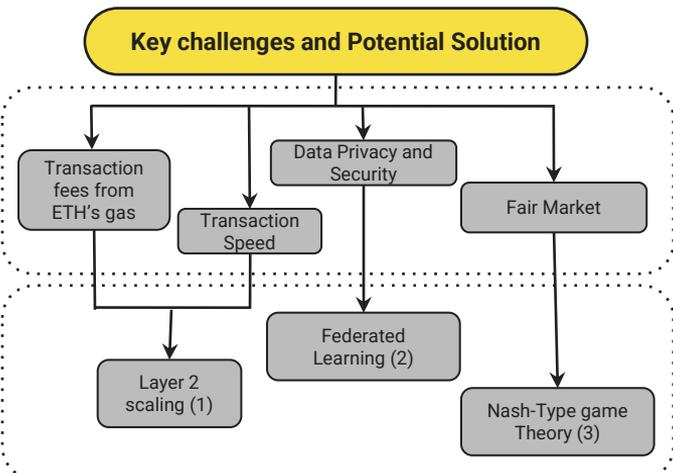
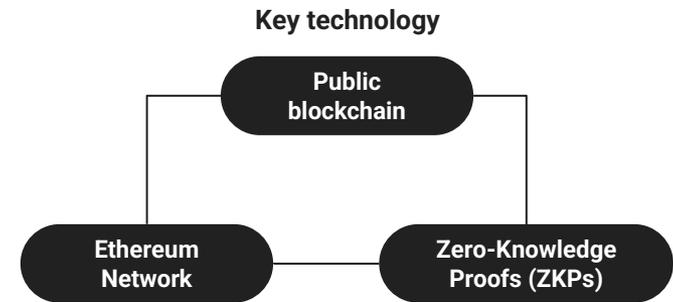
International Renewable Energy Agency (IRENA). (2022, September 26). ASEAN can cover two-thirds of energy demand with renewables. *IRENA News Room*. <https://www.irena.org/News/pressreleases/2022/Sep/ASEAN-Can-Cover-Two-Thirds-of-Energy-Demand-with-Renewables>

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. EY'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

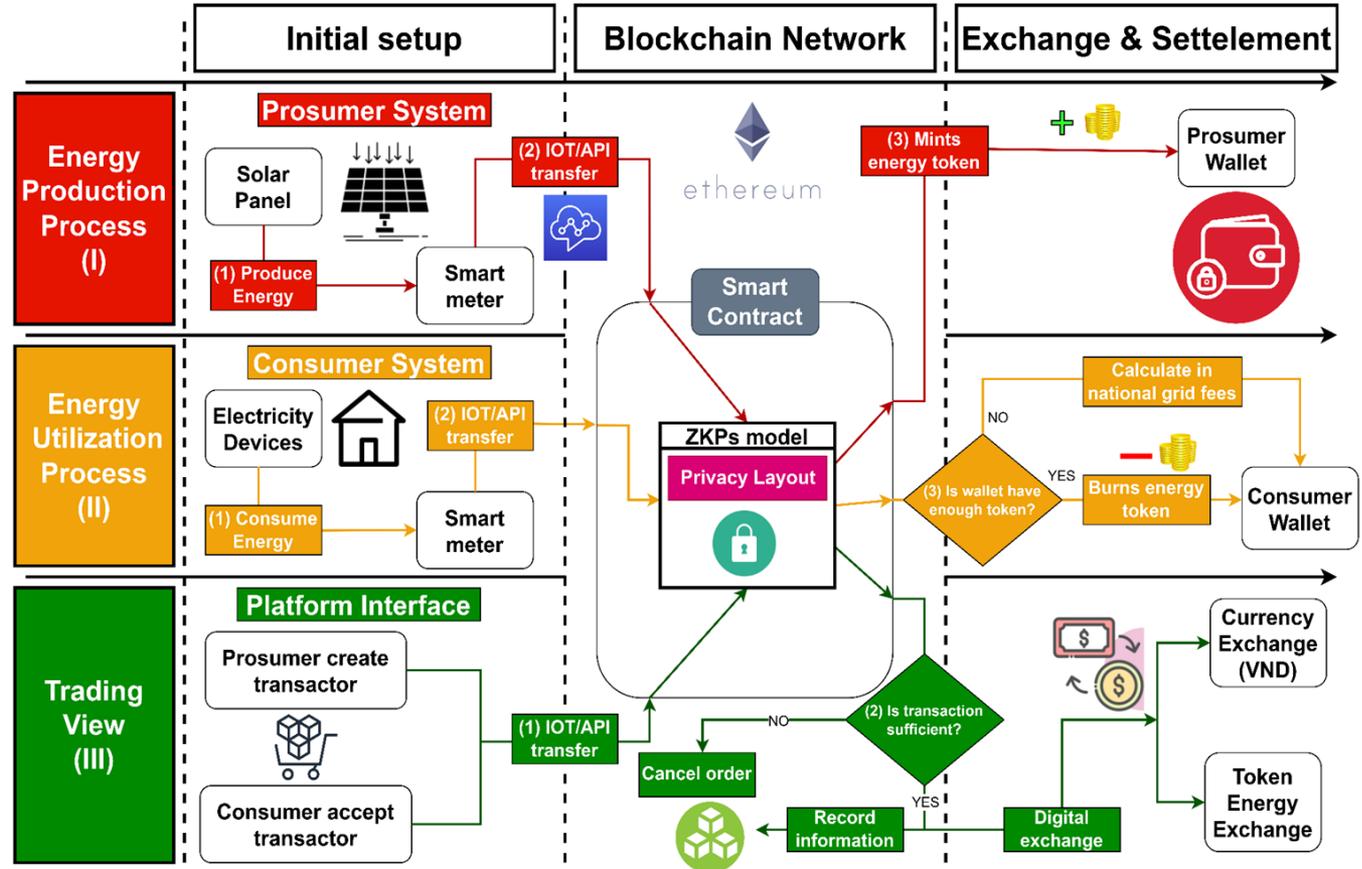
- **Smart Contracts:** Automates energy trading, reducing errors and intermediaries.
- **Interoperability:** Allowing seamless integration with existing infrastructure
- **Efficiency Growth:** Leverages the established Ethereum ecosystem for resource savings

- **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

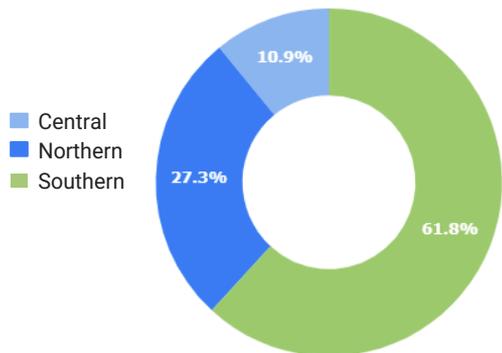
- The flow chart represent for how energy works with our system through 3 key perspectives (I), (II) and (III)
- Central to the entire system is the **blockchain network**, which serves as the **underlying infrastructure** for secure and transparent transactions
- **Smart contract** play a crucial role 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



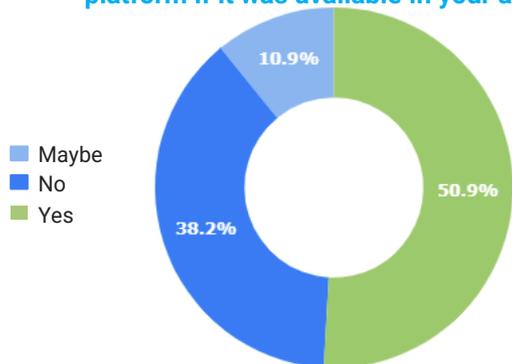
# Appendix

## Solution receives positive feedback and endorsement from direct power direct consumers

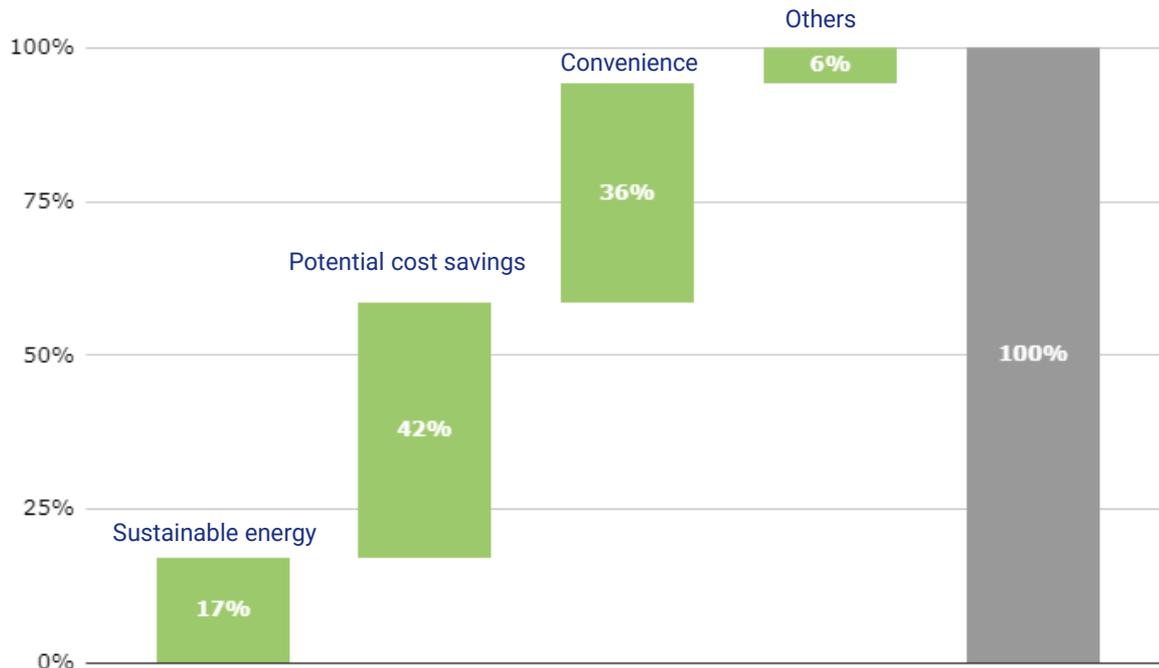
### Geographic Distribution of Participants



### 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
<b>Fixed Costs</b>	\$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
<b>Variable Costs</b>	\$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
<b>Total Costs</b>	<b>\$615,757</b>	<b>\$416,980</b>	<b>\$429,476</b>	<b>\$438,423</b>	<b>\$450,304</b>

### 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.

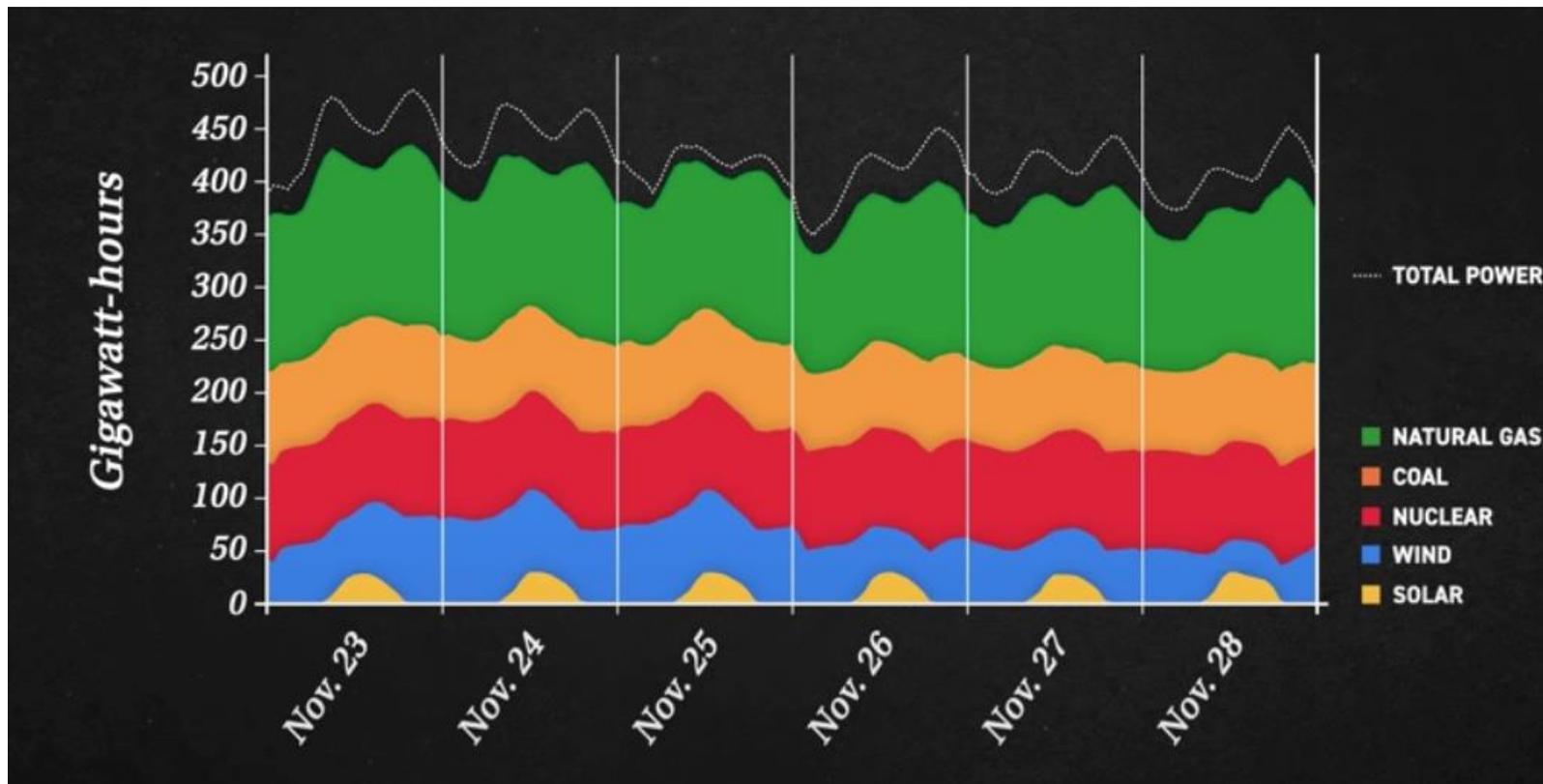
# Appendix

greenGrid to learn from successful cases

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

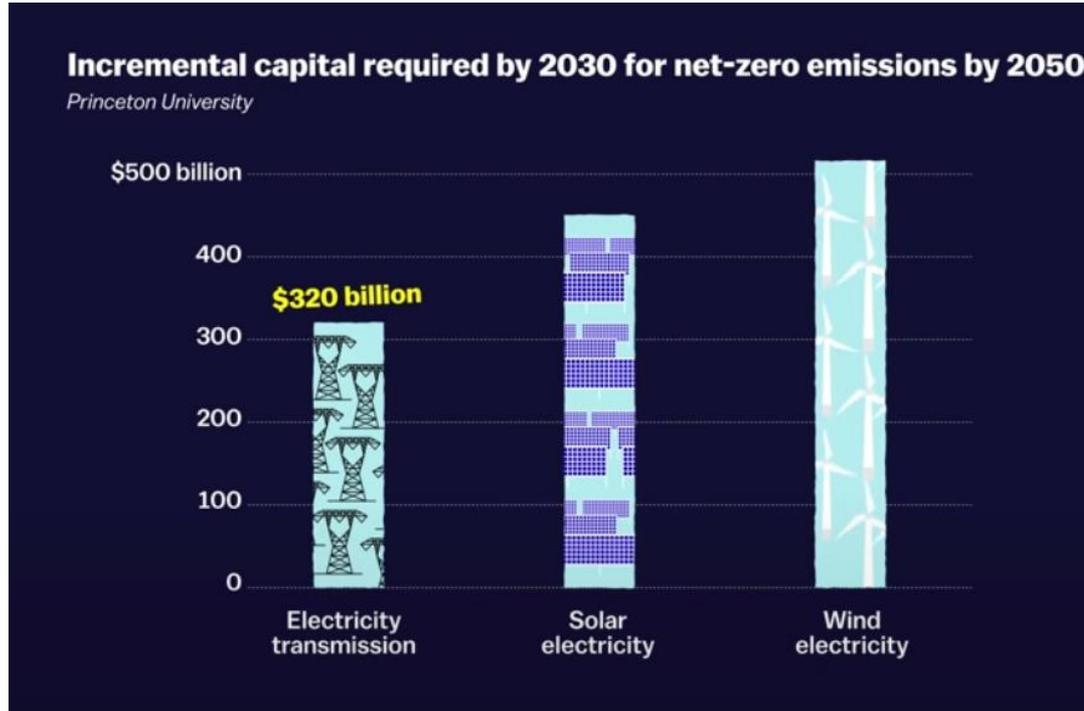
# Appendix

## Base Load and Peaker Plants



# Appendix

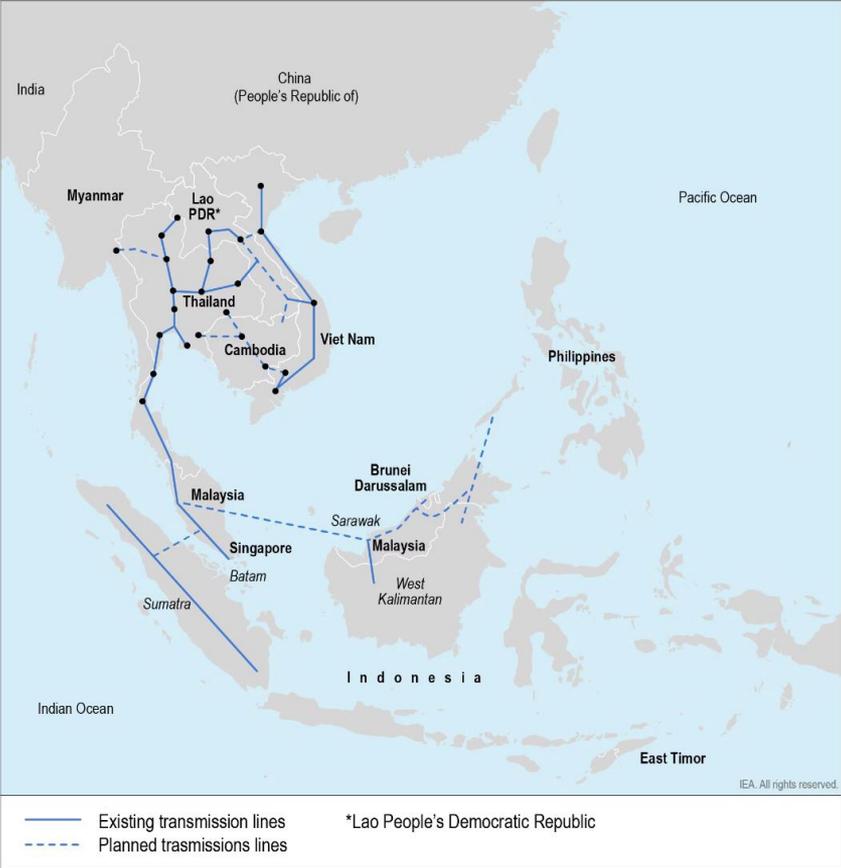
## Centralized renewable energy projects are costly



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	●	●	●	●	●	●	
	Grid upgrades and renewable addition plans aligned	●	●	●	●	●	●	
 Policy and regulation readiness	Grid impact studies/power system studies required to approve new intermittent renewable projects	●	●	●	●	●	●	
	Plans to increase flexible generation (gas and/or batteries)	●	●	●	●	●	●	
	Consistency in plans	●	●	●	●	●	●	
 Technology readiness	Battery adoption readiness	●	●	●	●	●	●	
	Flexible gas generation adoption readiness	●	●	●	●	●	●	

● Low   
 ● Medium   
 ● High