



Ministry of Industry and Trade



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Task 2.2: Evaluation & Recommendation for Improvement of Smart Grids Road Map

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Agenda

- Evaluation method
 - Evaluation results
 - Recommendation
 - Final evaluation
 - Discussion
- 
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Evaluation Method

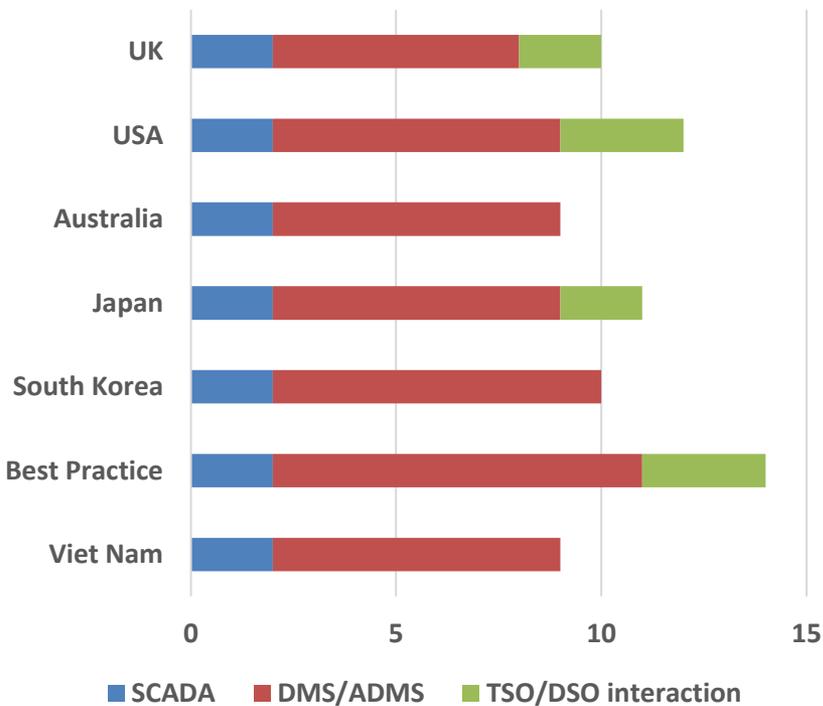
- ▀ 14 points: Monitoring & Control
 - ▀ 2 points: SCADA System
 - ▀ 1 point: Using SCADA to monitor & Control TSO network
 - ▀ 1 point: Using SCADA to monitor & Control DSO network
 - ▀ 9 points: DMS/ADMS application
 - ▀ 1 point per application: Network Connectivity Analysis, Switching Schedule & Safety Management, State Estimation, Load Flow Applications, Volt-VAR Control, Load Shedding Application, Fault Management & System Restoration, Load Balancing via Feeder Reconfiguration and Distribution Load Forecasting
 - ▀ 3 points: TSO/DSO interaction
 - ▀ 1 point: Congestion Management
 - ▀ 1 point: Voltage Support
 - ▀ 1 point: Ancillary services

Monitoring & Control

Monitoring & Control

Evaluation Results

Monitoring & Control



	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
SCADA	2	2	2	2	2	2	2
DMS/ADMS	9	7	8	7	7	7	6
TSO/DSO Interaction	3	0	0	2	0	3	2
Total	14	9	10	11	9	12	10

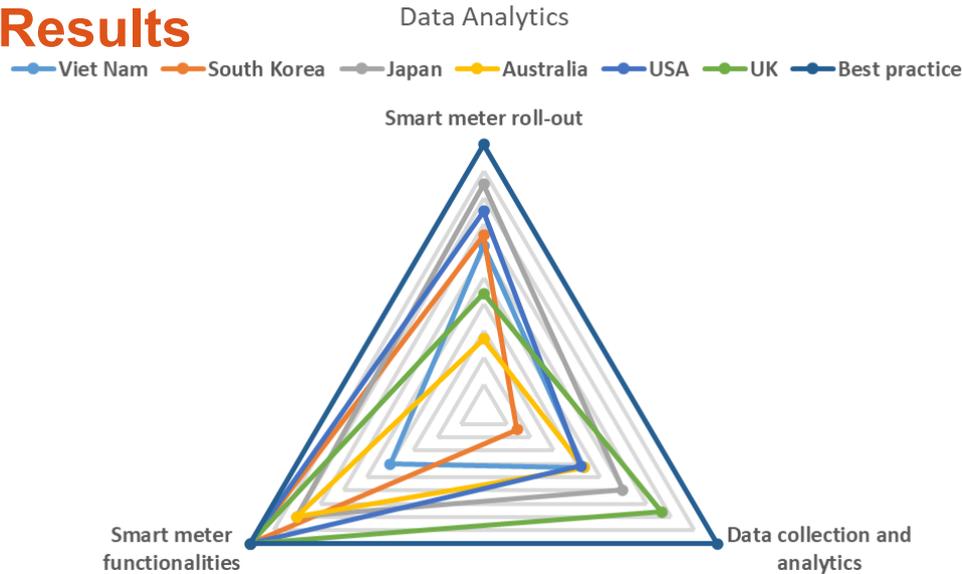
Recommendation

- It is recommended to further continue the deployment of the SCADA system to cover the whole Vietnamese network from ultra-high voltage down to low voltage.
- It has been noticed that not all the DMS/ADMS applications are installed at the DSOs side. It is recommended to study the needs and the challenges that each DSO faces and based on them to install the needed DMS and ADMS applications.
- It is recommended to extend the DMS and ADMS applications to include applications for switching schedules, safety management and load shedding.
- It is recommended to study the potential of TSO/DSO cooperation for congestion management, voltage support, balancing and ancillary services. The IEA has published a relevant report presenting research projects focusing on the TSO/DSO cooperation “International R&D Project Collection – Advanced Cooperation between Distribution and Transmission Network Operation”.

Evaluation Method

- ▀ Average in percentage
 - ▀ Percentage of Smart Meter roll-out
 - ▀ Data collection and analytics
 - ▀ Data collected by smart meter: power, energy, current, voltage, harmonics, power factor
 - ▀ Data analytics: network planning, maintenance & asset renewal, customer behaviour & consumption patterns.
 - ▀ Smart meter functionalities
 - ▀ Automatic billing system & dynamic tariffs
 - ▀ Real time monitoring
 - ▀ Demand response & load control functionalities
 - ▀ Outage detection
 - ▀ Losses & theft detection

Evaluation Results



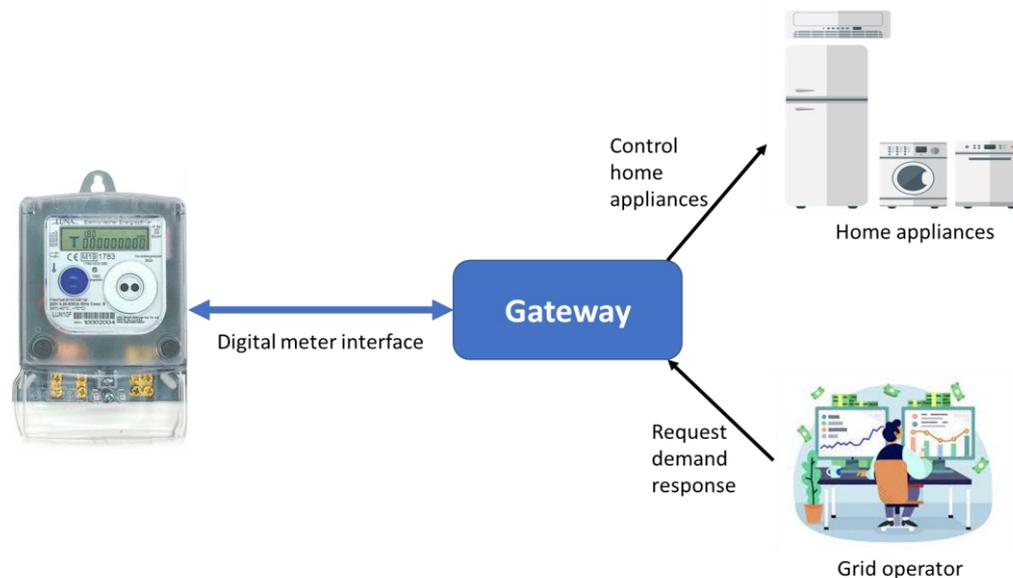
	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
Smart Meter roll-out	100%	62%	66%	85%	27%	75%	44%
Data collection and analytics	100%	43%	14%	60%	43%	42%	76%
Smart meter functionalities	100%	40%	100%	80%	80%	100%	100%
Total	100%	48%	60%	75%	50%	72%	73%

Recommendation (1)

- Accelerate the roll-out of the smart meters in Vietnam, especially in the southern region.
- Add outage detection functionality to the smart meters, as it would support DSOs in detecting faults and restoring them.
- Create big data centres and hire data scientists to analyse this data. The installed smart meters collect a huge amount of data. Analysing the smart meter data would help the network operators in better planning and maintenance of the grid.
- Create a demand response market to incentivize the consumers.

Recommendation (2)

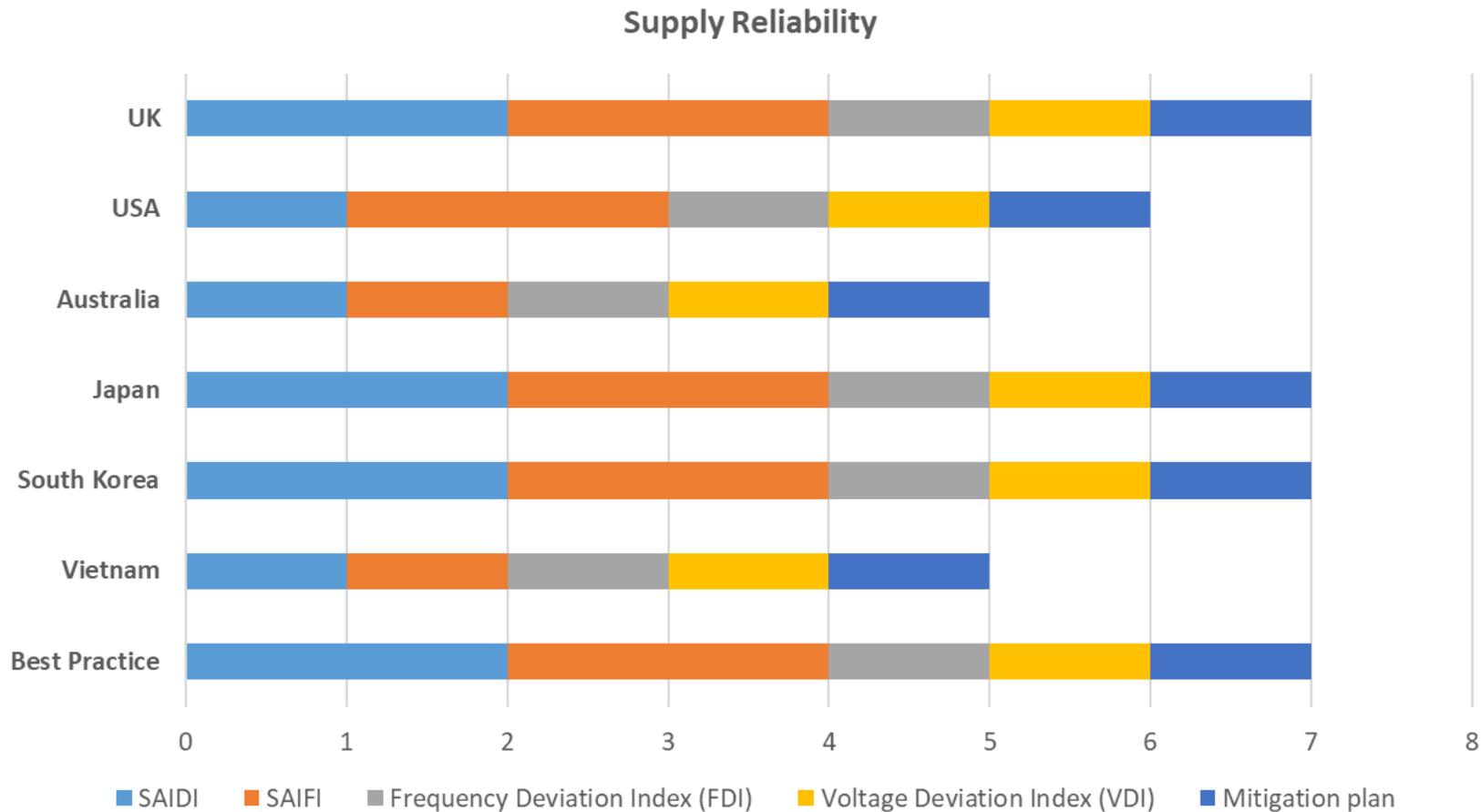
- Some of the customers in Vietnam are equipped with digital meters with limited functionalities. The digital meter could be upgraded by installing a gateway. This gateway can communicate with the digital meter via the digital meter interface and it can communicate with the grid operator via the internet.



Evaluation Method

- ▀ 7 points: Supply Reliability
 - ▀ 2 points: SAIDI
 - ▀ 1 point: SAIDI is recorded
 - ▀ 1 point: SAIDI is below EU average
 - ▀ 2 points: SAIFI
 - ▀ 1 point: SAIFI is recorded
 - ▀ 1 point: SAIFI is below EU average
 - ▀ 1 point: Frequency Deviation Index (FDI)
 - ▀ 1 point: Voltage Deviation Index (VDI)
 - ▀ 1 point: Mitigation plan

Evaluation Results (1)



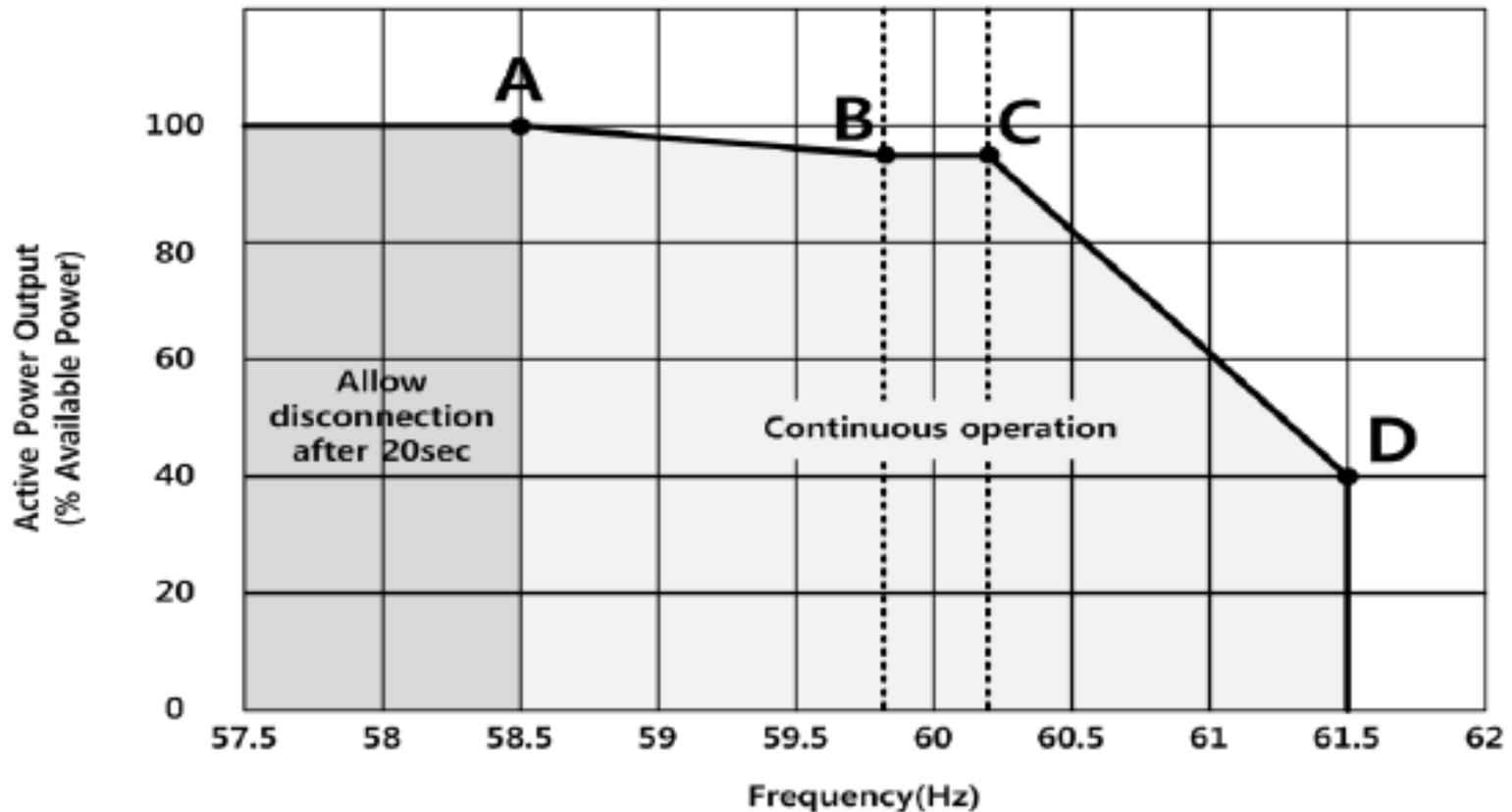
Evaluation Results (2)

	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
SAIDI	2	1	2	2	1	1	2
SAIFI	2	1	2	2	1	2	2
FDI	1	1	1	1	1	1	1
VDI	1	1	1	1	1	1	1
Mitigation plan	1	1	1	1	1	1	1
Total	7	5	7	7	5	6	7

Recommendation (1)

- Improve the values for SAIDI and SAIFI by conducting predictive maintenance to the electric grid and its components.
- Install Fault Management & System Restoration (FMSR) ADMS application on the SCADA system to reduce the outage time.
- Equip the smart meters with outage detection to support the DSO in detection faults and reduce the outage time.
- Update the grid codes for DER to support the grid in stabilizing the frequency.

Recommendation (2)

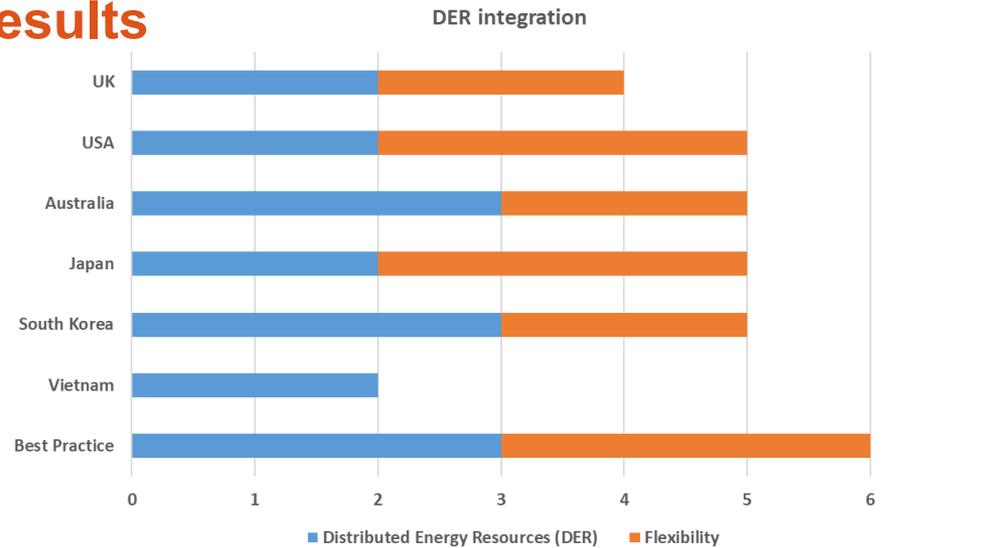


S.-I. Moon, G.-C. Pyo and J.-W. Park, "Study on development of Grid Code and operation scheme of Jeju Island with high wind penetration," in 21st World Energy Congress (WEC), Montreal, 2010.

Evaluation Method

- ▀ 6 points: DER Integration
 - ▀ 3 points: Distribution Energy Resources (DER)
 - ▀ 1 point: DER Feed-in-grid
 - ▀ 1 point: Grid code for DER
 - ▀ 1 point: DER provide ancillary services
 - ▀ 3 points: Flexibility
 - ▀ 1 point: Battery storage
 - ▀ 1 point: Power2Gas
 - ▀ 1 point: Flexible loads

Evaluation Results



	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
DER	3	2	3	2	3	2	2
Flexibility	3	0	2	3	2	3	2
Total	6	2	5	5	5	5	4

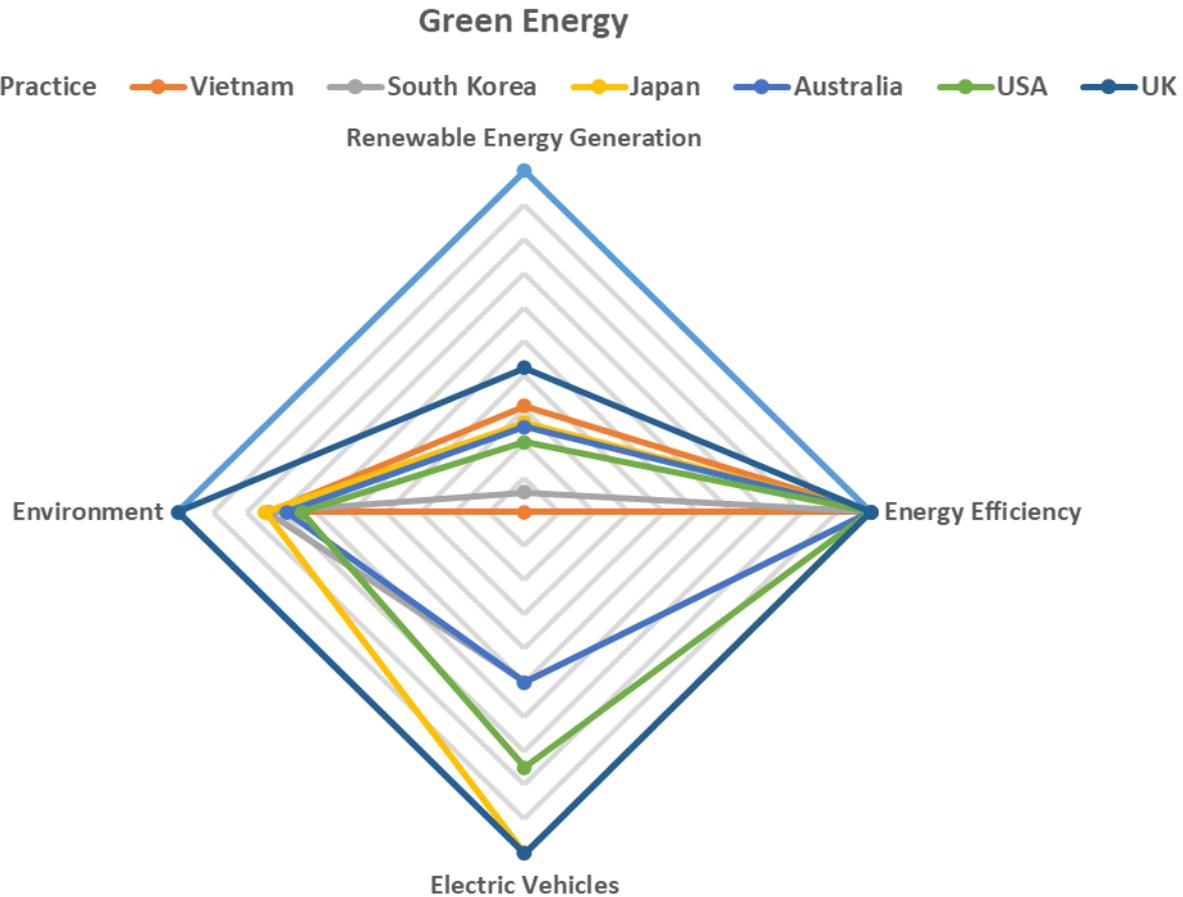
Recommendation

- Update the renewable energy grid code in Vietnam and introduce ancillary services.
- Integrate energy storage (e.g. battery storage) into the Vietnamese grid. The battery storage could be use in various applications e.g.:
 - Frequency regulation
 - Spinning reserve
 - The voltage or reactive power support
 - System peak shaving
 - Load management
 - Storing excess wind and solar generation
 - Backup power

Evaluation Method

- ▀ Average in percentage
 - ▀ Percentage of renewable energy in the power mix
 - ▀ Energy Efficiency program
 - ▀ Energy efficiency program for residential
 - ▀ Energy efficiency program for industrial
 - ▀ Electric mobility
 - ▀ Strategy for electric mobility
 - ▀ Smart charging/V2G
 - ▀ Environment
 - ▀ CO₂ per kWh below IEA average
 - ▀ Strategy for reducing CO₂ emission

Evaluation Results (1)



Evaluation Results (2)

	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
Renewable Energy Generation	100%	31%	6%	26%	25%	20%	42%
Energy Efficiency	100%	100%	100%	100%	100%	100%	100%
Electric Vehicles	100%	0%	50%	100%	100%	75%	100%
Environment	100%	74%	74%	75%	75%	64%	100%
Total	100%	51%	57%	75%	61%	65%	86%

Recommendation

- Continue the progress with integrating renewable energy and aim to higher shares of renewable energy in the power mix.
- Replace the coal power plants with low carbon emission fuel e.g., natural gas and renewable energy sources, which would help to reduce the carbon emission intensity. Vietnam has 20 GW of coal capacity, representing more than half of the generated power.
- Promote electric mobility and deploy charging infrastructure.
- Develop regulations to support smart charging and V2G technology, which could support the electric grid with a high share of variable renewable energy sources.

Note & Recommendation (1)

- ❖ It is noticed that grid operators don't share with the public how they secure and protect their network to protect their systems against cyberattacks.
- Establish a cybersecurity centre in Vietnam to conduct real-time monitoring for cyberattacks, information sharing and communication infrastructure for all generators, control centres, demand-side aggregators, smart meter infrastructure, energy management systems and charging station infrastructure.
- Test generation units and control centres against cybersecurity attacks by simulating cyberattacks.
- Implement a blocking prioritization scheme. F.e. South Korea developed and implemented a blocking prioritization scheme that shields web-connected software from international connections.

Note & Recommendation (2)

- Implement a security system to protect the meter system against cyberattacks. F.e. the smart metering system in UK is designed such that each message received by meter is authenticated via a cryptographic algorithm, where each meter have an unique authentication key.

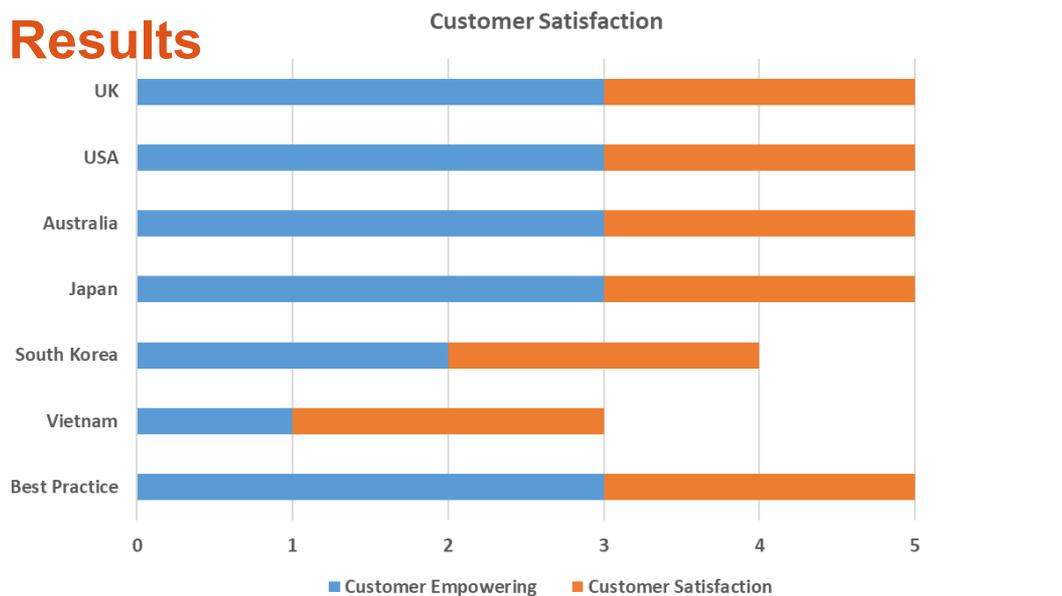
Evaluation Method

- ▀ 5 points: Customer Empowerment & Satisfaction
 - ▀ 3 points: Customer Empowering
 - ▀ 1 point: Real-time monitoring and appliance control
 - ▀ 1 point: Participate in demand response
 - ▀ 1 point: Change tariff or retailer
 - ▀ 2 points: Customer Satisfaction
 - ▀ 1 point: Organise regular surveys
 - ▀ 1 point: Customer data protection

Customer Empowerment & Satisfaction

Customer Empowerment & Satisfaction

Evaluation Results



	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
Customer Empowering	3	1	2	3	3	3	3
Customer Satisfaction	2	2	2	2	2	2	2
Total	5	3	4	5	5	5	5

Recommendation

- Create a demand response market to industrial, commercial and household customers, so they could participate in demand response and receive financial benefits.
- Create a competitive retail electricity market, which would result in lower prices and improve the service for the customer.

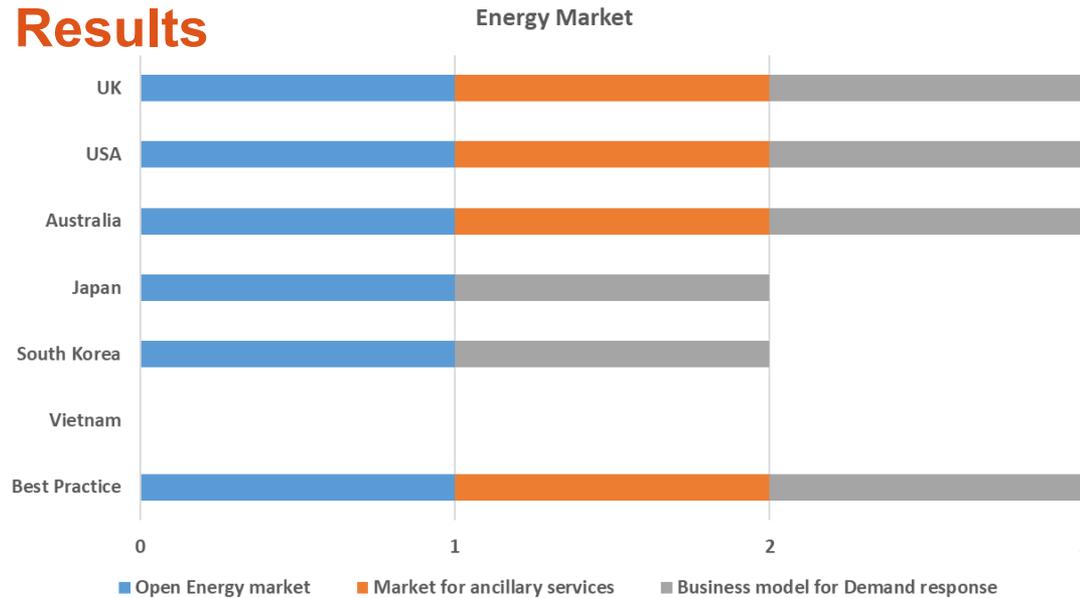
Evaluation Method

- ▀ 3 points: Energy Market
 - ▀ 1 point: Open energy market
 - ▀ 1 point: Market for ancillary services
 - ▀ 1 point: Business model for demand response

Energy Market

Energy Market

Evaluation Results

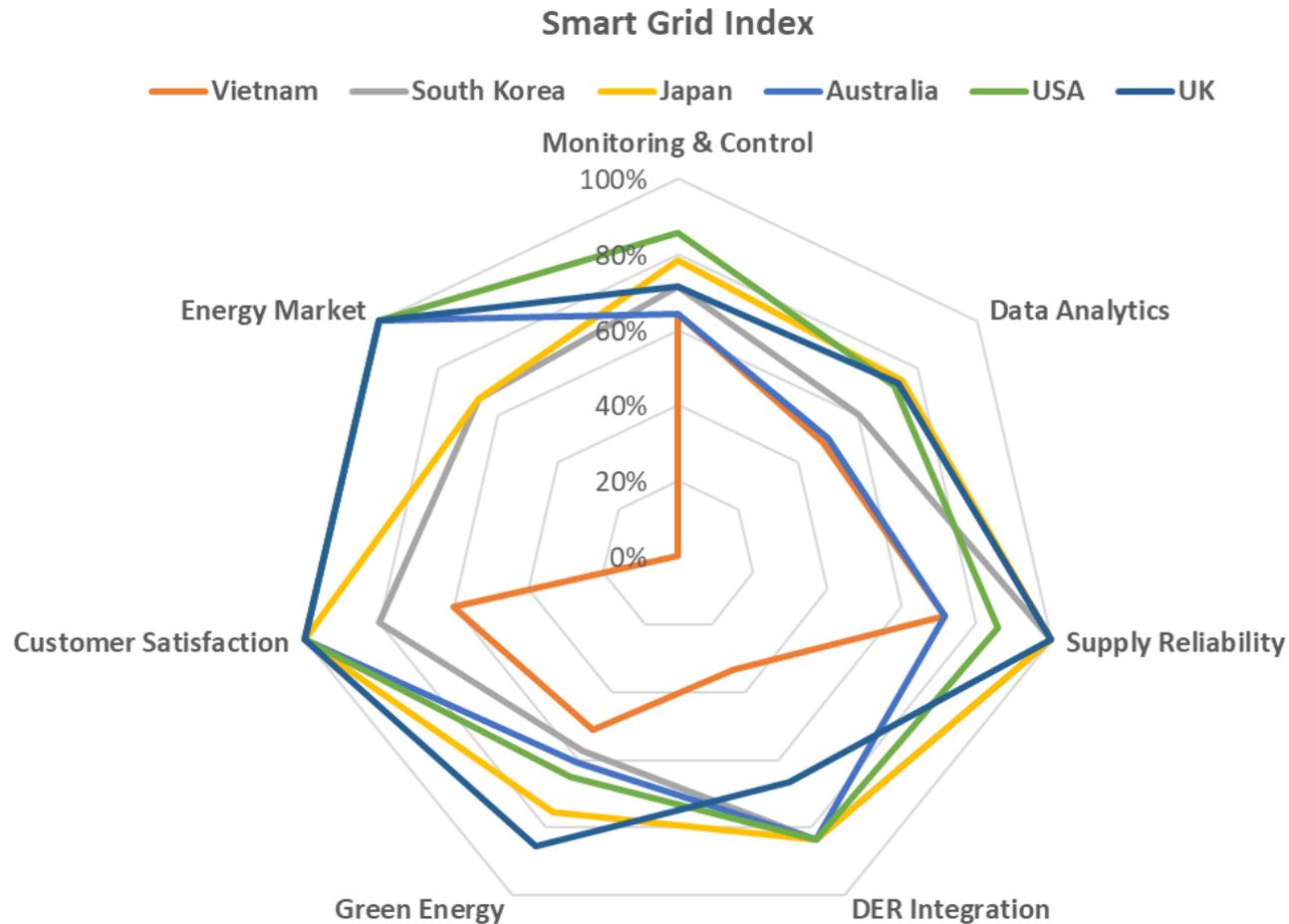


	Best Practice	Vietnam	South Korea	Japan	Australia	USA	UK
Open Energy Market	1	0	1	1	1	1	1
Market for ancillary services	1	0	0	0	1	1	1
Business model for DR	1	0	1	1	1	1	1
Total	3	0	2	2	3	3	3

Recommendation

- Issue regulation for the wholesale energy market. The wholesale energy market should include week-ahead sales, day-ahead sales and intra-day sales.
- Create an ancillary service and demand response market to balance grid in case of any deviation. This would increase the share of variable energy in the Vietnamese grid.
- Liberalize the retail market and increase the number of retailers to help creating a competitive market that provides end-users with cheaper prices and better service.

Final Evaluation

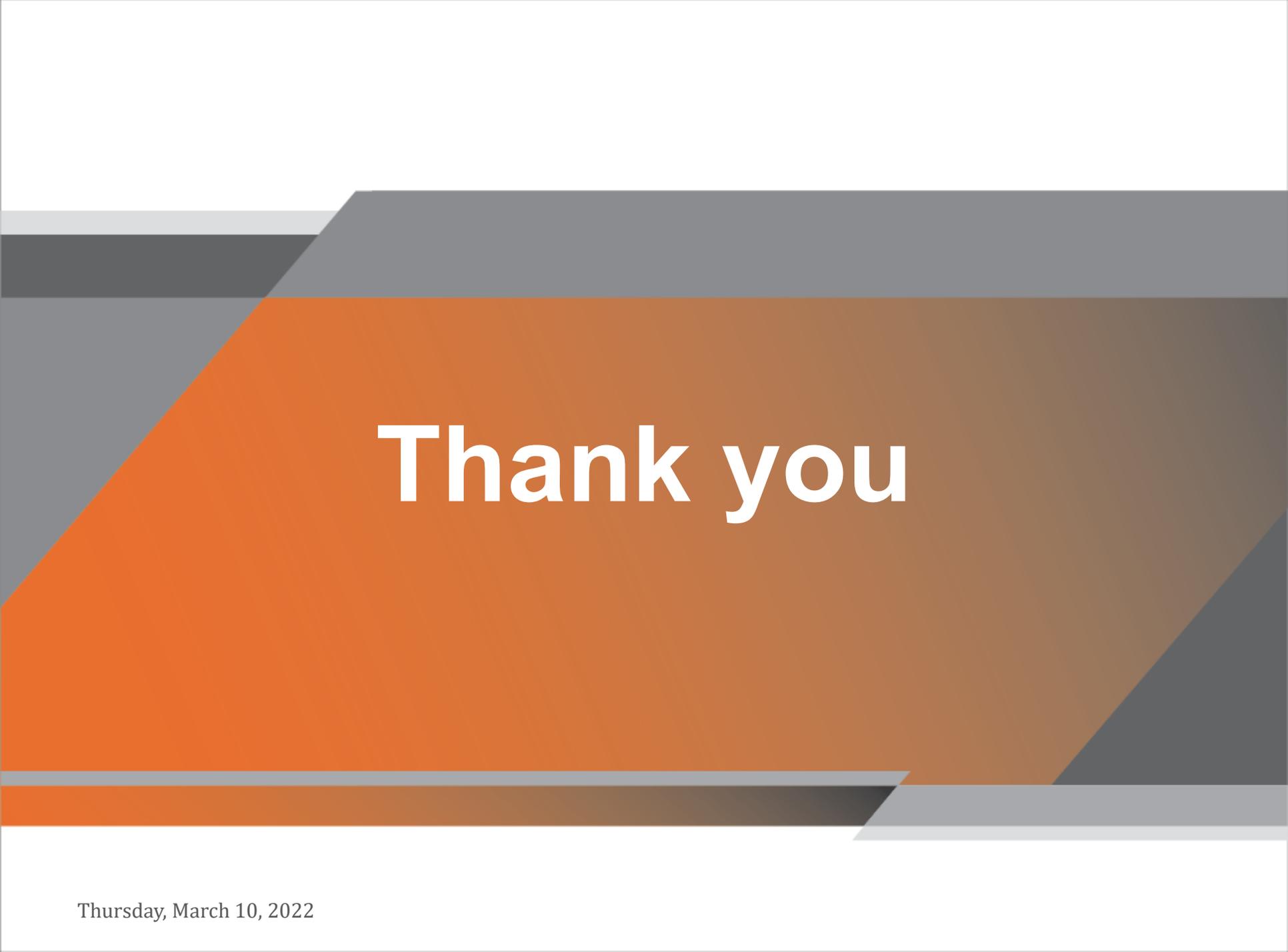


Final Evaluation

	Vietnam	South Korea	Japan	Australia	USA	UK
Monitoring & Control	64%	71%	79%	64%	86%	71%
Data Analytics	48%	60%	75%	50%	72%	73%
Supply Reliability	71%	100%	100%	71%	86%	100%
DER Integration	33%	83%	83%	83%	83%	67%
Green Energy	51%	57%	75%	61%	65%	86%
Customer Satisfaction	60%	80%	100%	100%	100%	100%
Energy Market	0%	67%	67%	100%	100%	100%
Final Score	47%	74%	83%	76%	85%	85%

Discussion





Thank you

Thursday, March 10, 2022