

31st March 2025

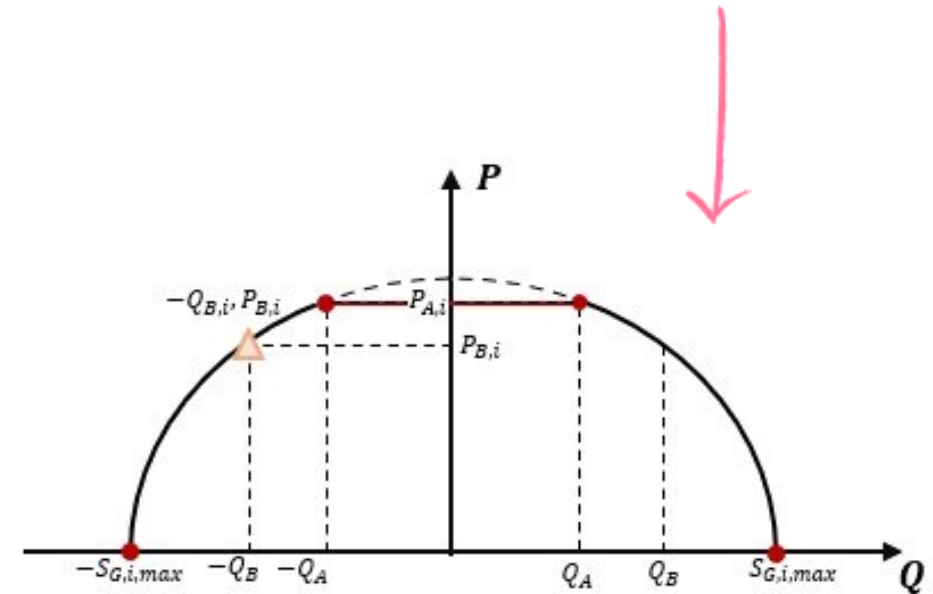
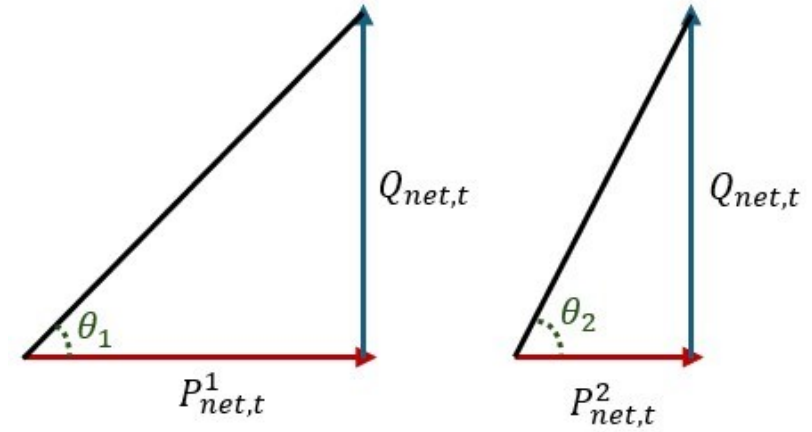
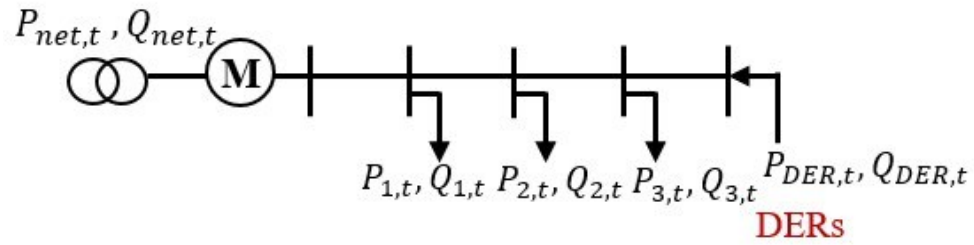
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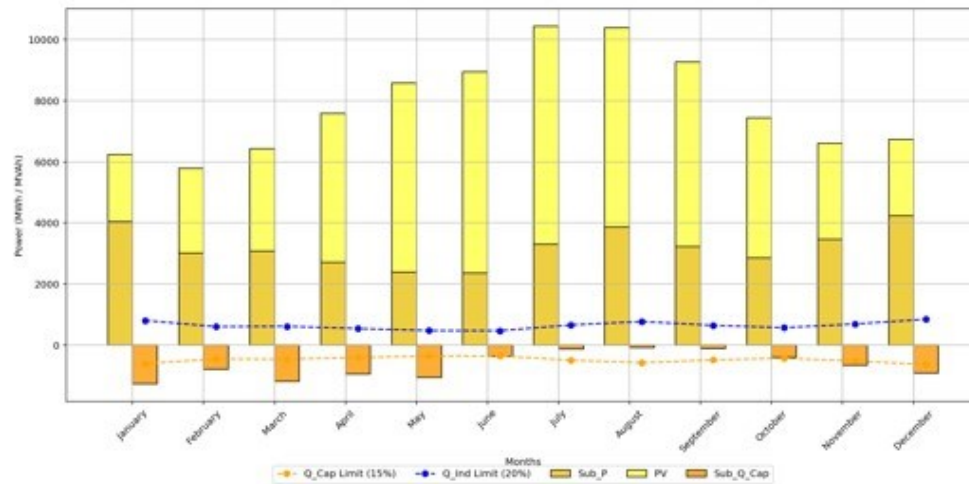
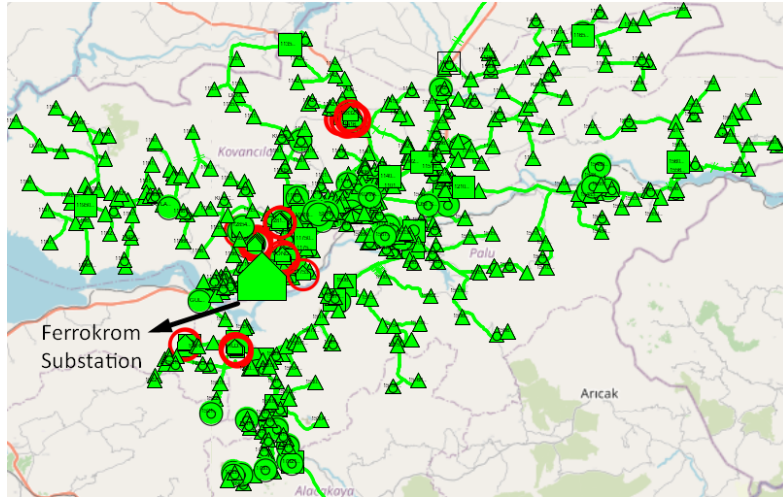
**Analysis of RL-based Bidding
Strategies in Local Electricity
Markets utilizing DLMP**

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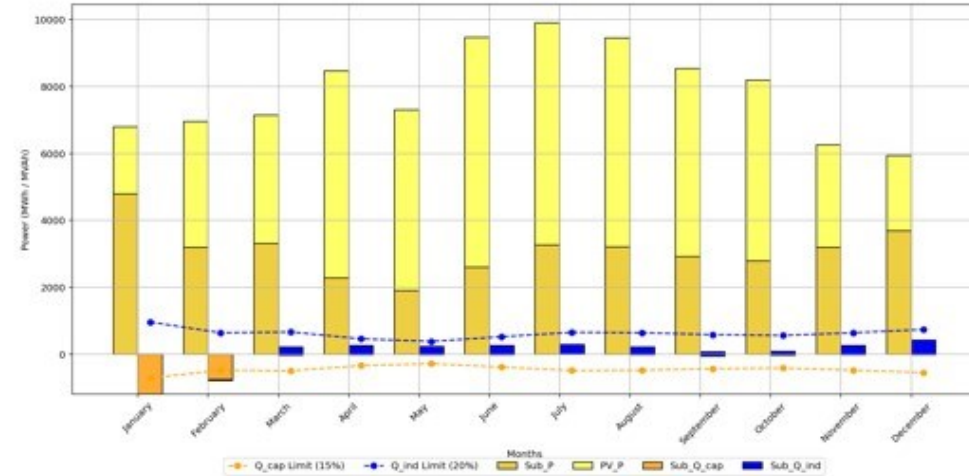
- **Introduction**
- **Problem Formulation**
- **Dataset**
- **Methods**
- **Experiments & Results**
- **Conclusion**



REAL-LIFE CASE FROM DSO OF THE TURKEY

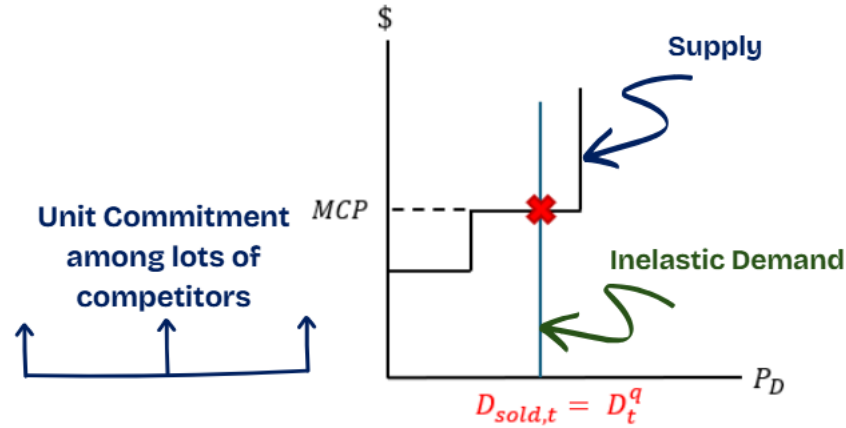


(a)

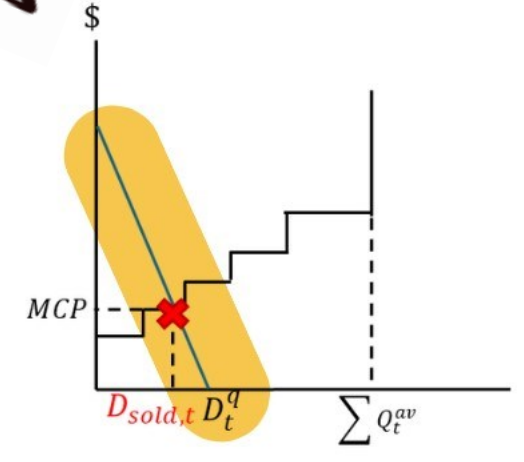
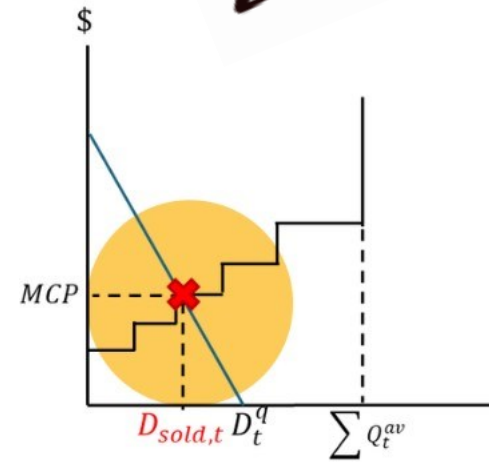
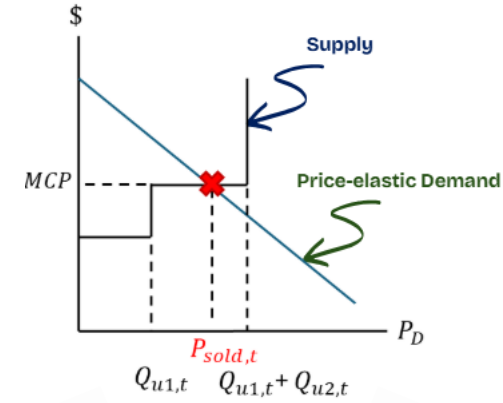


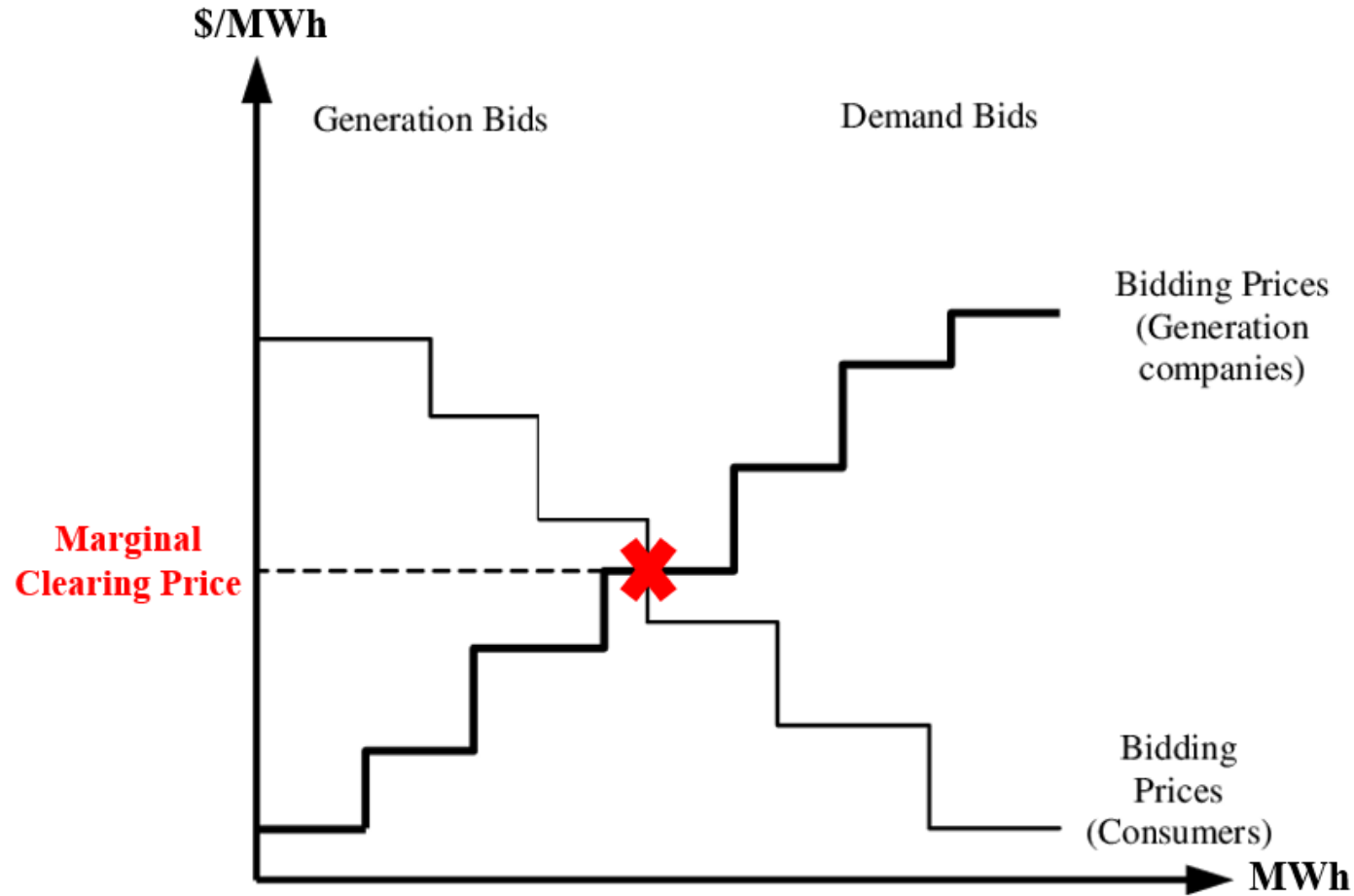
(b)

HOW CAN WE DESIGN Q-MARKET



OR





- The dynamic nature of the market,

- agents' adjusting their strategies responding to price fluctuations,

- ensures that the simulation captures realistic competitive interactions.

DERs' Objective is to maximize profit!!

$$cost = a * P_{g_i} + \beta * P_{g_i}^2$$

$$reward = DLMP_i * P_{g_i}$$

$$profit = reward - cost$$

DERs' submit higher bids →

MCP may rise, which increases their profits →

If the MCP increases, consumers will have to pay higher prices for electricity →

Leading to economic inefficiencies and welfare losses.

Lower bids can result in lower electricity prices → Benefiting consumers →

Reducing DERs' profits.

Generator Costs

These costs are fixed at time .

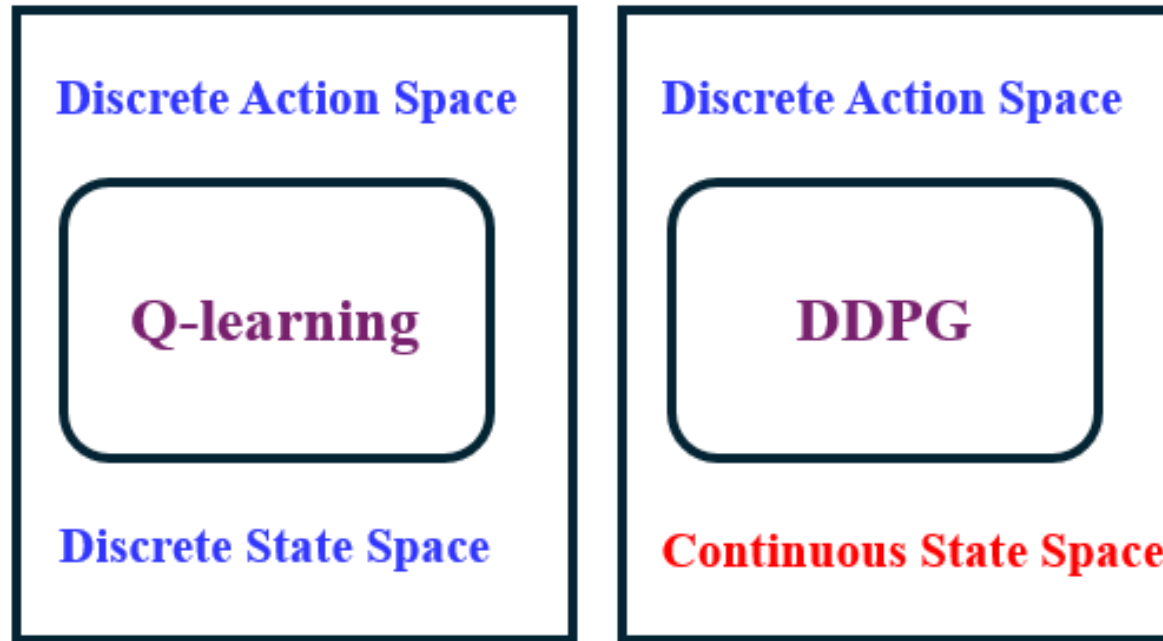
Active Demand

If the price is too high, demand may decrease as consumers are unwilling to pay elevated prices.

Jacobian Matrices

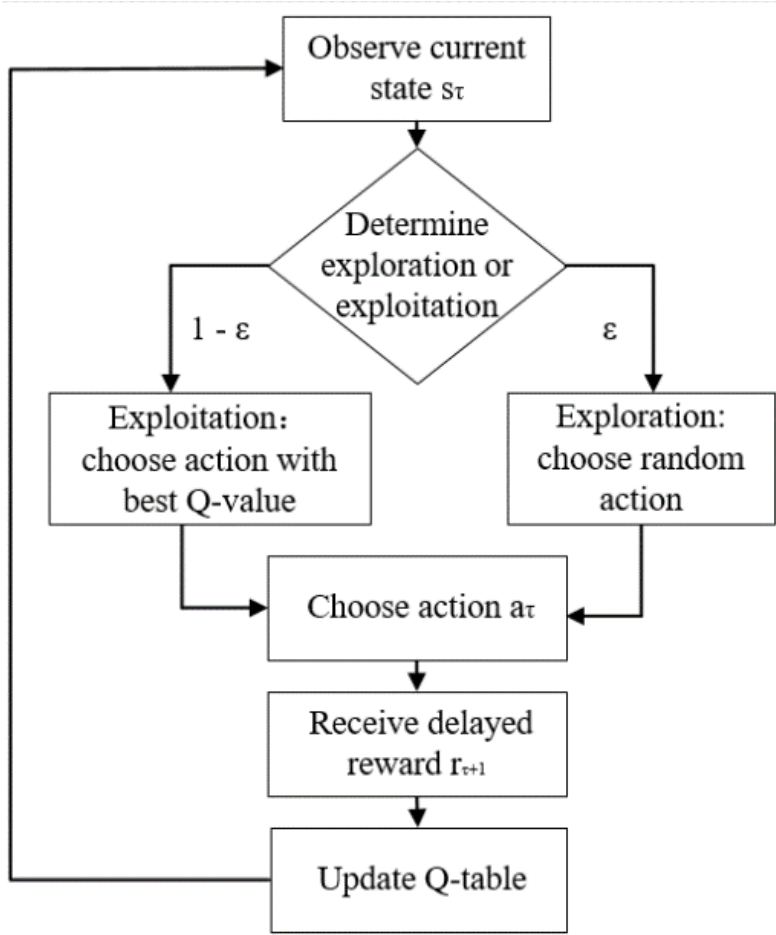
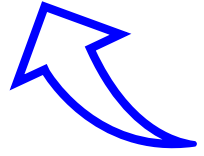
Used to perform power flow operations within the market simulation during the market clearing process.

No expensive preprocessing of the data is required!!

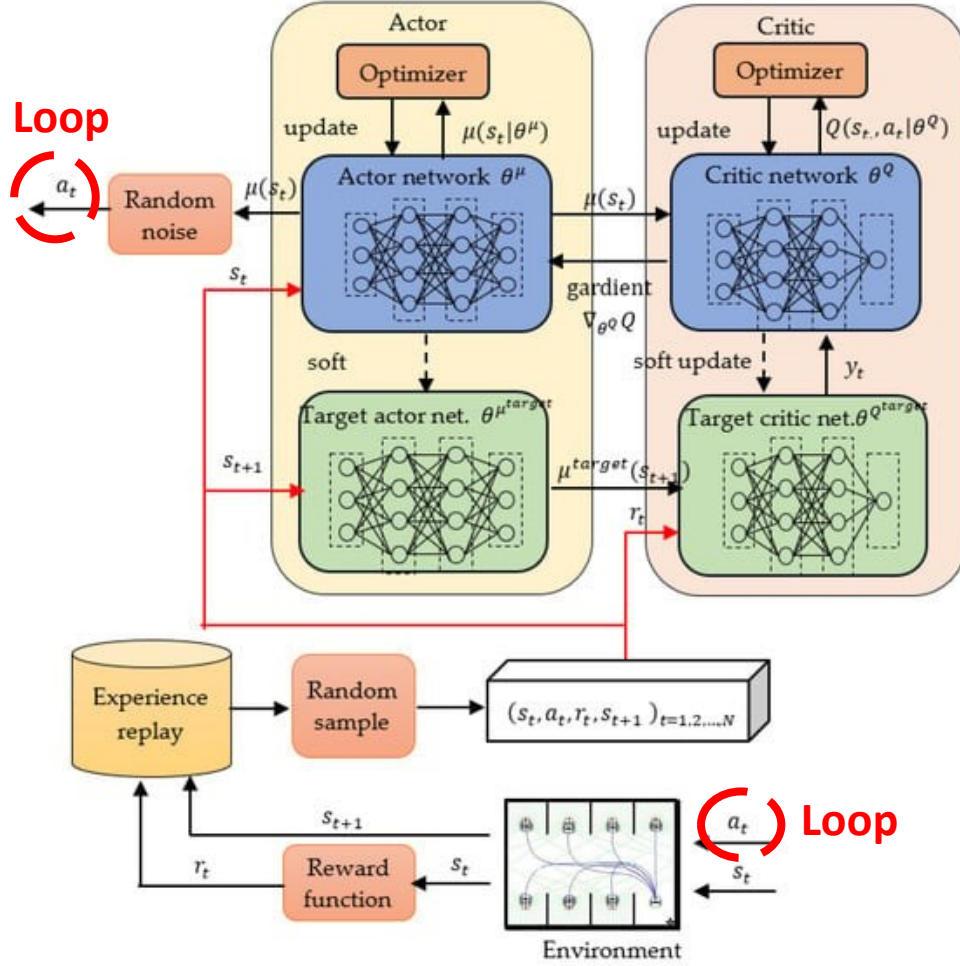
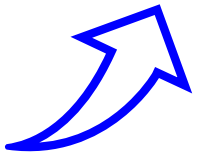


This distinction between discrete and continuous action spaces is critical and will influence the learning process and performance of each agent.

Q-learning



DDPG



This study

demonstrates the application of RL techniques, **specifically Q-learning and the DDPG algorithm, in modeling strategic bidding behaviors of DERs** in Local Electricity Market which called **Q-Market**.

The experiments

conducted on the **3-bus and 34-bus systems to validate the adaptability of DDPG**. The sensitivity analysis highlights the algorithm's performance under different hyperparameter settings.

The results

DDPG is effective in providing insights into the strategic behaviors of DERs. In contrast, Q-learning demonstrated limitations in scalability and optimal strategy discovery.

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THANK
YOU.

Questions?

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