Solutions

Task 1 – Run Analytical_Task_1.py

Task 2 – Run Analytical_Task _2.py

Task 3 – Run Analytical_Task _3.py

This task was not clear for me, however I have produced the 2 different output.

The output for this contains **Average Day Ahead (DA) hourly price in 2021** as 96.85 EUR/MWh and **Average Intraday hourly price in 2021** as 97.99 EUR/MWh. he difference in pricing between Average Day Ahead (DA) hourly prices and Average Intraday hourly prices can be attributed to several factors:

- **Market Timing:** DA prices are established in advance, whereas intraday prices are determined in real-time.
- **Fluctuations in Demand and Supply:** Intraday prices are influenced by sudden changes in demand and supply conditions.
- **Transmission Constraints:** Regional constraints on the power grid can impact intraday prices.
- **Behavior of Market Participants:** Market participants may adjust their strategies based on their expectations of future prices.
- **Variability in Renewable Energy Generation:** Intraday prices can be affected by the unpredictability of renewable energy production driven by weather conditions.

Task 4 – Run Analytical_Task _4.py

1. **Supply and Demand:** Prices reflect the balance of energy supply and demand. High renewable production (e.g., 2021-03-12) might result in oversupply and lower prices, while low production (e.g., 2021-11-16) could mean higher demand or less renewable supply, leading to higher prices.
2. **Market Conditions:** Factors like fuel prices, infrastructure limitations, and weather conditions impact prices. High gas prices or transmission constraints can raise electricity costs.
3. **Time of Day:** Price fluctuations occur due to demand patterns throughout the day. The 'Day Ahead Price hourly [in EUR/MWh]' considers hourly price variations. Low renewable days may have seen price spikes during peak demand hours.
4. **Weather:** Wind speed, solar radiation, and temperature affect renewable output. Unfavourable weather reduces renewables, potentially raising prices.

Task 5 - Run Analytical_Task _5.py

The average hourly Day Ahead (DA) price on weekdays is approximately 130.91 EUR/MWh, while the average hourly DA price on weekends is approximately 96.35 EUR/MWh. This indicates that the DA prices tend to be higher on weekdays compared to weekends on average The difference in Day Ahead (DA) electricity prices between weekdays and weekends can be attributed to several factors in the energy market:

1. **Demand Patterns:** Weekdays typically have higher electricity demand compared to weekends due to industrial and commercial activities. Higher demand often leads to higher prices as suppliers may need to use more expensive generation sources to meet the demand.
2. **Industrial Demand:** Many industries and businesses operate during weekdays, leading to increased electricity consumption. This can drive up prices during peak hours when these businesses are active.
3. **Renewable Energy Availability:** The availability of renewable energy sources like wind and solar can vary by day and time. Weekends may have more favourable weather conditions for renewable energy generation, reducing the need for more expensive conventional power sources and thus lowering prices.

Task 6 - Run Analytical_Task _6.py

Task 7 - . Run Analytical_Task _7.py

This strategy is designed to make money by taking advantage of differences in electricity prices. It focuses on buying electricity when it's cheaper in advance and selling it when it becomes more expensive on the same day. This approach can work because it exploits predictable patterns in electricity pricing, potentially leading to consistent profits. Here's a more detailed explanation of the strategy:

1. **Data Filtering:**
    - The code filters the electricity market data to include only the rows corresponding to the specified time range (13:00 to 14:00). This is done for all months, meaning the strategy is applied uniformly throughout the year during this specific hour.
2. **Trading Conditions:**
    - Two primary trading conditions are defined based on the comparison between day-ahead (DA) and intraday (ID) prices:
        - **buy_condition**: This condition is met if the day-ahead price (DA) is lower than the intraday price (ID). In other words, if the market expects that electricity will be cheaper in the future (DA) compared to the current price (ID) during the specified hour, it triggers a "buy" signal.
        - **sell_condition**: Conversely, this condition is met if the day-ahead price (DA) is higher than the intraday price (ID). If the market anticipates that electricity will be more expensive in the future (DA) than the current price (ID), it triggers a "sell" signal.

3. **Capital and Position Management:**
    - The code initializes two variables to manage trading capital (**capital**) and the trading position (**position**).
    - The trading position represents the amount of electricity traded and is measured in megawatts (MW).
    - Initially, both the capital and position are set to zero.
4. **Trading Loop:**
    - The code iterates through the filtered data, one data point at a time.
    - For each data point, it evaluates the trading conditions:
        - If the **buy_condition** is met, it goes long (buys) by purchasing 100 MW of electricity at the intraday price (ID). The capital is reduced by the cost of this purchase.
        - If the **sell_condition** is met, it goes short (sells) by selling 100 MW of electricity at the intraday price (ID). The capital is increased by the revenue generated from this sale.
        - If neither condition is met, it holds the current position.
    - At each step, the code calculates the cumulative performance, which represents the total capital over time.
5. **Trading Decisions:**
    - The code keeps track of trading decisions in a list (**trading_decisions**), which indicates whether the strategy decided to "Buy," "Sell," or "Hold" at each data point.
6. **Evaluation and Output:**
    - The code prints the length of the **trading_decisions** list, which essentially indicates how many trading decisions were made.