# Range Optimization Report

## 1. Overview of Optimum Values

- **Optimal Torque:** 150 Nm and 260.33 Nm are identified as efficient torque levels.
- **Optimal Speed:** 10 km/h is the speed with the lowest energy consumption.
- **Estimated Range:** At both torque levels, the highest range (54.22 km) is achieved at 10 km/h.

These findings highlight that the vehicle achieves maximum energy efficiency at low speeds (e.g., 10 km/h) and low torque levels.

---

## 2. Dataset Summary

| Parameter | Torque (Nm) | Speed (km/h) | Range (km) | Energy Consumption (kWh) |
|-----------|-------------|--------------|------------|--------------------------|
| Count | 5 | 5 | 5 | 5 |
| Mean | 150.0 | 30.0 | 18.824 | 0.36 |
| Min | 150.0 | 10.0 | 3.25 | 0.05 |
| Max | 150.0 | 50.0 | 54.22 | 0.85 |

---



Hız - Menzil ve Enerji Tüketimi İlişkisi
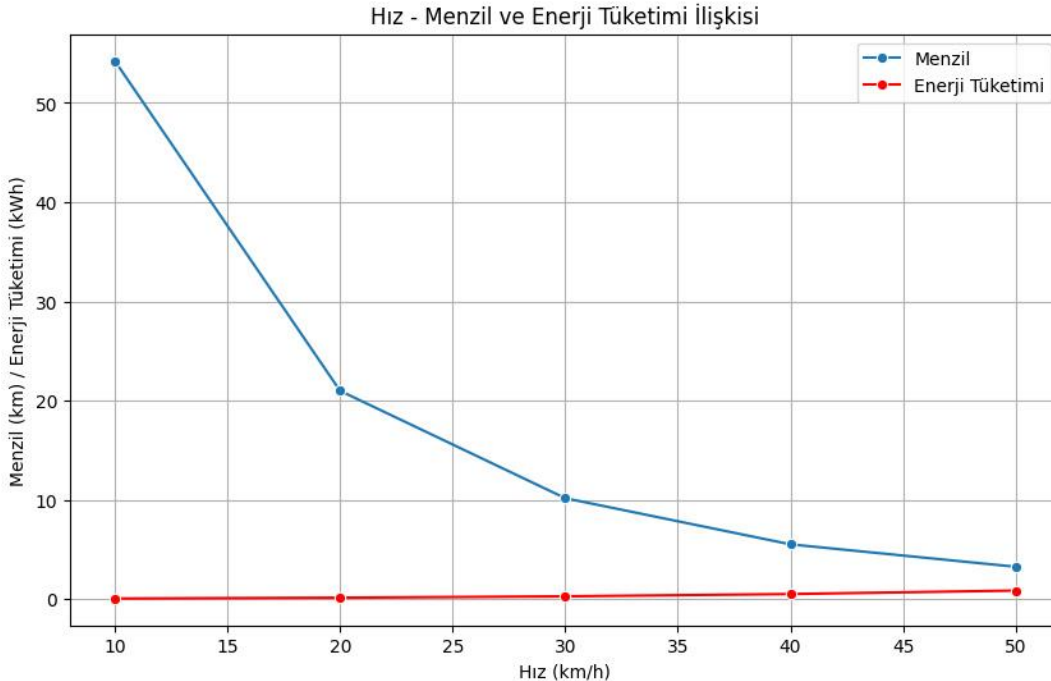
# 3. Key Findings

- **Energy Efficiency:** Maximum range is achieved at 10-20 km/h.
- **Speed Impact:** As speed increases, energy consumption rises rapidly, reducing the range significantly.
- **Optimization at Higher Speeds:** For speeds above 30 km/h, aerodynamic improvements are recommended.
- **Regenerative Braking and Steady Driving:** These strategies can improve range.



Hız ve Enerji Tüketimi İlişkisi
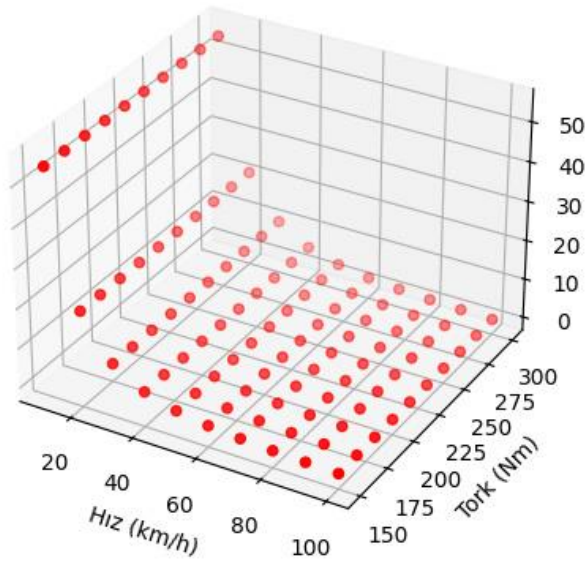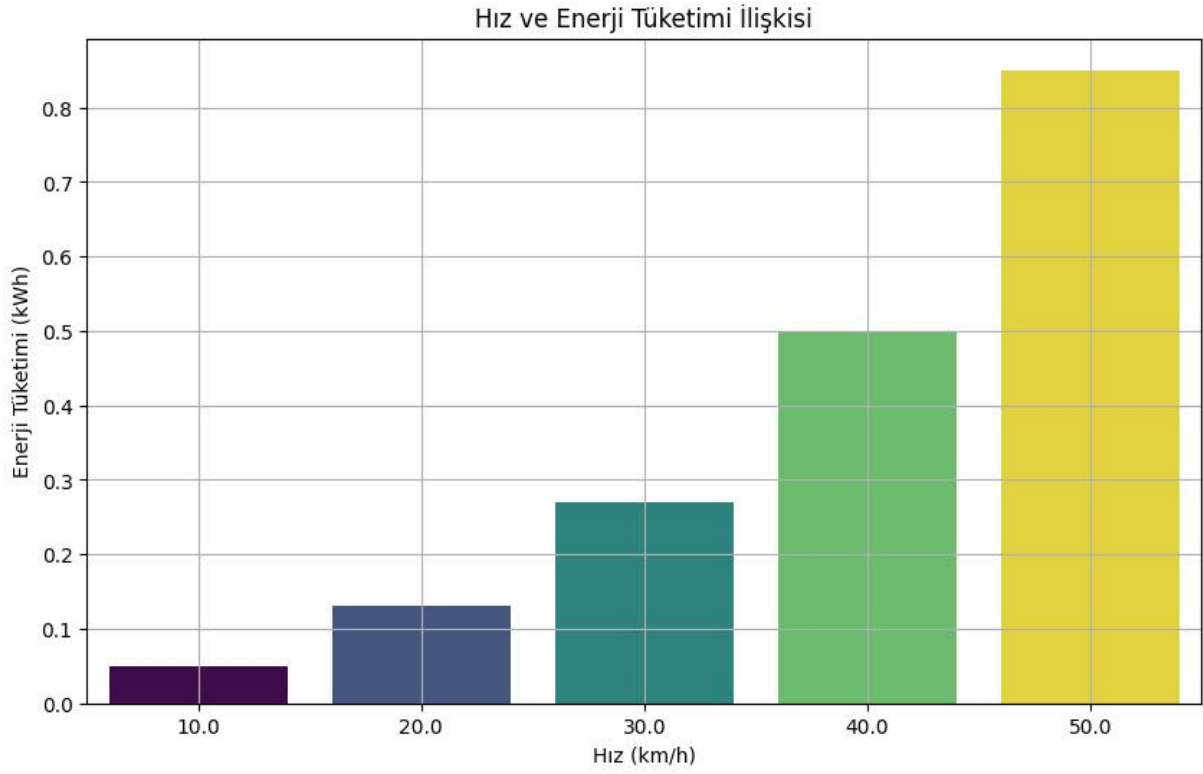
# 4. Recommendations

### 1. Efficient Usage at Low Speeds and Torque

- **10 km/h and 150 Nm:** This combination offers the lowest energy consumption and the maximum range, making it ideal for urban driving.
- **City Driving:** Maintaining low speeds in urban conditions can help minimize range loss.

### 2. Energy Optimization at Medium Speeds (20-30 km/h)

- **Aerodynamic Enhancements:** Reducing air resistance can improve efficiency, especially at higher speeds.
- **Transmission Optimization:** More efficient torque and motor control strategies could reduce energy consumption at 30 km/h.

### 3. Strategies for High Speeds (>50 km/h)

- **Regenerative Braking:** Recovering energy during braking can increase range.
- **Speed Management Systems:** Implementing speed limiters can optimize range for necessary high-speed driving scenarios.

### 4. Torque Optimization

- **260.33 Nm Torque:** Suitable for high-demand situations like hill climbing or acceleration. However, lower torque levels can be more efficient on flat roads.
- **High Torque and Low Speed:** This combination can be beneficial under challenging conditions such as steep slopes.

### 5. Driving Style Optimization

- **Avoid Sudden Accelerations and Braking:** Smooth acceleration and maintaining a steady speed can improve energy management and range.

---

# 5. Future Development Areas

1. **Additional Data Analysis:** Further investigation of trends in energy consumption across different speed and torque levels.
2. **Scenario Comparisons:** Comparing results under varying conditions to enhance reliability.
3. **Machine Learning Models:** Using regression or classification models to predict energy consumption.
4. **Error Analysis:** Evaluating potential errors in range and energy consumption predictions.
5. **Impact of Additional Parameters:** Investigating how factors like vehicle weight, aerodynamics, and driving conditions affect the range.