**🎯 Main Goal:**

Build a tool that allows users to **estimate and compare the total cost** of an EV trip vs a traditional fuel (ICE) vehicle trip, using real-world vehicle specs, energy prices, and trip distance.

**✅ Agenda / Research Objectives**

You should define your agenda and research in terms of:

**1. 🔍 Collect & Clean Data**

* Extract relevant fields from:
  + ev\_vehicles.csv: battery size, efficiency (kWh/km), brand/model
  + charging\_stations.csv: price per kWh, location, charger type
* Collect **benchmark ICE fuel prices and fuel efficiency** (e.g., 7L/100km)

**2. ⚖️ Build Comparison Logic**

For a given **trip distance (e.g., 100km)**:

* EV trip cost = distance × kWh/km × price\_per\_kWh
* ICE trip cost = distance × L/100km × fuel\_price

Use realistic values (e.g., electricity cost $0.30/kWh, petrol $2.00/L).

**3. 🧠 User Inputs**

* Select EV model
* Enter trip distance
* Select ICE benchmark vehicle or set custom fuel consumption
* (Optional) Set location to get local electricity prices

**4. 📊 Output**

Display:

* Total trip cost for EV
* Total trip cost for ICE
* Cost difference
* CO₂ savings (optional)

**🔧 Example Use Case**

User selects:

* **EV:** Tesla Model 3, efficiency = 0.15 kWh/km
* **ICE:** Fuel consumption = 7.0 L/100km, petrol = $2.00/L
* **Distance:** 100 km
* **Electricity price:** $0.30/kWh

Then:

**EV cost** = 100 × 0.15 × 0.30 = $4.50  
**ICE cost** = 100 × 7.0 ÷ 100 × 2.00 = $14.00

✅ EV is **$9.50 cheaper** for that trip.

**📌 Summary of Research Agenda**

| **Step** | **Focus** |
| --- | --- |
| 1. Data Understanding | Analyze fields in ev\_vehicles and charging\_stations |
| 2. Efficiency Mapping | Match energy use per km with charging cost |
| 3. ICE Benchmarking | Use fixed or dynamic ICE vehicle fuel efficiency & prices |
| 4. Comparison Engine | Calculate and compare EV vs ICE trip costs |
| 5. Visualization | Show result summary, charts, savings, CO₂ reduction (optional) |

**📚 Optional Enrichment**

* Add CO₂ emission calculations: EVs = 0-50 g/km, ICE = ~180 g/km
* Include location-based pricing from charging\_stations.csv
* Extend tool as a web app (with form inputs)

Would you like me to:

* Analyze the files and extract key fields?
* Help you design the tool in Python, Excel, or another platform?
* Create a research proposal or technical plan for this?

Let me know how you’d like to proceed!

Ask ChatGPT

**You said:**

design tools in python and create a research proposal and technical plan

**ChatGPT said:**

Updated saved memory

Excellent! Let’s break this into two parts:

**✅ Part 1: Python-Based Tool Design – "EV vs ICE Cost Comparison"**

**⚙️ Overview**

You will build a Python-based command-line or web tool that:

* Takes trip distance and vehicle details as input.
* Uses datasets to calculate **trip cost for EV** and **trip cost for ICE**.
* Outputs a cost comparison and potential CO₂ savings.

**🧰 Tool Inputs**

| **Input** | **Description** |
| --- | --- |
| EV Model | Selected from ev\_vehicles.csv |
| Distance | Total trip distance (in km) |
| Electricity Price | From charging\_stations.csv or custom |
| ICE Fuel Efficiency | Default (e.g. 7 L/100 km) or user input |
| Fuel Price | Default (e.g. $2.00/L) or user input |

**📤 Tool Outputs**

| **Output** | **Description** |
| --- | --- |
| EV Trip Cost | Computed from energy usage and electricity price |
| ICE Trip Cost | Computed from fuel usage and fuel price |
| Cost Difference | Savings from using EV |
| CO₂ Emission Estimate (optional) | Estimated emissions from ICE vs EV |

**🧪 Sample Calculation Logic (Python pseudocode)**

python

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ev\_efficiency = 0.15 # kWh/km (from ev\_vehicles.csv)

electricity\_price = 0.30 # $/kWh (from charging\_stations.csv)

distance = 100 # km

ev\_cost = ev\_efficiency \* distance \* electricity\_price

ice\_fuel\_efficiency = 7.0 # L/100km

fuel\_price = 2.0 # $/L

ice\_cost = (ice\_fuel\_efficiency / 100) \* distance \* fuel\_price

savings = ice\_cost - ev\_cost

**📦 Project File Structure**

CopyEdit

cost\_comparison\_tool/

│

├── ev\_vehicles.csv

├── charging\_stations.csv

├── app.py

├── utils.py

├── requirements.txt

└── README.md

**🔧 Python Packages Needed**

* pandas: for reading and processing CSV data
* argparse or streamlit: for command-line or web input
* matplotlib or plotly: for optional visualization

**🧾 Part 2: Research Proposal + Technical Plan**

**📜 Research Proposal (Summary)**

**Title:**

**EV vs ICE Cost Comparison Tool using Real-World Vehicle and Charging Station Data**

**Objective:**

To develop a data-driven tool that enables users to compare the cost of EV and ICE vehicle trips using real-world data on vehicle efficiency, fuel prices, and charging station rates.

**Research Questions:**

* How does trip cost vary between EVs and ICE vehicles for the same distance?
* How do location-based electricity and fuel prices impact cost efficiency?
* Can users make more informed decisions based on real-time or local benchmarks?

**Significance:**

This tool supports environmental and economic awareness and helps consumers transition to electric mobility by presenting transparent, data-backed comparisons.

**📐 Technical Plan**

| **Phase** | **Task** | **Output** |
| --- | --- | --- |
| 1. Data Collection | Load and inspect ev\_vehicles.csv and charging\_stations.csv | Cleaned datasets |
| 2. Feature Extraction | Get relevant fields: efficiency, battery size, price/kWh, etc. | Mapped data for analysis |
| 3. Model Logic | Build formulas for EV and ICE trip cost calculations | Cost engine |
| 4. Tool Development | Build CLI or web tool (with Streamlit) | Interactive comparison |
| 5. Testing | Run edge cases and real-world trip examples | Verified outputs |
| 6. Reporting | Summarize findings, charts, savings scenarios | Documentation/report |

**📊 Evaluation Metrics**

* Accuracy of cost estimates
* Usability (input/output clarity)
* Comparison effectiveness
* Optional: CO₂ saved per trip

Would you like:

* The **full working Python script** (Streamlit or CLI)?
* A **visual report or dashboard** layout?
* A **PDF proposal document** formatted for academic/industry use?

Let me know how you'd like to proceed, and I’ll get building.