ELECTRIC VEHICLE POPULATION ANALYSIS

A Data-Driven Exploration of EV Trends, Performance & Insights

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Project Overview & Objectives

✅Analyzed electric vehicle trends across Washington State.

✅Explored variations in Make, Model, Type, and Performance.

✅Investigated regional EV adoption using geographic data.

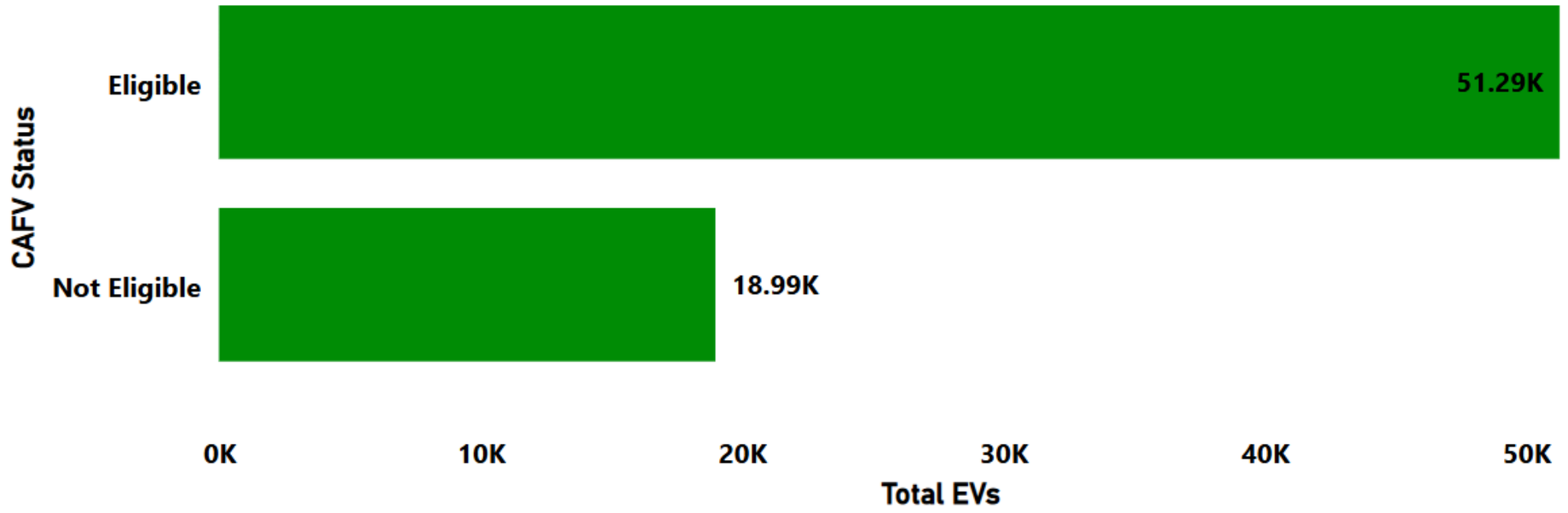
✅Identified actionable insights from CAFV eligibility & electric range.

✅Supported data-driven decisions and EV policy awareness.

Data Preparation & Cleaning Process

- Raw Dataset sourced from: [DATA.GOV – Public Government Dataset].
- SQL (MySQL): Data Cleaning, Filtering, Column Renaming, and initial summaries.
- Jupyter Notebook (NumPy, Pandas, SQLAlchemy, Matplotlib, Seaborn): Clean Data Inspection, EDA, Feature Engineering.
- Power BI (Desktop, DAX): Visualizing, Storytelling, and Report Layout.
- Final cleaned dataset: 2,47,344 → 97,690 → 70,277 EV records.

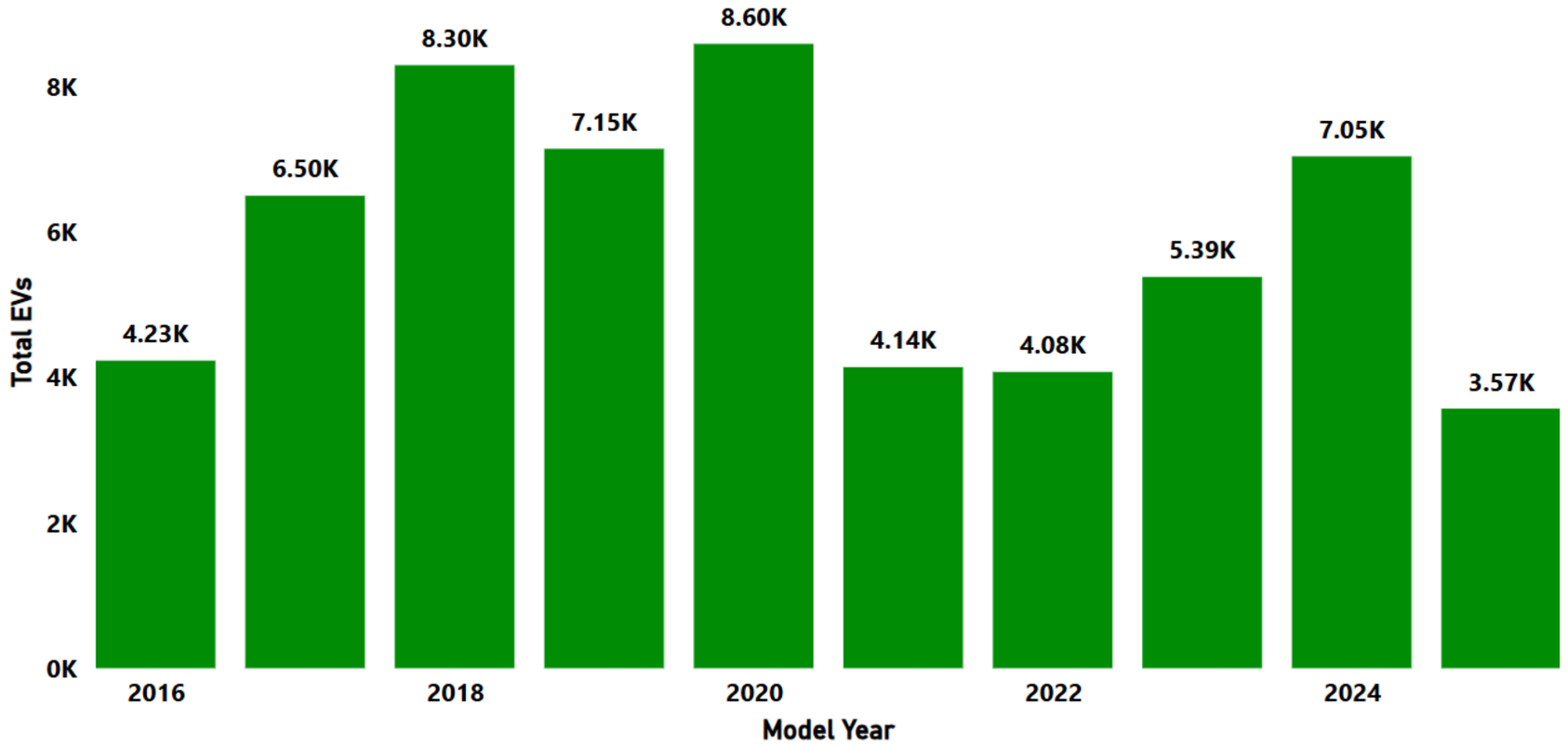
CAFV Eligibility Status



- Over 51K EVs (~72%) are CAFV Eligible, meaning they qualify for clean alternative fuel benefits.
- Around 19K vehicles (~28%) are Not Eligible, mainly due to low electric range.

This insight reflects a strong alignment between EV specs and eco-policy standards in Washington State.

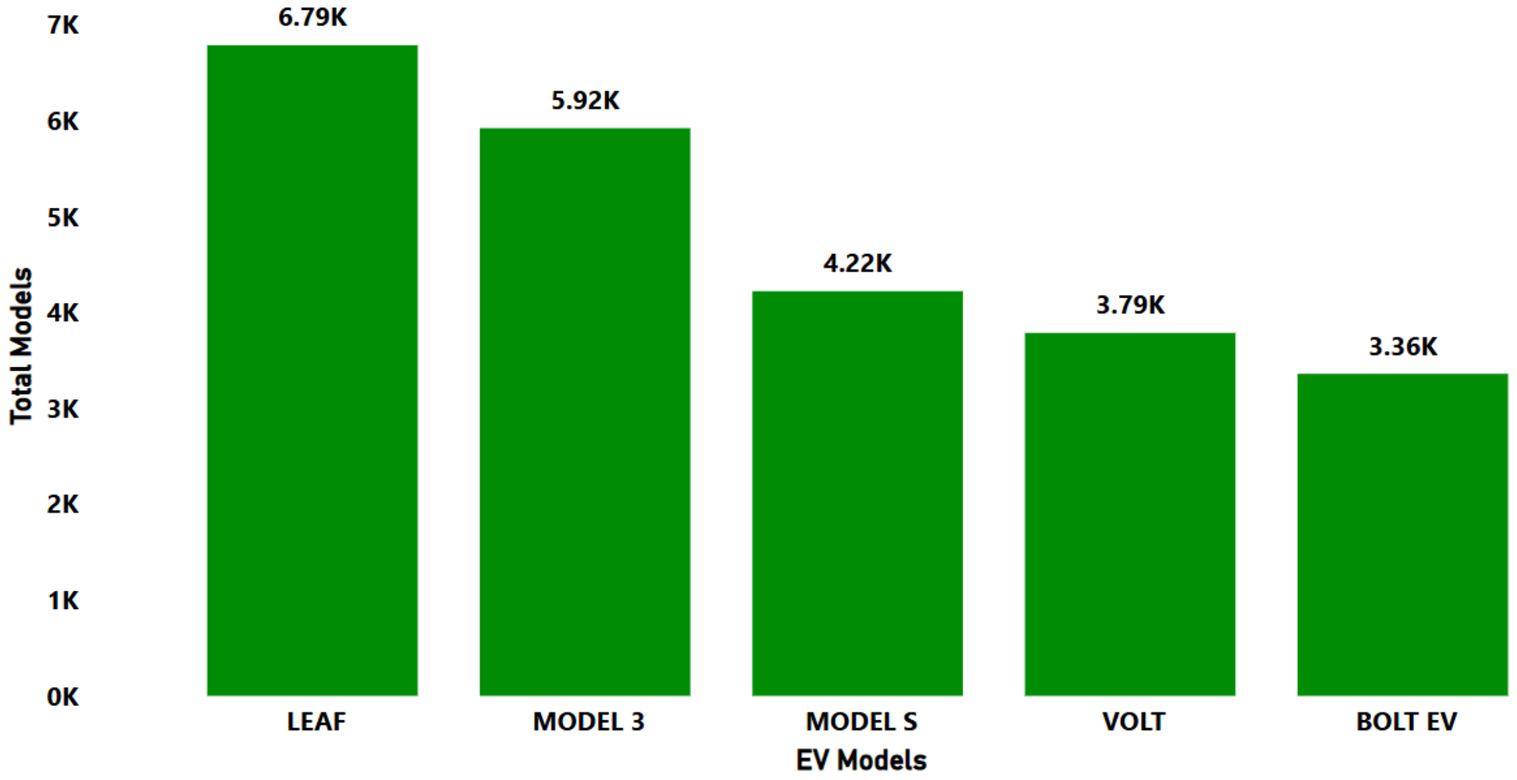
EV Growth by Model Year



- EV adoption grew rapidly from 2016 to 2020, peaking in 2020 with over 8.6K vehicles.
- A slight decline was observed post-2020, possibly due to supply chain disruptions and market adjustments.

This trend highlights a rising demand for EVs over time,
with policy and tech advancements playing a key role.

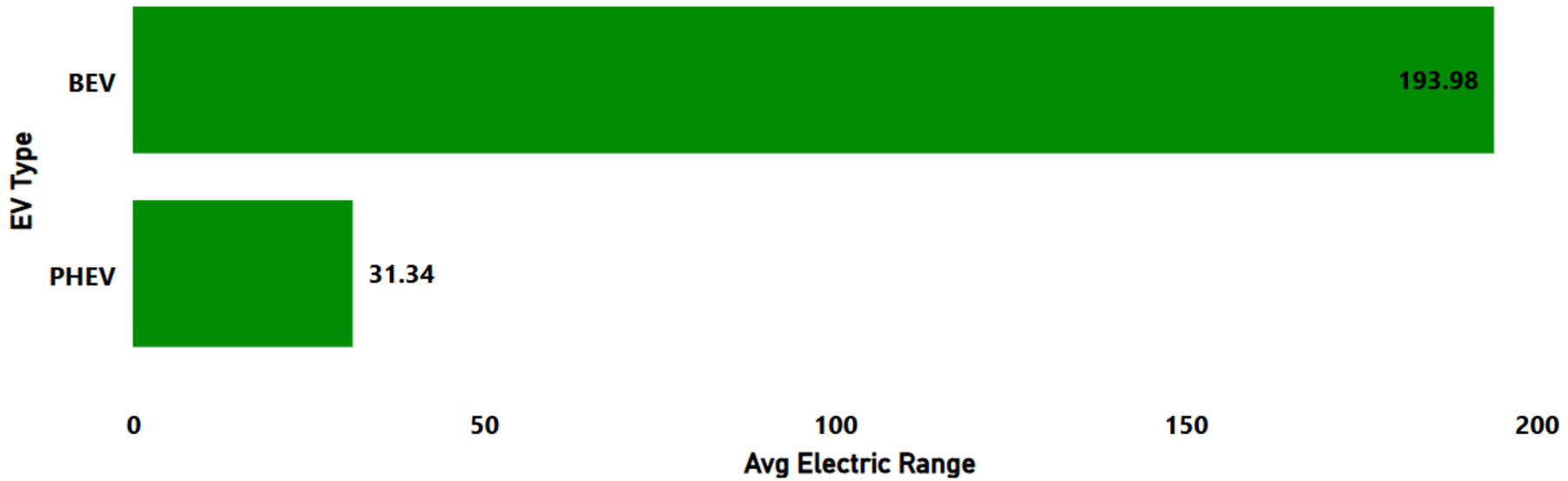
Top 5 EV Models in Washington



- Nissan LEAF leads the market with 6.79K units, followed by Tesla Model 3 with 5.92K.
- Tesla dominates the premium EV segment with multiple top-selling models (Model 3 & Model S).

These models reflect a balance of affordability, performance, and brand trust among EV users.

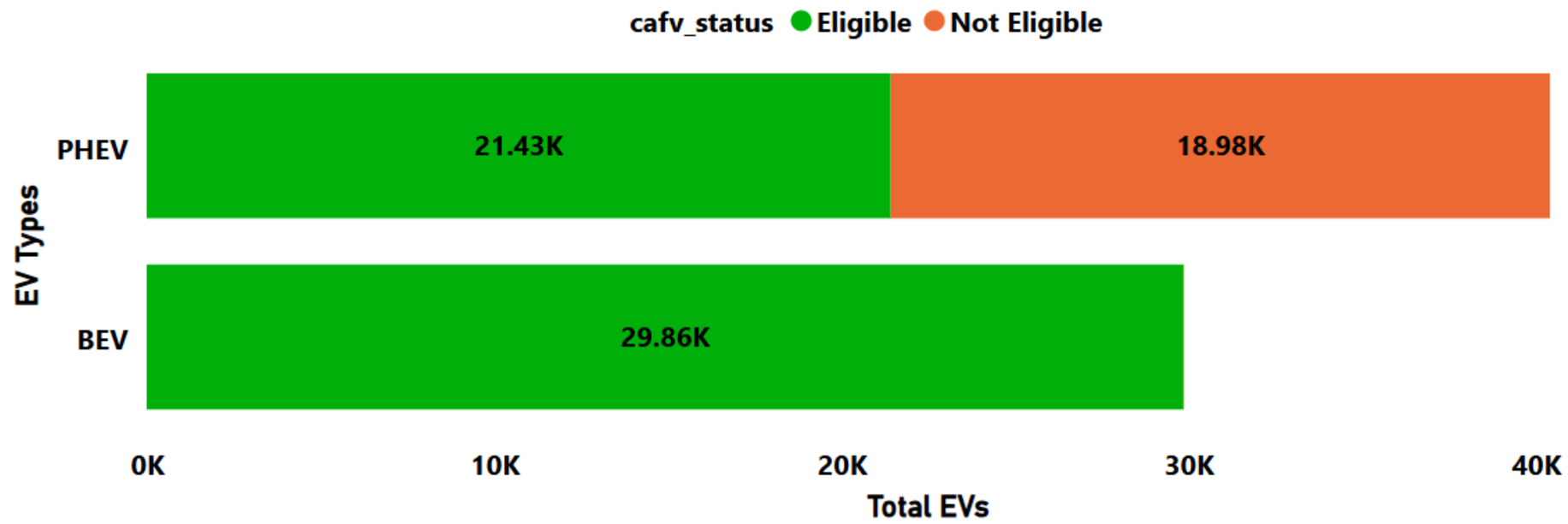
Average Electric Range by EV Type



- BEVs (Battery EVs) offer a significantly higher average range (~194 miles) than PHEVs (~31 miles).
- This range gap clearly indicates that BEVs are better suited for long-distance travel, while PHEVs are ideal for shorter commutes.

The insight reinforces why BEVs dominate among CAFV-eligible vehicles.

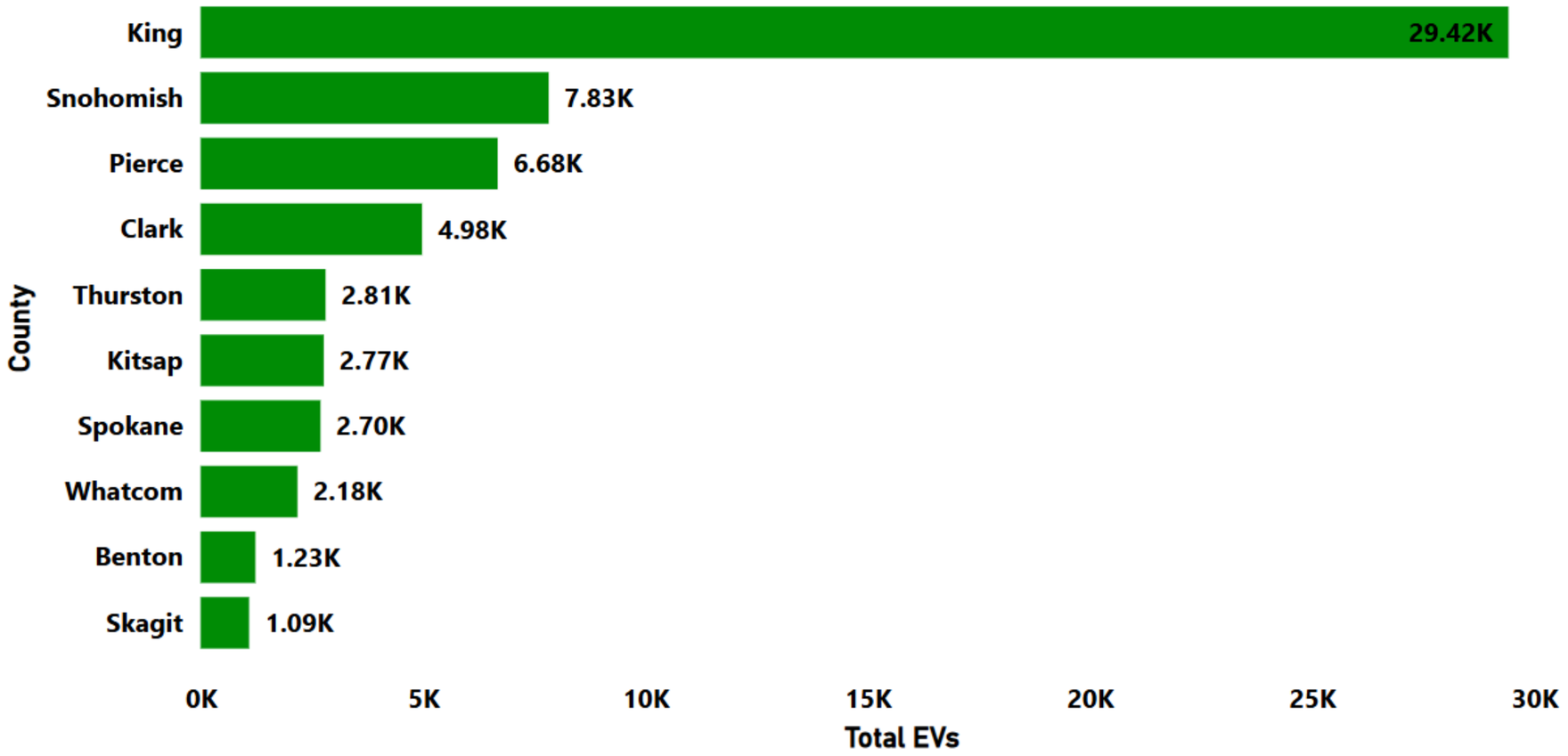
EV Types by CAFV Eligibility



- 100% of BEVs are CAFV Eligible, while only ~52% of PHEVs meet eligibility criteria.
- This shows that BEVs align more strongly with state policy standards compared to PHEVs.

Why? Because, PHEVs often have lower electric ranges, impacting their qualification.

Top 10 Counties by EV Count



- King County leads significantly with about 29K EVs, more than 3× the second place.
- Snohomish, Pierce, and Clark follow, showing strong EV adoption across urban corridors.

Suggests metro areas and utility infrastructure play a crucial role in EV penetration.

Overall Insights & Patterns

- Tesla dominates the EV market with significant leads in both Make and Model counts.
- Battery Electric Vehicles (BEVs) show much higher electric range than Plug-in Hybrids, making them better long-distance choices.
- A sharp rise in EVs was observed around 2018–2020, followed by a decline in newer years — possibly due to registration delays or market shifts.
- King County alone holds nearly 43% of the total EV population, indicating strong urban EV concentration.
- Most CAFV eligible vehicles also have higher electric range, reinforcing how eligibility supports clean energy goals.

Business Recommendations

✅ Focus on High-Performing EV Types:

Invest in promoting BEVs over PHEVs due to their significantly higher electric range and clean energy impact.

✅ Target Urban EV Expansion:

Strengthen EV infrastructure in non-urban counties like Benton, Skagit, and Whatcom to balance adoption across regions.

✅ Boost CAFV Eligibility Awareness:

Educate manufacturers and buyers on eligibility criteria — as it heavily correlates with better EV performance and incentives.

✅ Incentivize Proven Models & Makes:

Support top-performing models like Nissan Leaf, Tesla Model 3, and others with strong usage and range data.

✅ Monitor Yearly Registration Trends:

Investigate the post-2020 dip in EV numbers — possibly due to delayed data or slowing consumer interest — to act proactively.

Conclusion & Key Takeaways

- **EV Growth is Real, But Uneven:**

While EV adoption has increased significantly, especially in urban hubs like King County, growth remains inconsistent across regions and years.

- **Performance Drives Eligibility:**

Clean Alternative Fuel Vehicle (CAFV) eligibility is closely tied to electric range, EV type, and model, which is reinforcing the need for high-performing EVs.

- **Certain Makes & Models Lead the Market:**

Tesla, Chevrolet, Nissan, and their flagship models dominate registrations, highlighting consumer trust and performance reliability.

- **Data Reveals Actionable Patterns:**

Patterns in EV range, type, and geographic spread provide strong foundations for targeted policies and infrastructure planning.

Thank You

Nibedita Sahu

Let’s spark a data-driven conversation around EV adoption!