ELECTRIC VEHICLE POPULATION ANALYSIS

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

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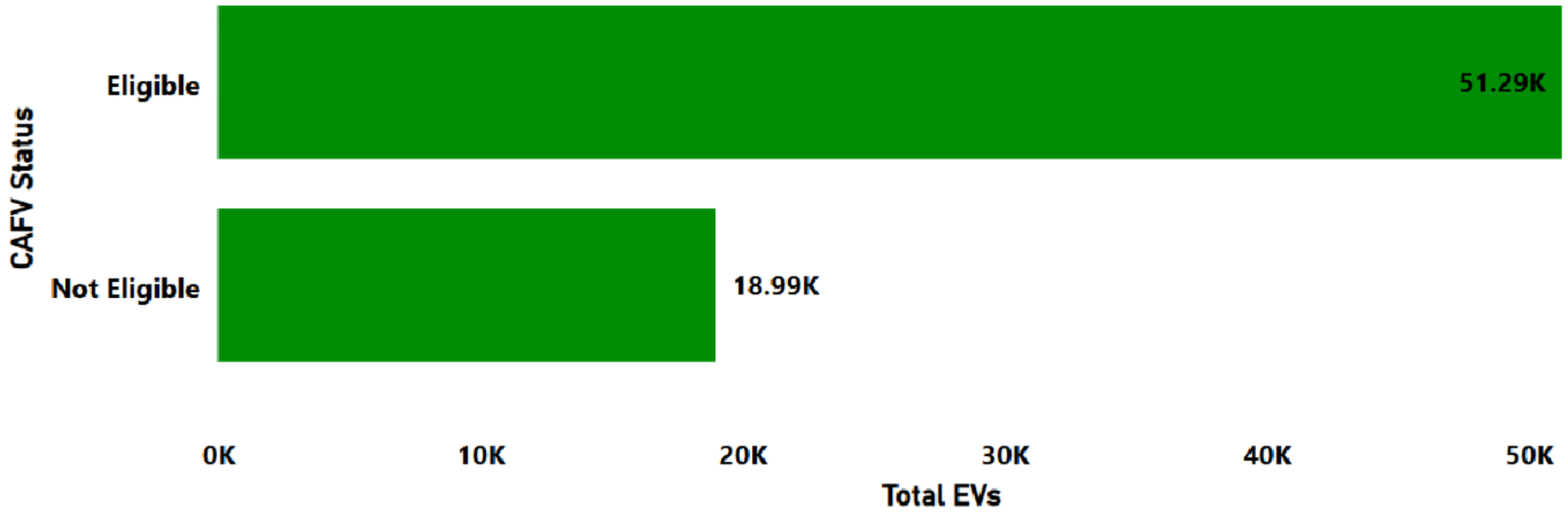
Project Overview & Objectives

- ✅ 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.

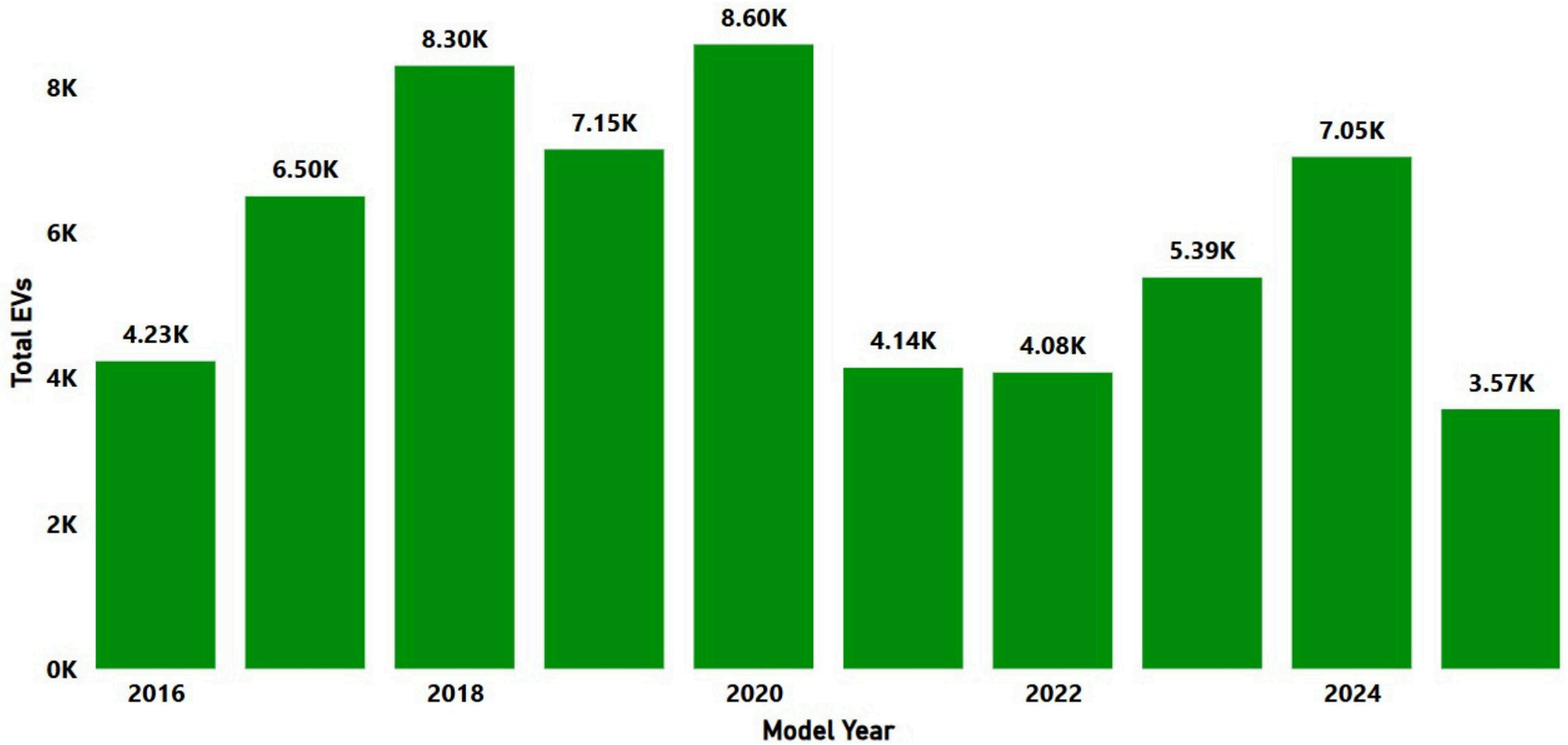
CAFV Eligibility Status



- *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.

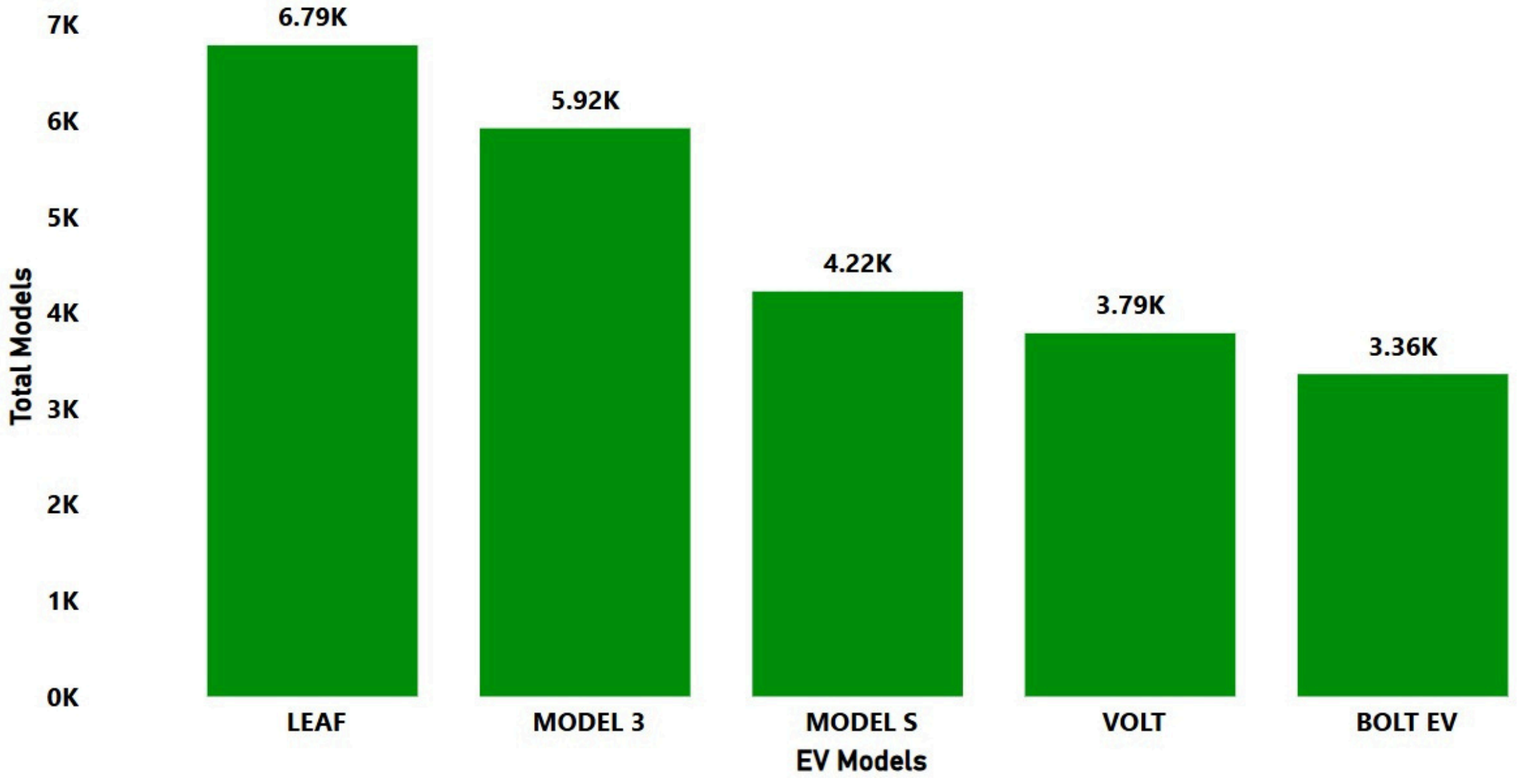
EV Growth by Model Year



- *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 trendhighlights arisingdemand forEVs over time, with policy and tech advancements playing a key role.

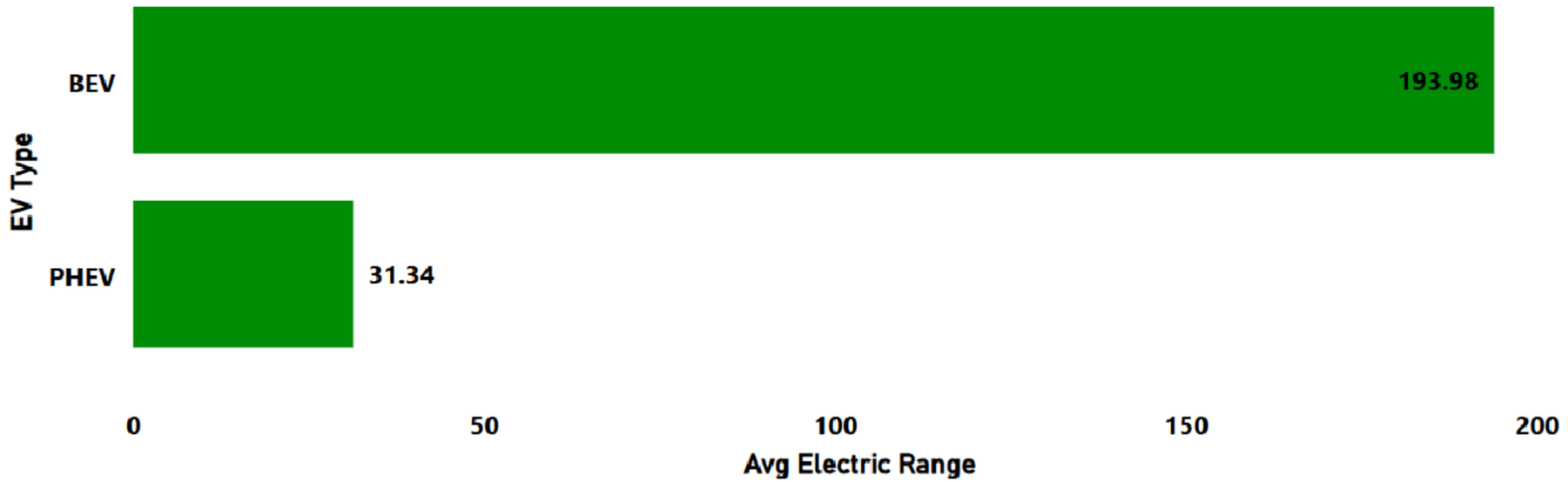
Top 5 EV Models in Washington



- *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).*

Thesemodels reflectabalance ofaffordability, performance, and brand trust among EV users.

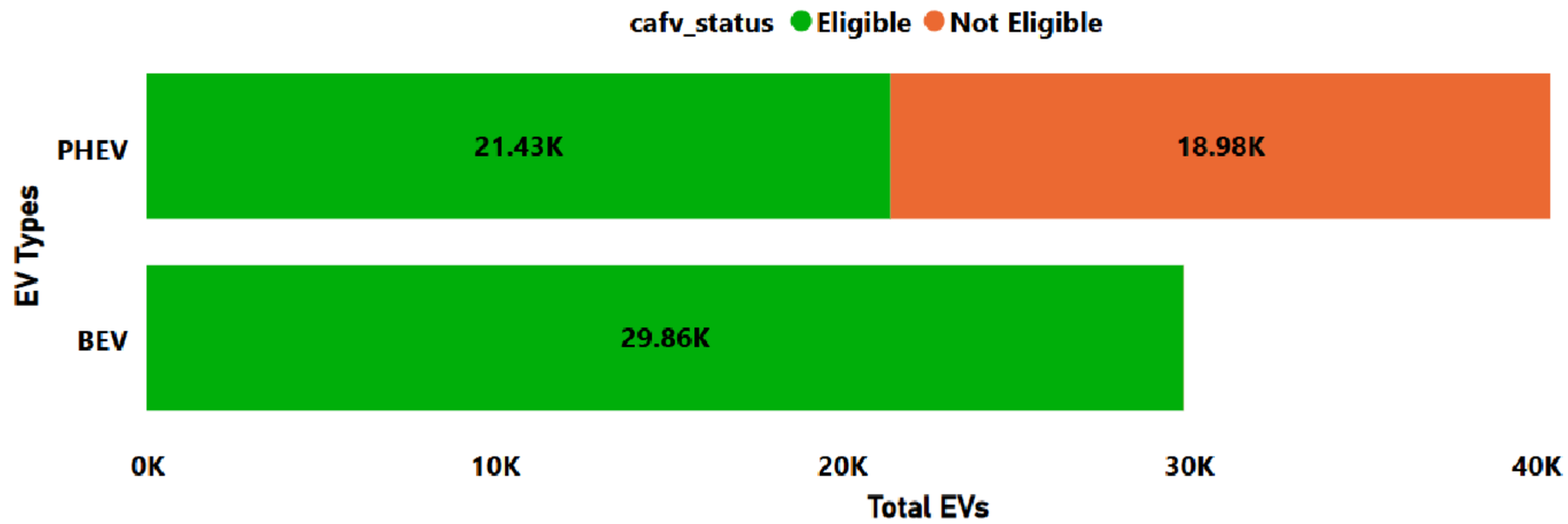
Average Electric Range by EV Type



- *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.

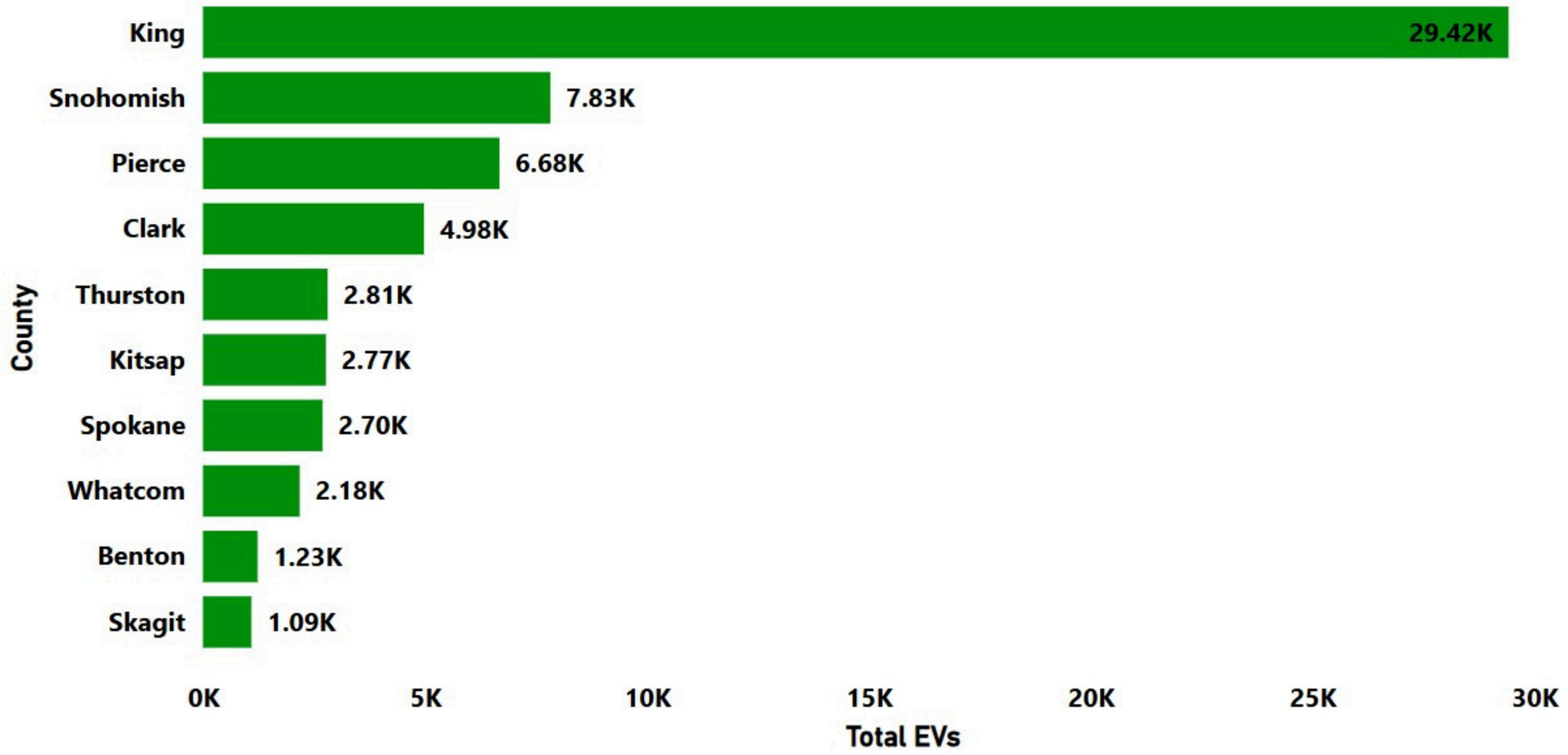
EV Types by CAFV Eligibility



- *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:**

StrengthenEV infrastructureinnon-urban counties like Benton, Skagit, and Whatcom to balance adoptionacross regions.

✅ **Boost CAFV Eligibility Awareness:**

Educatemanufacturersandbuyersoneligibility criteria — as it heavily correlates with better EV performance and incentives.

✅ **Incentivize Proven Models & Makes:**

Supporttop-performingmodelslikeNissanLeaf, Tesla Model 3, and others with strong usage and rangedata.

✅ **Monitor Yearly Registration Trends:**

Investigate the post-2020dipinEVnumbers— possibly due to delayed data or slowing consumer interest — to act proactively.

Conclusion & Key Takeaways

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

While EVadoptionhasincreasedsignificantly, especially in urban hubs like King County, growth remainsinconsistentacrossregions and years.

- **Performance Drives Eligibility:**

CleanAlternative FuelVehicle (CAFV)eligibility is closely tied to electric range, EV type, andmodel,which isreinforcing theneedforhigh-performing EVs.

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

Tesla,Chevrolet, Nissan,andtheir flagshipmodelsdominate registrations, highlighting consumertrust andperformance reliability.

- **Data Reveals Actionable Patterns:**

Patterns in EVrange,type, andgeographicspread provide strong foundations for targeted policies and infrastructure planning.

Thank You

SK SHANE ALAM

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