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Asia Pacific Automotive TCO

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Asia Pacific Automotive ICE vs EV Total Cost of Ownership

OBJECTIVES

- Global Automotive TCO Program ICE vs. EV for US, EU and AP. Project scope outline was updated for each region.
- This report is the total cost of ownership program for AP and focuses on the understanding automotive cost of ownership in China, Japan and Korea comparable internal combustion engine vehicles and electric vehicles

AP AUTOMOTIVE TOTAL COST OF OWNERSHIP SCOPE

- Three different geographies: China, Japan and Korea
 - Subsidies
 - Utility rates
 - Differential Costs
- Vehicles – Mid-size and Luxury – Included in Study
 - Small Cars
 - Japan – Honda Fit and Nissan Leaf SV
 - Korea – Kia Rio LX and Nissan Leaf SV
 - Mid-size SUV or Car
 - Japan – Toyota Rav 4 and Chevy Bolt Premier
 - Korea – Hyundai Accent SEL and VW ID4
 - China – JAC Jaiyue X4 and JAC iEV7L
- Acquisition Cost Options
 - Vehicle Costs
 - Financing Costs
 - Home Charger Station
- Subsidies
 - Country
- Vehicle Life
 - 3 years – short-term owner
 - 7 years – average vehicle ownership
 - 10 years – long-term ownership
- Driving Distance
 - AP average driver ~ 50 Km/day or 18,500 Km/year
 - AP high mileage driver ~130 Km/day or 48,000 Km/year
- Fuel Cost
 - Gasoline high penetration in China, Japan and Korea
 - Home Utility Price – home based charging 90%
 - 100% Public Chargers – no home base charging
- Maintenance
 - Oil and Filter Change
 - Tire Rotation and Replacement
 - Multi-point Inspection
 - Brake Pad & Rotors
 - Other
- Expected Residual Value
 - 3 years – short-term owner
 - 7 years – average vehicle ownership
 - 10 years – long-term ownership
- TCO Categories
 - Vehicle Cost
 - Fuel
 - Maintenance
 - Total

AP AUTOMOTIVE TOTAL COST OF OWNERSHIP PROJECT

- ④ Data was developed from multiple sources and most data points had 3-4 sources to establish accuracy
 - ④ Based on data access for AP we included 9 vehicles listed in the project, market is fairly mature in China for EVs, very early in Korea and Japan
 - ④ Based on availability of electric vehicles only small and medium cars were available in Japan (cumulative total for EVs <100k vehicles) and Korea <37k vehicles
 - ④ EV resale prices based on CN and EU averages, since launches have been recent, data very consistent in all regions
 - ④ Availability of gasoline passenger cars are extremely limited in China
 - ④ Registration and vehicle taxes are combined as most of the countries have linked registration, taxes based on vehicle values and engine displacement
 - ④ China Gasoline License plates are only available by auction – average for last year was >50,000RMB
 - ④ Leasing for personal vehicles is not done widely in AP, so this was eliminated from the analysis
- ④ All data for the project was compiled in the Excel Spreadsheet
 - ④ TCO model was established for modeling of each vehicle
 - ④ Each country was modeled separately in local currency
 - ④ 3, 7- and 10-year models were developed for both low and high mileage
 - ④ For electric vehicles separate models were developed for home charging and public charging
 - ④ Separate tabs in the model were developed to compile each element of the model
 - ④ A table was established for each element for inclusion in each vehicle/country model
- ④ Data sources include OEM websites, Carsalesbase.com, ccarprice.com, watterv2buy.com, country and utility websites and others.

TOTAL COST OF OWNERSHIP AP INSIGHTS AND FINDINGS

- 🕒 In all cases the EV acquisition cost except China the gap was substantial, some nearing 2x based on limited availability of EVs in country, launches will reduce this gap in 2022-2023
- 🕒 Subsidies have a major impact closing the gap for TCO as the AP subsidies can reach between 10-20% of purchase price of EV.
- 🕒 Electricity costs in China are much lower than other countries and regions at 0.545RMB, Korea similar to lowest in US and Japan near highest in US and EU
- 🕒 Public charging infrastructure has above 1M locations in China, 40k in Japan and 30k in Korea, charging is based on flat rate/month or about 1.4x home costs – home base charging is common in parking garages, less private home locations.
- 🕒 Gasoline costs lower than EU, 1.5-2.3x US averages, Gasoline vehicles have lower residual value, In China license plates for ICE are only available by auction – average for last year was >50,000RMB
- 🕒 All EVs have significant advantages due to subsidies, electricity cost advantages, lower maintenance and residual values, except low mileage in Korea where acquisition costs of 2-2.5x.
- 🕒 Home chargers are less expensive in the AP due to higher voltage systems being common and systems cost being lower.
 - 🕒 Fuel from public chargers is more competitive than any other region either with flat rate pricing or average of 1.4x home charger
- 🕒 Fuel from home chargers and vehicle maintenance costs for electric vehicles are about 50% of the internal combustion engine vehicles
 - 🕒 Vehicle taxes in the AP are similar for either by using engine displacement or horsepower, the tax basis for diesel and gasoline remains open for consideration.

SMALL CAR PURCHASE – JAPAN

Honda Fit - ICE

Japan	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	¥795,194	¥1,011,704	¥2,431,760	¥2,540,015	¥2,654,015	¥2,762,270
Fuel Costs	¥502,460	¥1,303,680	¥1,172,407	¥3,041,920	¥1,674,867	¥4,345,600
Maintenance Costs	¥471,000	¥600,000	¥1,099,000	¥1,400,000	¥1,570,000	¥2,000,000
	¥1,768,65					
Total Cost	4	¥2,915,384	¥4,703,166	¥6,981,935	¥5,898,881	¥9,107,870

Nissan Leaf SV – EV – Home Charger

Japan	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	¥1,060,833	¥1,387,388	¥3,262,950	¥3,491,538	¥3,866,782	¥4,030,060
Fuel Costs	¥282,786	¥733,714	¥659,833	¥1,712,000	¥942,619	¥2,445,714
Maintenance Costs	¥232,500	¥300,000	¥542,500	¥700,000	¥775,000	¥1,000,000
Total Cost	¥1,576,119	¥2,421,102	¥4,465,283	¥5,903,538	¥5,584,401	¥7,475,774

MEDIUM CAR PURCHASE – JAPAN

Toyota RAV4 - ICE

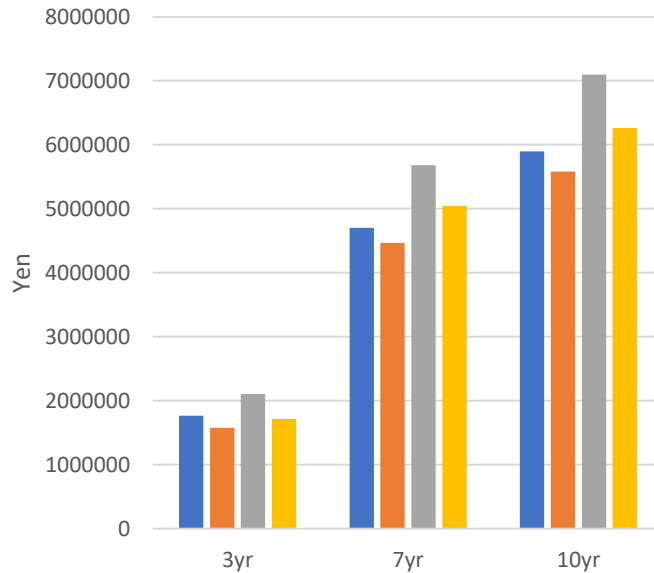
Japan	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	¥973,249	¥1,246,879	¥3,041,475	¥3,178,290	¥3,322,290	¥3,459,105
Fuel Costs	¥661,132	¥1,715,368	¥1,542,640	¥4,002,526	¥2,203,772	¥5,717,895
Maintenance Costs	¥471,000	¥600,000	¥1,099,000	¥1,400,000	¥1,570,000	¥2,000,000
Total Cost	¥2,105,381	¥3,562,247	¥5,683,115	¥8,580,816	¥7,096,062	¥11,177,000

Chevy Bolt Premier - EV

Japan	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	¥1,242,315	¥1,640,165	¥3,937,061	¥4,215,556	¥4,677,836	¥4,876,761
Fuel Costs	¥243,452	¥631,660	¥568,056	¥1,473,874	¥811,508	¥2,105,534
Maintenance Costs	¥232,500	¥300,000	¥542,500	¥700,000	¥775,000	¥1,000,000
Total Cost	¥1,718,267	¥2,571,825	¥5,047,617	¥6,389,430	¥6,264,344	¥7,982,295

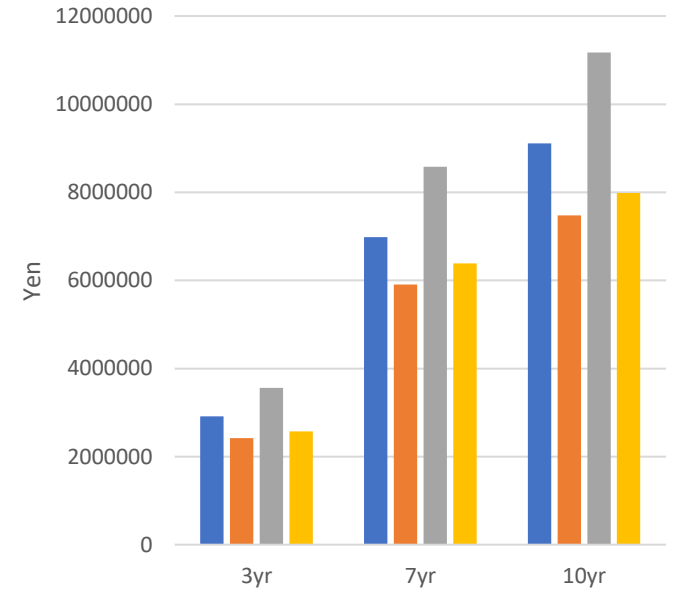
TOTAL COST OF OWNERSHIP - JAPAN

Japan Total Cost of Ownership
Low Mileage



■ ICE Honda Fit ■ EV - Nissan Leaf SV
■ ICE Toyota RAV4 ■ EV VW ID4

Japan Total Cost of Ownership
High Mileage



■ ICE Honda Fit ■ EV - Nissan Leaf SV
■ ICE Toyota RAV4 ■ Chevy Bolt Premier

SMALL CAR PURCHASE – KOREA

Kia Rio SV

Korea	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	₩5,862,047	₩7,654,722	₩18,604,381	₩19,500,719	₩19,769,620	₩20,665,957
Fuel Costs	₩4,913,780	₩12,749,268	₩11,465,488	₩29,748,293	₩16,379,268	₩42,497,561
Maintenance Costs	₩3,975,000	₩5,400,000	₩9,275,000	₩12,600,000	₩13,250,000	₩18,000,000
Total Cost	₩14,750,828	₩25,803,991	₩39,344,869	₩61,849,011	₩49,398,888	₩81,163,518

Nissan Leaf SV – EV – Home Charger

Korea	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	₩11,701,468	₩13,209,941	₩31,869,014	₩34,038,627	₩37,103,102	₩38,652,825
Fuel Costs	₩1,190,135	₩3,087,918	₩2,776,982	₩7,205,143	₩3,967,117	₩10,293,061
Maintenance Costs	₩2,025,000	₩2,700,000	₩4,725,000	₩6,300,000	₩6,750,000	₩9,000,000
Total Cost	₩14,916,603	₩18,997,859	₩39,370,996	₩47,543,770	₩47,820,219	₩57,945,886

MID-SIZE CAR PURCHASE - KOREA

Hyundai Accent SEL - ICE

	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	₩6,450,680	₩8,423,365	₩20,472,525	₩21,458,867	₩21,754,770	₩22,741,113
Fuel Costs	₩4,913,780	₩12,749,268	₩11,465,488	₩29,748,293	₩16,379,268	₩42,497,561
Maintenance Costs	₩3,975,000	₩3,975,000	₩9,275,000	₩9,275,000	₩13,250,000	₩13,250,000
Total Cost	₩15,339,460	₩25,147,633	₩41,213,013	₩60,482,160	₩51,384,038	₩78,488,674

VW – ID4 EV

	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	₩13,273,266	₩16,940,149	₩37,190,429	₩39,757,247	₩43,360,786	₩45,194,227
Fuel Costs	₩1,436,960	₩3,728,329	₩3,352,907	₩8,699,433	₩4,789,867	₩12,427,762
Maintenance Costs	₩2,025,000	₩2,700,000	₩4,725,000	₩6,300,000	₩6,750,000	₩9,000,000
Total Cost	₩16,735,226	₩23,368,477	₩45,268,335	₩54,756,680	₩54,900,652	₩66,621,989



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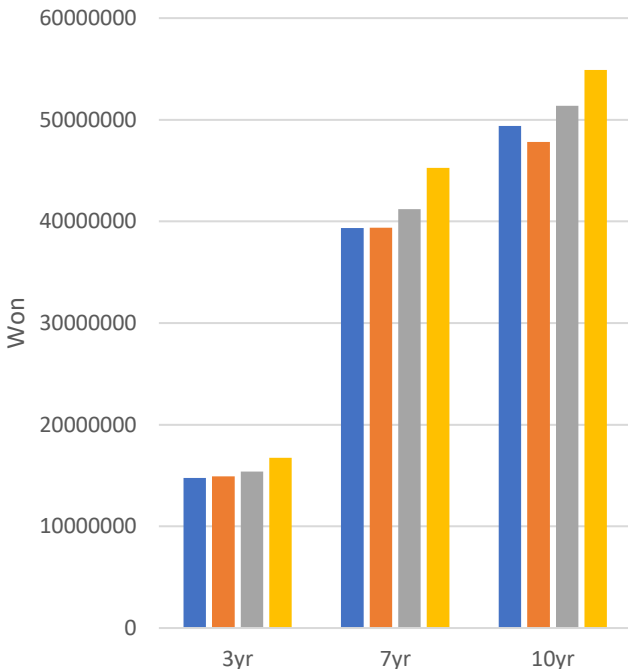
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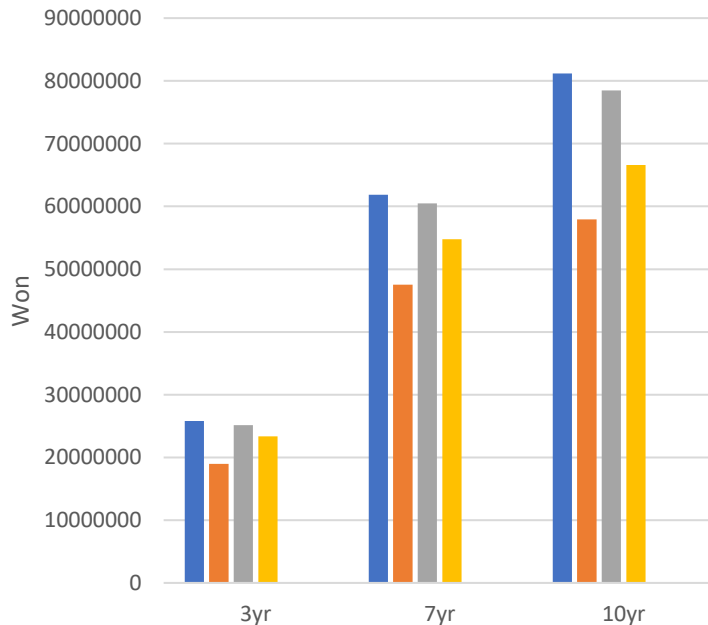
TOTAL COST OF OWNERSHIP - KOREA

Korea Total Cost of Ownership Low Mileage



■ ICE Rio SV ■ EV Nissan Leaf SV
■ ICE Hyundai Accent SEL ■ EV VW ID4

Korea Total Cost of Ownership High Mileage



■ ICE Rio SV ■ EV Nissan Leaf SV
■ ICE Hyundai Accent SEL ■ EV VW ID4



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MID-SIZE CAR PURCHASE - CHINA

JAC Jaiyue X4 - ICE

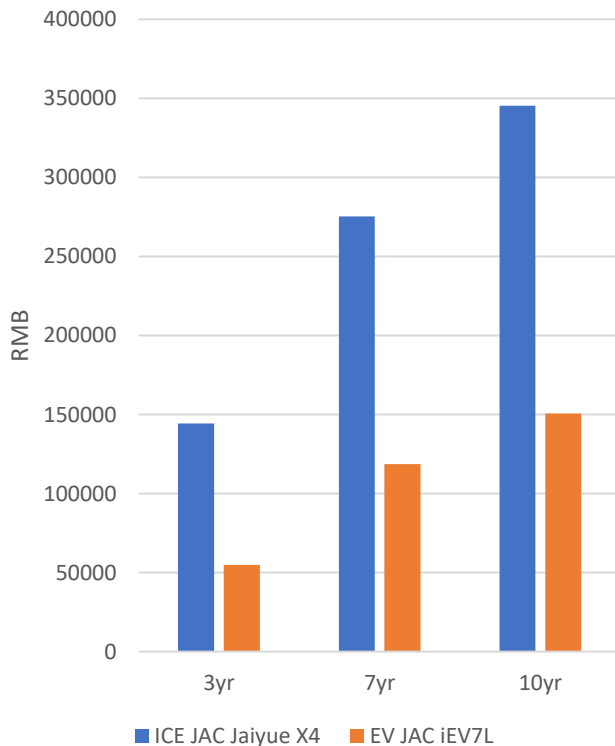
	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	82,378	89,658	130,710	134,350	138,718	142,358
Fuel Costs	37,975	98,529	88,607	229,900	126,582	328,429
Maintenance Costs	24,000	24,000	56,000	56,000	80,000	80,000
Total Cost	144,352	212,186	275,317	420,250	345,300	550,787

JAC iEV7L - EV

	3yr		7yr		10 yr	
	Low Mileage	High Mileage	Low Mileage	High Mileage	Low Mileage	High Mileage
Vehicle Costs	38,612	45,662	80,772	85,707	96,357	99,882
Fuel Costs	4,260	11,054	9,940	25,792	14,201	36,845
Maintenance Costs	12,000	12,000	28,000	28,000	40,000	40,000
Total Cost	54,872	68,715	118,713	139,499	150,558	176,727

TOTAL COST OF OWNERSHIP - CHINA

China Total Cost of Ownership
Low Mileage



China Total Cost of Ownership
High Mileage

