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STUDENT VERSION
Spread of Plug-in-Electric Vehicles

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Abstract: We present data on world sales data of plug-in electric vehicles (PEVs) and request a model on the rate of change in sales over time, leading to prediction as to number of PEVs in the future.

SCENARIO DESCRIPTION

We quote from the source[1]:

"The object of this research is to present the current market status of plug-in-electric vehicles (PEVs) and to predict their future penetration within the world and U.S.markets. The sales values for 2015 show that China leads in yearly sales at 214,283 (triple increase over 2014) followed by Western Europe at 184,500 vehicles sold. The U.S. is third at 115,262 followed by Japan at 46,339 vehicles.These four countries comprise 95% of the global sales market. The world total of EV sales for 2015 is estimated to be 565,668 up from 315,519 in 2014. The data also shows that the overall world growth is 79% and that Western Europe is now ahead of the U.S.in total cumulative vehicles.

"Within the U.S., the PEV sales results for 2015 show that 115,262 vehicles were sold as compared to 118,882 vehicles in 2014 which is lower by 3%.However, sales for the first 6 months of 2016 are 19% greater than the sales for the same period in 2015. On a state basis, California is the largest market with about 55% of the sales for 2015 and a growth of 4.6% in 2015. The total cumulative number of EVs sold in the U.S. over the six year lifetime is now at more than 400,000 vehicles. Looking at the PEV sales data the future world market is extremely bright and is rapidly growing due to the various country policies and to the development of lithium - ion batteries from both a technological and manufacturing standpoint.

"The current work also evaluated the types of barriers to EV usage and the actions, incentives and research to overcome the barriers. The barriers to large scale EV usage are costs, range, availability of charging stations, charging time, battery life and infrastructure, standard and permitting. Results are presented for overcoming each of the barriers that includes incentives and technical progress."

Assignment

Using the data from the Research Results [1] as displayed in Figure 1 create a mathematical model for the rate of change in the number of PEVs over time and then of the predicted number of PEVs over time.

State your assumptions and discuss model limitations.

Research Results

The world historical sales data for 2010 through 2015 (the only years PEVs were available) and in tabular form is as follows:

Table 1- World PEV Sales by Year

	YEARLY TOTALS					CUMULATIVE
	2011	**2012**	**2013**	**2014**	**2015**	**TOTALS**
China	5,202	10,699	15,004	61,984	214,283	307,172
Western Europe	14,160	40,000	71,233	102,565	184,500	412,458
U S	17,763	53,169	97,102	118,882	115,262	402,178
Japan	12,600	20,667	28,716	30,567	46,339	138,889
Canada	275	1,225	931	1,521	5,284	9,236
TOTALS	50,000	125,760	212,986	315,519	565,668	1,269,933

Figure 1. Data from Prediction of Electric Vehicle Penetration[1].

REFERENCES

[1] Electric Vehicle Transportation Center. 2015. University of Central Florida, Cocoa FL USA. *Project 5: Prediction of Electric Vehicle Penetration*. `http://evtc.fsec.ucf.edu/research/project5.html`.