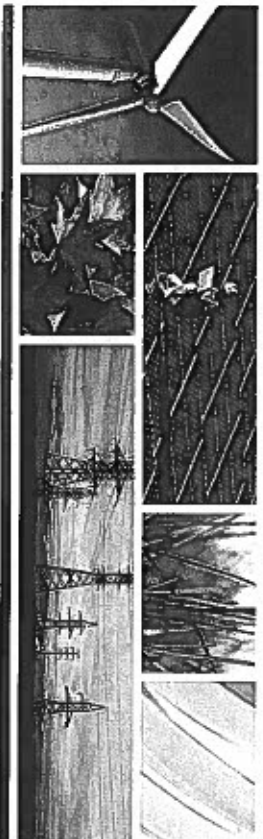


Cost-Benefit Analysis of Plug-in Electric Vehicle Adoption in the AEP Ohio Service Territory

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Energy+Environmental Economics

prices to real 2017\$ before entering them in our model. Future costs or benefits are then discounted to present value dollars using a real discount rate which adjusts the after-tax WACC using an average of AEP Ohio's inflation forecast. The real discount rate for calculating present value of future costs or benefits priced in fixed 2017 dollars is 5.05%.

3.3 PEV Population

Since there is a large degree of uncertainty around any forecast of PEV adoption, E3 created two bookend PEV adoption cases for AEP Ohio's service territory: a Low PEV Adoption case and a High PEV Adoption case. Both begin with the PEV population for Ohio as of January 1st, 2017 (Alliance of Automobile Manufacturers, 2016). AEP Ohio's share of the Ohio's current PEV population is assumed to be 24%, which is the share of Ohio's electricity customers served by AEP Ohio (EIA, 2015).

3.3.1 PEV SALES

We used an S-curve function to model the growth of sales from current levels through 2025:

- + In the Low PEV Adoption case, PEVs are assumed to reach 6% of all personal light-duty vehicle sales in Ohio by the year 2025. This is the level of PEV sales in California as of January 1st, 2017, as a percentage of new vehicles sales in that state (Alliance of Automobile Manufacturers, 2016).
- + In the High PEV Adoption case, PEVs are assumed to reach 15% of all personal light-duty vehicle sales in Ohio by the year 2025. This is the same level of sales that would be required for compliance with the Zero-

Emissions Vehicle (ZEV) Mandate, to which 8 states are currently signatories (Pacific Gas & Electric, 2016).

Beginning in 2030, we assume that the S-curve levels off, and PEV sales grow at a slower 2% per year in both cases.

3.3.2 RETIREMENTS

Each PEV is assumed to have a 10-year useful lifetime, at which point it is replaced in our model with a new PEV of the same type, with associated costs.

3.3.3 RESULTING PEV POPULATION

In order to model the population of PEVs on the road at any given time, we considered both PEV sales and PEV retirements in a stock rollover model. Figure 2 shows the resulting population trajectory for personal light-duty PEVs in AEP Ohio's service territory with a 20-year study horizon. This figure portrays the number of PEVs on the road in any given year. The share of PEVs that are battery electric vehicles (BEVs) or plug-in hybrid electric vehicles (PHEVs) in future years was assumed to be fixed at the population mix seen in Ohio in 2016 of 41% BEVs and 59% PHEVs.