New York ISO
Independent System Operator

Electric Vehicle Forecast

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Electric System Planning Working Group/Load Forecasting Task Force Meeting

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Agenda

- Electric Vehicle (EV) Stock Forecast Assumptions
- EV Stock Forecast
- EV Energy Forecast

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Stock Forecast Policy Drivers

- **Legislation signed by the New York State Governor sets goals of**
  - All new Light Duty Vehicles (LDV) sales by 2035 to be Zero-Emission Vehicles (ZEV)
  - All new Medium-and Heavy-Duty Vehicle (MHD) sales by 2045 to be ZEV
- **Multi State MHD ZEV Memorandum of Understanding (MOU)[1]**
  - All new MHD sales to be 100% ZEV by 2050
  - All new MHD sales to be 30% ZEV by 2030
- **School Buses**
  - All new purchases to be ZEV by 2027
  - The entire fleet (~50,000) to be ZEV by 2035

New York State electric school bus plan

January 6, 2022: In a document the governor released called the State of the State Book, page 161, "Achieve 100% Electric School Buses by 2035," states:

> There are roughly 50,000 school buses on streets in New York State, polluting the communities they operate in with harmful emissions. It is estimated that fully electrifying school buses in New York City alone would be the equivalent of taking nearly 650,000 passenger vehicles off the road.
>
> To improve air quality for New York State's children while also working toward our Climate Act goals, Governor Hochul will propose legislation to require that, by 2027, all new school bus purchases will be zero-emissions, and by 2035, all school buses on the road will be zero-emissions.
>
> Critically, this legislation will ensure that the State provides school aid toward installing electric bus infrastructure, including charging stations, and purchasing or leasing electric buses. Additionally, this legislation will enable school districts to contract for buses for longer than the current five-year limitation, which will expand the ability of school districts to meet this goal.

https://electrek.co/2022/04/08/new-york-state-governor-100-electric-school-buses-2035/

[1] https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf
States: CA, CO, CT, D.C., HI, ME, MD, MA, NJ, NY, NC, OR, PA, RI, VT, WA, VA, NV

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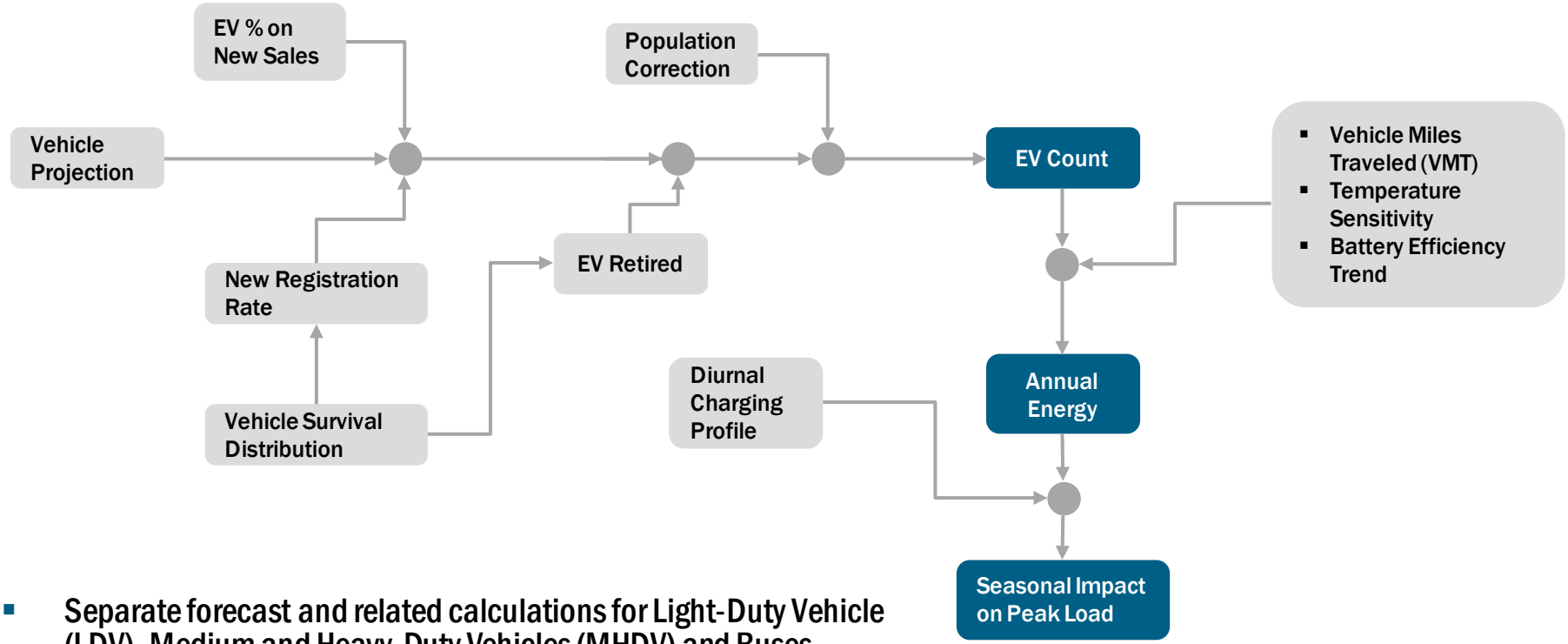
EV Forecast Methodology



- Separate forecast and related calculations for Light-Duty Vehicle (LDV), Medium and Heavy-Duty Vehicles (MHDV) and Buses
- Further separation for Transit and School buses

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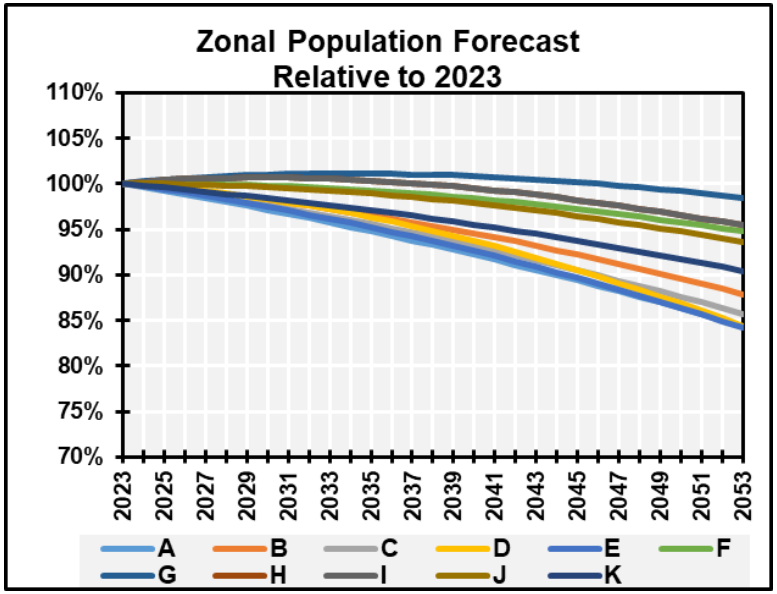
Population Assumption



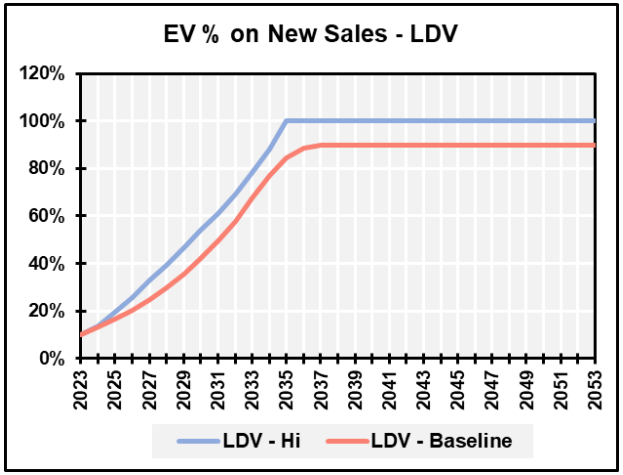
Source: Moody's Analytics

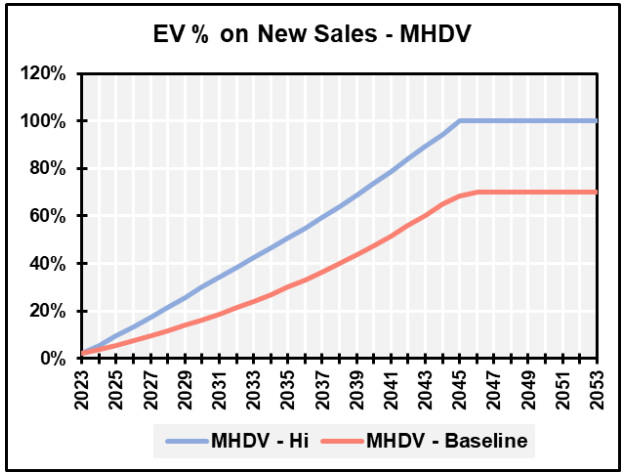
- Downward trend in population forecast
- Constant vehicle per capita assumption
- Downward trend in total vehicles on road

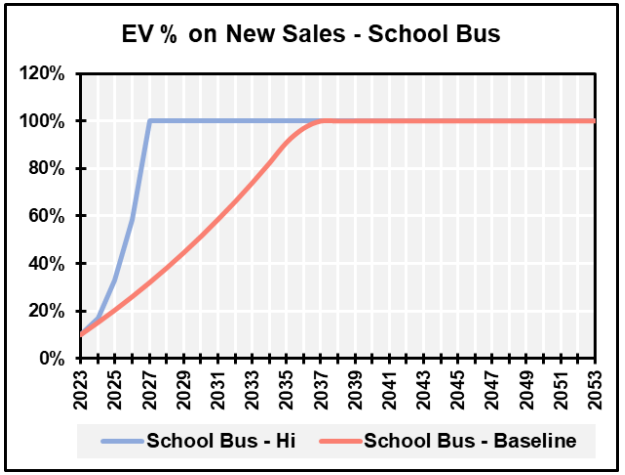
Vehicles on Road (Current Estmate)			
LDV	MHDV	School Bus	Transit Bus
9,752,003	514,064	49,997	12,393

Source: EValuateNY, NY DMV

EV Sales Assumptions







- **Two sales scenarios were created for different vehicle categories**
  - High – assumes all Zero Emission Vehicles (ZEV) to be EVs
  - Baseline – assumes other ZEV technologies for all vehicles categories except School Bus
- **School Bus:**
  - High scenario assumes 100% EV sales target by 2027 and 100% EV fleet by 2035
  - Baseline scenario assumes all EV sales by 2036 and 100% EV fleet by 2045
- **Transit Bus scenarios similar to MHDV category**

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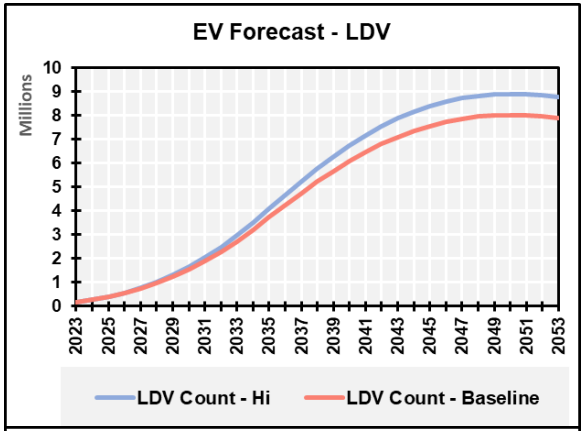
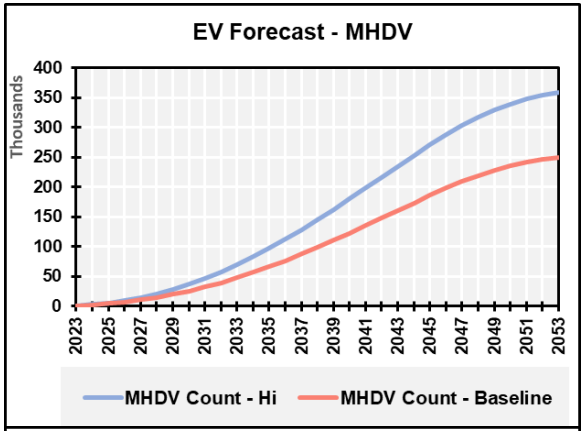
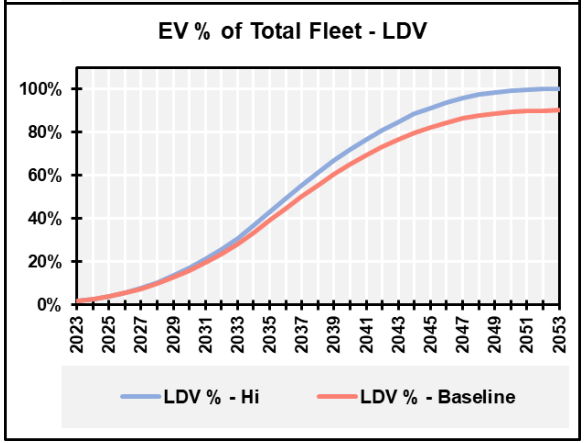
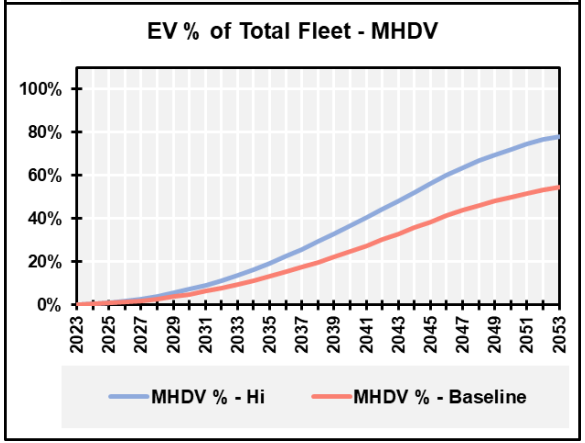
EV Stock Forecast







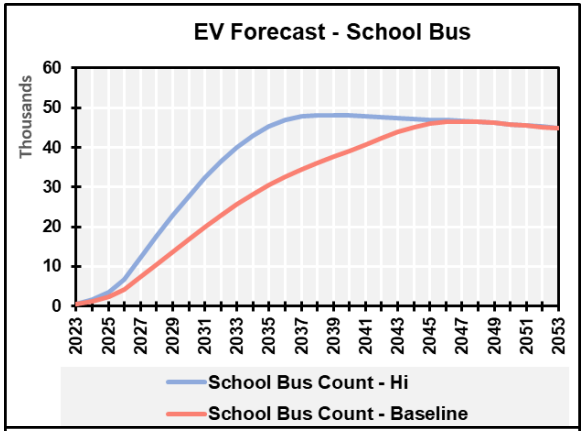


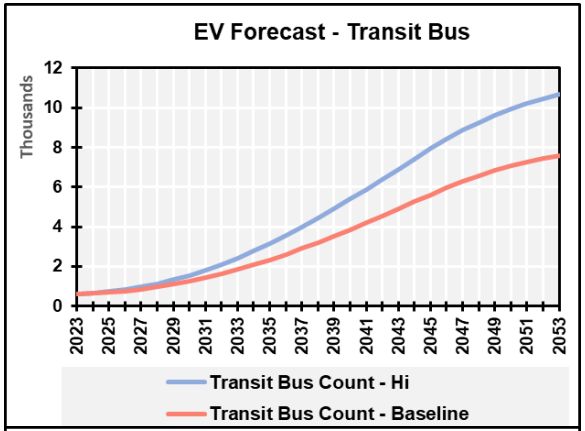
	EV Forecast - LDV			
	High	High %	Baseline	Baseline %
2023	181,418	1.9%	181,418	1.9%
2025	394,893	4.1%	387,649	4.0%
2030	1,663,882	17.2%	1,540,172	16.0%
2035	4,103,385	43.1%	3,732,073	39.2%
2040	6,751,219	71.9%	6,099,468	65.0%
2045	8,403,996	91.3%	7,572,966	82.3%
2050	8,911,529	99.2%	8,027,812	89.4%

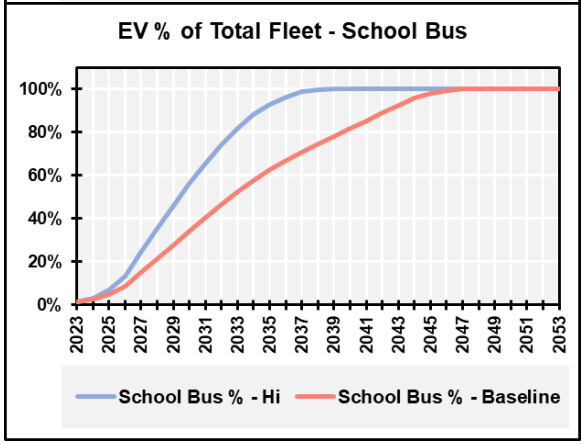
	EV Forecast - MHDV			
Year	High	High %	Baseline	Baseline %
2023	965	0.2%	965	0.2%
2025	5,513	1.1%	4,313	0.8%
2030	36,923	7.3%	25,666	5.1%
2035	97,303	19.4%	66,284	13.2%
2040	180,533	36.6%	122,773	24.9%
2045	271,606	56.2%	186,355	38.6%
2050	339,597	72.2%	235,573	50.1%

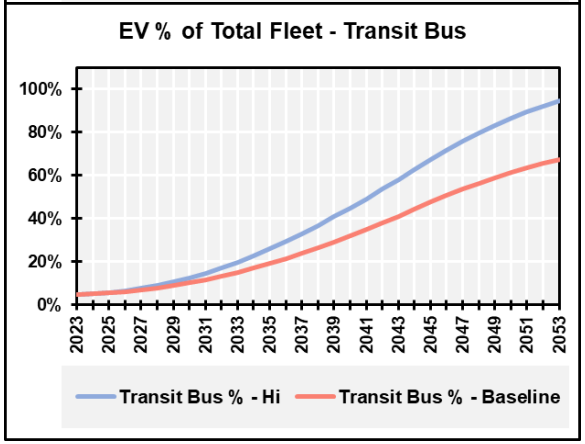
These are preliminary estimates and subject to revision prior to Gold Book forecast

EV Stock Forecast (cont'd)









	EV Forecast - School Bus			
Year	High	High %	Baseline	Baseline %
2023	619	1.2%	619	1.2%
2025	3,430	6.9%	2,423	4.9%
2030	27,762	56.2%	16,904	34.2%
2035	45,284	92.8%	30,473	62.5%
2040	48,007	100.0%	39,191	81.6%
2045	47,055	100.0%	46,089	97.9%
2050	45,871	100.0%	45,856	100.0%

	EV Forecast - Transit Bus			
Year	High	High %	Baseline	Baseline %
2023	608	4.9%	608	4.9%
2025	728	5.9%	697	5.6%
2030	1,559	12.7%	1,260	10.2%
2035	3,163	26.0%	2,338	19.2%
2040	5,401	45.0%	3,856	32.1%
2045	7,935	67.2%	5,621	47.6%
2050	9,962	86.3%	7,075	61.3%

These are preliminary estimates and subject to revision prior to Gold Book forecast

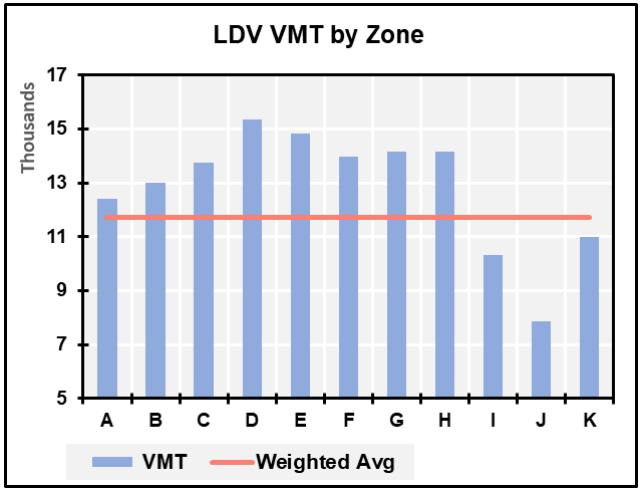
Energy Forecast Assumptions

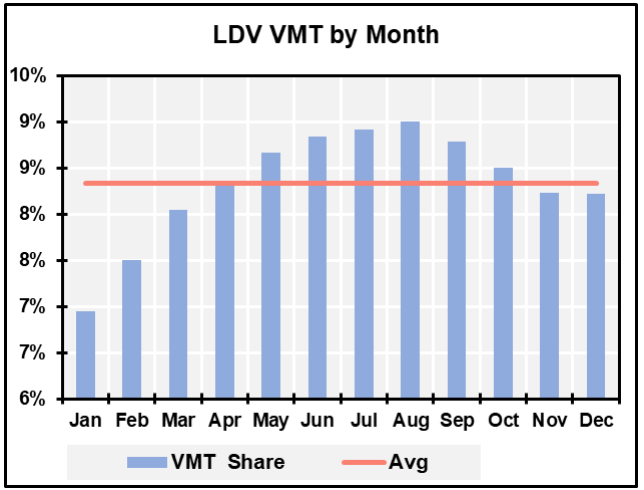
- EV count was converted into energy using:
  - VMT
  - kWh/mile
  - Temperature sensitivity
  - Battery efficiency trend

- For LDV, VMT was varied based on the season and geographic location

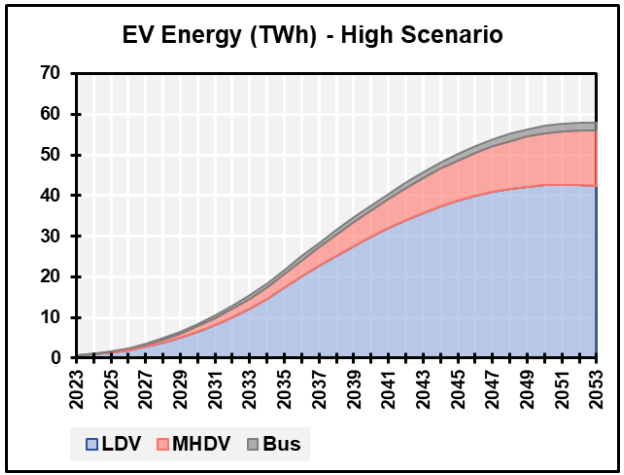
	NYCA Level			
	LDV	MHDV	School Bus	Transit Bus
Annual VMT	11,712	21,300	8,900	43,647
Nominal kWh / mile	0.32	1.4	1.3	2.5
Effective Annual Efficiency	93.2%			

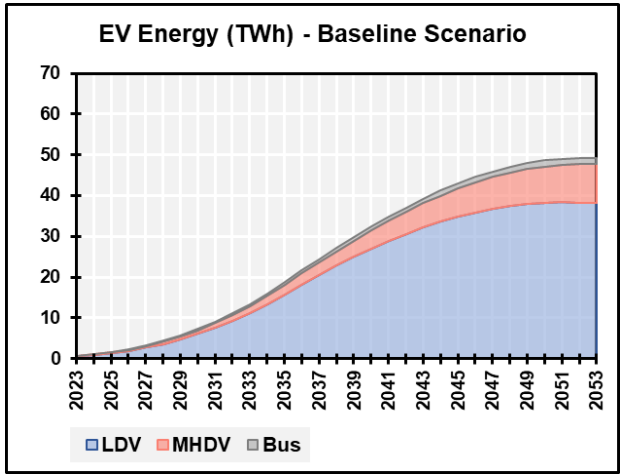
Data sources include:
Bureau of Transportation Statistics, US Department of Energy, Federal Highway Administration, NY DMV, NREL, Alternate Fuel Data Center, Geotab, Battery University, National Grid Electric Highway Study, NYISO weather





Energy Forecast





	EV Energy Forecast (GWh) - High			
Year	LDV	MHDV	Bus	Total
2023	631	32	76	**738**
2025	1,381	183	125	**1,690**
2030	6,567	1,260	530	**8,357**
2035	17,353	3,407	954	**21,714**
2040	29,887	6,484	1,283	**37,654**
2045	38,687	10,003	1,618	**50,307**
2050	42,481	12,822	1,900	**57,204**

	EV Energy Forecast (GWh) - Baseline			
Year	LDV	MHDV	Bus	Total
2023	631	32	76	**738**
2025	1,356	143	109	**1,608**
2030	6,074	876	359	**7,309**
2035	15,775	2,321	667	**18,763**
2040	26,994	4,409	978	**32,381**
2045	34,854	6,863	1,310	**43,026**
2050	38,262	8,895	1,521	**48,678**

These are preliminary estimates and subject to revision prior to Gold Book forecast

Peak Impact Assumption

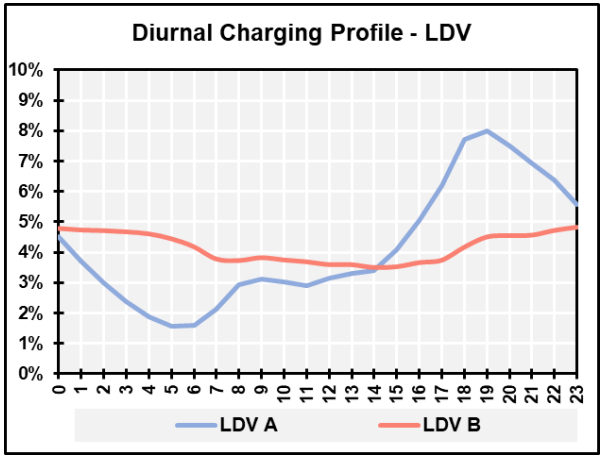
To estimate peak impact

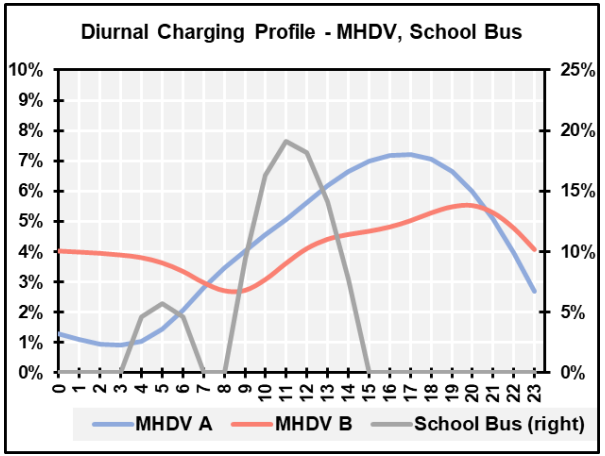
- Convert annual energy into daily consumption by vehicle category and by month
- Apply per unit charging profile to the daily energy consumption to determine EV diurnal load curve

Diurnal charging profiles

- Charging profiles were developed for managed and unmanaged charging
- Current plan is to mix managed and unmanaged charging profiles at varying proportions for different scenarios

Data sources for charging profiles include:
EVI-Pro Lite tool (Alternate Fuel Data Center), National Grid Electric Highway Study, NREL, California DOE





Questions?

New York ISO

Our Mission & Vision

Mission

Ensure power system reliability and competitive markets for New York in a clean energy future

Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation

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