On-road Data Collection and Analysis : 12 Volt Auxiliary Load

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Introduction

- Non-electrified vehicle 12V Auxiliary Load measured
  - Individual accessory load benchmark measurement
  - Benchmark testing over standardized drive cycles
    - Dynamometer testing (Argonne's APRF)
  - On-road operation in fleet application

- Study supports automotive manufacturers
  - Baseline data for potential off-cycle fuel economy credits for advanced technologies used to reduce the energy consumption from vehicle auxiliary loads
  - Other characteristics are quantified from on-road operation (avg. idle time, city/hwy percent, etc.)

- Quarterly and summary fact sheets are published
- SAE World Congress paper in progress

Vehicles Evaluated

- 4 of each model
  - 2012 Honda Civic CNG
    - No fuel pump
    - No electric power steering
    - No heated seats
    - No rear defroster
    - 95 Amp Alternator
  - 2013 Volkswagen Jetta TDI
    - Turbo diesel and dual clutch trans.
    - 140 Amp alternator
  - 2014 Chevrolet Cruze Diesel
    - Turbo diesel and automatic trans.
    - 140 Amp alternator
  - 2014 Mazda 3 i-ELOOP
    - 25V Capacitor system and variable voltage generator (12 – 25V)

Data Collection

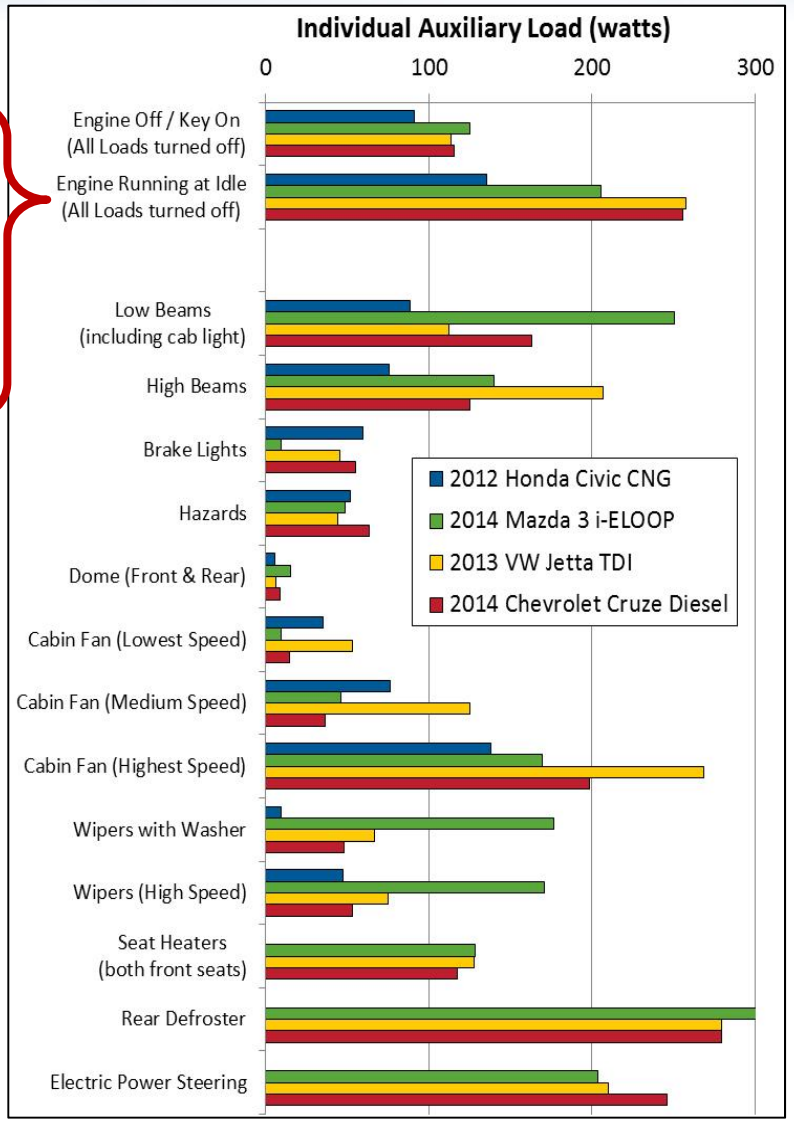
- Leveraged: 16 AVTE vehicles, data acquisition, data transfer system, data storage, and data analysis process
  - Many signal already collected (at 1 Hz): 12V voltage, vehicle speed, ambient temp., A/C on/off, fuel flow, accel pedal position, etc.

- New: Added two current sensors
  - Alternator current
  - 12V Battery current

Individual Accessory Load Benchmarking

- Baseline load, Accessories OFF

Vehicle Model	Steady State Auxiliary Load with Engine Idling and All Accessories Off (watts)
2013 VW Jetta TDI	257.9
2014 Chevy Cruze Diesel	255.6
2012 Honda Civic CNG	135.6
2014 Mazda 3 i-ELOOP	206.0



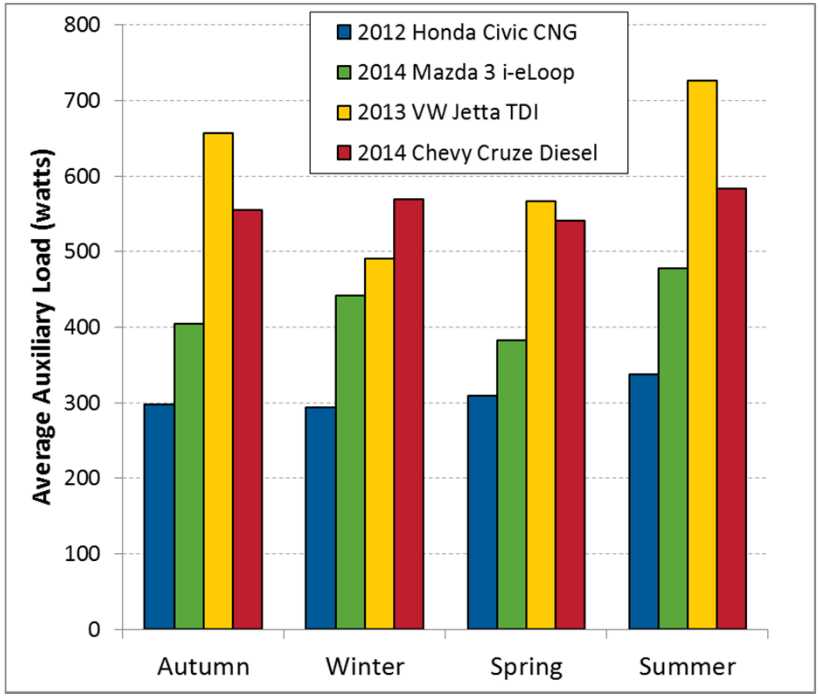
- Individual accessory auxiliary loads were measured during steady state operation
  - Results shown are the difference from "*baseline: all accessories OFF*"
- Not all vehicles have all accessories

Quarterly Average Accessory Load

- Vehicle data collection over a 12 month period

- Highest auxiliary load occurred during Summer for all vehicles

Vehicle Model	Average Auxiliary Load over one year (watts)
2013 VW Jetta TDI	608.0
2014 Chevy Cruze Diesel	570.2
2012 Honda Civic CNG	309.8
2014 Mazda 3 i-ELOOP	425.0



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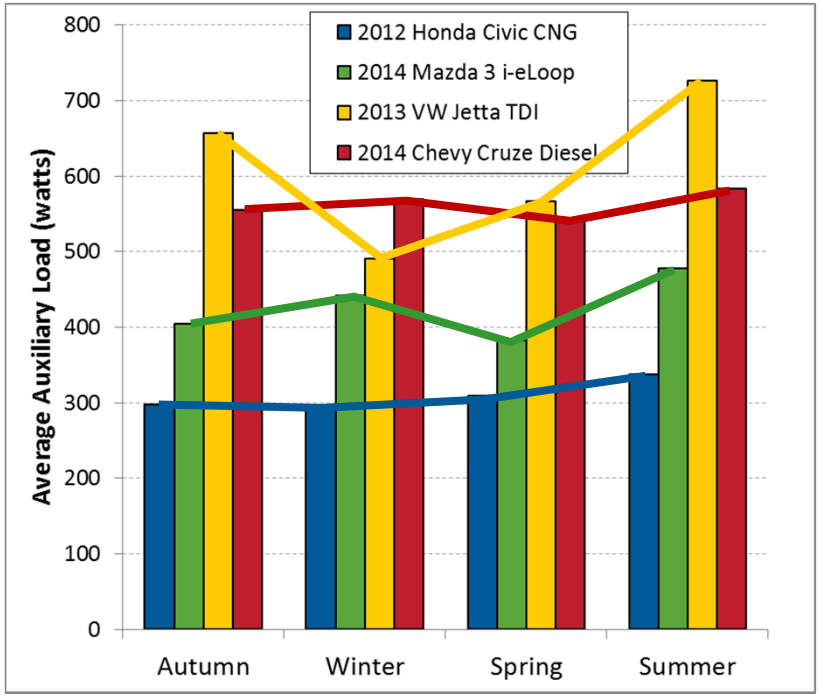
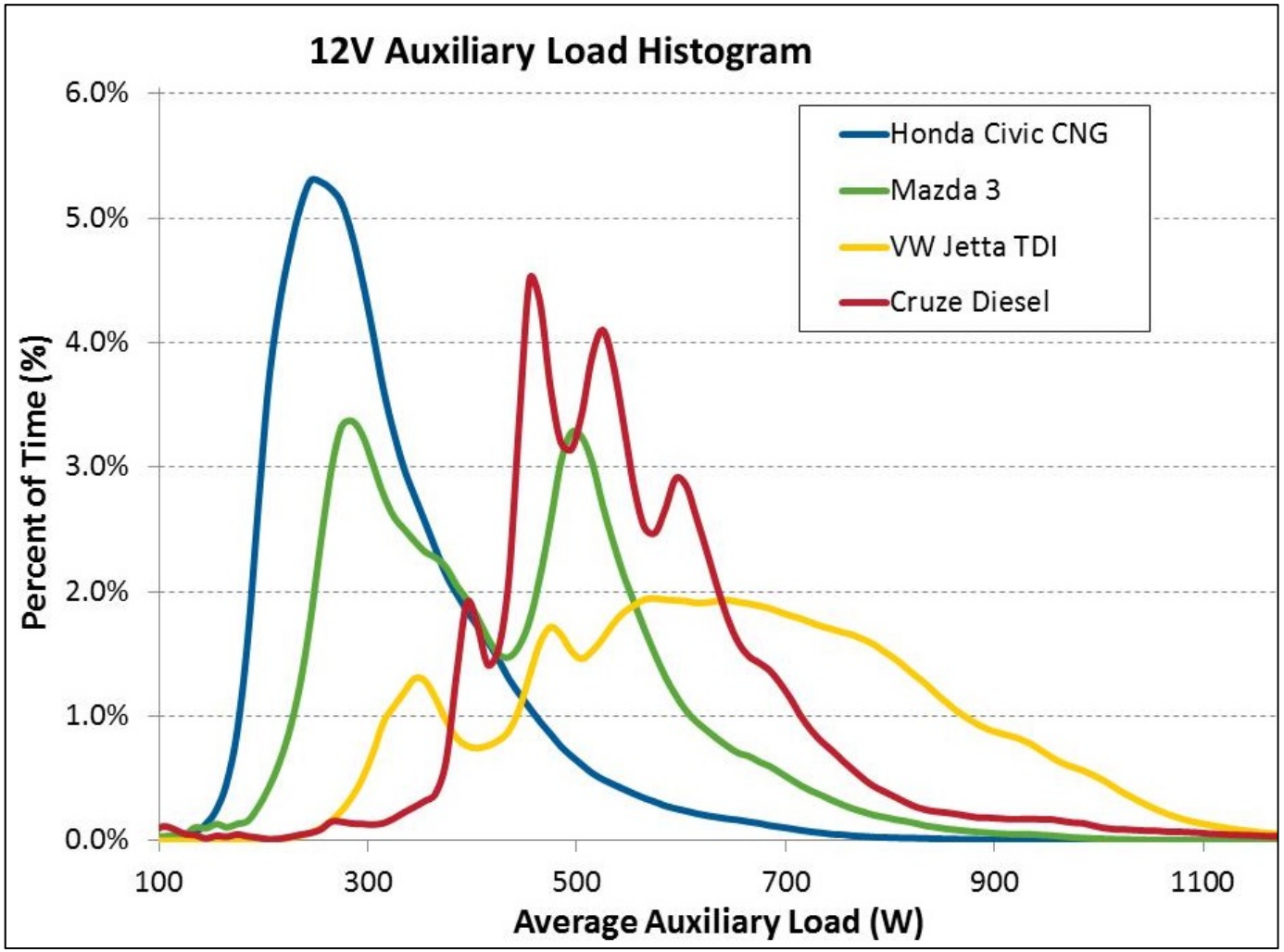


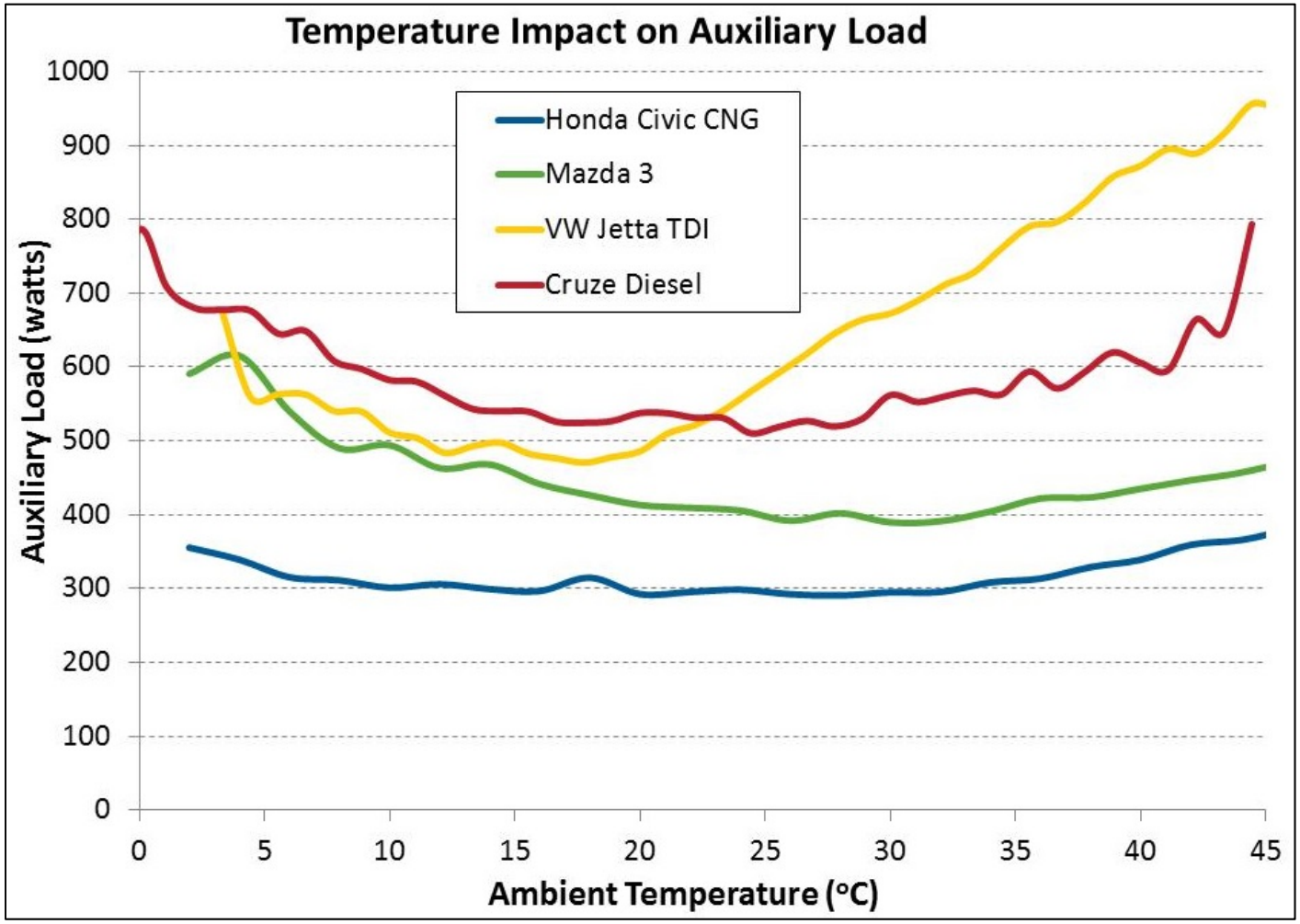
Auxiliary Load - Histogram

- Histogram shows results from one year of on-road operation



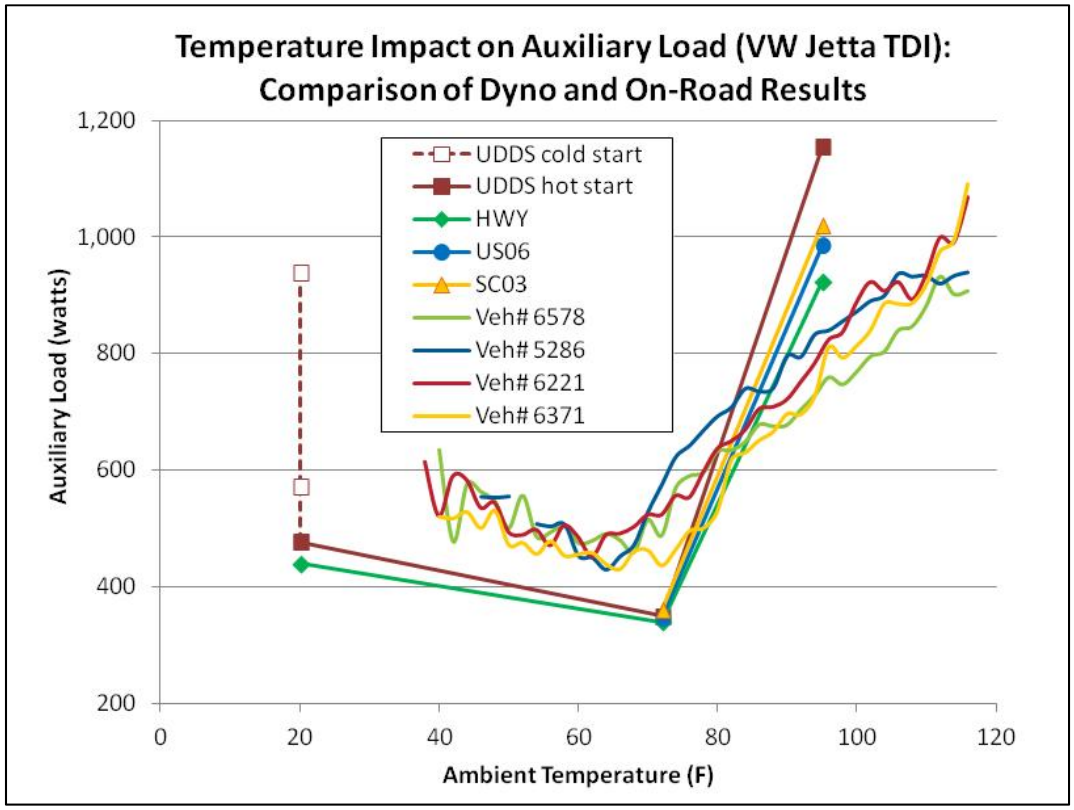
Auxiliary Load – Impact of Temperature

- Histogram shows results from one year of on-road operation



Temperature Impact: Correlation between Dyno & On-road operation

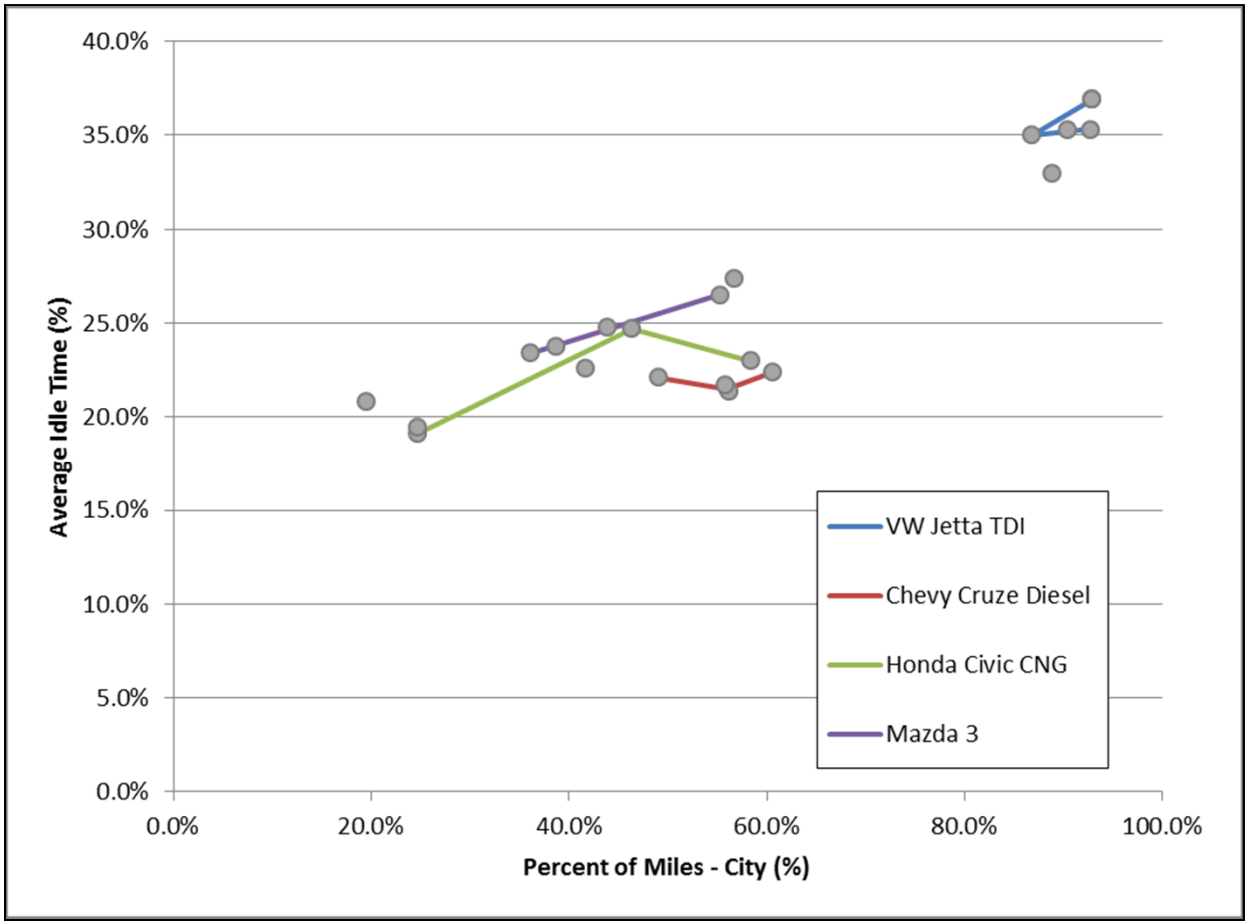
- Results shown only for: **Jetta TDI**
- Slight difference between On-road and Dyno results
  - Accessories chosen by driver differ from dyno accessory settings
- Similar comparison is under way for the other vehicle model types in this study



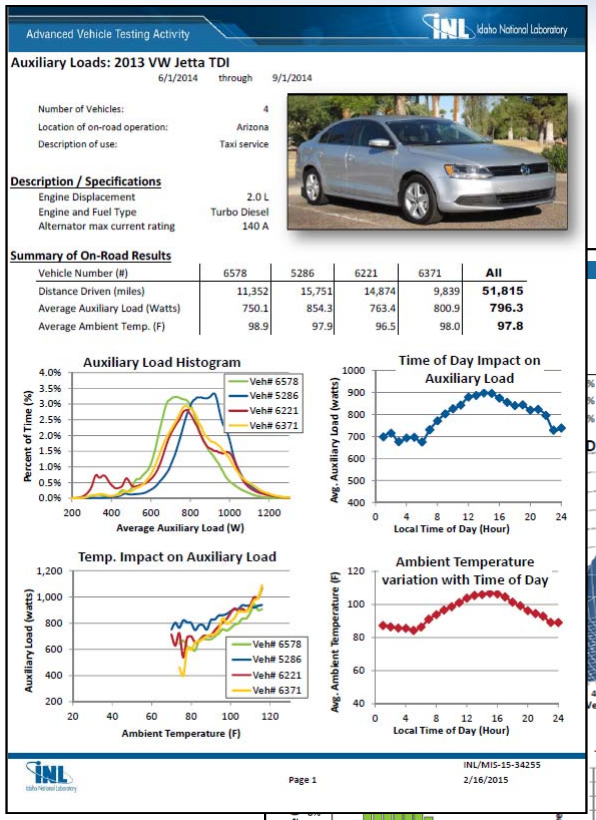
*Dyno test results from **Argonne's APRF***

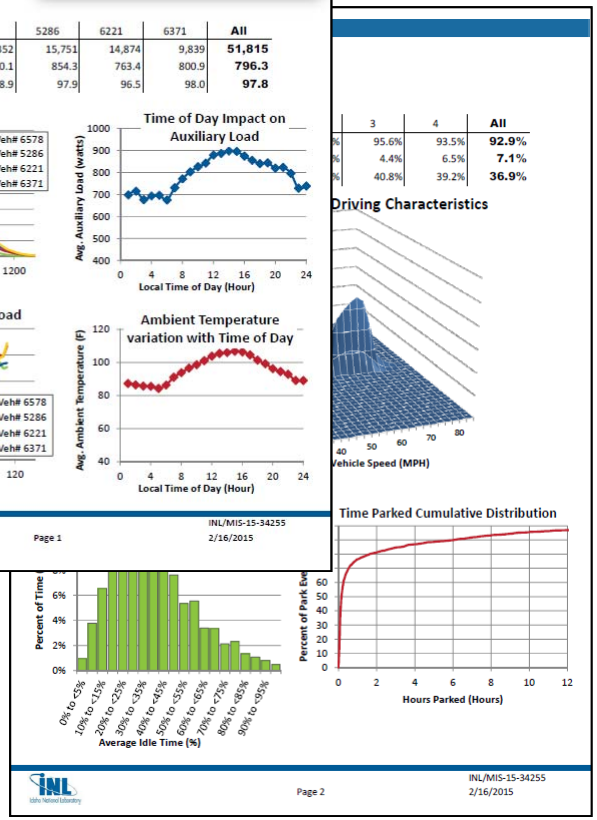
City / Hwy Driving Impact on Average Idle Time

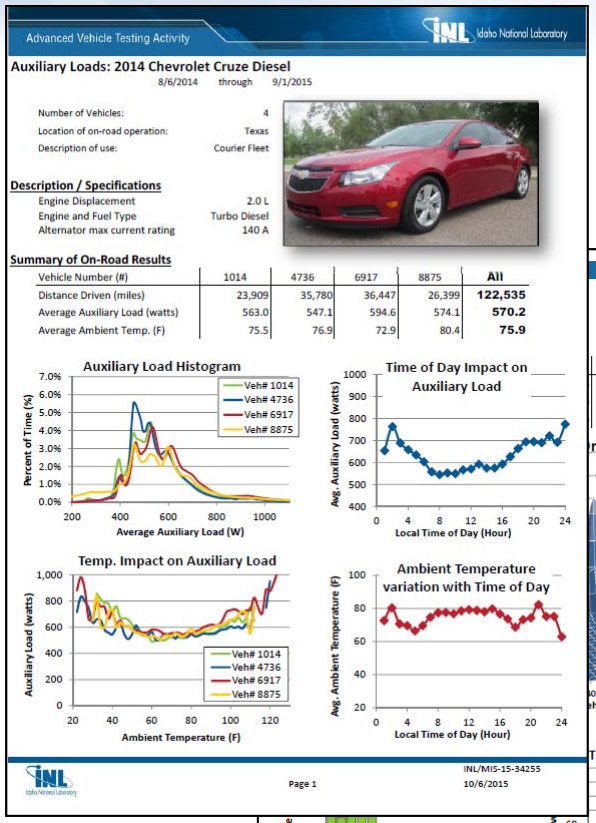
- As expected, increasing the percent of city driving, increases average idle time percent

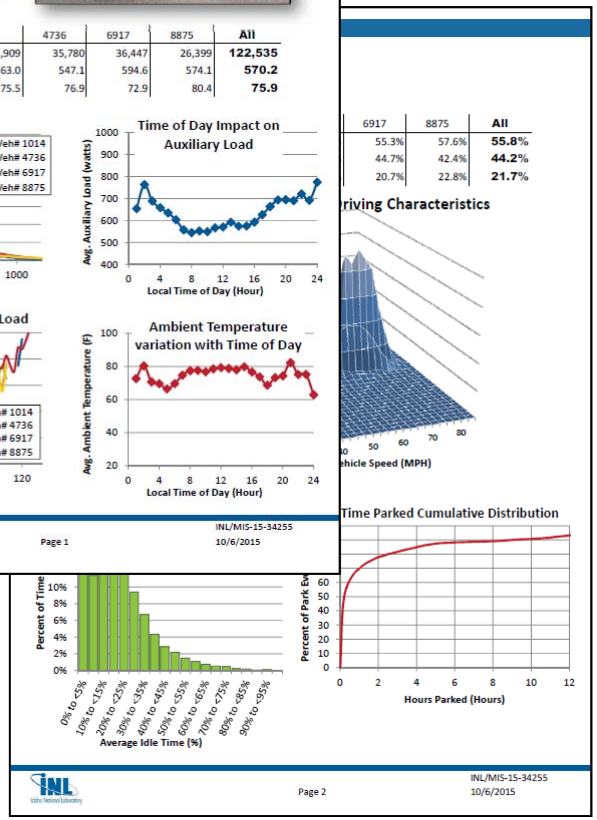


Fact Sheets Published Quarterly









http://avt.inel.gov/ice.shtml

Summary:

- Continue data collection on the 4 models through a minimum of one year of data collection and analysis

- Continue to publish:
  - Quarterly fact sheets
  - Project to Date fact sheets

- Evaluate additional vehicles (non-electrified) as available through AVTE
  - Chevy Impala Bi-fuel (CNG and gasoline)

Acknowledgement

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More Information

http://avt.inl.gov