Fleet Optimization Tool

Greater Yellowstone Interagency Climate Action Plan Working Session

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Optimization Tool

**Challenge:** Implement an efficient fleet management strategy
- In light of an increasing number of Federal fleet mandates and an increasing number of available technologies.

**Mission:** Produce optimal solutions for fleet manager consideration
- Resulting in an efficient vehicle acquisition process and identification of alternative fuel infrastructure opportunities to maximize petroleum and GHG emission reductions.

**These scenarios will take into account:**
- Mission needs
- All statutory and EO mandates,
- Budget constraints,
- …and, any number of additional pre-defined constraints.
Agency Background – Navy, 2005

- Replace 2,182 GSA-leased light duty vehicles
  - 1,638 sedans
  - 267 vans
  - 137 pickups
  - 118 SUVs
  - 22 others

- 59 different types of vehicles needing replacement
- 41 HEV/AFV choices from GSA

- Garaged in 900 different Zip codes
Agency Background -- Continued

• $1.2M incremental AFV budget

• EPAct 1992 (75% AFV acquisition requirement)
  • 1,651 vehicles in MSAs → 1,239 requirement

• Use AF in AFVs more than half the time
  • 20% reduction in petro use 1999 to 2005
  • How to fund fire trucks at $400k each?

E.O. 13149
## Optimization Results

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<td>“Max AF Use”</td>
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<td>75%</td>
<td>9</td>
<td>41.3%</td>
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One Optimal Result…
Preliminary Results for Agency XXX

EPAct Requirements
• Model: Could have exceeded requirements
• Actuality: Agency did exceed EPAct requirements

Cost
• Model: Could have exceeded AFV acquisition requirements AT NO COST
• Actuality: spent over $1M

Other Opportunities
• Could have spent $1M on AF infrastructure
• Could have acquired some AFVs that had access to AF instead of HEVs
Optimization Tool Development

Initial Model

• EPAct maximization and compliance
• Cost minimization
• Maximize acquired AFVs with access to Alternative Fuel
• Estimated petroleum and GHG emissions reductions

Future Development

• Optimize petroleum reduction
• Optimize GHG reductions
• Optimize alternative fuel use increases
• Existing AFV relocation to align with alternative fuel
• Many more models…
Optimization Tool Progress

• Base models under construction

• Volunteer agency data collection is on-going
  • Department of Energy
  • Department of Commerce
  • GSA Internal Fleet
  • Department of Agriculture?
Data Discussion

- Detailed accurate data is required for optimal results
  - GSA Reports Carryout Report is sufficient for GSA leased vehicles
  - Equivalent information is needed for Commercial Leased and Agency Owned vehicles

A template of needed data is available:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Vehicle Identifier</th>
<th>Vehicle Type and Use</th>
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</thead>
<tbody>
<tr>
<td>Agency</td>
<td>Class-Tag (Lic Plate)</td>
<td>Make (Manufacturer Name)</td>
</tr>
<tr>
<td>Ownership</td>
<td>VIN</td>
<td></td>
</tr>
<tr>
<td>Agency Owned</td>
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<tr>
<td>GSA Leased</td>
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Data Challenges

- **Geo-coded vehicle garage locations** allow for optimal alignment of AFVs with available and future AF
  - Zip Code centers distort model results

- **Replacement criteria** for Commercial leased and Agency Owned vehicles will need to be defined
  - GSA Leased vehicle requirements are standard

- **Outgoing vehicle categorizations** must be assigned to properly align replacement vehicles
  - ex: LD Pick-up 4X4 vs. MD SUV 4X4
Optimization Software Discussion

• The optimization tool is being developed in the FICO Xpress Optimization Suite.

• The software handles thousands of vehicle combinations spread over thousands of possible locations.

• The tool is primarily an integer optimization program constructed of a system of equations defining all fleet constraints in terms of the decision variables to be optimized.

• The tool returns the best-possible value for the decision variables given the constraints.
Optimization Programming Interface

Setup

Coding

Output

Incoming AFV

Outgoing VIN
Fleet Goals

- What challenges is the GYA fleet trying to address?
  - Specific mission capability
  - Mandates
  - Budget constraints
  - GHG reductions
  - NEV use
  - Right sizing
  - Reallocation of existing vehicles
    - Ex: relocating AFVs to locations with AF access
  - Specific technology focus