

# State of Hawaii Energy Efficiency in Transportation: Data, Metrics & Modeling

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# Stated Goals

- Increase choices for modes of travel
- Increase fuel efficiency in vehicle population
- Diversify energy sources available to meet transportation energy needs

# Driving Forces

- Create more sustainable transportation systems
- Improve the energy efficiency of the transportation system while still protecting mobility and choice
- Increase fuel security
- Reduce carbon emissions
- Transform Hawaii into an energy transportation paradise

# Previous Scope of Work

- Reviewed Plans & Planning Process
- Reviewed Strategies from Other Jurisdictions
  - Modes of Travel
  - Fuel Efficient Vehicles
  - Diversifying Energy Sources
- Developed Preliminary Strategies
- “more information and data are required before goals, objectives, strategies/initiatives, and benchmarks can be adopted ...”

# Preliminary Strategy Ideas ...

## suggested for further examination

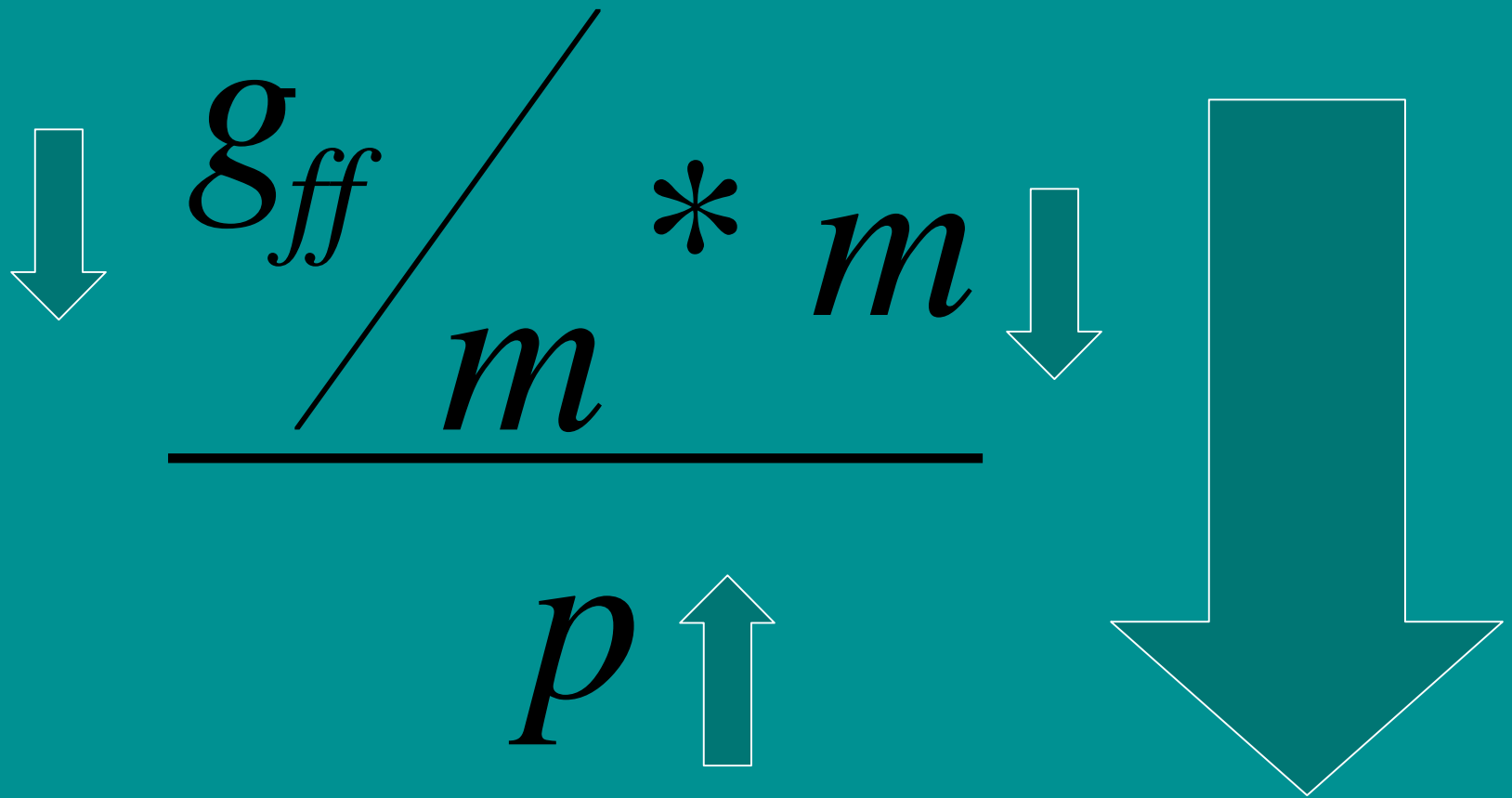
- Government incentives/subsidies
- Car-sharing to reduce fleet
- Big island bus service innovations (free ridership)
- Increase transit ridership
- Increase use of shared ride modes of travel (carpools, vanpools, etc.) through innovative marketing strategies (carpool sweepstakes)
- Telecommuting
- Build more bike lanes and establish requirement for more bicycle friendly programs
- Build HOV lane on all new highway segments
- Bikes on boats
- Bus and bike parking/lockers
- HOT-lane type elevated highways to increase vehicle throughput and manage traffic congestion

Where to go from here?

# What will work???

- Each County/community may differ based on population needs, land-use patterns, available technologies
- Through general literature, Hawaii-specific data collection and analysis, can begin to determine *what is low-hanging fruit* and *which strategies will be most effective*
- Start with ground transportation, as it's responsible for 71% of Hawaii's transportation fuel use - and "subject to influence by public policy at the State level" (Phase I report).

# A Simple Model





# Vehicle Market Share

Transportation Energy Data Book

# Factors that affect (Fossil) Fuel Efficiency $\left[ \frac{g_{ff}}{m} \right]_i$

- Mode Type (public or private)
  - Passenger loads,  $p$ , vary by mode type
- Vehicle type
  - Hybrids or Hummers?
- Road conditions, Travel Speed
- Fuel type - fuel switching
- Note: Some strategies will affect vehicle switching and others will affect mode switching (ex: free parking for hybrids versus company incentives to pocket parking fees)
- Sample Metrics
  - Average Fuel Economy of the Motor Vehicle Fleet
  - Average Sale of “Gas-Guzzlers”

# Factors that affect VMT

- Land-Use & Built Environment
- Work v. Home
  - Distance Between
    - Housing prices
  - Community at or between nodes (Shopping, Entertainment, Schools)
- Modes: prices like gasoline, parking, and fares; time; convenience
- Planning for Tours v. Trips
- Metrics
  - VMT

*m<sub>i</sub>*

# Factors that affect passenger load

- Value of Time
- Value of Amenities
- Household Income (up-front & O&M costs)
- Prices (gasoline, fares, etc.)
- Other incentives (ex: cost-sharing)
- Land use & Built environment
- Sample Metrics
  - Average number of passengers in private vehicles
  - Average number of passengers in public transit (by type)

$P_i$

# How does it all fit together?

$$\left[ \sum_i \sum_j \frac{(g_{ff}/m)_i * m_i}{P_i} \right] * P = G$$

$i$  mode types, (auto, bus, transit...)

$j$  types within mode type “auto,” (hybrid, hummer...)

# How do people make decisions about transportation?

## Economic framework

- Marginal cost of transportation to consumer
  - Car: gasoline & parking (paid daily)
- Fixed costs
  - matter upfront, but once choice is made, becomes irrelevant in per use decision-making
  - may affect number of household vehicles
- Policy Choice: target existing vehicles or new vehicles? Or both? Different strategies

# Ground Transportation Market

- Private automobiles are the primary share of transportation market - in Hawaii and US (87.5% of U.S. workers use private vehicles - U.S. Bureau of the Census 2000)
- Can focus on vehicle switching, overall # of vehicles, & mode switching
- Vehicle Switching Strategies:
  - Gasoline prices (happening without public policy) - what was the affect?
  - Parking incentives for fuel-efficient cars
- Mode Switching Strategies:
  - Gasoline prices
  - All-around parking incentives/disincentives
  - Pay-as-you-go insurance

General logic: relatively cheap to operate a car

Tradeoff between vehicle type and mode

If vehicles are low-cost, mode-switch more difficult

# Proposed Initial Scope of Work

- Description of current state of Hawaii's driving patterns

- Determine model for private automobile use

$$\frac{g_{ff}}{m} * m$$

- Break-down by County where possible

*p*

- Data sources (primary & secondary): National Sources (such as Oak Ridge National Laboratory), Local Sources (DBEDT, Counties, other?)

- Comprehensive review & prioritization of strategies that affect vehicle type and mode switching, including long-term factors like land use and the built environment



- Propose model development of transportation consumer demand - demand for transport tours, price/income elasticity of demand
  - Survey method? Contingent Ranking study
- Outcome
  - prioritization of strategies based on data & models
  - assessment of reasonable benchmarks & goals

Questions and Comments?

Mahalo!