

**Institute of Transportation Studies  
University of California, Davis  
University of California, Berkeley**



***Feebate Policy  
Consultation Meeting***

***February 26, 2009***

***Air Resources Board  
State of California  
Sacramento, CA***



# Agenda / Review

- Introductions and Quick Project Overview
- Presentation of Feebate Policy Options
  - Structures
  - Locus of Transactions
  - Public information
  - Implementation Strategies
- Recommendations for Analysis
- Discussion and Stakeholder Inputs
- Wrap-up and Next Steps

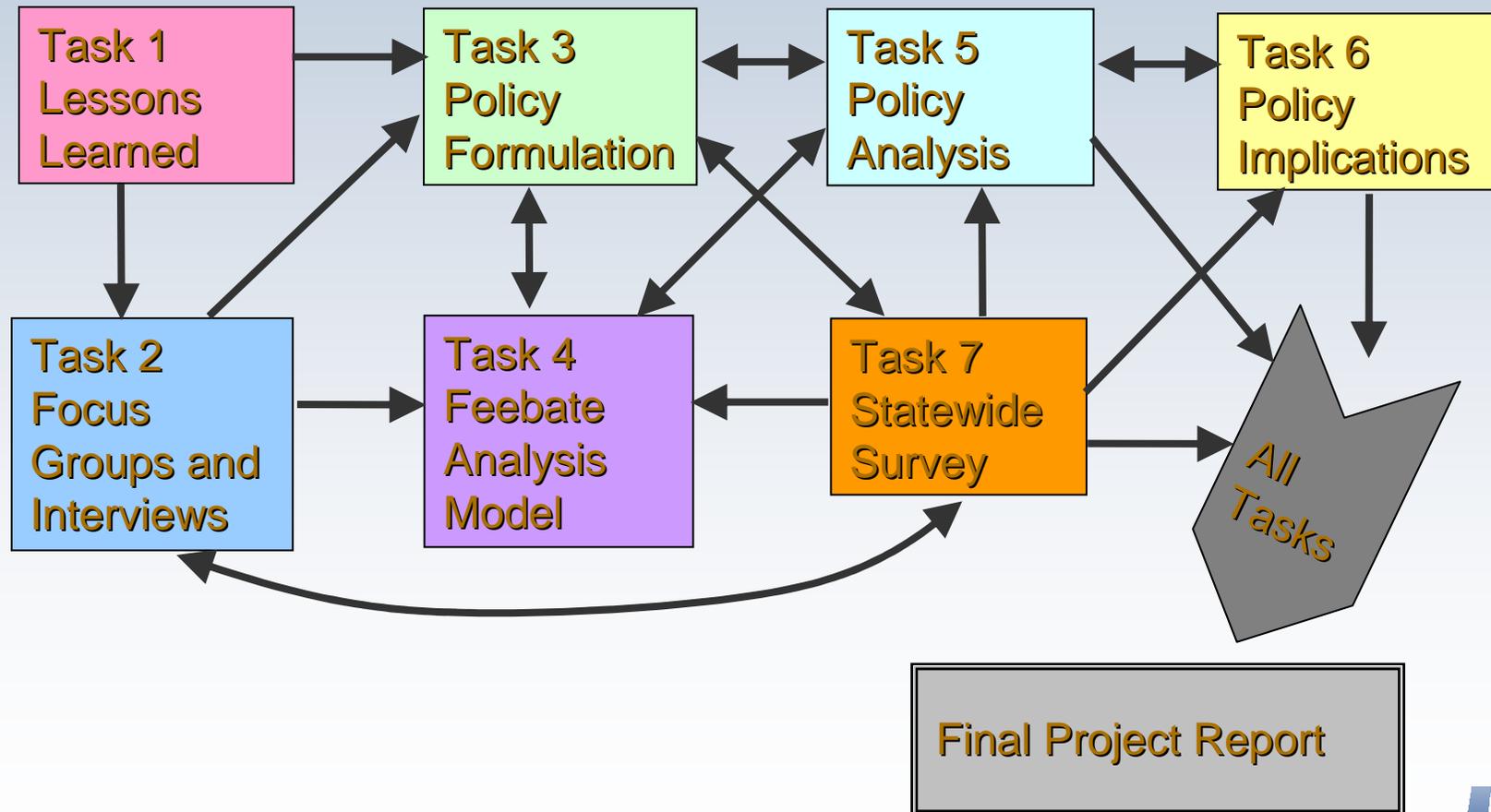
# Our research is designed to provide ARB with the information necessary to implement a feebate system if they decide to do so.

1. Lessons learned from other feebate programs
2. Analysis of alternative feebate program design options to achieve emissions reductions to replace Pavley I or Pavley II standards
3. Potential for cost-effective emissions reductions from feebates in addition to Pavley standards

## The UC Feebates study for the California Air Resources Board is designed to comprehensively support decision-making about feebates.

- Lessons learned (France, Canada, U.S., etc.)
- Focus groups, dealer and manufacturer interviews
- **Policy formulation with formal public input**
- California Feebate Analysis Model
- Policy Analysis
- Assessment of Policy Impacts
- Statewide survey of consumers

# Task Overview

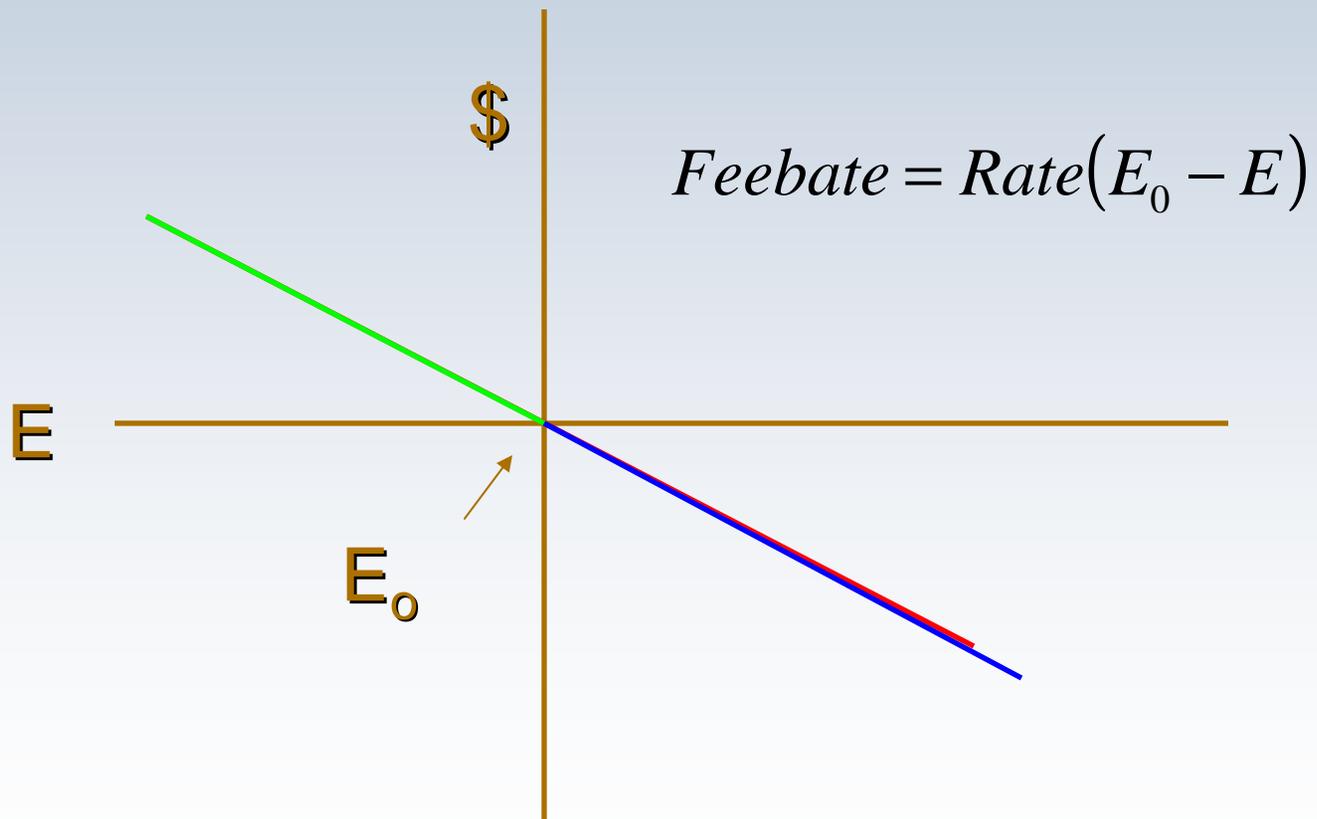


# What is a feebate?

- A fiscal policy transacted at vehicle purchase combining
  - A **FEE** on high emission vehicles
  - A re**BATE** to low emission vehicles.
- **Emission measure** = grams CO<sub>2</sub> equivalent GHGs per mile
- A **benchmark** defines who pays and who receives. (distribution/equity)
- A **rate** determines the marginal costs and benefits. (efficient solution)
- A **functional form** determines how feebates vary with emissions
- There are also important options for:
  - **Locus** of transactions
  - **Public information** strategies
  - **Implementation** strategies
- Finally, we must consider “surprises” that could affect the program’s impacts.

# There are an infinite variety of feebates.

Simplest feebate is **linear** in GHG emissions per mile.  
**Benchmark  $E_0$**  is origin, **Rate,  $R$** , is slope of the line.  
System is **revenue neutral** if right benchmark chosen.



## Feebates may be viewed as correcting externalities or other market imperfections.

A linear feebate can be viewed as a capitalized charge for future GHG emissions.

$$PV = \int_{t=0}^L C(E_0 - E)M_0 e^{-\delta t} e^{-\rho t} dt$$

- Assuming:

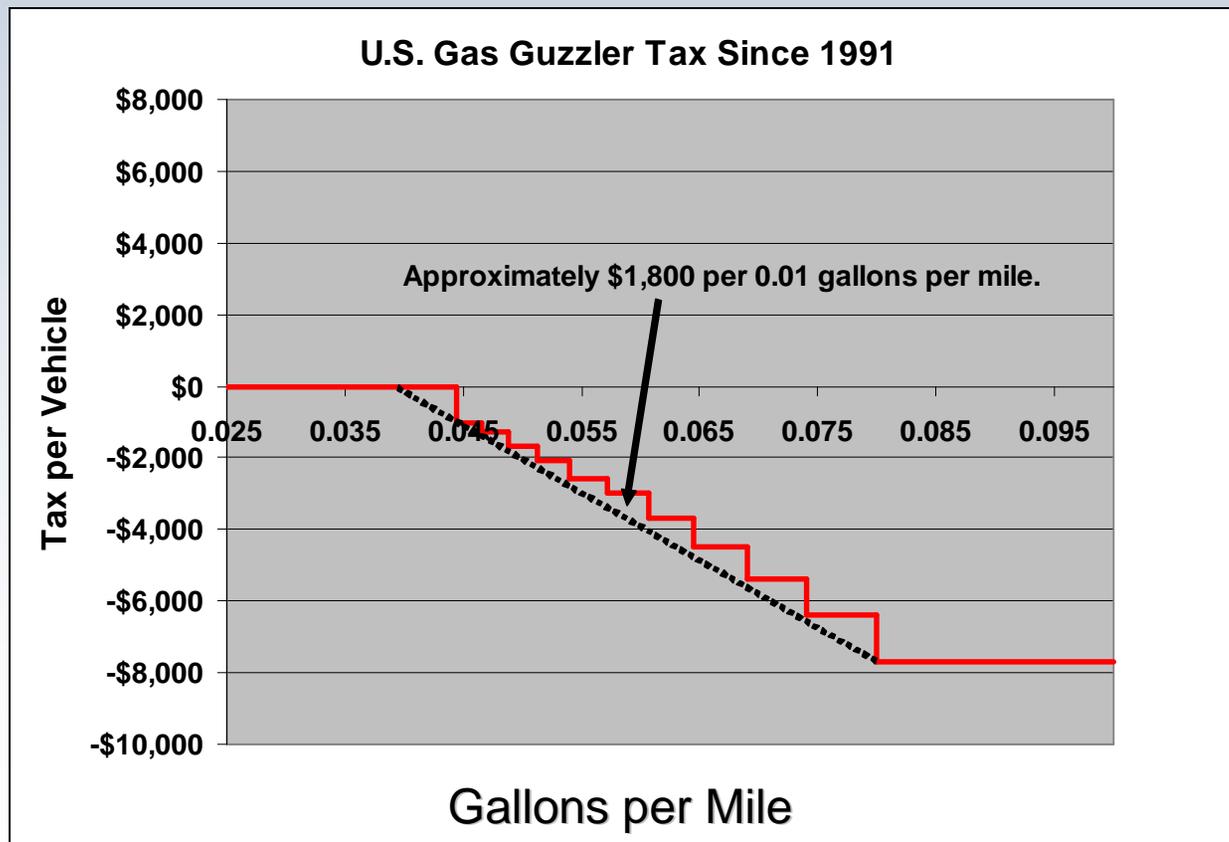
- $M_0 = 14,000$  miles/year when new
- Decreasing at  $\delta = 4\%$ /year
- Discount rate of  $\rho = 7\%$ /year
- Expected life of  $L = 14$  years
- $C =$  effective price of carbon

$$PV = C(E_0 - E)100,000$$

$$PV = \frac{\$100}{tCO_2} \left( \frac{1g}{mi} \right) 100,000 mi \Rightarrow R = \frac{\$10}{gCO_2 / mi}$$

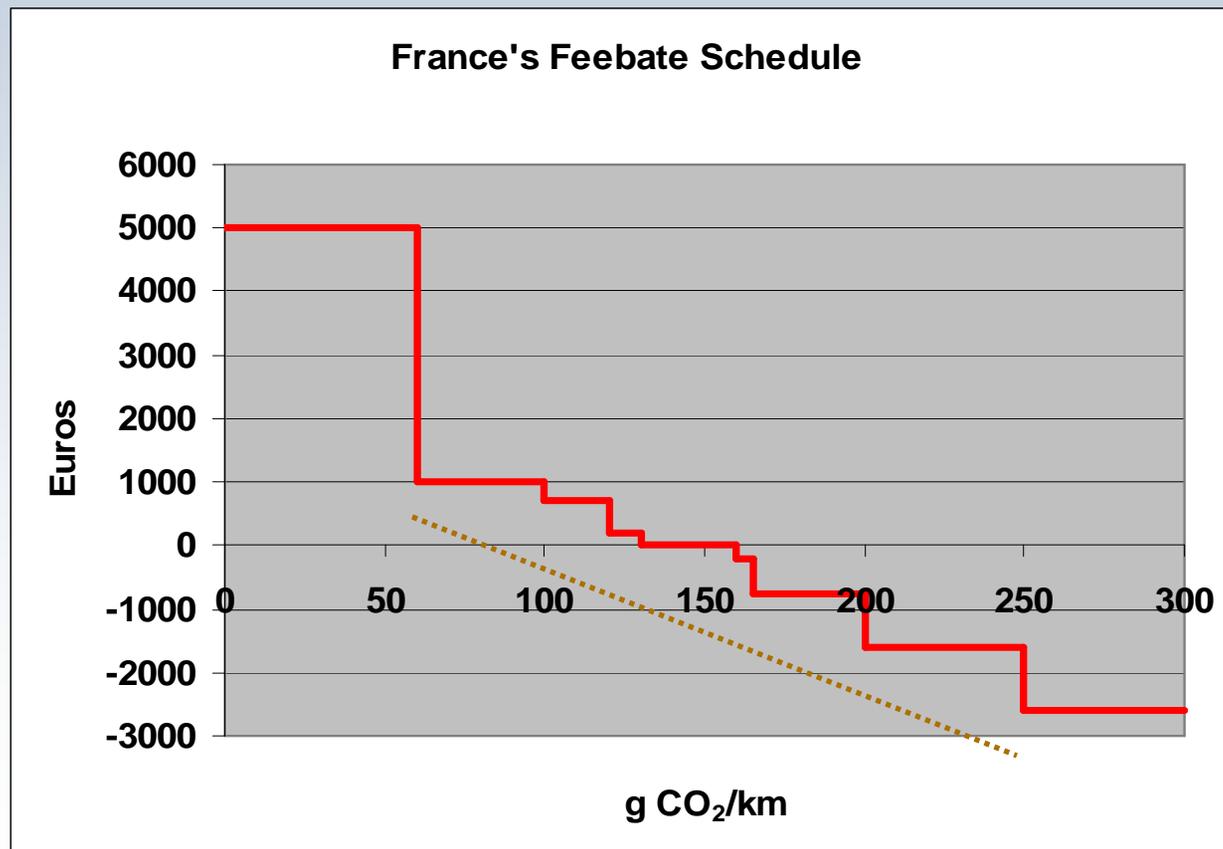
# The U.S. Gas Guzzler Tax on passenger cars is a kind of feebate.

- = Half a feebate system.
- Is a step function rather than a straight line.
- R is approx  $\$1,800/0.01\text{gal}/\text{mi}$  (=  $\$20/\text{g}/\text{mi}$ )



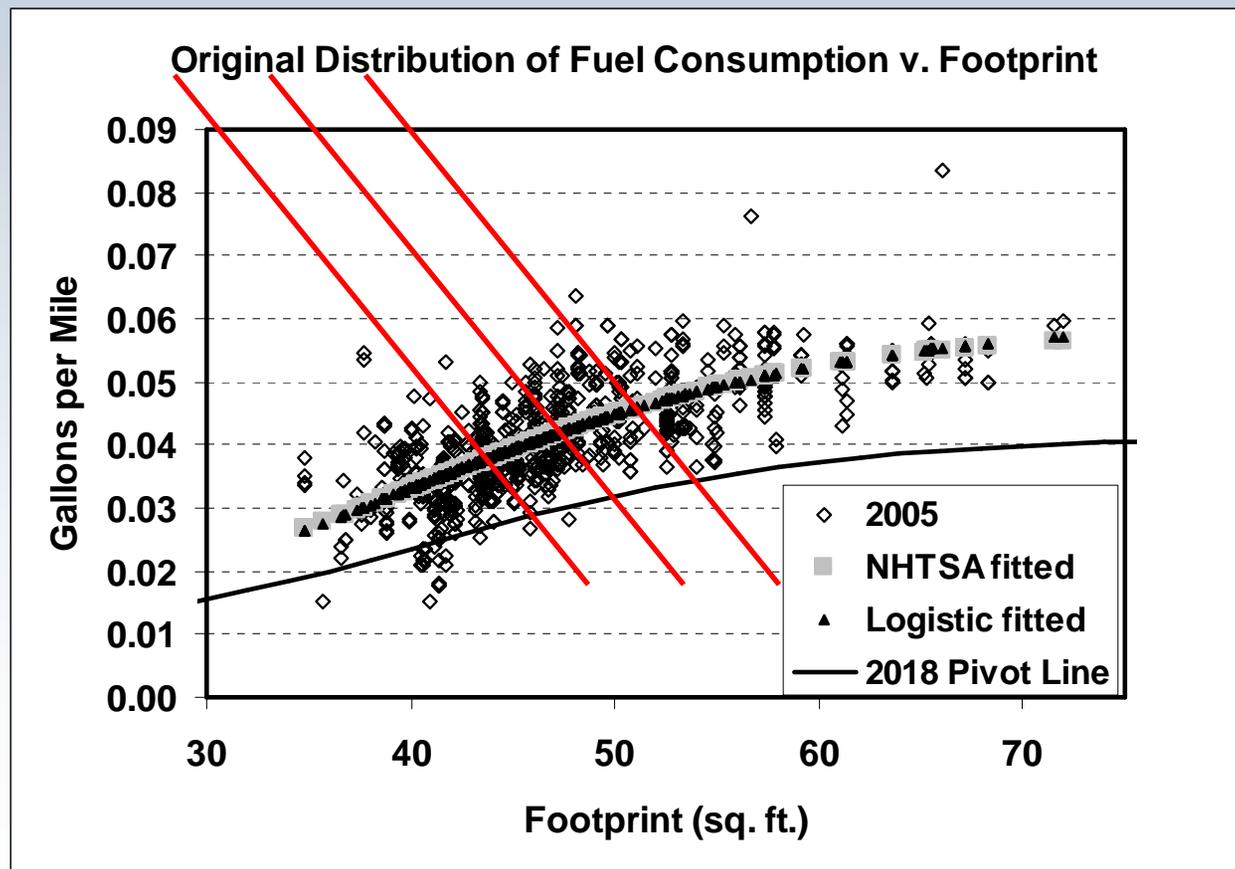
# France's Bonus/Malus is a complete feebate system for passenger cars which took effect in January 2008.

- Is also a step function.
- $R \approx \$16.50$  per g/mi ( $\$1,500$  per 0.01 gal/mi)
- Large bonus for lowest emitting vehicles



# Multiple Benchmark Systems

Feebate benchmarks could be vehicle class-specific or could even be a function of footprint, like the new CAFE footprint standard.



# Options for Functional Forms

- We recommend ARB analyze both **straight line** and **step functions**.
- Straight lines:
  - Value every g of CO<sub>2</sub> mitigated equally.
  - Probably easier to manage revenues
- Step functions:
  - Contain discontinuities that can lead to inefficient responses.
  - The French government considered step functions easier for consumers to understand.
  - The U.S. gas guzzler tax, French Bonus/Malus and Canadian feebate systems were all step functions.

# Options for Rates

- We recommend:
- ARB consider rates ranging from \$5-\$25 per g/mi.
- Replacement of Pavley will require allowing the feebate rate to be determined by the need to reduce emissions.
- Feebate rates higher than a cap-and-trade C price can be justified:
  - Correct market imperfection
  - Reduce oil dependence

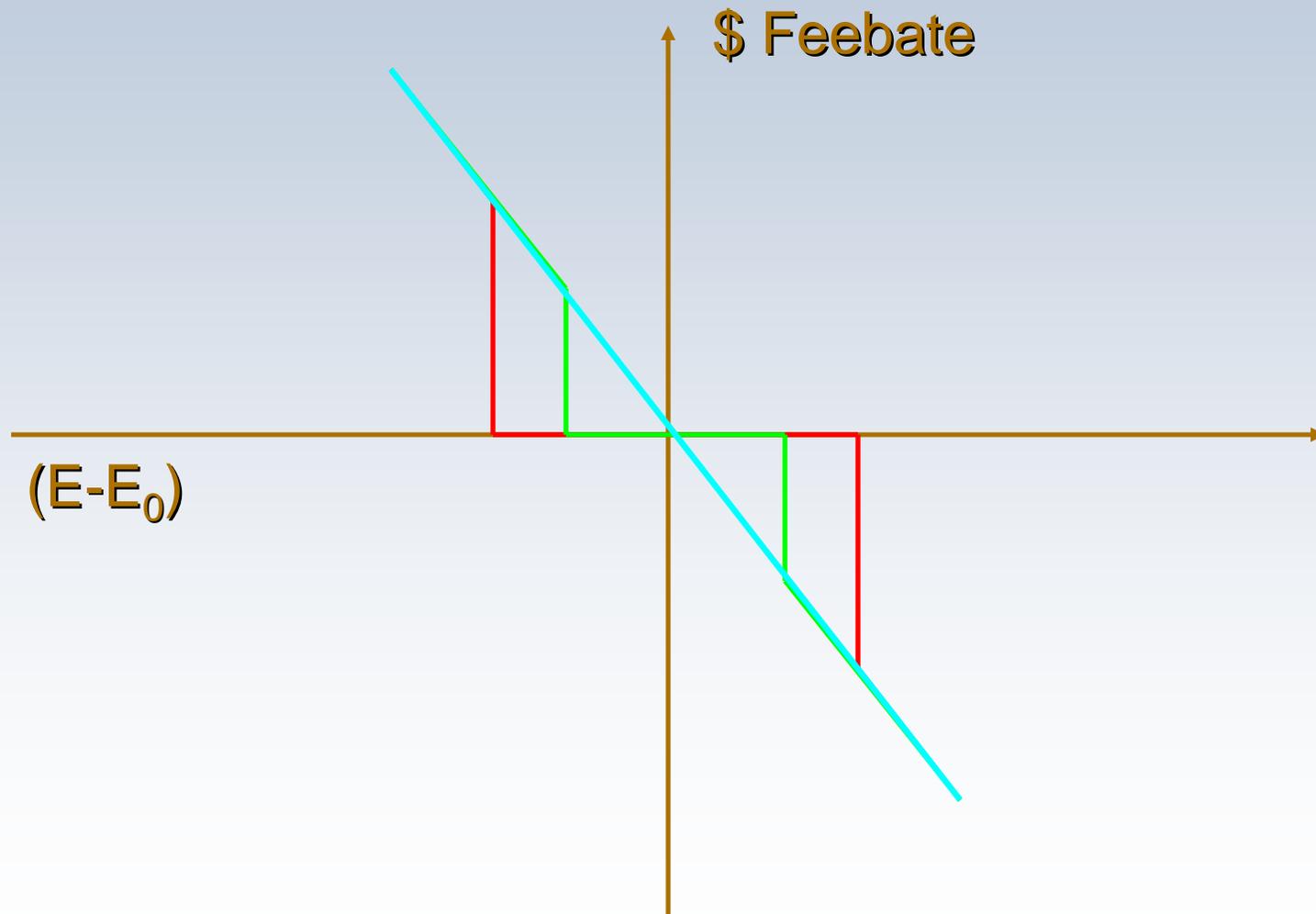
# Options for Locus of Transactions

- UC Berkeley has the lead in analyzing this issue:
  - May or may not be able to include in computer model.
  - Chiefly affects administrative costs.
  - *Labeling, notification, & advertising can be independent of locus of transaction.*
- Key options:
  - **State-to-manufacturer**
  - **Dealer-to-customer**
  - **State-to-customer**

**How best to implement or phase in a feebate system has been largely neglected by researchers.**

- Immediate implementation (Bonus/Malus)
- 2-year delay
  - Manufacturers have time to adapt
  - Consumers may accelerate or delay purchases
- Phase-in by gradually increasing rate
- Phase in by transition from net subsidy to revenue neutrality
- Phase in by closing “doughnut hole”.

# What is a closing doughnut hole?



# A complete Feebate Policy combines all the various components.

- We recommend analyzing 23 policy options.
- Straight line and step function.
- Rates between \$5 and \$25 per g/mi in \$5 increments.
- Single, 2-class, 6-class and footprint benchmarks.
- Transactions between state and manufacturer, dealer and customer, state and customer.
- Phase in by gradually increasing rate, transition from subsidy to revenue neutrality, closing neutral zone.
- Reconsider design after initial results are available.

# We propose a structured analysis of 23 cases, with the likelihood that it will be modified as we learn through experience.

## Feebate Systems Proposed for Analysis

17-Jan-09

No.	Functional Form	Rate \$/g/mi	Benchmarks	Transaction Locus	Phase-in Strategy
1	Linear	\$5	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
2	Linear	\$10	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
3	Linear	\$15	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
4	Linear	\$20	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
5	Linear	\$25	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
At this point decide on default feebate rate. For instance, \$15.					
6	Linear	\$15	Single	State-Manufacturer	2-Year Delay
7	Linear	\$15	N Vehicle Classes	State-Manufacturer	2-Year Delay
8	Linear	\$15	Footprint	State-Manufacturer	2-Year Delay
9	Linear	\$15	Single	State-Manufacturer	Immediate
9	Linear	\$15	Pcar v. Lt. Trk	State-Manufacturer	Immediate
10	Linear	\$15	N Vehicle Classes	State-Manufacturer	Immediate
11	Linear	\$15	Footprint	State-Manufacturer	Immediate
12	Step Function	\$15	Single	State-Manufacturer	2-Year Delay
13	Step Function	\$15	Pcar v. Lt. Trk	State-Manufacturer	2-Year Delay
14	Step Function	\$15	Single	State-Manufacturer	Immediate
15	Step Function	\$15	Pcar v. Lt. Trk	State-Manufacturer	Immediate
At this point decide on default benchmark strategy. For example, Car v. Lt. Trk.					
16	Linear	\$15	Pcar v. Lt. Trk	State-Customer	2-Year Delay
17	Linear	\$15	Pcar v. Lt. Trk	State-Customer	Immediate
18	Linear & "neutral zone"	\$15	Pcar v. Lt. Trk	State-Customer	Immediate
19	Linear	\$15	Pcar v. Lt. Trk	Dealer-Customer	2-Year Delay
20	Linear	\$15	Pcar v. Lt. Trk	Dealer-Customer	Immediate
21	Linear & "neutral zone"	\$15	Footprint	State-Manufacturer	Closing neutral zone
22	Linear	\$15	Pcar v. Lt. Trk	State-Manufacturer	Rate gradually increases
23	Linear	\$15	Pcar v. Lt. Trk	State-Manufacturer	Initial Subsidy to Neutrality

# What sort of surprises should be considered?

- Oil price volatility, as well as high and low price paths.
- Impacts of technology breakthroughs.
- Others?

**Thank you for helping us.**

# Wrap-up and Next Steps

- Review of today's discussion