

<b>DOCKETED</b>	
<b>Docket Number:</b>	18-IEPR-09
<b>Project Title:</b>	Decarbonizing Buildings
<b>TN #:</b>	223993
<b>Document Title:</b>	Michael Bullock Comments Reducing GHG from Buildings, Including the Building's Parking Facility
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	Michael Bullock
<b>Submitter Role:</b>	Public
<b>Submission Date:</b>	6/28/2018 3:06:04 PM
<b>Docketed Date:</b>	6/28/2018

*Comment Received From: Michael Bullock*  
*Submitted On: 6/28/2018*  
*Docket Number: 18-IEPR-09*

## **Reducing GHG from Buildings, Including the Building's Parking Facility**

Mike Bullock  
1800 Bayberry Drive  
Oceanside, CA  
June 28, 2018

Greetings,

Introduction

Please allow me to introduce myself. I have a BSEE, an MSE, and worked for Lockheed Martin for 36 years. For most of those years I worked as a Satellite Systems Engineer. For the last 11 years I have been working on the problem of how cars and light-duty trucks can achieve climate-stabilizing targets. In that work, I have presented 6 papers at the Air and Waste Management Association (AWMA) conferences and 4 papers at the Energy Utility Environment Conference (EUEC). I have also worked on the issue of climate change and transportation in the California Democratic Party (CDP) as a member of both the San Diego County and the California Central Committee.

Initial Assessment

It is important to recognize that in California, cars and light-duty trucks (Light-Duty Vehicles, or LDVs) emit significantly more greenhouse gas (GHG) than electricity and NG combined. Good progress is being made on reducing GHG emissions from the electrical sector. However, LDVs are proving to be much more difficult. The work I have done on LDVs shows that we cannot possibly convert from internal combustion engine (ICE) LDVs to zero-emission vehicles (ZEVs) fast enough to not need to also significantly reduce per-capita driving.

CARB must realize that car-parking facilities are part of any building and how those parking facilities are operated is an extremely important consideration in doing an honest and complete evaluation of how a building performs regarding its impact on the emission of GHG.

Considering the current state of our anthropogenic climate change crisis, it is too late to be intellectually lazy. "Car parking may be easy but a systems analysis shows it to be unacceptably poor regarding both economic fairness and GHG emissions.

But first, ignoring the car parking facilities, as most will, here are my recommendations:

Ignoring Car-Parking Facilities

Recommendations

1. CA needs policies to decarbonize and electrify buildings. Investing in electrification and efficiency is necessary. Keep in mind also that for the case of near-proximity geothermal energy, it may be best to use that energy source for air and water heating. That option should never be overlooked. Gas use in buildings for heating should be phased out. So-called biofuels have no future. NG will always contribute to methane leakage. NG must be phased out as soon as possible.
2. More to the point: "Decarbonized fuels" (i.e. biogas and power-to-gas) is not a viable strategy to decarbonize buildings. Limited and more expensive supply, methane leakage, criteria pollution, and safety issues make this strategy a waste of time and money.
3. Building electrification, along with improved efficiency, and geothermal use when available is

the least cost and most viable strategy to decarbonize CA's buildings

4. Beyond GHG benefits, electrification offers energy efficiency, grid harmonization, better air quality and health, economic and job growth, safety, comfort and climate resiliency benefits.

5. The CEC, CUC, and CARB should establish building electrification and efficiency targets for 2030-2050 through a public process and then develop a joint plan to achieve those targets.

6. Please have CEC/CPUC/CARB and other agencies unlock funding to support building efficiency, electrification, market transformation for heat pumps via rebates/incentives and fuel-switching programs and the use of geothermal, when available.

7. Recommend all agencies account for methane leakage in all GHG accounting, reporting, and decision-making. Methane leakage should be attributed to the end use sector (i.e. in this, case buildings) and not all lumped into the Industrial sector which I understand is CARB's current practice. This should include behind the meter leakage as well.

Car Parking Facilities

Background

For a single story building, the area of car parking is often nearly 1.5 times the area of the building. This is calculated using the requirement of 4 car-parking spots per 1,000 Square Feet of building area, which is the baseline zoning in many municipalities AND the fact that only about 120 cars can be placed on an acre of land. (4 cars required  $4 * 44,000/120 = 1,466$  square feet.)

The question arises: Is the car parking system used for a building a consideration in the building's energy use? It certainly should be. After all, about 7 years ago, when electricity was much more GHG-emitting than it is now, in SD County, electricity and gas together only emitted 34% of the GHG while LDVs emitted 41%. It is more lopsided now that electricity is cleaner.

It is well known that so-called "free" parking greatly increases the Single Occupancy Vehicle (SOV) mode split, compared to similar locations that have value-priced parking.

However, just introducing a charge for parking is likely to be unpopular with employees or other potential drivers and it could never be supported by the CDP, an organization which is concerned with wage discrepancy.

Dividend-Account (DA) Parking (defined in Reference 1) conforms to the official policy of the largest and most influential political and environmental organization in California, which is the CDP, as expressed in its party platform. Bundled-cost and/or bundled-benefit car-parking systems (erroneously called "free parking") do widespread and unacceptably large harm. Society now has great technology. CARB needs to update its thinking on this issue.

Recommendations

1. Parking facilities should include charging stations. As you know, most BEVs will have a range of well over 200 miles, even though most commutes will be less than 20 miles each way. We know that V2G (vehicle to grid) energy transfer will be an option in the future. This means that charging at work can allow for a significant discharging when the vehicle arrive home, killing the so-called "duck curve" for good.

2. First at employment centers, as describe in Reference 1 but later at other types of destinations, as described in Reference 2, bundled-cost or bundled-benefit car parking facilities should be replace with Dividend-Account Car-parking systems. I am working on a Request for Information (RFI) to locate a worthy vendor. Please contact me if you would like to see the document and to see Reference 2.

Thank you for your leadership.

Highest regards,

Mike Bullock  
1800 Bayberry Drive  
Oceanside, CA 92054  
760-754-8025

*Additional submitted attachment is included below.*

# *Eliminating the Harm* of Bundled- Cost or Bundled- Benefit Parking

- Definitions of Parking Systems
- New System: *Dividend-Account Parking*
  - Motivations for change
  - An example of a demonstration project

Mike Bullock  
[mike\\_bullock@earthlink.net](mailto:mike_bullock@earthlink.net)  
760-7548025

# A Bundled-Cost Parking System

The most common of all parking systems. Erroneously called “free”

The **cost** of the parking is contained within some other payment, such as:

- Rent
- Train fare (at least 1 train station with so-called “free” parking)
- Price of consumer items, including food

# **A Bundled-Benefit Parking System**

**The 2<sup>nd</sup> most common of all parking systems. Erroneously called “free”**

**The parking is part of a benefit package being provided, such as:**

- **Compensation for work**
- **Public education**
- **Public anything, such as a library or park**

The harm of a *Bundled-Cost* or a *Bundled-Benefit* car-parking system is that they take *money* from people without their knowledge or consent.

**These systems also increase the choice to drive alone.**

Sierra Club Resolution: Appropriate pricing of parking is documented as one of the least costly tools to reduce vehicle miles travelled.

***Bundled-Cost* or *Bundled-Benefit* car-parking systems should be replaced with **Dividend-Account** Parking systems.**

## **Dividend-Account** Parking System

- Value priced baseline, with congestion pricing option
- People for whom the parking is built will get the **earnings**, or “**dividends**”
- Cars parked must be associated with an **Account**
- Parking is shared with all drivers, as long as their car is recognized as being associated with an **account**

# From the California Democratic Party (CDP) Platform:

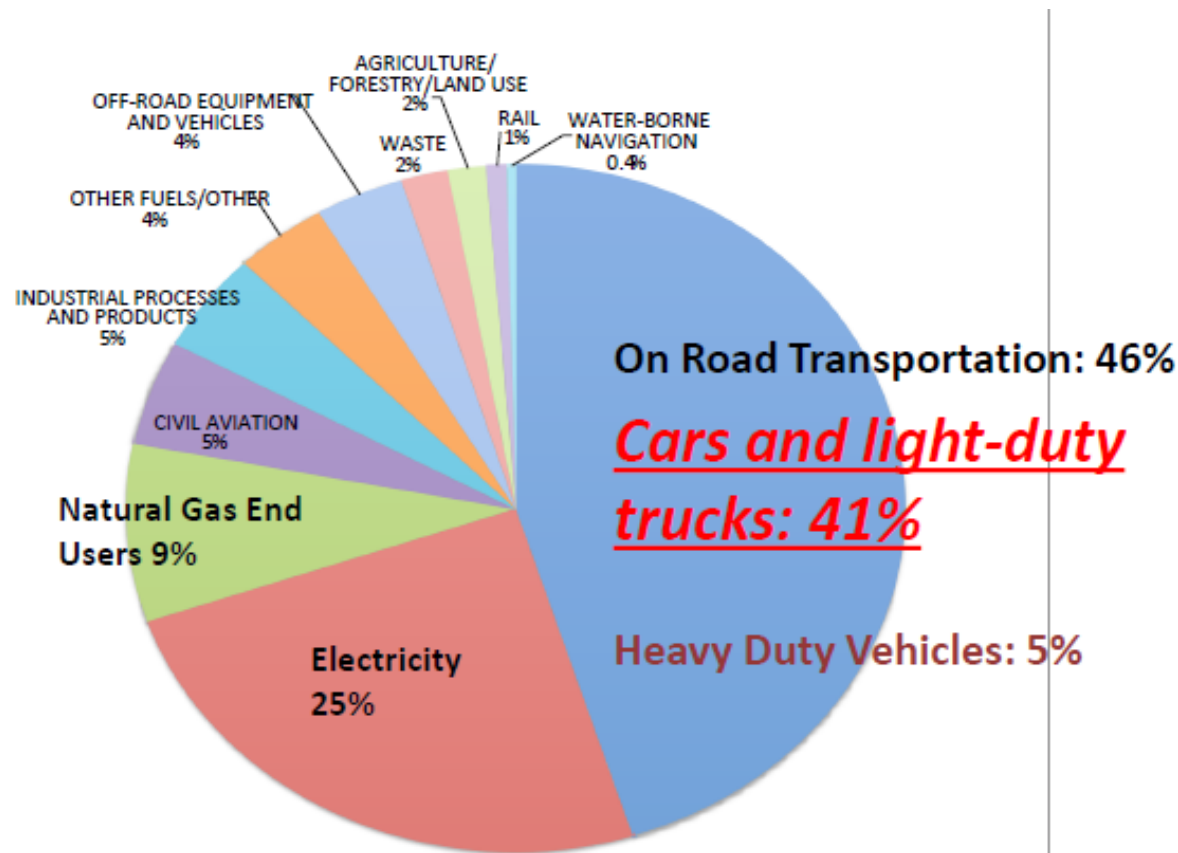
From: <http://www.cadem.org/our-california/platform/2016-platform-energy-and-environment> (The 2016 California Democratic Party (CDP) Platform)

## Transportation

Work for **shared**, convenient and **value-priced** parking, operated with a system that provides earnings to those paying higher costs or getting a reduced wage, due to the cost of providing the parking

# Motivation for Change, 1 of 7

1. Cars and Light-duty vehicles (LDVs) emit the most GHG of any category



# Motivation for Change, 2 of 7

2. Fleet Efficiency **Will Not Come Soon Enough**, as shown in peer-reviewed report:

## **EUEC 2017 Paper**

### ***Climate-Stabilizing California Light-Duty-Vehicle (LDV) Requirements***

Derives a set of **requirements** to ensure that our fleet of cars and light-duty trucks will achieve a **climate-stabilizing target**.

# Motivation for Change, 3 of 7

## EUEC 2017 Paper

### *Climate-Stabilizing California Light-Duty-Vehicle (LDV) Requirements*

## Problem Solution Overview

1. Get a **climate-stabilizing target** from climate scientists
  - % Reduction in emission from some baseline, for some target year
2. Derive the equation for level of driving, as a function of fleet efficiency and the **climate-stabilizing target**
3. Define a set of **requirements** resulting in fleet efficiency
4. Compute required level of driving for the target year
5. Develop a set of **requirements** to get the needed driving reductions

# Motivation for Change, 4 of 7

2. Fleet Efficiency **Will Not Come Soon Enough**, as shown in the peer-reviewed report:

## *EUEC 2017 Paper*

*Climate-Stabilizing California Light-Duty-Vehicle  
(LDV) Requirements*

- **Fleet Efficiency Requirements Included:**
  1. Programs to remove gas guzzlers
  2. Yearly Fractions of Sales that are Zero-Emission Vehicles (ZEVs, or Battery Electric)
  3. Corporate Average Fuel Efficiency (CAFE) for internal combustion engine cars sold, by year
  4. Percent of Electricity that is renewable, in target year

# Motivation for Change, 5 of 7

- Two Solutions: *Heroic* and *Extra Heroic*

15 years of ZEV %, for two Cases								
First 5 Years			Middle 5 Years			Last 5 Years		
Year	Heroic	Extra Heroic	Year	Heroic	Extra Heroic	Year	Heroic	Extra Heroic
2016	4.0%	4.0%	2021	34.0%	90.0%	2026	95.0%	99.0%
2017	7.0%	12.0%	2022	48.0%	93.0%	2027	98.0%	99.0%
2018	12.0%	24.0%	2023	62.0%	96.0%	2028	99.0%	99.0%
2019	18.0%	40.0%	2024	76.0%	97.0%	2029	99.0%	99.0%
2020	24.0%	62.0%	2025	90.0%	98.0%	2030	99.0%	99.0%

Many prefer the “Extra Heroic” case because they want to believe we won’t need to reduce driving

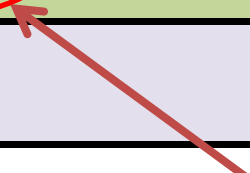
% Reduction in Per-Capita Driving, with Respect to 2005	
Heroic	32%
Extra Heroic	0%

However, the “Extra Heroic Case” percentages are not reasonable.

# Motivation for Change, 6 of 7

- Two Solutions: *Heroic* and *Extra Heroic*

% Reduction in Per-Capita Driving, with Respect to 2005	
Heroic	32%
Extra Heroic	0%



We must achieve a **significant reduction** in per-capita driving, by 2030, with respect to 2005, if we are going to **stabilize the climate at a livable level.**

# Motivation for Change, 7 of 7

A big part of the needed 32% reduction will need to come from car-parking reform. The first step will be a simplified demonstration project of a **Dividend-Account** Parking System at a work location. Such a proposal will now be presented.

# ***A Dividend-Account Parking System for Oceanside***

**A System to Eliminate the Harm of Bundled-Benefit  
Car Parking for City Employees  
300 North Coast Highway**

- Overview
- Calculations
- Who gets to use the system and how
- Overcoming problems and perceptions
- Outcomes of a new incentive

Mike Bullock  
[mike\\_bullock@earthlink.net](mailto:mike_bullock@earthlink.net)  
760-7548025

# Overview

- Fully-automated parking system, operated as a business for the financial gain of employees
  - Earnings = revenue minus expense
  - All earnings go to employees
- Price is cost per minute
  - Such as 2.356 cents per minute (= \$1.41 per hour)
- An employee's **earnings** (“**Dividend**”) is proportional to their time spent at work

# Calculations of an Employee's Earnings

- An employee's earning is proportional to time spent at work:

Definitions to Compute an Employee's Monthly Earnings	
$T_{\text{Employee}}$	The Employee's Monthly Time at the Work Site
$T_{\text{AllEmployees}}$	Total Monthly Time at the Work Site, All Employees
$E_{\text{AllEmployees}}$	Total Monthly Earnings from the Employee Parking

$$\text{Employee Earnings} = E_{\text{AllEmployees}} \times (T_{\text{Employee}} / T_{\text{AllEmployees}})$$

# Additional Payment so Those that Drive Every Day Will Lose No Money

Note: This is for an individual employee, “Joe”

Joe's Parking Payment =

Joe's Earnings – Price per Minute x Minutes Joe Parked + “ (Joe's) Add In”

“Add In” is zero, unless it must take on a positive value so that Joe loses no money

# Charge, Earnings, & Add-In, Payment *For Each Employee*

- **Charge**
  - Total Minutes Parked x Cost per Minute
- **Earnings**
  - As shown on earlier slide (proportional to employee's time spent at work)
- **Add-In**
  - Zero, unless **Charge** > **Earnings**
  - If **Charge** > **Earnings**, **Add-In** = **Charge** – **Earnings**
- **Payment** = **Earnings** – **Charge** + **Add-In**

# Who Gets To Use Dividend-Account Parking

1. Employees driving a car registered in the system
  - There is a person with an account associated with the car
2. Anyone else driving a car registered in the system
  - There is a person with an account associated with the car

# Employee Behavior

*Employees Must Park in Their Parking Lot if they Drive to Work*

## Measures to Reduce “Cheating” = Parking in the Neighborhood

- Soft, pre-emptive measure: messaging
  - **Perceived integrity** is every employee’s responsibility
  - **Insufficient perceived integrity** can cost employees
    - Reduced chance of promotion
    - Smaller pay raises
    - More chance of terminated employment
  - Empty spaces in the employee parking garage cost all employees money
  - Parking free in the neighborhood will not be tolerated
  - The City wants to be a good neighbor: this is the reason for off-street parking ordinances
- Soft, pre-emptive measure: data collection
  - Operate the system for a time, perhaps even a year, before actually collecting or distributing money
  - Non drivers are identified, thanked, and asked to provide details as to how they are getting to work without driving
- Soft, In-Operational Mode: Non drivers are thanked and interrogated
- **Hard: cameras or RFID sensors can identify employees walking into the work perimeter from the neighborhoods**

# Hard-to-Not-Drive Example

## Fictional, Simplified Case with Pricing and Payout Considered per Day, [Page 1](#)

- Employment Center (factory and office)
- Outside Hemet, California
- 100 employees; parking lot has 100 spaces
- No Transit, 110 degree temperature with poor roads for biking, culture of not car-pooling
- Before installing
  - 99 drive
  - 1 bikes

# Hard-to-Not-Drive Example

Fictional, Simplified Case with

Pricing and Payout Considered per Day, *Page 2*

- Dividend-Account Parking charges \$10/day
- After installing
  - 99 drive
  - 1 bikes
- Total collected each day: \$990
- Each employee gets \$9.90 earnings per day
- Each driver loses 10 cents per day
- The “crazy” bike rider gets \$9.90 per day extra

**Hey, isn't this an improvement? I would say the “crazy” bike rider is earning his money!**

If another employee bikes, the drivers would lose 20 cents per day and the bike riders would get \$9.80 per day. If the company president rented out the 2 extra spaces for \$10 per day, the drivers would lose nothing and the bike riders would get \$10 per day. Biking would increase by 100%!

**What's wrong with that?**

# Results of 3 Actions, Including Cash-out

Case (#1), Reference Patrick Siegman's article in Bicycle Pedestrian Federation

- Company: CH2M Hill
  - Location: Bellevue, WA (Seattle suburb)
  - Engineering Firm with 430 employees
- Actions
  - \$54/month (1995 \$'s), to not drive
  - Improved Transit
  - Improved Bike/Ped facilities

CH2M Hill Work Trips		
Mode	Before	After
Drive Alone	89%	54%
Carpool	9%	12%
Bus	1%	17%
Bike, Walk	1%	17%
	100%	100%

Since these changes are brought about by more than just cashout, this case is not used in the tabulation of cashout results (next chart)

**Money  
Matters  
!!!!!!**

# Cash-Out Results

(11 Locations, 3 Groups, 1995 Dollars)

- Reference: *How to Get Paid to Bike to Work: A Guide to Low-traffic, High- Profit Development* by Patrick Siegman\*. Published in *Bicycle Pedestrian Federation of America*, 1995.
- 3 Largest Responses
  - 38%, 36%, 31%
- 3 Smallest Responses
  - **15%**, 18%, 24%
- Responses are the change; car vacancy rates would be larger

\* Patrick  
Siegman, of  
Nelson Nygaard



Impact of Financial Incentives on Parking Demand			
Location	Scope	1995 dollars per mo.	Parking Use Decrease <sup>1</sup>
<b>Group A: Areas with little or no public transportation</b>			
CenturyCityDistrict, West Los Angeles	3500 employees at 100+ firms	\$81	15%
Cornell University, Ithaca, NY	9000 faculty & staff	\$34	26%
San Fernando Valley, Los Angeles	1 employer, 850 employees	\$37	30%
Costa Mesa, CA		\$37	22%
Average for Group		<b>\$47</b>	<b>23%</b>
<b>Group B: Areas with fair public transportation</b>			
Los Angeles Civic Center	10000+ employees, several firms	\$125	36%
Mid-Wilshire Blvd., Los Angeles	1 mid-size firm	\$89	38%
Washington DC Suburbs	5500 employees at 3 worksites	\$68	26%
Downtown Los Angeles	5000 employees, 118 firms	\$126	25%
Average for Group		<b>\$102</b>	<b>31%</b>
<b>Group C: Areas with good public transportation</b>			
University of Washington, Seattle Wa.	50,000 faculty, staff & students	\$18	24%
Downtown Ottawa, Canada	3500+ government staff	\$72	18%
Bellevue, WA	1 firm with 430 employees	\$54	39% <sup>2</sup>
Average for Group, but not Bellevue Washington		<b>\$45</b>	<b>21%</b>
Over All Average, Excluding Bellevue Washington			<b>25%</b>
<sup>1</sup> Parking vacancy would be higher! <sup>2</sup> Not used, since transit & walk/bike facilities also improved.			

# Implementation Example

Since this is a new system, it would be prudent for the City to have the vendor take the full responsibility for operating the system, for the first 10 years. This would ensure that the vendor would debug the system and continue to look for operational efficiencies, over the 10 year period. A sliding scale of vendor-compensation could be specified in the contract, as follows: The vendor would operate the system for 10% of the revenue, for the first 5 years; 5% of the revenue, for the next 3 years; and 2% of the revenue, for the final 2 years. For example, if it is assumed that, on average, 600 cars are parked for 8 hours, for 200 days per year, at a rate of 50 cents per hour, then the yearly revenue would be \$480,000 per year. The vendor would therefore collect \$240,000 over the first 5 years, \$72,000 over the next 3 years, and \$28,800 over the last two years. Vendor contact information is available. This vendor has stated that the design and installation of a fully-automated system is feasible.

# Back up Slides

# Measures to Get 32%

Estimated  
Reduction

- Predictions, Regional Transportation Plans 10%
  - Stop expanding most roads and all freeways 2%
    - No need, Eliminate congestion with less driving
  - Reallocate freeway-expansion \$\$\$ to **transit** 2%
  - **Payment methods, to increase fairness & choice**
    - Demonstration projects: Dividend-Account Parking
    - **Legislation**
      - Replace Bundled-Cost or Bundled-Benefit Parking 8%
      - Equitable and environmentally-sound road-use fees 8%
  - **Smarter growth, complete streets, bike classes** 2%
- 32%**

# Motivation for Change

- Fairness to individuals
  - Costs no longer hidden
  - Costs avoided or recovered, by not using parking
- Less driving, to reduce environmental harm
  - Motivates choosing alternative modes
  - Less driving to find parking
- Cost Effective Development
  - Less parking needed reduces land and building costs

# Goals, 1 of 2

- One agency operates all parking
- Nearly all parking is shared
- Parking costs are effectively unbundled
  - From wages and rents
  - From costs of goods and services
- No change to how parking gets built
  - Generally, municipalities require & developers build

# Goals, 2 of 2

- Priced right
  - Value Priced: Base price derived from costs
  - Driver demand determines a congestion price
- No need to search for parking
  - Directions to parking that meets user's needs
  - Accurate price predictions
- Each parking space's use is archived
  - Supports informed decisions
- Privacy and the needs of the disabled are supported

# Definitions and Methods, 1 of 6

- Definition & Examples of ***Parking Beneficiary Group***
  - Owners
    - Private investors or governments operating public parking
  - Those losing money due to provided parking
    - Employees
    - Apartment renters or condominium owners
    - Hotel or restaurant patrons
    - Shoppers
  - Those offered specific parking
    - Driving-age students at a school with parking
    - Driving-age train riders using a station with parking

# Definitions and Methods 2 of 6

- How to Effectively Unbundle the Cost or the Benefit
  - Price charged per minute
    - Base price rate established to cover all costs
    - Congestion price rate
      - Dynamically set as a function of occupancy rate
      - Charge is time average, if rate changes, while car is parked
  - Parking generally available to all drivers
  - Earnings distributed to members of Beneficiary Group
    - Calculation of individual's earnings depends on situation

# Definitions and Methods, 3 of 6

- Calculation of monthly earnings
  - If parking is provided for several groups, each group's portion of the earnings is proportional to its original contribution to cost (Mixed use case)
  - Each beneficiary group's total is divided up among its members
    - Condominium owners: proportional to spaces effectively purchased
    - Renters: proportional to spaces effectively renting
    - Shoppers: proportional to money spent
    - Employees or students of driving age: proportional to time spent at work or school
    - Train riders of driving age: proportional to time spent on round trips

# Definitions and Methods, 4 of 6

- For congestion pricing, *define **Cluster of Parking***
  - 20 to 40 contiguous spaces nearly equal in desirability
  - Assigned the same price

- Pricing

- Base price

- Covers all costs  $r_{BaselineHourly} = \frac{(r_{Investment} \times v_{Parking}) + c_{YOPD}}{(n_{HoursPerYear} \times f_{TO})}$
    - Report's Page 13 & 14 provides details

- Congestion price, for each cluster

$$r_{HourlyRate} = r_{BaselineHourly} \times (B^{(30-V)/5}), \text{ for } V < 30; r_{BaselineHourly}, \text{ otherwise}$$

- $B$  is nominally 2; adjusted to keep vacancy above 15%
    - $V$  is the vacancy % rate (Report's Eq. 2, Table 2, Pages 14 & 15)

# Definitions and Methods, 5 of 6

- Pricing predictions
  - For any set of dates, start times, durations, and destinations
  - Availability of predictions
    - Broadcast into navigational units
    - Website or phone
- Help to find desired parking
  - Driver gives times and locations and stipulates . . .
    - Max price, to get space at minimum walk distance
    - Max walk distance, to get space at minimum price
  - Voice-activated navigational system for ease and safety

# Definitions and Methods, 6 of 6

- Monthly statements
  - All parking charges and earnings
    - First, within state
    - Then, within nation
    - Finally, within North and South America
  - Customer selects presentation detail
    - Less detail for ease and more privacy
    - More detail to know and adjust parking decisions
  - Packaged with other statements
    - All utilities, transit use, road use

# Implementation Plan, 1 of 3

- Prototype design
  - Most likely a Climate Action Plan Mitigation Measure
- Requirements document to support request for proposal (RFP)
- Winning proposal leads to design
  - Hardware selection and design
  - Software generation
- Prototype installation
  - Most likely a Climate Action Plan Mitigation Measure
  - Debug
  - Adjustments to satisfy stakeholders

# Implementation Plan, 2 of 3

- Government agency develops and executes full installation strategy
  - To minimize impact on institutions
  - To maximize early success and driving reductions
    - Large employment centers with “free” parking
    - Train stations with large, “free” parking lots
  - Supported by new law that requires cooperation but very little effort, from . . .
    - Private and public institutions
    - Individuals

# Implementation Plan, 3 of 3

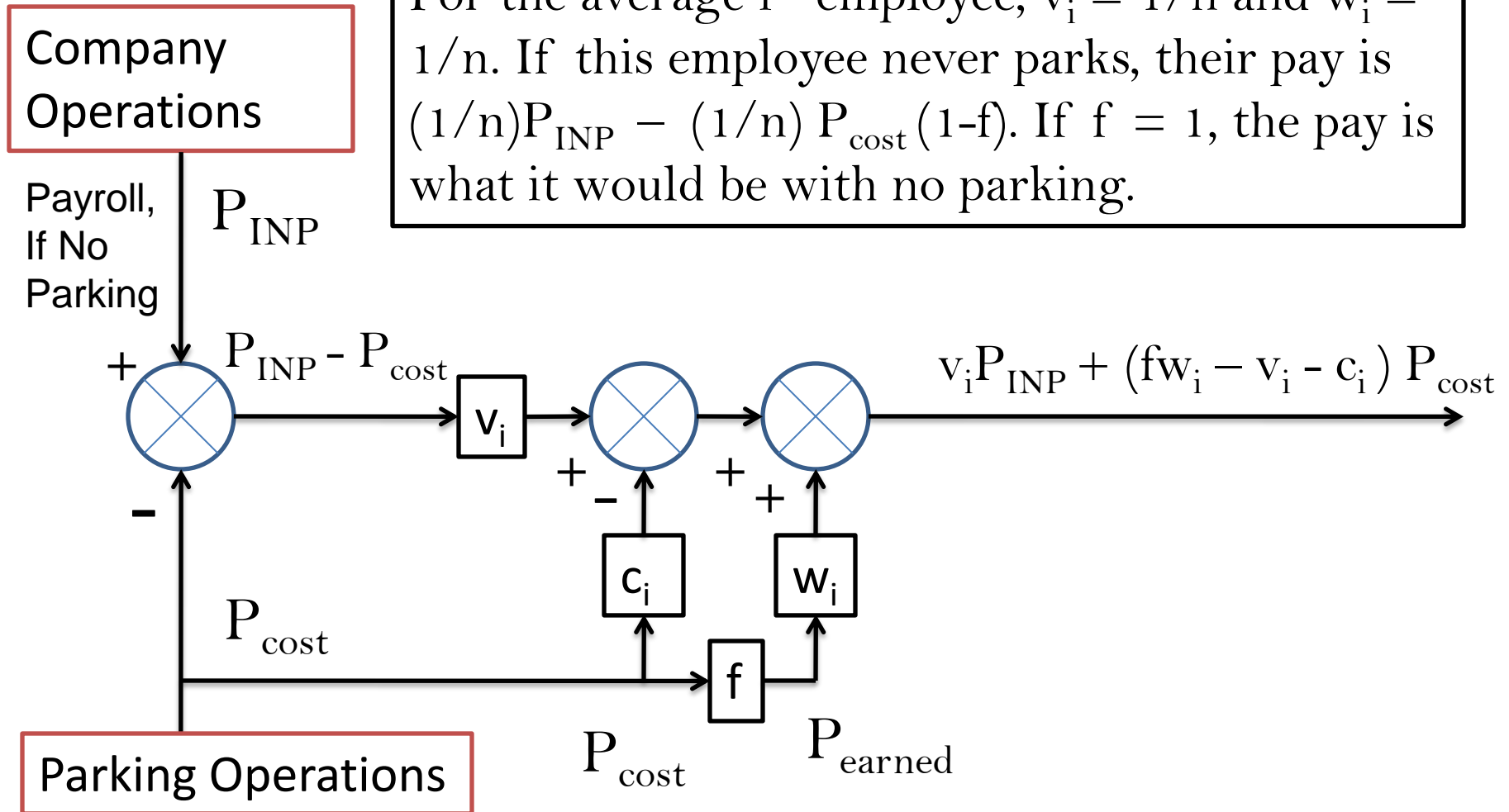
- Basis for a new law supporting installations
  - To provide equal protection of the law
    - Government has required parking for 50 years
    - Those driving less than average often lose money
  - Prototype will have demonstrated feasibility
  - Global warming considerations show subsidized parking to be a public nuisance
    - Global warming will likely cause a human catastrophe
    - Short term strategies are critical
    - Electric cars and getting most electricity from renewables will take decades
    - Properly pricing parking is relatively cheap and quick (5 years)

# Unbundle Flow Diagram Definitions

Variable	Definition
$P_{\text{INP}}$	Company payroll if there were no parking costs
$P_{\text{cost}}$	Total parking cost. Price will be sized to recover this.
$P_{\text{earned}}$	Parking earnings equals parking cost minus collection cost
$v_i$	Employee value. Fraction of available pay. For the average employee, $1/n$
$c_i$	Fraction of parking cost paid. Zero, if the employee never parks.
$f$	Parking earnings divided by parking cost. Close to 1 for efficient collection
$w_i$	time worked divided by total time worked of all employees. If average, this is $1/n$ .

# Unbundle Flow Diagram

For the average  $i^{\text{th}}$  employee,  $v_i = 1/n$  and  $w_i = 1/n$ . If this employee never parks, their pay is  $(1/n)P_{\text{INP}} - (1/n)P_{\text{cost}}(1-f)$ . If  $f = 1$ , the pay is what it would be with no parking.



# Mike Bullock, 1 of 2

- Personal
  - Married, two daughters, 3 grand daughters, 1 grandson
    - Daughter Laura Bullock White (Berkeley)
    - Heidi Bullock (Oceanside)
  - Moved from Cupertino to Oceanside in April 2007
  - Oceanside home (1800 Bayberry Dr) and 4-plex (506 N. Ditmar)
  - Swims with and competes for Oceanside Swim Masters
- Education
  - BSEE, Lamar University
  - MSE, University of Texas at El Paso
- Professional
  - Lockheed Martin Systems Engineer, 1971 to 2007
    - Last 2 years, Space Based Infrared System (SBIRS, satellite to detect and track missiles)
    - 10 Years previous: Milstar (communication satellite)
      - Verification of antenna pointing accuracy
      - Antenna pointing calibration

# Mike Bullock, 2 of 2

- Most Recent Activities
  - California Democratic Party
    - Delegate, 76<sup>TH</sup> AD
    - Elected member of the San Diego County Central Committee
    - CDP Resolutions and Platform