



Davis FREE

HVAC Segmentation Analysis

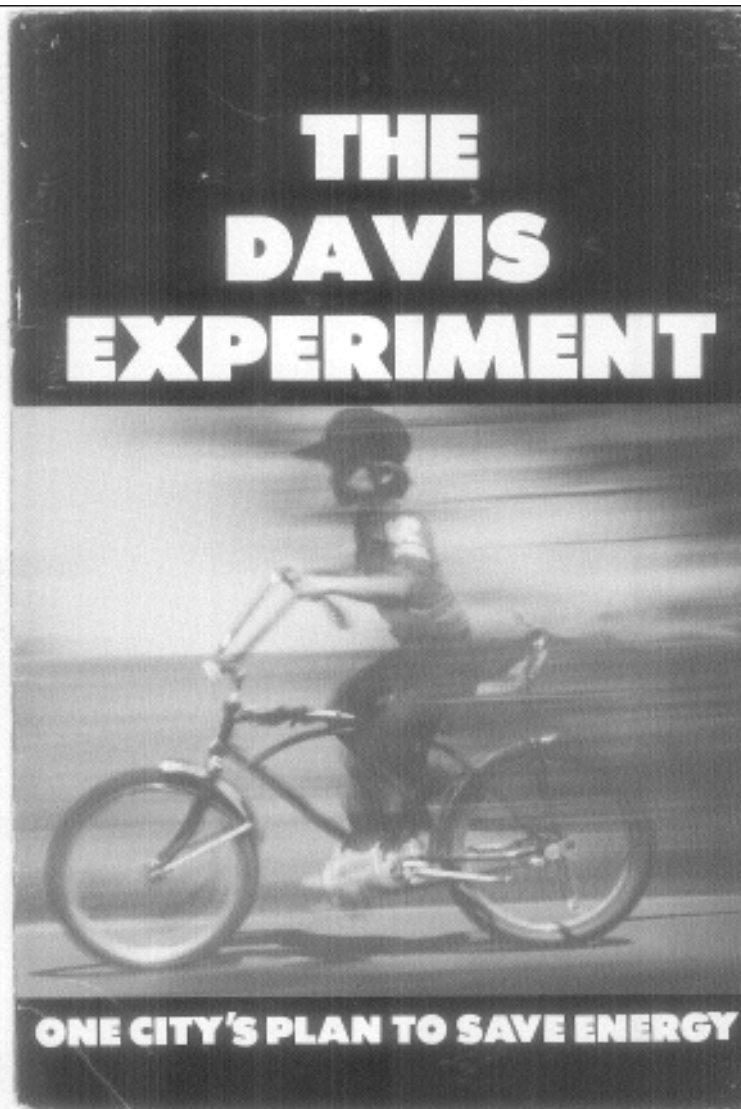
**Local Government Commission
Statewide Energy Efficiency Forum**

Wednesday June 15, 2016

Riverside, CA

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City of Davis

History/Future



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1 DAVIS, CALIFORNIA. The citizens of Davis have been involved in progressive city planning and energy conservation since 1968, when the City Council decided to facilitate bicycle transportation by developing a system of bikeways. In 1972, the City drew up a general plan for future development, based on questionnaires distributed to residents. Their goals were to limit growth and to conserve land, water, energy, and other natural resources.

2 ENERGY USE. An important part of Davis' General Plan was to determine how energy was being used by residents. A survey of residents showed that automobiles represented 50 per cent of energy consumption, and space heating and cooling accounted for 26 percent. So, transportation and building construction became important focal points in the Davis Plan.

3 BUILDING CODE. The Energy Use Survey revealed that a building's placement on a lot — its east-west orientation — greatly influenced its space heating and cooling needs. Insulation, amount of window area, exterior roof and wall colors, overhang shading, and other factors were also important. Armed with this information, the City Council drew up a building construction code which local developers have followed successfully.

4 SOLAR HOUSES. To demonstrate to local builders and developers methods for complying with Davis' new construction code, the city is building model solar homes — one single-family dwelling which took advantage of natural southern-exposure sunlight, and several duplex buildings which create a basic plan that could be adapted to difficult siting ("worst case") situations.

5 SOLAR DRYERS. Like many other communities, several years ago Davis banned the use of clotheslines as unsightly. After the Energy Use Survey, Davis reversed its position and nullified its ordinance banning clotheslines.

6 SWIMMING POOLS. When the Energy Use Survey revealed that many of Davis' 700 swimming pools cost \$40 to \$60 a month to heat, the city decided to ban any new pool heating except solar systems, and to require that current gas-heated pools be converted to solar heating within the next ten years.

7 FENCES AND HEDGES. In most communities, fencing regulations require that fences be constructed relatively close to houses — leaving a large amount of yard space between the fence and the street. Davis had similar regulations until the city realized that fencing close to a house blocks the winter sun.

8 WORK IN THE HOME. By encouraging cottage industry, Davis hopes to cut down on home-to-office transportation and to reduce some of the need for new office-building construction.

9 STREETS. As new developments are built, Davis believes that reducing street width from 34 to 28 feet or less will not only save space — it would also use less asphalt and may contribute to slower auto speeds, thereby enhancing fuel efficiency.

10 RECYCLING. Davis' recycling effort began five years ago and has grown into a full-fledged trash-collection, deposit, and recycling center that handles newspapers, cans, glass, even waste oil. With large initial investments in drop boxes, a collection scooter, trucks, and a can crusher, the recycling effort lost money in its early years. But now, the operation breaks even by selling \$3,000 worth of recyclables every month.

11 SHADE TREES. Trees provide important shading for the city's streets and buildings, and the city maintains them with care. Davis plants a large number of evergreen trees to decrease the need for leaf pickup in the Fall.

12 BICYCLES. Davis' bikeways and bicycle safety programs provide unique incentives to bicycle transportation unequalled anywhere else in the U.S. In a city of 33,000 people, Davis has some 25,000 bicycles registered.

13 BUSES. By using second-hand, diesel-fueled, double-decker buses, Davis is able to provide convenient public transportation facilities at minimum cost and energy use.

14 APPENDICES. To assist other city planners and public officials, Davis' city codes, ordinances, and plans related to residential construction, trees, and bicycle traffic are reproduced in appendices A, B, and C.

“...most importantly, this shows that a small community can have an affect on a global issue”

Davis
Experiment
1977

Davis Sustainability

Combining social and
technological innovation to
achieve measurable results

Application of Principles

Community Based Social Marketing

- ID Barriers/Motivations
- Develop Strategy
- Implement
- Assess
- Repeat

Back Ground: Davis Energy Roadmap

Buildings + Trans (IRESN)

| Ideal Davis Energy Usage/Supply Balance - 2015 to 2035 | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|
| | 2015 | 2020 | 2025 | 2030 | 2035 |
| | Annual GWh | | | | |
| Unrestrained Usage | 503.9 | 524.9 | 550.1 | 581.7 | 626.8 |
| Usage Reductions | 0.0 | -15.5 | -30.0 | -44.3 | -60.4 |
| Reduced Usage | 503.9 | 509.3 | 520.1 | 537.4 | 566.4 |
| Local Supply Sources | | | | | |
| Solar Heat | 0.5 | 1.0 | 4.7 | 10.0 | 21.2 |
| On-site PV | 35.2 | 51.0 | 67.1 | 83.2 | 99.3 |
| Community PV | 0.0 | 18.0 | 72.0 | 104.4 | 126.2 |
| Community Wind | 0.0 | 46.7 | 151.6 | 198.3 | 245.0 |
| Total Local Supply | 35.7 | 116.7 | 295.5 | 395.9 | 491.6 |
| Imports | 468.2 | 392.6 | 224.6 | 141.5 | 74.8 |
| Total Supply | 503.9 | 509.3 | 520.1 | 537.4 | 566.4 |



Photo: Yvonne Hunter

Segmentation – In 2 Parts

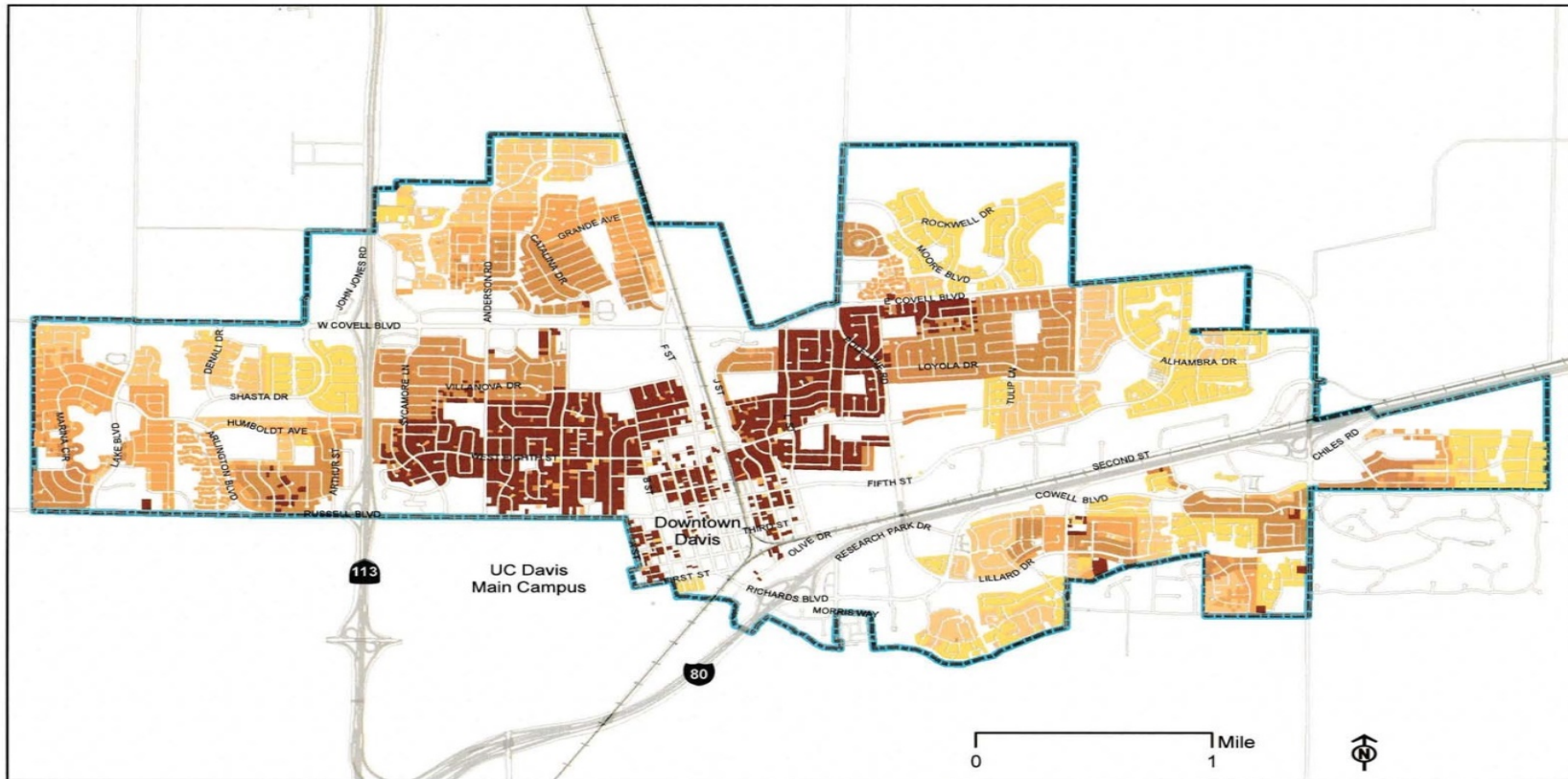
1. Community

- Neighborhood Vintage
- HVAC Replacement – Replacement Curve

2. Household

- What is the need? How is the consumer decision made?
- Add value with information at time of need

Understanding the community



Single Family Housing

Year of Construction
City of Davis, California

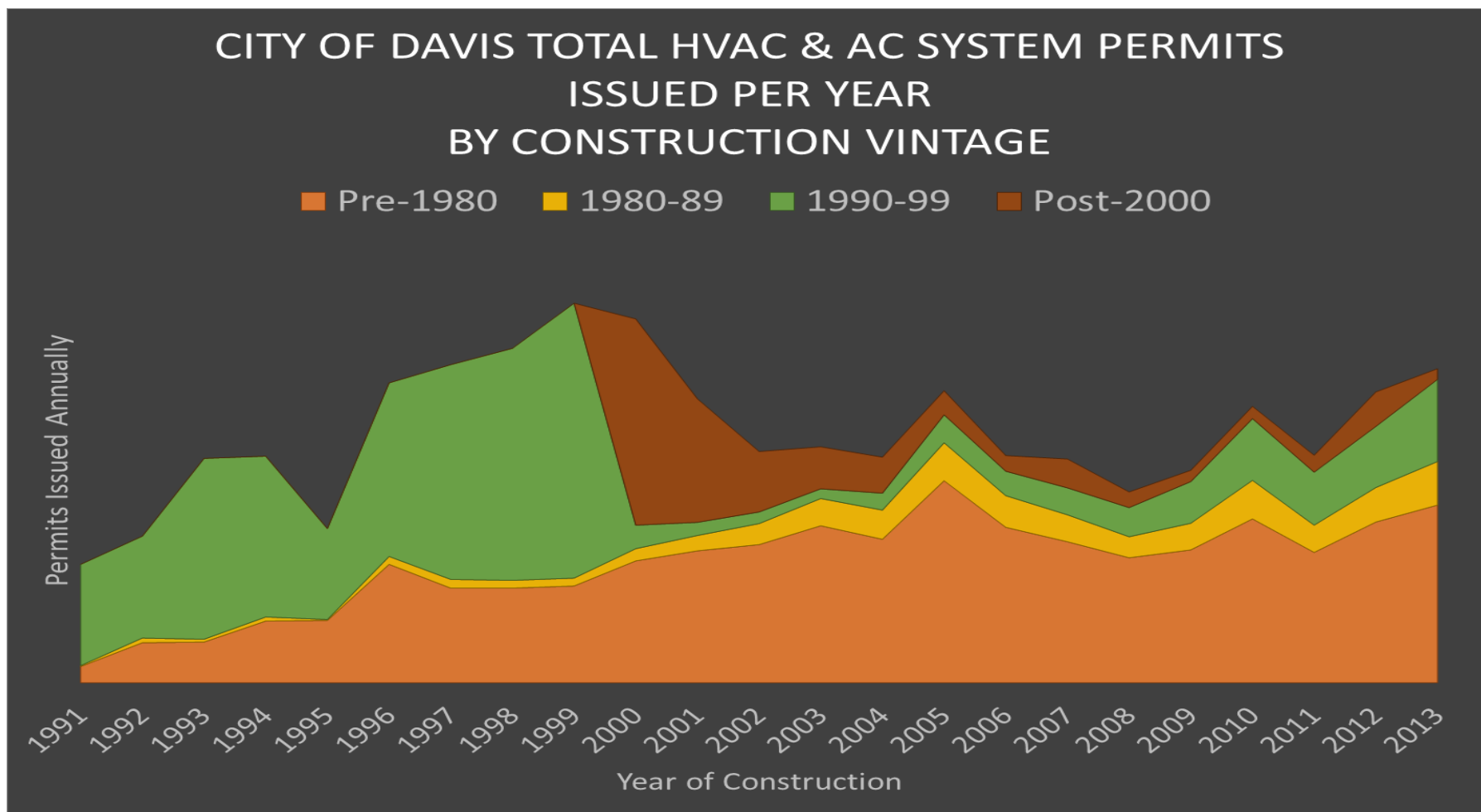


Community Segmentation – Home Vintage (1970's)

| HVAC Size to Meet Loads | Baseline | Good | Better | Best |
|---|----------|------|--------|------|
| Cooling (Tons) | 6.2 | 3.1 | 2.1 | 2.1 |
| Heating (kBtu/hr) | 47.8 | 27.1 | 17.7 | 13.1 |
| % Reduction HVAC Size | - | 47% | 65% | 69% |
| PV for ZNE (kW required for 100% source energy savings) | 9.3 | 6.2 | 5.4 | 4.6 |

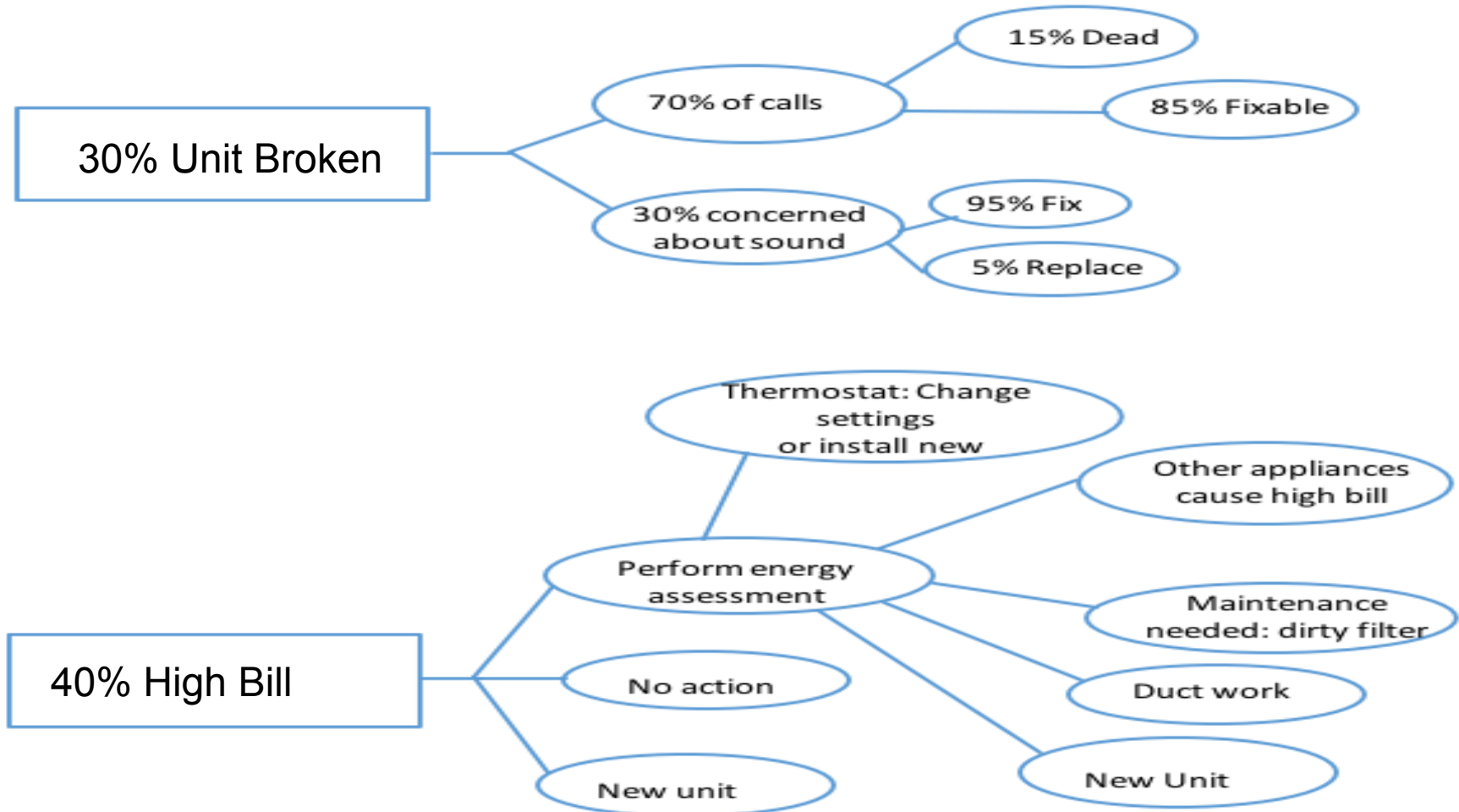
Community Segmentation

Davis HVAC Replacement Curve



Household Segmentation – Need

How household decisions are made – HVAC



Next Steps

Pilot:

- Planning stage
- Developing contractor check list
- Opportunity to test suite of household based EE actions based on housing vintage segmentation study
- Designing housing vintage EE upgrade community workshops – “if you live in a 1970’s vintage home, here’s what we know about your house and the best strategies to reduce energy costs”

Segmentation Partners - HVAC



UCDAVIS

ENERGY EFFICIENCY CENTER

Specific Conclusions

- Mine your community data to optimize message development and targeting
- Segmentation analysis key – as best as possible, understand why and how consumers are making decisions about household systems related to energy (e.g. HVAC, roof replacement, H2O Heaters, etc)
- Develop mutually beneficial partnerships to execute strategy

Contact



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