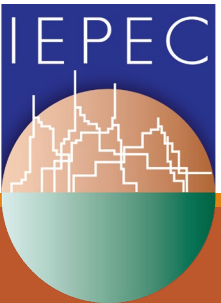


Hidden Health Care Costs: Energy Demand for Home Medical Equipment

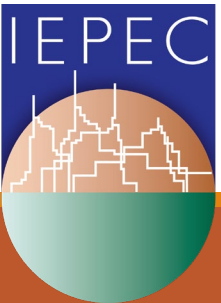
Safdar Chaudhry

Theresa Bohannon



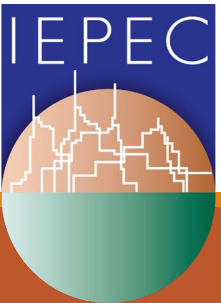
Purpose of this presentation

- Share the results of a research on energy consumption of different types of home medical equipment
- Demonstrate annual costs of operating home medical equipment, based on a time-of-day rate schedule
- Present estimates of additional energy consumption and operating costs due to increase in the space cooling and heating temperature points
- Discuss future considerations and policy implications



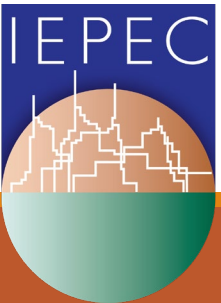
Home Medical Equipment (HME)

- HME is an equipment intended for users in any environment outside of a professional healthcare facility
- Examples: oxygenators, dialysis equipment, CPAP machines etc.
- HME have become more common due to an aging population and increase in chronic diseases
- Estimated 12 million people in the U.S. receive home healthcare
- Currently, U.S. HME market is about \$15 billion and estimated to reach \$20.4 billion by 2027



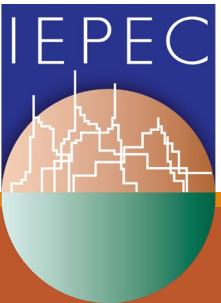
Home Medical Equipment Discount Programs

- Programs aimed at offering bill discounts to customers who utilize HME
- Typically designed for customers in need of bill assistance and qualify based on the type, prescribed by a healthcare professional
- Some patients are temperature sensitive and may require air-conditioning or controlled environment
- SCE, PG&E, SDG&E and LADWP are examples of utilities offering Medical discount programs to qualifying customers in California



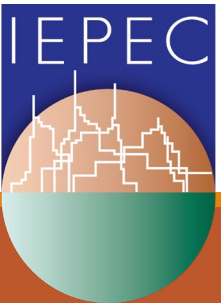
Methodology & Data Collection

- Literature review of devices commonly prescribed to patients for home use by medical professionals
- Review of power ratings from manufacturers' specifications
- Interviews of healthcare providers to understand the frequency and duration of use of prescribed devices
- Building energy simulations to determine additional energy consumption for maintaining appropriate environmental conditions for patients
- Cost Estimates using a Time-of-Day rate schedule



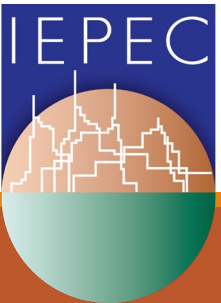
Time of Day (TOD) Rates (hypothetical)

Period	\$/kWh
Summer Peak	\$0.30
Summer Mid-Peak	\$0.20
Summer Off-Peak	\$0.15
Non-summer Peak	\$0.15
Non-summer Off-Peak	\$0.10



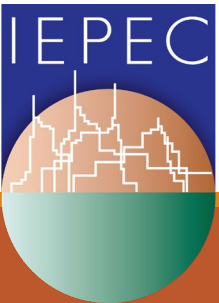
Electricity consumption and operating costs of commonly used HME

Medical Equipment	Annual kWh	Non-Summer Operating Costs (\$/Year)	Summer Operating Costs (\$/Year)	Annual Operating Costs (\$/Year)
Oxygen Concentrator Full Size	3,066	\$213	\$181	\$394
Dialysis Cycler Full Size	1,937	\$144	\$127	\$271
Electric Wheelchair	690	\$47	\$39	\$86
Respirator	357	\$25	\$21	\$46
CPAP Standard with Humidifier	248	\$17	\$14	\$31
Electric Hospital Bed	53	\$4	\$4	\$8

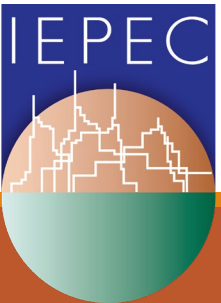
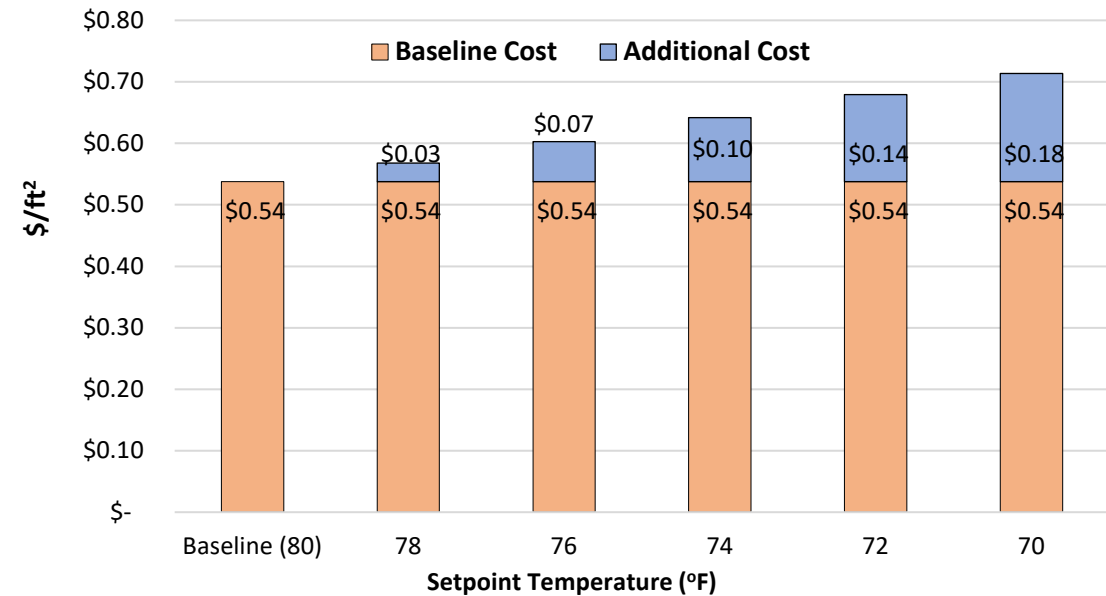
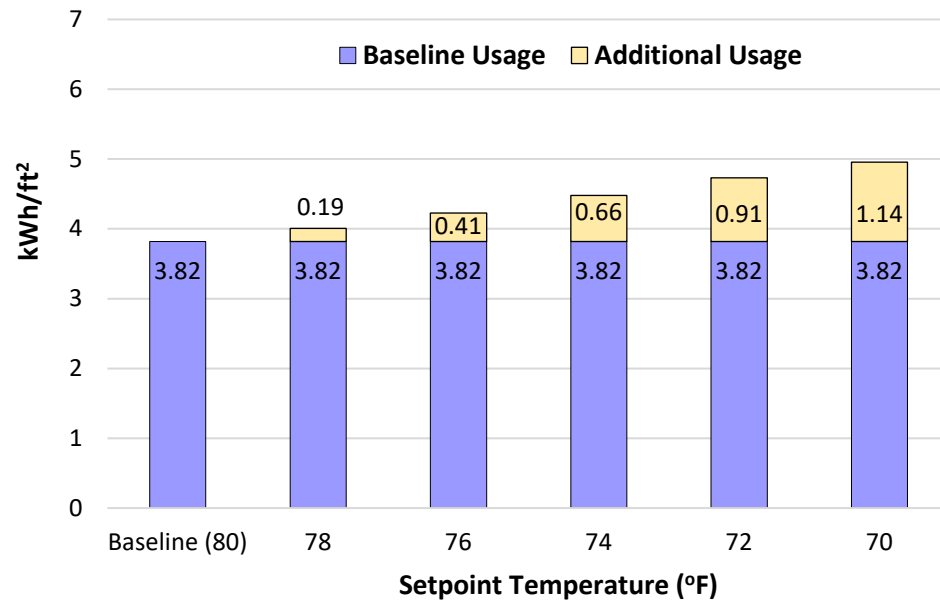


Summary of Simulation Model

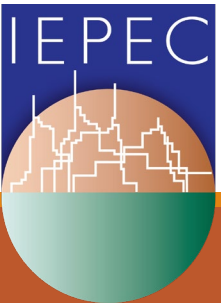
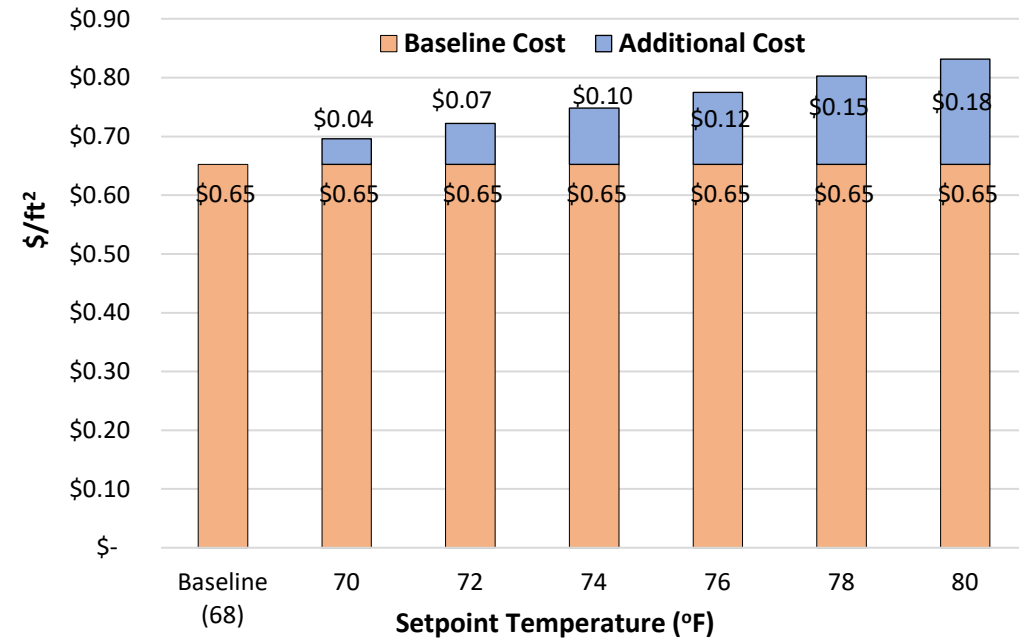
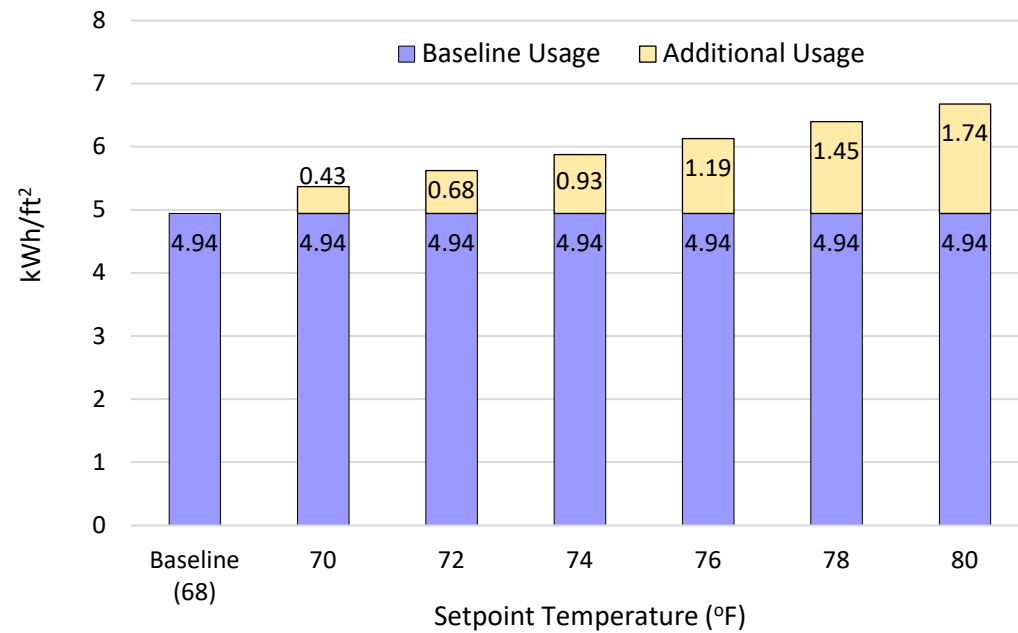
Construction	Floor Area (ft ²)
Single Family (Single Story)	1,887
Single Family (Multi-Story)	2,904
Multi Family (2-Story w/ 24 units)	912 each Unit
All Single Family (Weighted Average)	2,396
All Residential	1,900



Increase in annual energy use & cost due to changes in cooling setpoints

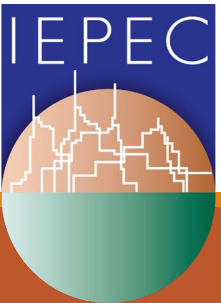


Increase in annual energy use & cost due to changes in heating setpoints



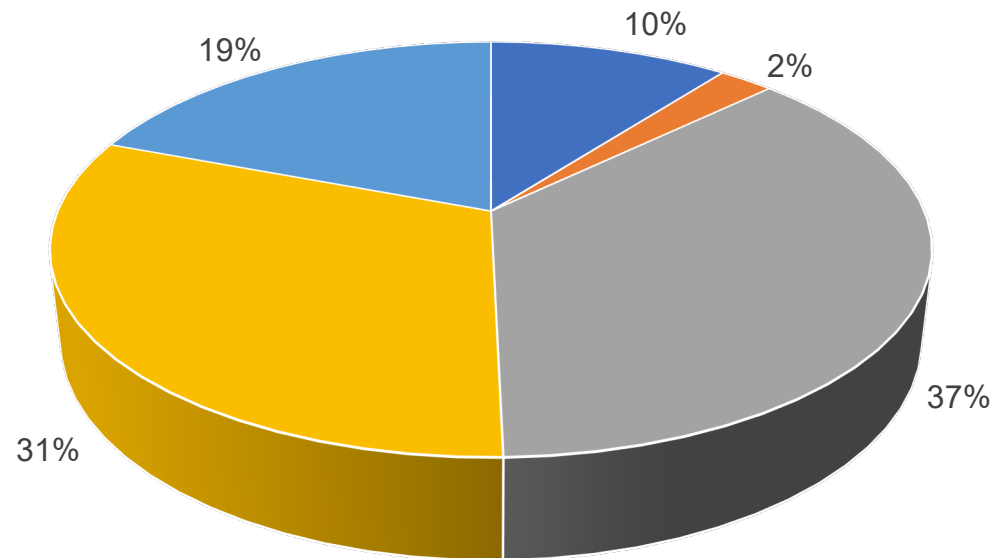
Summary of additional energy costs for different thermostat setpoints

Thermostat Setpoint	Cooling Cost (\$/ft ² -yr.)	Heating Cost (\$/ft ² -yr.)
68 °F	NA	\$ 0.00
70 °F	\$ 0.17	\$ 0.04
72 °F	\$ 0.13	\$ 0.07
74 °F	\$ 0.10	\$ 0.10
76 °F	\$ 0.06	\$ 0.12
78 °F	\$ 0.03	\$ 0.15
80 °F	\$ 0.00	\$ 0.18



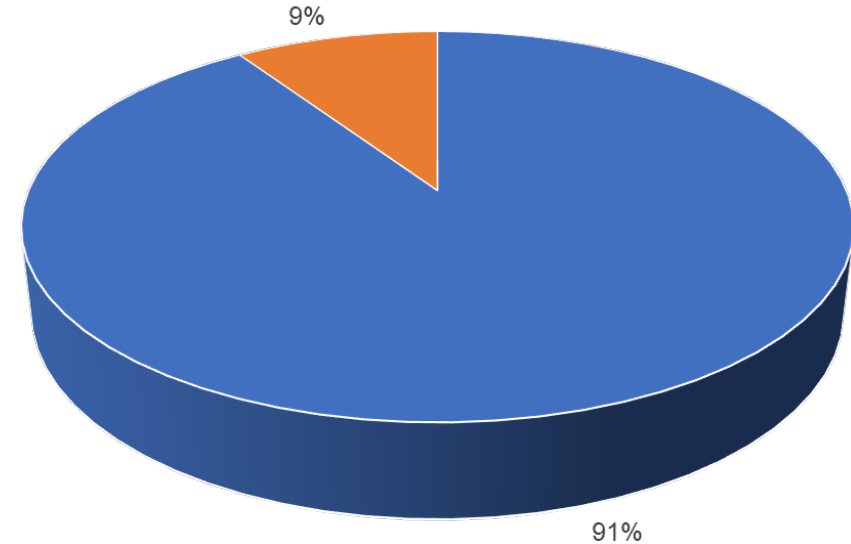
Breakdown of energy cost by time of day due to changes in setpoints

Cooling

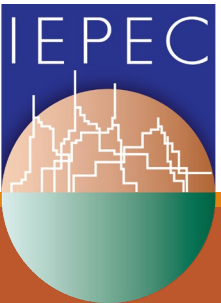


- Off-Peak non-summer
- Peak non-summer
- Off-Peak summer
- Mid-Peak summer
- Peak summer

Heating

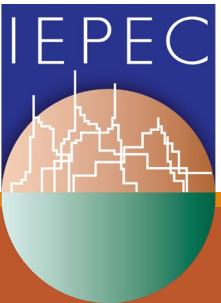


- Off-Peak non-summer
- Peak non-summer



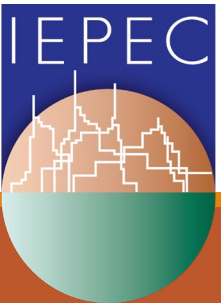
Key Takeaways

- Utility companies offer a valuable service to customers who may struggle to pay the increased costs associated with the HME
- 24 different types of HME were evaluated for energy consumption and cost
- The Medical providers with differing levels of experience with HME were interviewed
- Oxygenators, CPAP machines, dialysis equipment, electric wheelchairs, hospital beds, and pain relief equipment were the most common HME
- The energy consumption and cost ranged widely among different HME



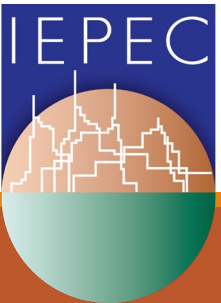
Key Takeaways

- The environment control inside the home may have an impact on the home's energy usage and cost
- It is estimated that on average, every 2 °F reduction in cooling setpoint temperature increases the cooling energy usage by 5.4% and cooling energy operating cost by 6%
- Every 2 °F increase in heating setpoint temperature increases the heating energy usage by 5.2% and heating energy operating cost by 4.4%
- The TOD analysis concludes that on average, about 16% of the cooling energy usage increase is contributable to off-peak non-summer, 3% to peak non-summer, 43% to off-peak summer, 28% to mid-peak summer, and 10% to peak summer period
- The additional 10% energy use during the peak summer period costs the customer 21% of the total cost increase, due to the high rate during this period
- For the heating season, 93% of heating energy usage increase is contributable to off-peak non-summer, 7% to peak non-summer, and none to other periods



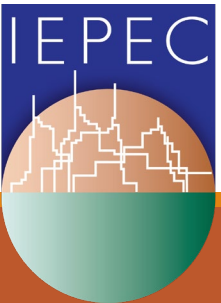
Future Research Activities

- The scope of this research can be expanded
- Collect more data and information about medical equipment usage from participants
- This research study would be valuable to researchers and program administrators to ensure that operating costs are accurately calculated and to improve the delivery of program services to customers
- Program administrators can provide educational materials to program participants about on- and off-peak hours
- Discount programs offer utilities a touchpoint with customers to help them better understand how they can reduce their energy consumption when using at-home medical equipment
- When feasible, patients can choose to use or charge their medical devices during off-peak hours and increase their understanding of energy usage in their homes



Policy Implications

- HME discount programs may have broad policy implications and considerations because they provide benefits to an underserved population
- The use of home medical equipment is potentially increasing every year; therefore, the need for HME discount programs may also increase
- Utility companies should seek partnership opportunities with local and state health authorities
- Opportunities to increase funding for the programs and increase participation through Medicaid waivers or other state-sponsored programs



Thank You!

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