



# **Review of Staff Report and Analysis**

**Battery Charger Workshop**  
Hearing room A

March 3, 2011

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# Staff Report Analysis

- Considered in staff report:
  - IOU CASE study
  - US DOE preliminary analysis
  - Stakeholder comments from October workshop
- To be considered in final staff report:
  - Data request responses
  - Comments received for this workshop.



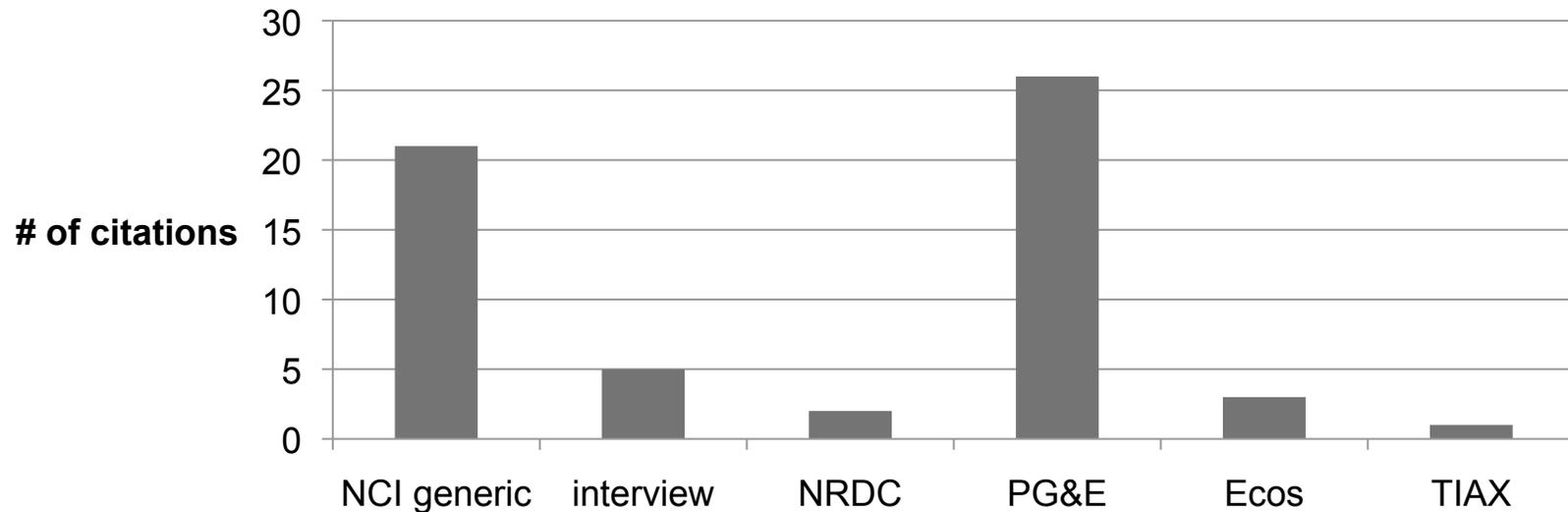
# DOE preliminary analysis

- The DOE analysis relies heavily on PG&E and Ecos as sources.
- Other sources are simply tied to “generic profiles” and “estimates”
- Industry input found in two key measures: duty cycle and cost.
- Industry information not directly available.



# Duty Cycle

Duty cycle cited sources



- Industry inputs above include: power tools and hedge/weed trimmers



# DOE preliminary analysis: cost

- DOE estimated incremental costs are very different from CASE report estimates.
- CASE cost is based on Ecos estimates to implement various circuit changes
- DOE cost is based on two sources: interviews, and third party “teardowns”



# DOE preliminary analysis: cost

- Extremely high costs to improve from baseline to compliance.
  - Class 2 (cordless phones, shavers, mp3 players) incremental cost of \$16.69
  - Class 4 (laptops, power tools, universal chargers) incremental cost of \$12.57
- Inconsistent with expected design changes



# Battery Charger Model

- Model calculates:
  - Statewide energy use
  - Unit and statewide energy savings
  - Cost to benefit ratio
- Model source data:
  - IOU CASE data



# Energy Savings

- Unit savings are calculated using:
  - Duty cycle
  - Charge, maintenance, and no battery power
- Statewide savings are calculated using:
  - Sales and current saturation of products
  - Estimated compliance rate



# Formulas and Availability

- The assumptions and formulas are available in Appendix B of the staff report
- Staff has provided an excel version of this information for stakeholder convenience



# Results

- Statewide energy consumption
  - 7,128 GWh/yr
- Statewide energy savings:
  - 2,038 GWh/yr
- Cost-benefit ratios are all positive and greater than 3

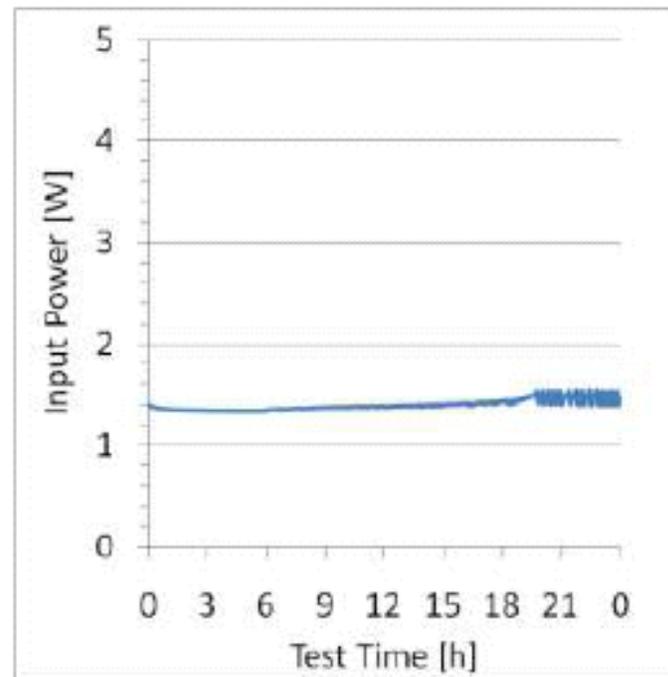


# Technical Feasibility

- Small battery chargers can improve efficiency by incorporating a “switch” that turns the battery off when it is charged.
- Large battery chargers can improve efficiency by improving power conversion and by incorporating the same switch.

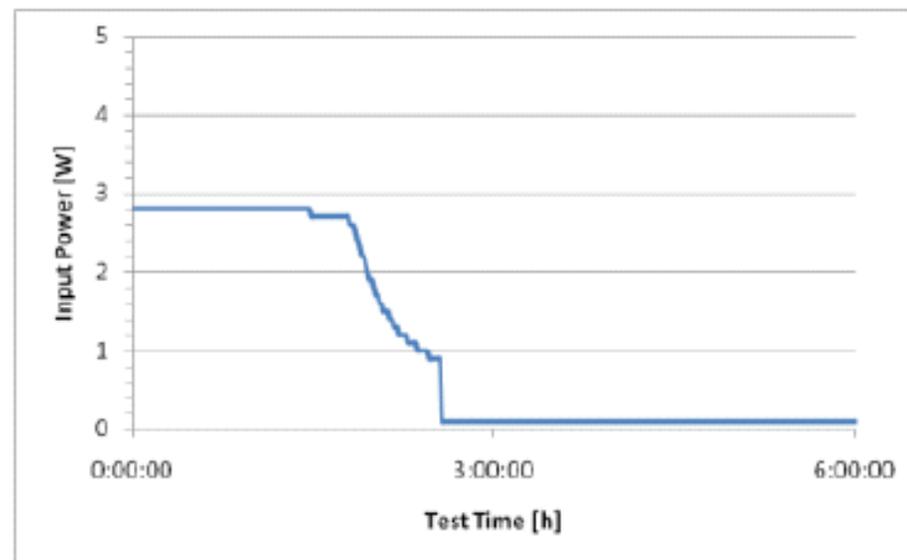
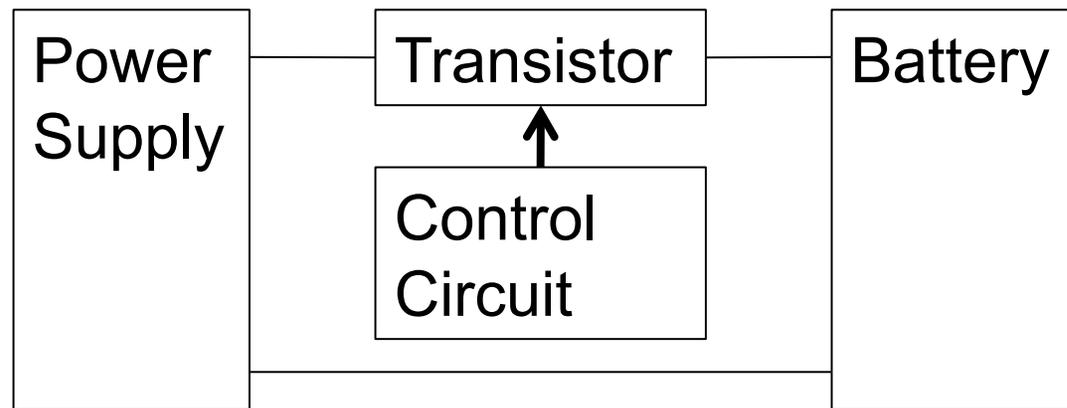


# Switch Concept: No Switch



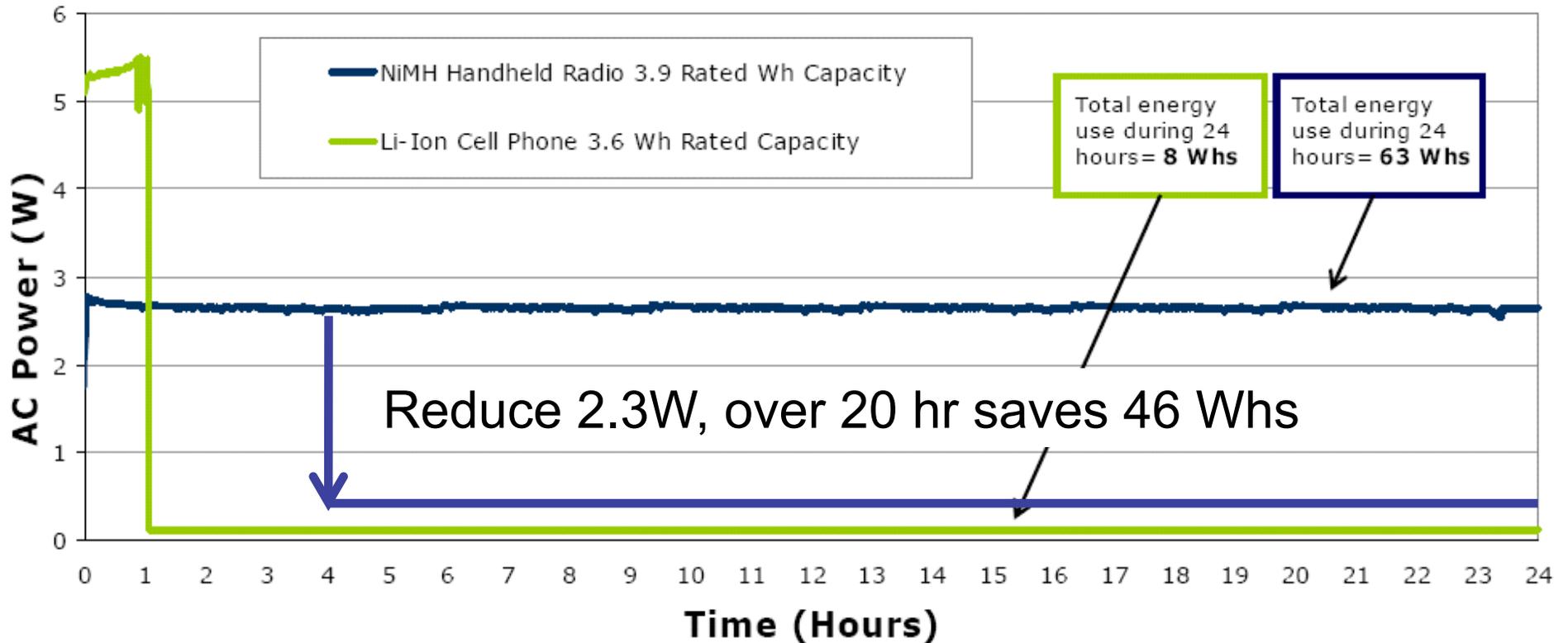


# Switch Concept: Switch





# Switch Strategy and Compliance



- Now 17 Wh and compliant



# Power Factor

- Power factor correction requirements at two levels
  - Passive
  - Active
- The savings are directly related to the power draw of the product.
- CASE demonstrates cost effectiveness



# Small Battery Charger Test Procedure

- Test provides four key measures:
  - 24 hour energy consumption
  - Maintenance mode power
  - No battery mode power
  - Power factor



# Small Battery Charger Test Procedure cont'd

- Tests entire system
  - Power supply, charger, and battery
  - Is consistent with DOE proposed approach
- External power supply (EPS) energy is measured as part of the procedure
  - No bias for internal vs. EPS
  - EPS for chargers have previously been exempted.



# Small Battery Charger Test Procedure cont'd

- Includes battery selection methodology
- Requires that functionality not related to battery charging be turned off
- Methodology covers all battery chemistries and charger configurations
  - NiCd, Li-ion, NiMH, Lead Acid
  - Cradles, multi-bay, built-in chargers.



# Small Battery Charger Standard Metrics

- Standards for:
  - 24 hour energy
    - Must be less than 1.6 times battery capacity plus 12 watt-hours
  - Maintenance mode
    - Must be less than or equal to 0.5 watts
  - No battery mode
    - Must be less than or equal to 0.3 watts
  - Power factor – 0.55 or 0.9 depending on power



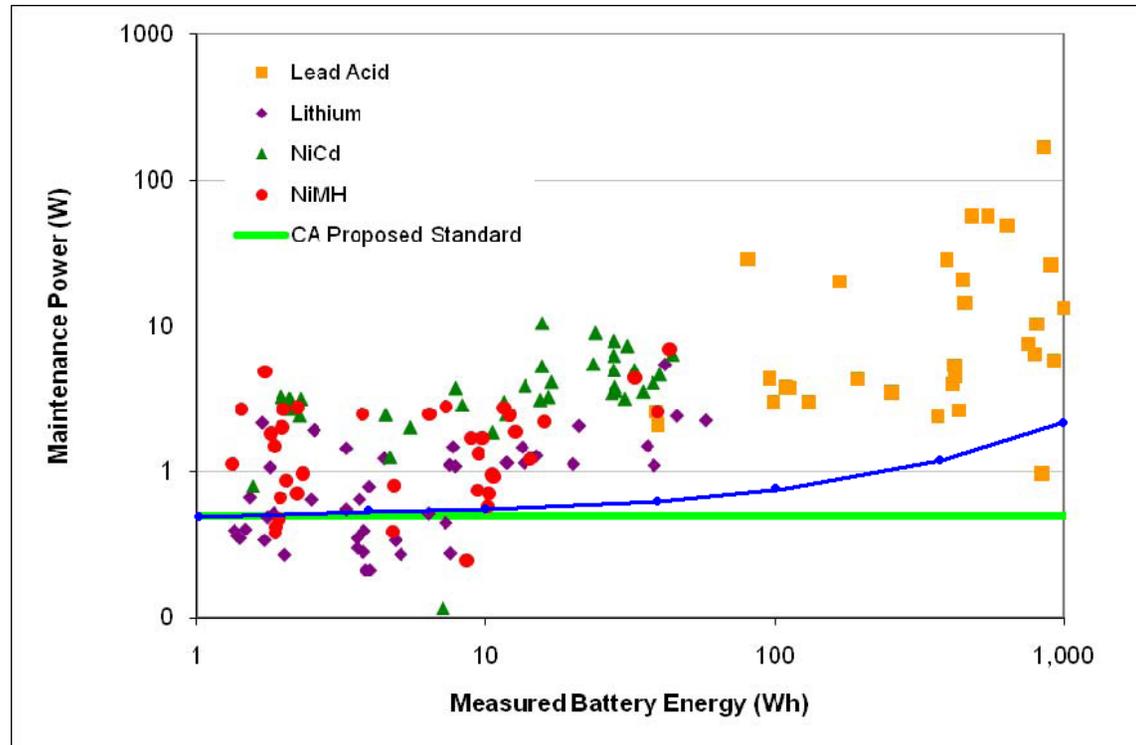
# Alternative Maintenance Approach

- Scale the maintenance by battery capacity
  - Helps larger battery chargers counter self-discharge
  - Maintenance must be  $\leq 0.5 + 0.03 * \text{Battery Capacity} / (24 \text{ hours} * 0.6)$
  - 0.03=3% loss per day
  - 0.6 = 60% efficiency



# Approach Comparison

- Blue=Alternative      Green=Current





# Large Battery Charger Standard Metrics

Performance Parameter		Tier 1	Tier 2
Charge Return Factor (Crf)	100%, 80% Depth of Discharge	$Crf \leq 1.15$	$Crf \leq 1.10$
	40% Depth of Discharge	$Crf \leq 1.20$	$Crf \leq 1.15$
Power Conversion Efficiency		Greater than or equal to: 84%	Greater than or equal to: 89%
Power Factor		Greater than or equal to: 0.85	Greater than or equal to: 0.95
Maintenance Power		Less than or equal to: 75 W	Less than or equal to: 10 W
No Battery Power		Less than or equal to: 20 W	Less than or equal to: 10 W



# Inductive Chargers

- Alternative compliance option
  - 1 watt maximum draw
- Can still comply using general small charger proposal



# Alternative Exit Sign Proposal

- Staff report does not treat these products differently
- CASE recommended higher allowances
  - $20+1.6*E_b$  for 24 hour test
  - 0.8W in maintenance mode
  - No standards for no-battery mode
- Allowance to account for lighting that may not be shutoff



# Effective Dates

- Small Chargers – July 1, 2012
- Large Chargers
  - Tier 1: July 1, 2012
  - Tier 2: July 1, 2013
- Replacement Parts
  - Replacement/repair parts must meet applicable standards by July 1, 2017



# Exceptions

- Staff proposes medical devices that require certification to FDA be exempt
- Staff proposes replacement parts have longer period of time to comply for compatibility
- Is consistent with EPS approach
- Does not include on-road vehicle chargers.



# Labeling

- Battery chargers are incorporated in such a large number of products, certification is difficult.
- Labeling reduces certification cost and time.
- Propose a “S-II” mark for small chargers and a “L-II” mark for large chargers.



# Labeling Location

- Products which use a charging cradle, the label goes on the cradle
- Products which incorporate charge circuitry and contain batteries during charge, the label goes on the battery powered product
- If no charge circuitry, label goes on external charger.



# Comment responses

- Comment: CEC has not provided ample time to respond to process
  - Response: Stakeholders have been asked for data since November 2008, have been asked for feedback in October 2010 and again in January 2011.
- Comment: CEC data and assumptions are flawed
  - Response: CEC has requested basis and substantiation of these flaws.



# Comment responses

- Comment: The process is not transparent
  - October workshop: open discussion on the IOU CASE report. The CASE report was fully disclosed.
  - January request for data: open to all stakeholders
  - March workshop: includes staff report detailing CEC approach, responses to prior comments, and includes a model of calculations.



# Summary

- Staff has analyzed CASE, DOE, and stakeholder comments and has found:
  - Proposed regulations will save a significant amount of energy
  - Proposed regulations are technically feasible
  - Proposed regulations are cost effective



# Written Comments

- Submit comments both electronically and in writing by March 15, 2011
  - Email comments to [docket@energy.state.ca.us](mailto:docket@energy.state.ca.us)
  - Include docket number 09-AAER-2 in the subject line of comments
  - Mail hard copy to:

California Energy Commission  
Dockets Office, MS-4  
Re: Docket No. 09-AAER-2  
1516 Ninth Street  
Sacramento, CA 95814-5512