

PG&E Evaporative Cooler Programs and Incentives

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SWEEP / WCEC Evaporative Cooler Workshop

July 10, 2007

PG&E Evaporative Cooler Program 2001-2006

- Customer Rebates for Qualifying Rigid Media Coolers with:
 - Two speed fan motors
 - Water management system
- Tier 1: \$300 for Direct Evaporative Coolers
(Minimum 85% Effectiveness)
- Tier 2: \$500 for Indirect or combination
Evaporative Coolers
- Additional \$100 with the installation of
pressure relief dampers (“up ducts”)

Rebate Program Participant Survey

- Surveyed 217 rebate program participants in 12/2005
- Before participating participants had:
 - No Cooling 7%
 - Swamp Coolers Only 51%
 - Swamp Coolers and AC 21%
 - AC Only 21%
- Key Findings:
 - 87% of respondents said the rigid media cooler “keeps the house cooler at higher outdoor temperatures than the Swamp cooler
 - 100% of the respondents with both rigid media and AC said “the evaporative cooler has allowed them to either delay turning on the central AC or not use it at all.”

Rebate Program Participant Survey

- Recommendations for future programs
 - Directing rebates and product information to those who currently have some form of mechanical A/C
 - Emphasize EC's ability to dramatically reduce the cost of cooling
 - Do not oversell – Not a complete replacement for A/C (may still be needed under certain climate conditions)
 - Promote right-sizing or down-sizing of A/C

Rebate Program Suspended in 2007

- Declining Participation
 - From approximately a 1000 rebates in 2001 to less than 200 in 2006
- Market demographics didn't favor a customer program
 - Low income
 - Seniors
 - Non-English speaking
- Application and process were too complex
- Contractors did not promote the rebates
- No active industry support
- Rebate still available to multi-family housing
- Product information still available:
http://www.pge.com/res/rebates/whole_house/evap_colers/index.html

2007 Emerging Technologies Pilot

- Create and test a new program model in the city of Fresno
- Contractor Rebate Program
 - Direct Coolers: \$300
 - Indirect/Direct and Indirect: \$600
 - Pressure Relief Dampers: \$100
- Small Incentive for Distributors
- 30 Contractors Trained
- Goal: 1000 rebates in 2007

Commercial Programs

- Small Business Rebate
 - \$123/ton of A/C removed or disabled after EC install
 - <http://www.pge.com/includes/docs/pdfs/application/07HVAC.pdf>
- Other
 - Eligible through existing new construction and retrofit incentive programs
 - Based on annual energy savings over Title 24 baseline
 - May have added value due to new Time-Dependent Valuation (TDV) of energy

Product Evaluations

- Understand the capabilities and limitations of new products
- Estimate energy savings potential over alternative (A/C)
- Determine promotion level
 - Educational information
 - Rebates
- Gain understanding of new California Appliance Standards (Title-20) Evaporative Cooler Efficiency Ratio (ECER)
- Reports available on the Emerging Technologies Coordinating Council web site:
<http://www.etcc-ca.org>

California Title-20 ECER

- Intended to establish a single-number metric for evaporative cooler energy efficiency and allow comparison of systems

$$ECER = 1.08 \times CFM \times (T_{db_{room}} - (T_{db_{in}} - \epsilon \times (T_{db_{in}} - T_{wb_{in}}))) / W$$

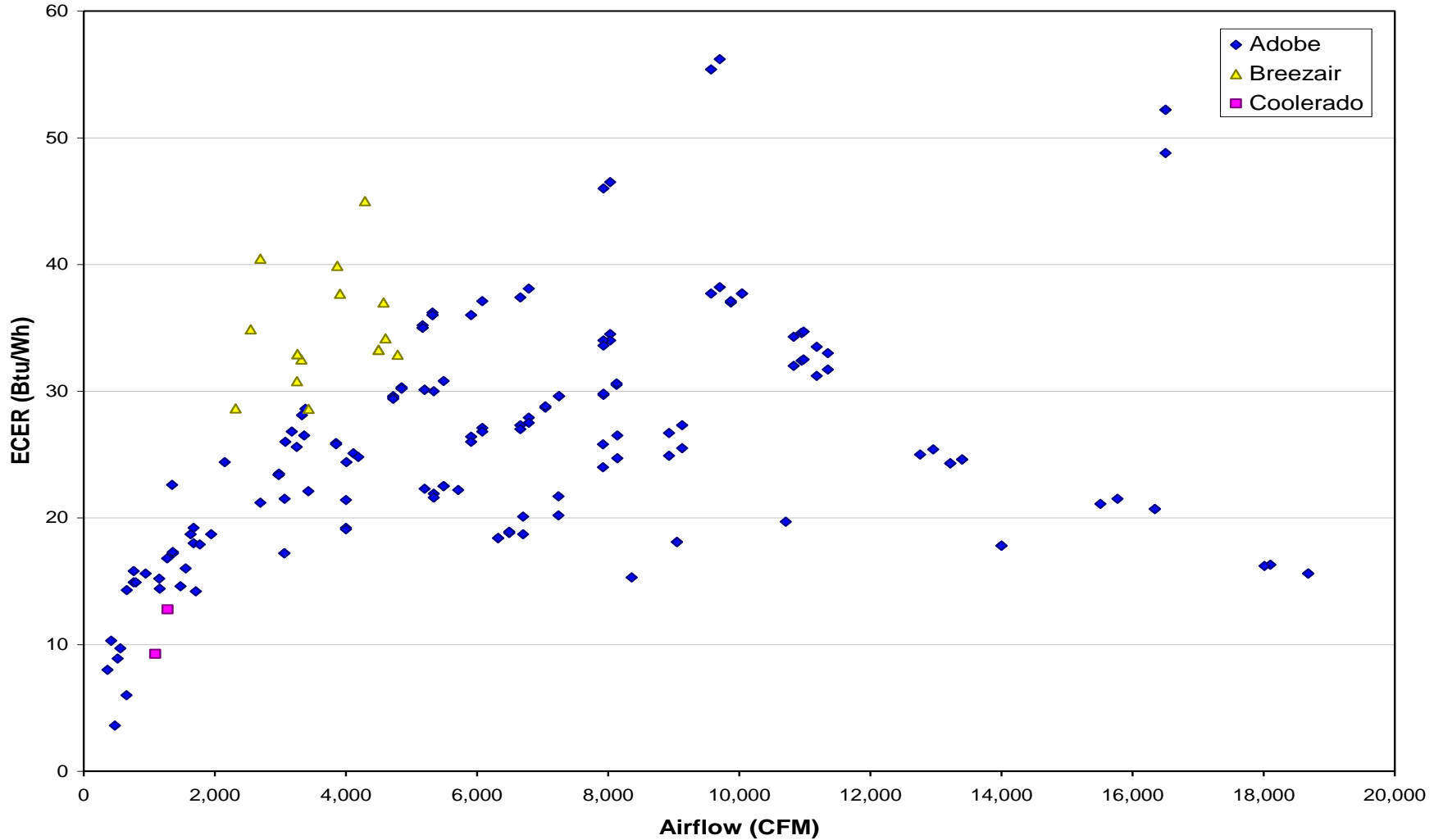
Standard Rating Conditions	ECER	Australian Standard AS2913
Reference Indoor Dry Bulb Temperature	80°F	81.3°F (27.4°C)
Outdoor Dry Bulb Temperature	91°F	100.4°F (38°C)
Outdoor Wet Bulb Temperature	69°F	69.8°F (21°C)
Outlet Static Pressure	0.3" w.g.	0.32" w.g. ≤8,475 CFM (80 Pa ≤ 4,000 l/s) 0.48" w.g. > 8,475 CFM (120 Pa > 4,000 l/s)

$$ECER = 11.88 \times CFM \times (2\epsilon - 1) / W$$

California Title-20 ECER

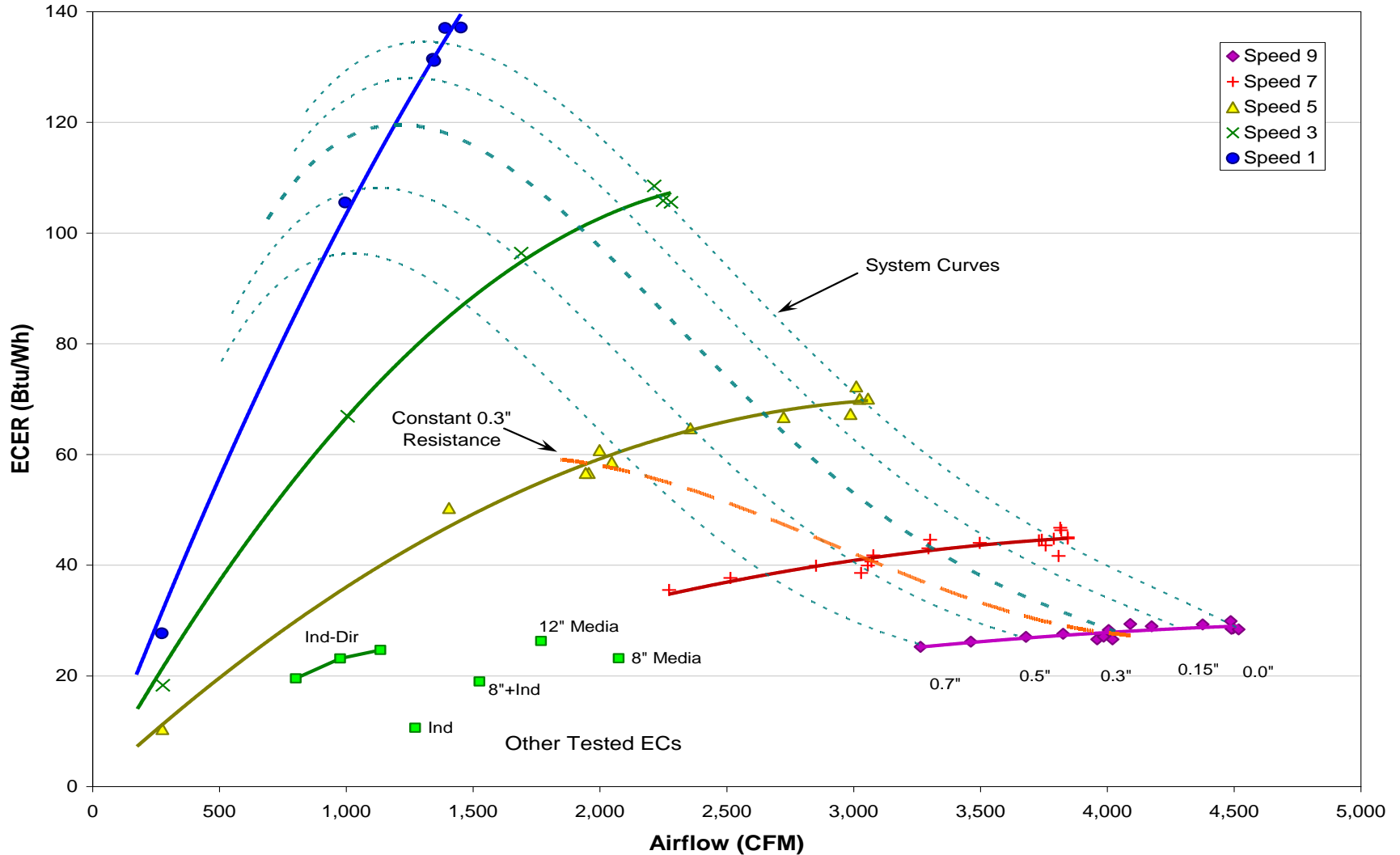
- Drawbacks
 - Handles indirect and combination systems poorly
 - Treats all ECs as sensible coolers
 - Extra resistance restricts airflow
 - Power penalty for secondary airflow
 - Does not capture low-speed performance
 - Fan power $\propto (\text{Airflow})^3$
 - EC may have most operating hours at low speed if controlled by thermostat
 - Needs to be linked to delivered airflow

California Title-20 ECER



http://www.energy.ca.gov/appliances/appliance/excel_based_files/non_central_air/evap_coolers.zip

Lab Tests on EC with Variable Speed Fan

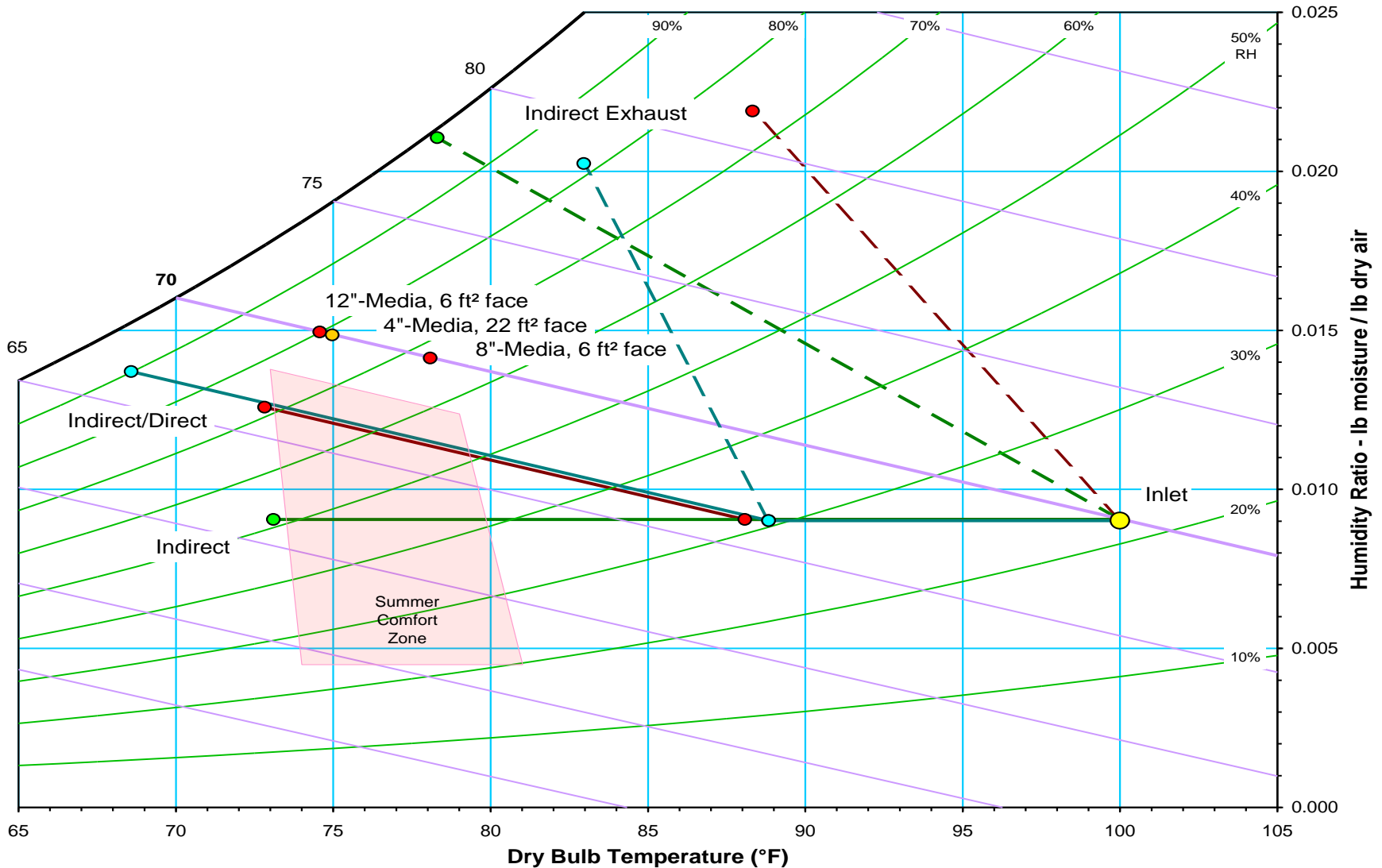


Summary of Test Program Results

(High Speed at 0" w.g. Outlet Resistance)

Test Unit	8" Media	12" Media	8" Media + Indirect	I/DEC	Indirect	4" Media + VS Fan
Supply Airflow (CFM)	3,320	3,070	2,440	1,330	1,500	4,520
Exhaust Airflow (CFM)	–	–	610	360	1,320	–
Total Power (W)	737	726	939	584	1,329	1,196
Effectiveness	73%	84%	90%	104%	88%	83%
ECER (@ 0.3" w.g.)	23.2	26.3	19.0	23.1	10.4	27.8
At intake conditions of 100°F _{db} / 70°F _{wb}						
Supply Temperature (°F)	78	75	73	69	73	75
Water Consumption (GPH)	13	14	14	5	12	13
Moisture Increase (%)	56%	65%	39%	52%	0%	64%

Summary of Test Program Results



Conclusions

- Industry needs to develop or refine sizing methods
 - e.g. At the design ambient conditions, how many air changes / hour are needed for comfort?
- Better performance models are needed to determine energy and demand savings over A/C while providing adequate comfort
 - Incorporate into tools used for code compliance