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Combined Heat and Power



DOCKET

09-IEP-1H

DATE July 23 2009

RECD. July 27 2009

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California Energy Commission
IEPR Workshop
July 23, 2009

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Topics

- CHP's role in AB 32 goals
- CHP benefits
- Overview of oil and gas industry CHP facilities
- Status of California CHP policy
- Barriers to CHP retention and development
- Opposition to CHP
- Observations on ICF findings
- Need for integrated state CHP policy

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CHP Supports AB 32 Goals

- CHP adopted as GHG reduction strategy in ARB Scoping Plan
- CHP reductions complement other electricity sector measures
 - RPS: 21.3 MMTCO₂e
 - Energy Efficiency: 19.6 MMTCO₂e
 - CHP: 6.7 MMTCO₂e
- Failure to retain *existing* efficient CHP will increase required Scoping Plan reductions
- How will the ICF report influence ARB?

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CHP Benefits – More Than Just GHG Reductions

- Customer benefits
 - On-site reliability
 - Cost control
 - Business certainty
- Societal benefits
 - Fuel efficiency
 - Reduction in GHG and criteria pollutant emissions
 - Grid reliability
 - Not dependent on transmission investment
 - Reduced transmission and distribution energy losses

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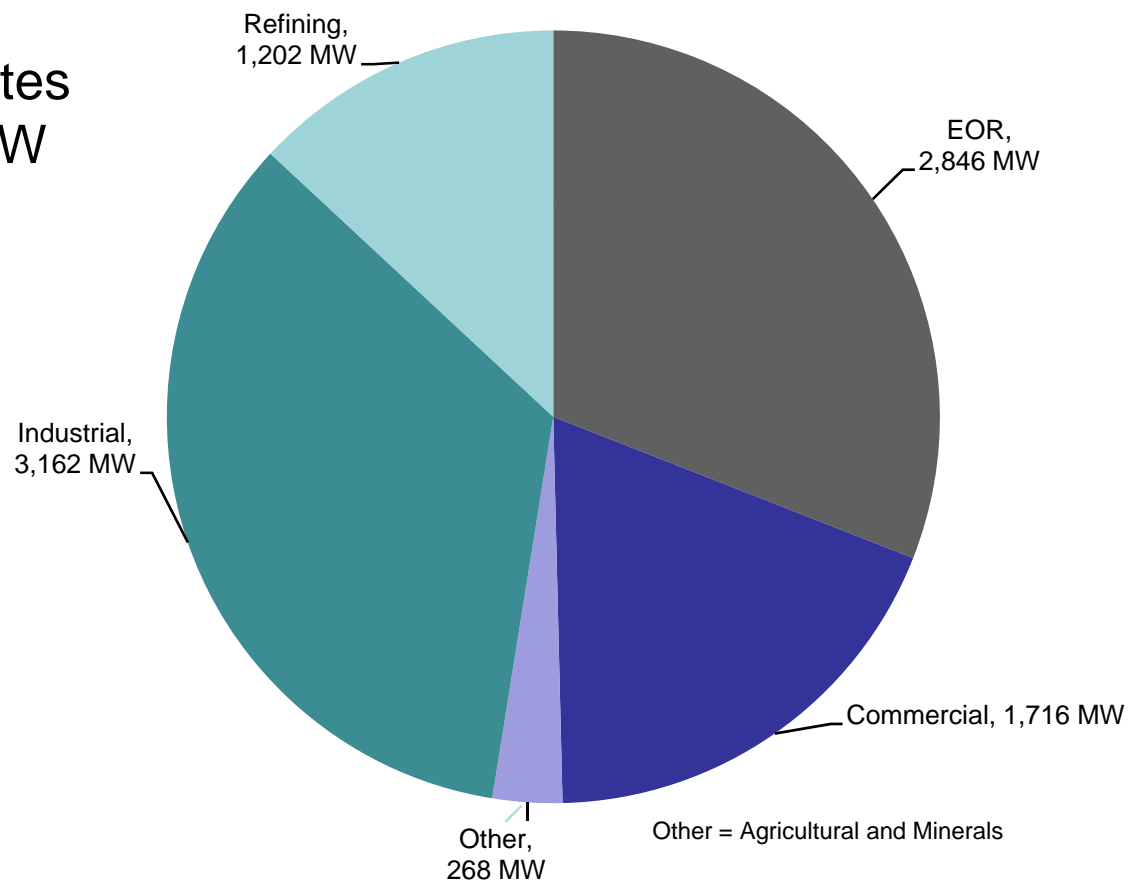
Agency Support for CHP

- **CPUC:** *“We support the treatment of CHP as an emission reduction measure and the goal to encourage cost-effective, fuel-efficient, and location-beneficial CHP.”*
- **CEC:** *“Combined heat and power in particular offers low greenhouse gas emissions rates for electricity generation taking advantage of fuel that is already being used for other purposes...”*
- **ARB:** *“ARB recommends that California take steps to encourage the development of new CHP facilities, with a target of an additional 4,000 MW of installed CHP capacity by 2020.”*

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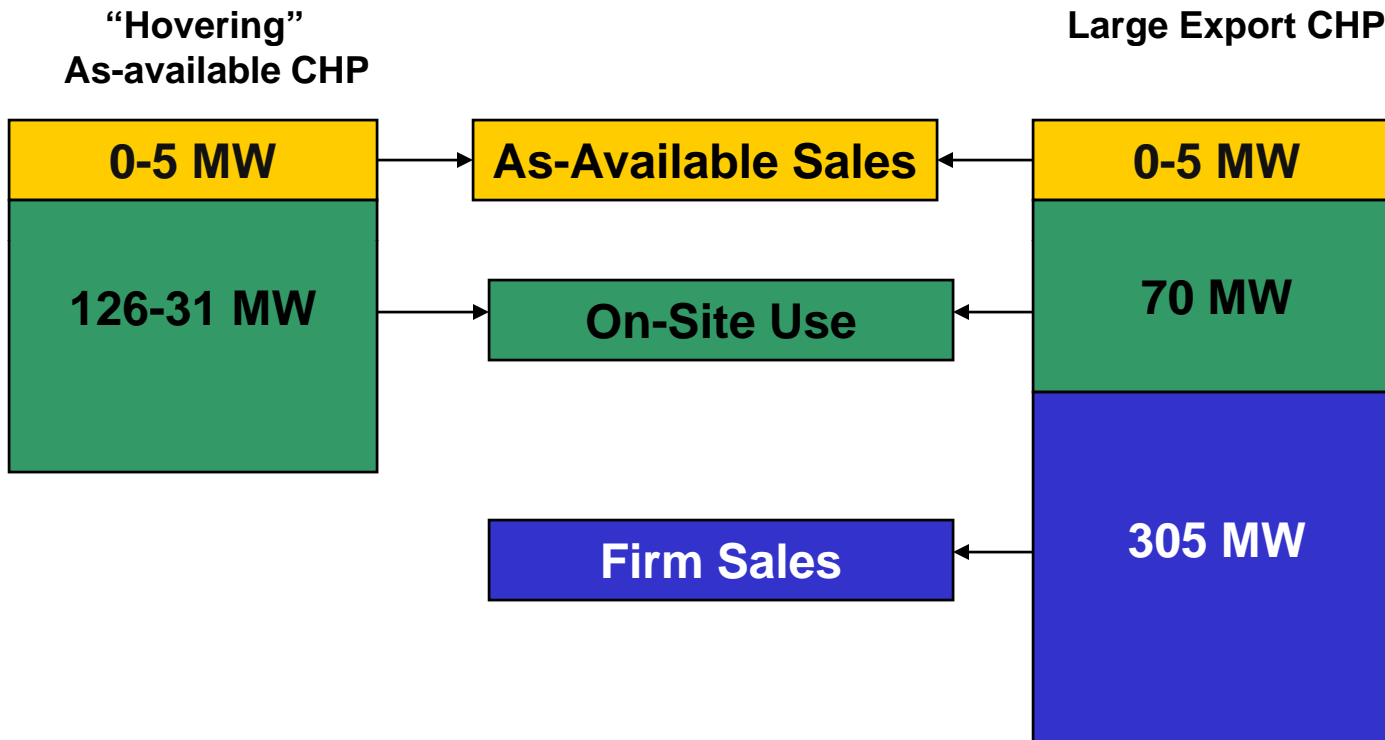
Oil and Gas Industry Share of CHP

- 1,186 Sites
- 9,194 MW



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Typical Large Customer CHP Scenarios



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Oil and Gas Industry CHP Facilities

- ~ 2800-3000 MW CHP capacity*
- Built in response to PURPA and 2000-01 energy crisis
- Roughly half of electricity exported
- Enhanced oil recovery/Refining CHP among most efficient
 - ♦ General range from 60-80% HHV**
- GHG Savings for existing facilities (based on EIA data for 2589 MW)
 - ♦ **4.54 MMtCO₂e** annually with vintaged benchmark
 - ♦ **2.94 MMtCO₂e** annually benchmarked against current vintage combined cycle

* EIA, CEC, CAISO and private data bases present varying views of installed CHP MW in the oil and gas industry.

** Based on EIA 2008 data, for comparison purposes, SCE's Mountainview efficiency was 46% (7460 HR); average California gas-fired non-CHP generation averaged 42.5% (8032 HR).

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WSPA Company CHP Potential

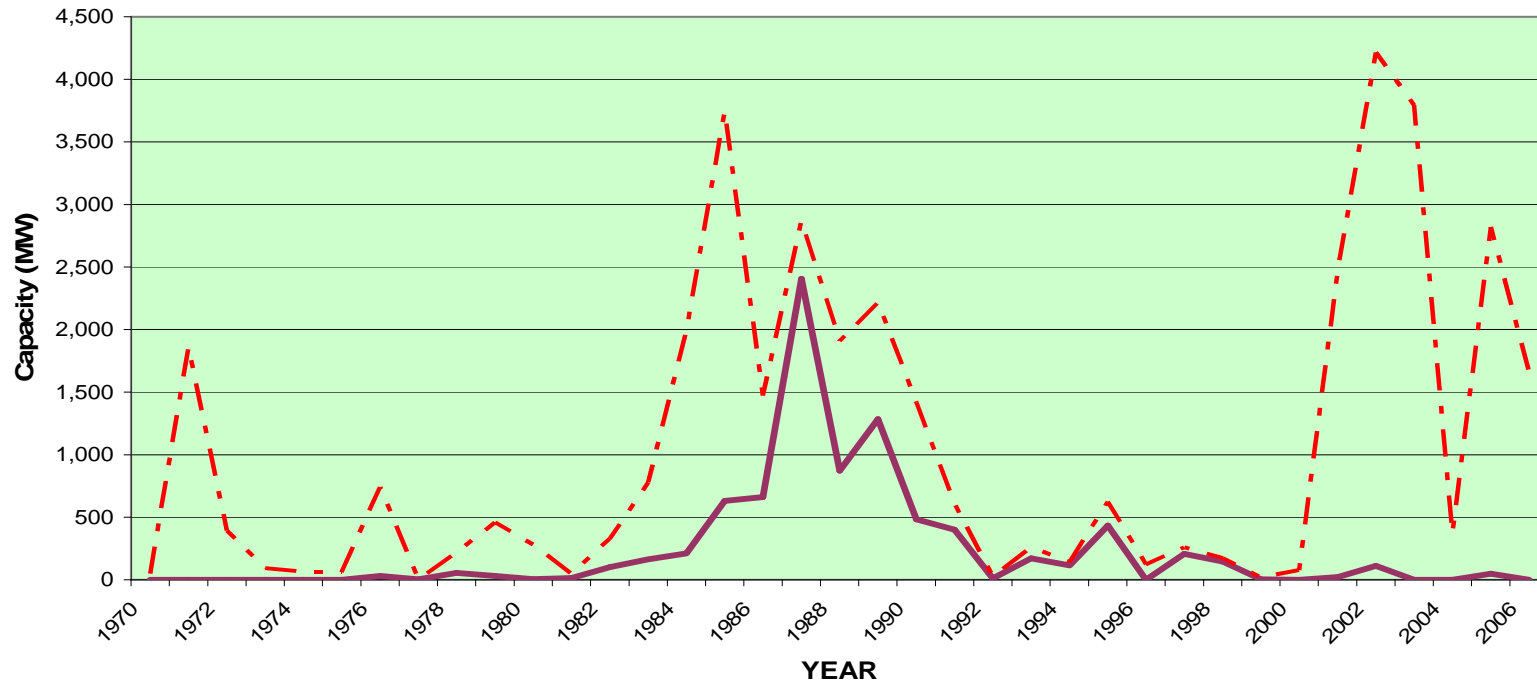
- With supportive CHP policy WSPA members could add more than 1722 MW of thermally matched CHP capacity
 - ◆ EOR: 1070 MW
 - ◆ Refining: 652 MW
 - ◆ Potential varies materially by facility
- Additional CHP capacity would result in additional GHG savings of **1.7-2.0 MMtCO₂e** by 2020
- Represents roughly half of the 3551 MW developed by 2020 under the ICF “all-in” scenario and two-thirds of the estimated 2.52 MMtCO₂e savings estimated by ICF by 2020

* Calculated by RCS Inc. against benchmark using following assumptions: 70 - 72% total CHP efficiency; 1.5 H/P ratio; 85 - 90% capacity factor; 80% avoided boiler efficiency; avoided electricity benchmarks based on 2008 EIA data for California gas-fired generation.

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CHP Development has Stalled

**California Capacity Additions
CHP vs Total Capacity Additions
1970 Through 2006 (in MW)**



Source: CEC Database of California Power Plants.

— CHP — Total Capacity Additions

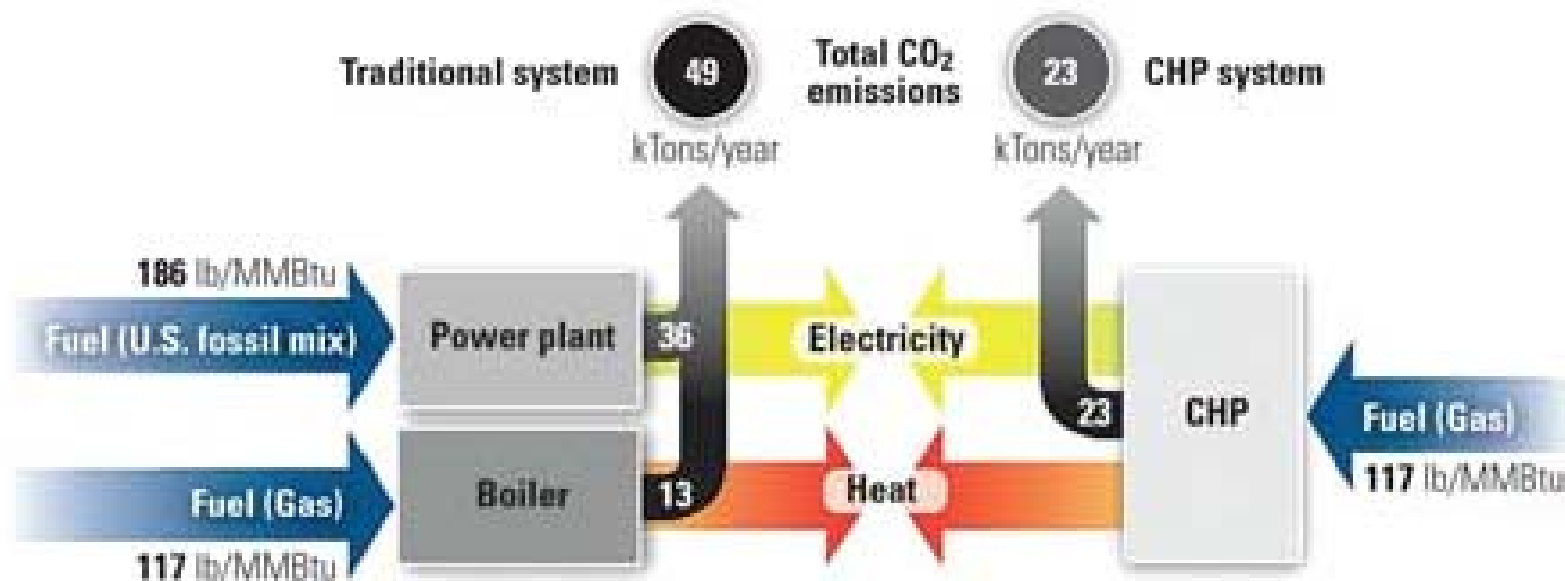
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Barriers to CHP Operation & Development

- Limited export opportunities for excess power
 - ◆ No PURPA enforcement despite years of proceedings
 - PURPA undermined by EPAAct 2005
 - ◆ No state CHP policy to complement PURPA
 - ◆ No real “market” alternatives to utility purchases for CHP products
 - ◆ No “carrot” or “stick” to encourage utility purchases
- Unknown GHG costs; no recovery assurance
 - ◆ CHP increases host GHG compliance obligation
- Utility departing load fees added to customer capital costs (\$9.17 - \$21.38/MWh)
- Complex grid interface and interconnection rules
- AQMD restrictions

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CHP Increases Host GHG Compliance Obligation



Source: ICF International

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Existing Customer Generation Departing Load Charges Applicable to Cogeneration/CHP Facilities > 5 MW (as of May 14, 2009)

| IOU | Charge | Rate (\$/MWh) | Exemption |
|----------------------------------|--|---|--|
| PG&E E-20T | Public Purpose Program Charge | \$5.16 | none |
| | Nuclear Decommissioning | \$0.28 | none |
| | Competition Transition Charge (CTC) | Exempt (\$4.79) | Public Utilities Code § 372 |
| | DWR Bond Charge | \$4.91 | none |
| | DWR Power Charge Indifference Adjustment | Exempt (\$15.21) | D.03-04-030 |
| | PG&E Energy Cost Recovery Amount | Exempt (\$2.31) | D.04-02-062, D.04-11-015 |
| | 2009 Vintage CRS (Procurement NBC) | Exempt (\$2.96) | D.08-09-012; PG&E AL 3446-E |
| TOTAL KNOWN PG&E NBCs | | \$10.35 | |
| SCE TOU-8-Sub | Public Purpose Program Charge | \$3.67 | none |
| | Nuclear Decommissioning | \$0.59 | none |
| | Competition Transition Charge (CTC) | Exempt (\$4.11) | Public Utilities Code § 372 |
| | DWR Bond Charge | \$4.91 | none |
| | DWR Power Charge Indifference Adjustment | Exempt (\$17.22) | D.03-04-030 |
| | SCE Historical Procurement Charge | customer-specific calculation; fully paid | D.03-04-030 |
| | 2008 Vintage CRS (Procurement NBC) | \$12.21 | D.08-09-012 exemption; SCE AL filing 2320-E (updated 2336-E) applies to CGDL departing after 2008; protested |
| | New System Generation Charge (CAM NBC) | Exempt (\$0.28) | D.08-09-012 |
| TOTAL KNOWN SCE NBCs | | \$9.17-\$21.38 | |

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Interface of CHP/Renewables Policy

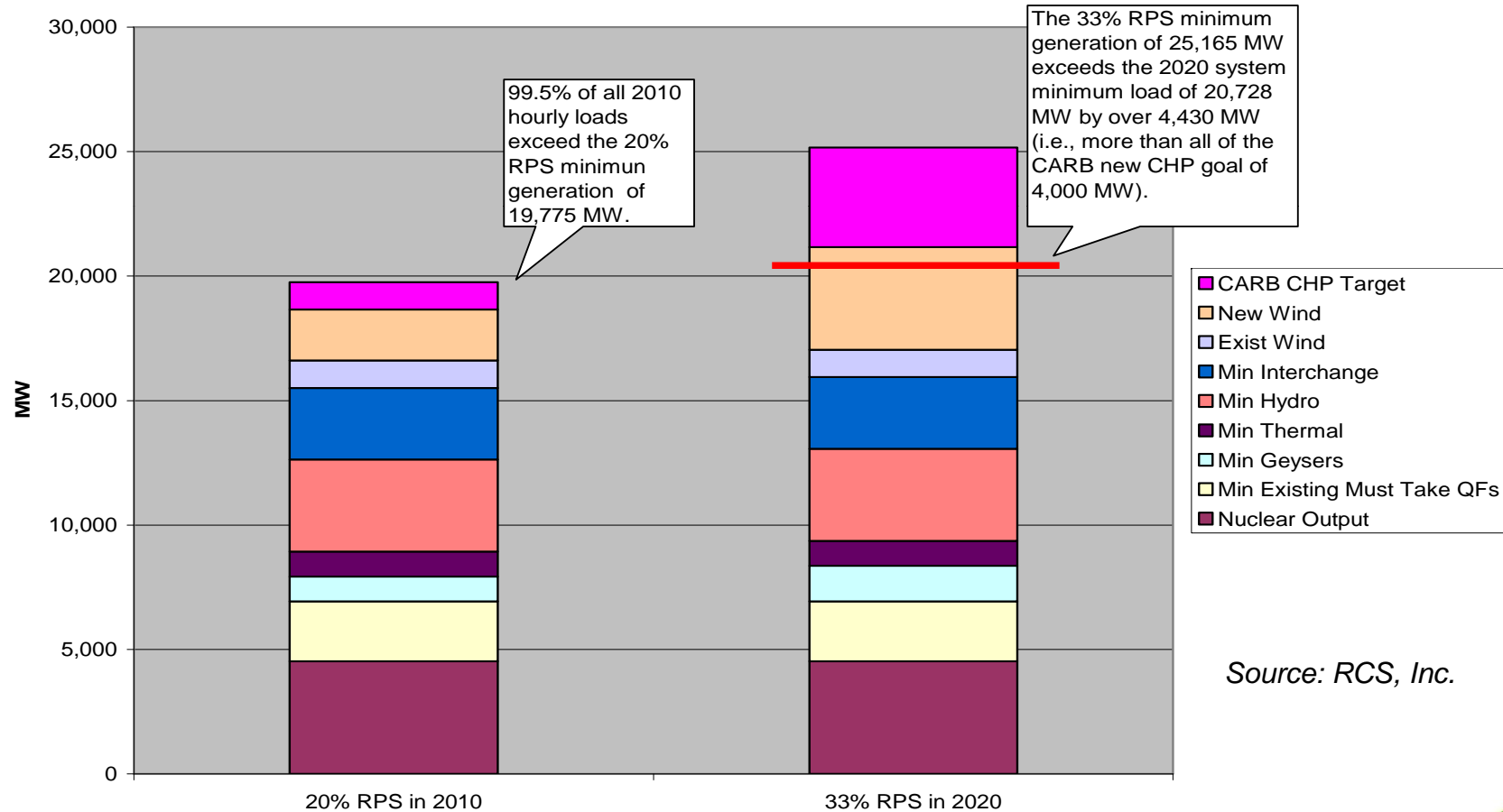
- Utilities' ability to accommodate electricity from CHP is critical; in many cases CHP delivers 24/7
- Ability to accommodate CHP power is challenged during off-peak periods due to overgeneration
 - ♦ Several categories of facilities, including nuclear, hydro spill, wind, etc. are "must run" during off-peak periods
 - ♦ Depending on resource mix during low-demand periods, increased renewable portfolio may "crowd out" CHP
- Further study required as noted by CEC June 2009 Staff Report
- *CHP isn't uniquely the cause of overgeneration and should not bear all of the consequences*

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Increased RPS and CAISO Over-Generation

Illustrative Impact of Increased RPS on CAISO Over-Generation

(Based on November 2007 CAISO Renewable Integration Report)



Source: RCS, Inc.

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Opposition to a State CHP Policy

- CHP can sell directly into the market
 - ♦ No real alternatives; utility remains the primary purchaser
 - ♦ MRTU lacks depth and certainty necessary to support CHP
- Utilities don't need power with CHP characteristics
 - ♦ Ignores full range of CHP benefits
 - ♦ Places burden of solving overgeneration solely on CHP policy
 - ♦ Issue can be addressed with Time of Delivery pricing
- CHP isn't as efficient as separate production alternative
 - ♦ True in some cases, but not in all
 - ♦ Issue is moot under policy that places greater emphasis on efficiency

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Opposition to a State CHP Policy (2)

- It's cheaper to reduce GHG by planting trees in Brazil
 - ♦ Ignores full range of CHP benefits and co-benefits
 - ♦ California needs to maximize reductions to achieve AB 32 goal
- CHP has matured and doesn't require policy support
 - ♦ Maturity isn't the issue with CHP; need for policy support arises out of the unique characteristics of CHP generation
 - Benefits and operations span electricity and industrial sector
 - Need to follow thermal load sets CHP apart from other generation
 - Third-party CHP development is "double trouble" to the utilities: competes with utility shareholder-return generation projects and takes load off system

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Comparison of CEC CHP Market Assessments

| Date of Report | Technical Potential (MW) | | Aggressive Deployment (MW in 2020) | | | | GHG Savings |
|--|--------------------------|----------------|------------------------------------|--------|-------------|------------|------------------------|
| | All CHP | Industrial CHP | All CHP | AC CHP | On-site CHP | Export CHP | All CHP (MM tonnes/yr) |
| April 2005 | 30,232 | 6,418 | 7,340 | - | 4,471 | 2,869 | 6.7 |
| July 2009 | 18,417 | 8,701 | 3,550 | 239 | 2,431 | 880 | 2.5 |
| May 2009 | | 6,132 | | | | | |
| Note: Updated survey of industrial CHP only. | | | | | | 5 - 20 MW | |
| | | | | | | 263 | |
| | | | | | | > 20 MW | |
| | | | | | | 4,000 | |

Source: Crossborder Energy

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Observations on ICF CHP Potential Analysis

- Important ICF findings
 - ♦ Under current policies, CHP will fall well short of ARB goals
 - ♦ With *aggressive* CHP stimulation (all-in case) the market penetration goals can be met a few years beyond 2020
 - ♦ Greatest market and GHG benefit comes from preserving existing large CHP and pursuing remaining large CHP technical potential
- Conclusions regarding GHG savings would benefit from reviewing additional sensitivities
 - ♦ Heat rate used in benchmark to calculate GHG savings
 - ♦ Power price forecast assumptions for export program
 - ♦ Capacity factors for new CHP
 - ♦ Efficiencies for new CHP
 - ♦ Market penetration of large CHP

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Next Steps?

- Refine and implement CPUC Decision 07-09-040 as a bridge to a more stable policy
 - ♦ Proceeding opened early 2004
 - ♦ Decision issued two years ago
- Analyze overgeneration potential and consider solutions if necessary
- Bring coordinated action among CEC, CARB and CPUC to develop a comprehensive and durable state CHP policy that:
 - Recognizes the *full range* of CHP benefits; and
 - Addresses comprehensively the barriers to CHP operation and development