Building Greener Communities in the San Diego Region: A Forum to Catalyze Collaboration

Organized by:

CLEAN TECH San Diego

BURNHAM-MOORES CENTER FOR REAL ESTATE UNIVERSITY OF SAN DIEGO

CITY OF CHULA VISTA

NECSC

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Building Greener Communities

- Introduction -

Jim Waring

Board Chair & Co-Founder

CleanTECH San Diego

Forum Contents

- Forum Sequence & Speakers
- Recent Research Findings
  - Engineering, Market & Policy Analysis
- The Municipal Perspective
  - Integrating Green Development & Local Economic Development
- The Real Estate Development Industry Perspective
  - The Case of the Eastern Urban Center
  - The Adobe Headquarters Campus
- The Energy Technology Industry Perspective
  - Gas Turbine Technologies for Community-Scale Energy-Efficiency
- Next Step in Building Regional Collaboration
- Open Forum Discussion

Building Greener Communities:
Recent Research Findings

The Chula Vista Research Project

Doug Newman

Director

National Energy Center for Sustainable Communities

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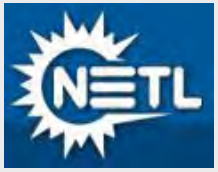
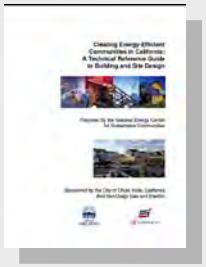
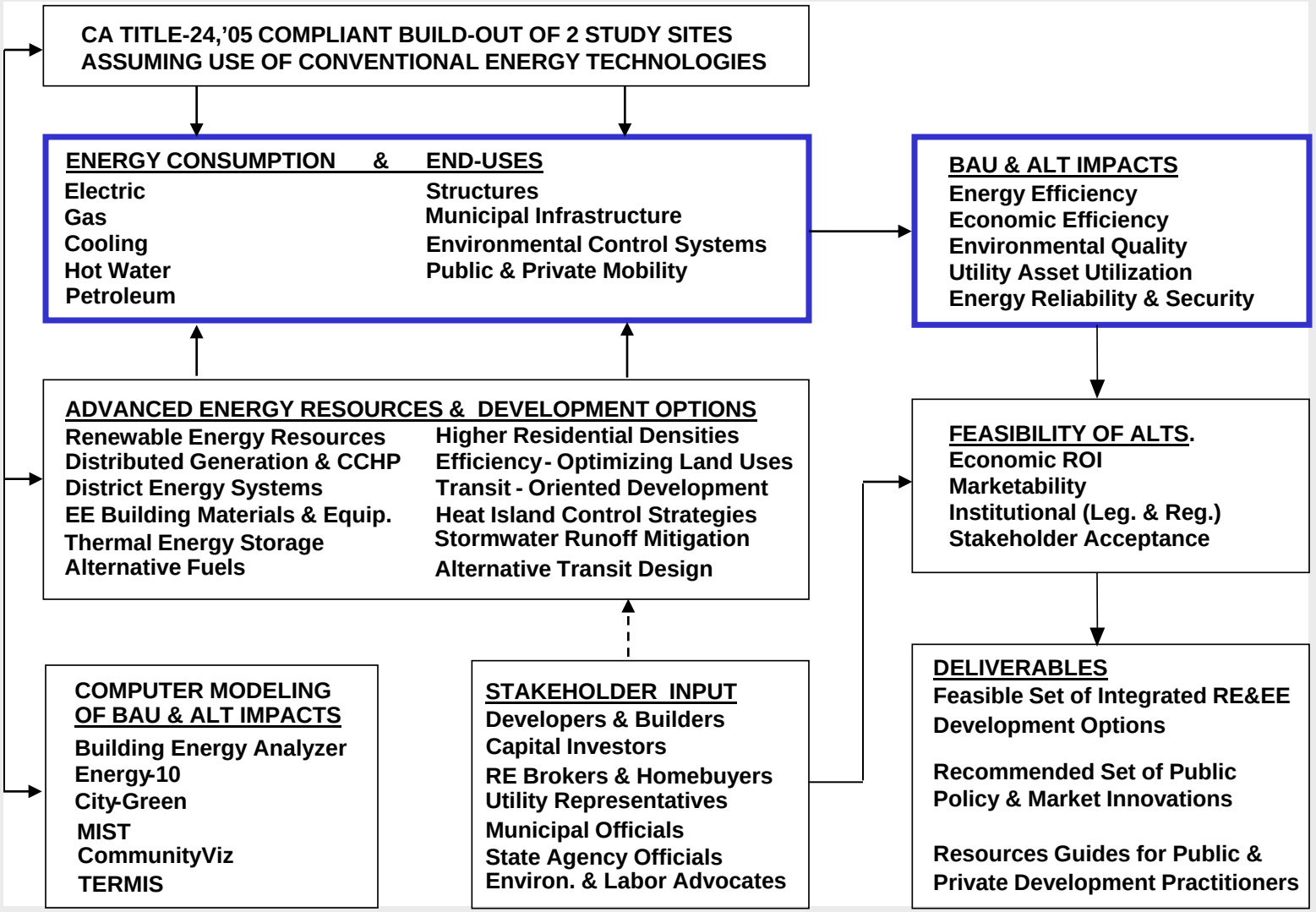
Building Greener Communities:
Recent Research Findings

- **The Chula Vista Research Project (CVRP)**
  - **Major Engineering Findings**
  - **Major Market & Policy Analysis Findings**
- **Available Resource Guides**
  - **Contained on Your CDs**





Building Greener Communities:
Recent Research Findings



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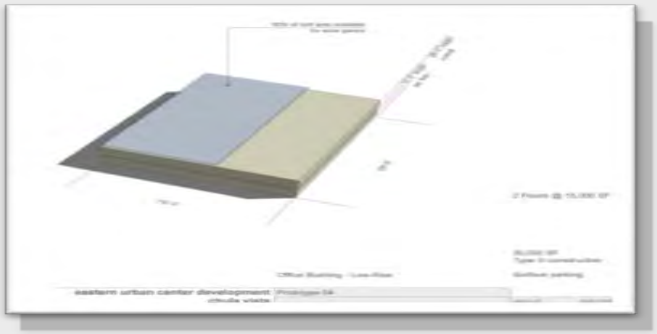
Building Greener Communities:
Recent Research Findings

Building Modeling Scenarios:



1. Builder Proposed Baseline

   CA 2005 Title 24 +

2. EE Package

   design approach incorporating advanced energy efficiency measures including alternative grades of wall & roof insulation, windows, doors, lighting, HVAC equipment including thermal storage, appliances, & implementation of solar thermal technology

3. EE Package with PV

   design approach supplements EE Package with solar PV-based power generation

4. EE Package with DG

   design approach which supplements the EE Package with fossil fuel (natural gas) microturbine-based power generation with heat recovery (combined heat and power or CHP)

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Building Greener Communities:
Recent Research Findings

Aggregate Building Efficiency & Utility Impact:

- EE - PV scenario reduces aggregate energy consumption by approx. **45% over a 2005 Title 24 compliant approach**
- EE - DG scenario reduces aggregate energy consumption by approx. **41% over a T 24 compliant approach**
- EE scenario alone reduces aggregate energy consumption by approx. **21% over a T 24 compliant approach**
- Selective deployment of DG with EE measures could achieve a **45% reduction in peak demand**

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Building Greener Communities:
Recent Research Findings

Aggregate Building CO_2 Emissions:

- Implementation of photovoltaics could reduce building-related CO_2 emissions by **33%**
- Selective deployment of DG with EE measures could reduce building-related CO_2 emissions by **21%**
- Implementation of recommended EE measures alone could reduce building-related CO_2 emissions by **12%**

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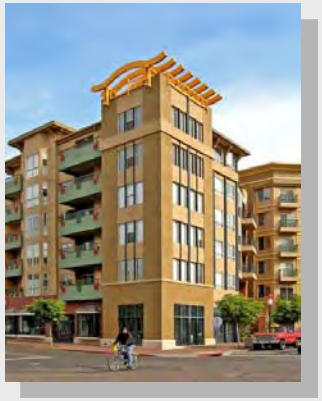
Building Greener Communities:
Recent Research Findings

Aggregate Spatial Analysis:

- **Mixed-use, moderate-density development results in a…**
  - **68%** decrease in central power plant energy consumption when this form of development is coupled with CCHP technologies



  - **64%** decrease in costs related to the use of district cooling systems
  - **13-15%** decrease in Vehicle Miles Traveled (VMT) annually
  - **70-77%** decrease in land acquisition costs

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Building Greener Communities:
Recent Research Findings

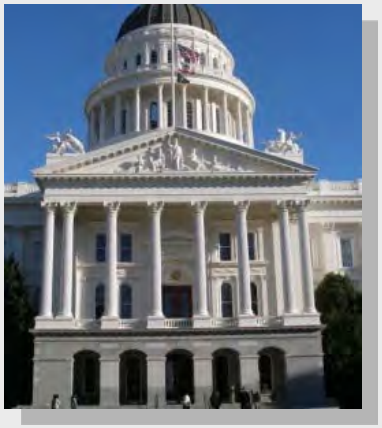
Aggregate Spatial Analysis (cont.)**:**

- **Urban Runoff Mitigation & Carbon Sequestration Measures Produce…**
  - **94-181%** savings in costs and emissions related to stormwater management
  - **200-416%** increase in carbon storage in tree biomass
- **Urban Heat Island Effect Mitigation Measures Produce…**
  - **6-14%** decrease in electricity usage
- **Passive Solar Building Orientation Alone Produce…**
  - **2.8%** decrease in electricity usage and **2.2%** decrease in natural gas usage

Building Greener Communities:
Recent Research Findings

Market & Policy Analysis

- **Workshops, Surveys & Interviews**
  - Stakeholder Workshops x 3
  - Development Industry Survey
  - Capital Market Industry Survey
  - Follow-On Interviews
  - Round-Table Draft Review



- **Municipal Planning Process Analysis**
  - State, Regional & Local Gov't Planning Analysis
  - Development Industry Interviews

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Building Greener Communities:
Recent Research Findings

- Market & Policy Analysis -

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Lou Galuppo, Esq., Director, Residential Real Estate

Burnham Moores Center for Real Estate

University of San Diego

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Building Greener Communities:
Recent Research Findings

Focus: Costs, Policies and Incentives

BMCRE addressed two primary focus areas:

- The maximum incremental cost that the California building industry and consumers will accept for energy-efficient residential, commercial, and institutional structures.

- The financial and business models and associated public policy incentives that will lead to accelerated deployment of EE, DR, RE and DG technologies in development projects throughout California.

Building Greener Communities:
Recent Research Findings

Maximum Acceptable Incremental Costs:

- The maximum incremental cost that California building industry & their consumers will accept for energy-efficient structures varies by technology enhancement & by practitioner

  [Energy-efficient buildings were defined as those that exceed the 2005 Title 24 building energy efficiency standards by 20 to 43%]

- However, the researchers determined that *most* of the development industry practitioners found the incremental costs for modeled energy efficiency/technology components too high!
  - EE package = $2 / square foot (with a range of $1 to $5 / sq. ft)
  - EE-DG package = $4 / square foot (with a range of $3 to $5 sq. ft. assuming incentives);
  - EE-PV package = $15 / square foot (with a range of $5 to $30 / sq.ft.)

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Building Greener Communities:
Recent Research Findings

Maximum Acceptable Incremental Costs:

Technology Enhancements Costs / Sq. ft	Average	Developers	Property Managers	Design Professionals	Others
EE ($2.00)	$1.59	$1.43	$1.45	$2.00	$1.66
EE - DG ($4.00)	$2.64	$1.83	$2.25	$3.63	$2.50
EE - PV ($15.00)	$7.41	$5.22	$6.75	$11.75	$8.40

Additionally, there is an industry perception that there is insufficient market demand for energy-efficient structures in California at the present time

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Building Greener Communities:
Recent Research Findings

Financial & Business Models, Public Policies & Incentives:

- The models, policies & incentives necessary to accelerate energy-efficient community development (EECD) in California will be those that address five key economic, information & procedural barriers:

1. Need for direct & indirect financial support for developers & builders
2. *Split Incentive Dilemma* - a misalignment between investment costs & benefits
3. Need for EECD capacity-building, procedures & investments at the local level
4. Lack of consumer willingness to pay for the value of energy-efficient features
5. Investment risks that inhibit capital market entities from financing projects

Building Greener Communities:
Recent Research Findings

Financial & Business Models, Public Policies & Incentives (continued):

- Equity investors believe that the greatest barriers to investments are:
  - The lack of consumer awareness of the benefits of energy-efficient buildings & development projects
  - The lack of private (utility & financial institution) incentives
- Lenders & particularly developers believe the top two barriers are:
  - The lack of consumer awareness
  - The lack of public (government) financial incentives
- All three occupational subgroups believe that tenants will not be willing to pay higher rents for energy-efficient space & that the value of this space may not be recognized by appraisers & lending institutions

Building Greener Communities:
Recent Research Findings

Conclusions:

- Widespread adoption of these advanced energy technologies & community design features by the development industry will not be realized without a fundamental transformation of the real estate development marketplace. Two essential changes are necessary to achieve this transformation:
  - The value of energy-efficient building technologies and community design options is recognized by all entities in the real estate development transaction chain (lenders, investors, developers, builders, design professionals, appraisers and brokers)
  - This recognition results in market transactions that enable developers to capture capital investments in energy-efficient design features through real estate sale prices that are acceptable to consumers

Building Greener Communities:
Recent Research Findings

Conclusions (continued):

- State government- & utility-funded intervention will be necessary to produce these changes over the near-term (five to ten years). Intervention must include:
  - Additional research to further estimate the economic & environmental costs & benefits of alternative energy technologies & community design features in large-scale development projects
  - A set of California-specific, mandatory site development standards for energy-efficiency & carbon emissions reduction
  - A uniform set of direct & indirect economic & procedural incentives for developers & builders that recognize & reward performance above minimum compliance
  - Uniform product labeling of all residential, commercial, industrial & institutional structures & planned communities that communicates the estimated energy, water & resource efficiency of each at the point-of-sale

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Building Greener Communities:
Recent Research Findings

Conclusions (continued):

- An education effort mounted to inform the lending, investment, & real estate appraisal & brokerage industries about the value of energy- & resource-efficient structures & community development projects
- Further development of real-time resource (electricity, gas & water) monitoring technologies that inform consumers about their resource consumption
- A workforce training initiative for municipal authorities on the use of tools & methods to evaluate energy-efficient development projects & an awareness-building initiative to communicate the value of these projects/properties to the consumer
- A combination of market push & market pull mechanisms, in roughly this sequence, to transform the market to the point where public & utility intervention will no longer be necessary to sustain energy-efficient community development in California.

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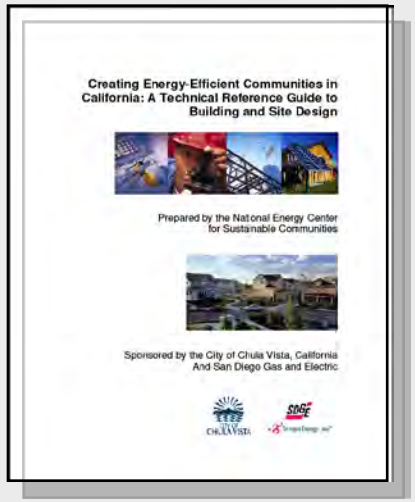
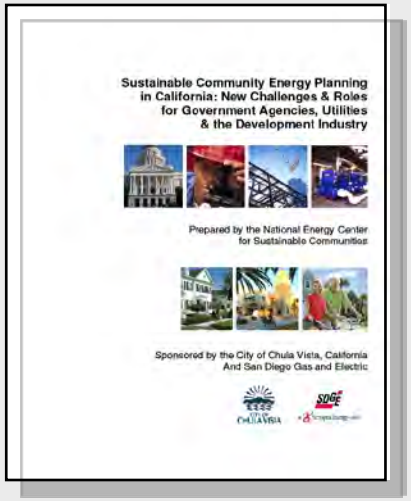
Building Greener Communities:
Available Resource Guides

- **Technical Reference Guide to Energy-Efficient Building & Site Design**
  - Containing economically feasible building energy technologies & community design options for high-efficiency, low-impact development & transferable design guidelines applicable to communities across California and the nation



- **Reference Guide to Policy Barriers, Solutions & Resources for Energy-Efficient Development**
  - Containing recommended public policy, incentive & market mechanisms to accelerate investment in & use of advanced energy technologies & enabling community design options in development projects. The Guide also contains examples of energy-efficient community development projects



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Building Greener Communities:
Municipal Perspective

Integration of Green Development in Local Economic Development

Denny Stone

Economic Development Officer

City of Chula Vista, California

Building Greener Communities:
Real Estate Development Industry Perspective

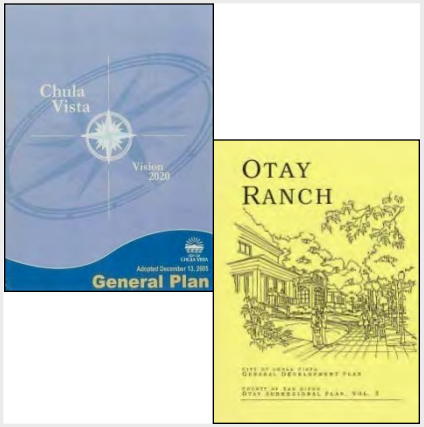
The Case of the Eastern Urban Center

Nick Lee

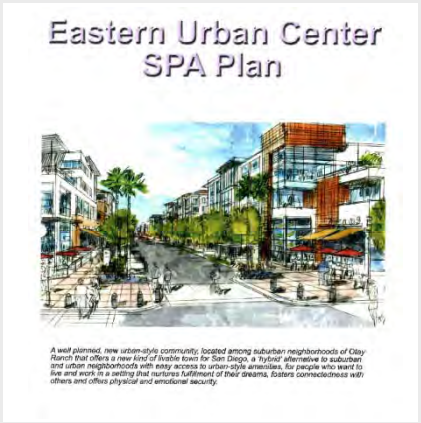
Formerly, VP, McMillin Land Development
Associate, The Paul Design Group

Building Greener Communities:
Real Estate Development Industry Perspective

- Progress through partnership…
  - The City of Chula Vista
    - The vision for the EUC and its role in the Otay Ranch was defined by the City in their General Plan and in the Otay Ranch General Development Plan.

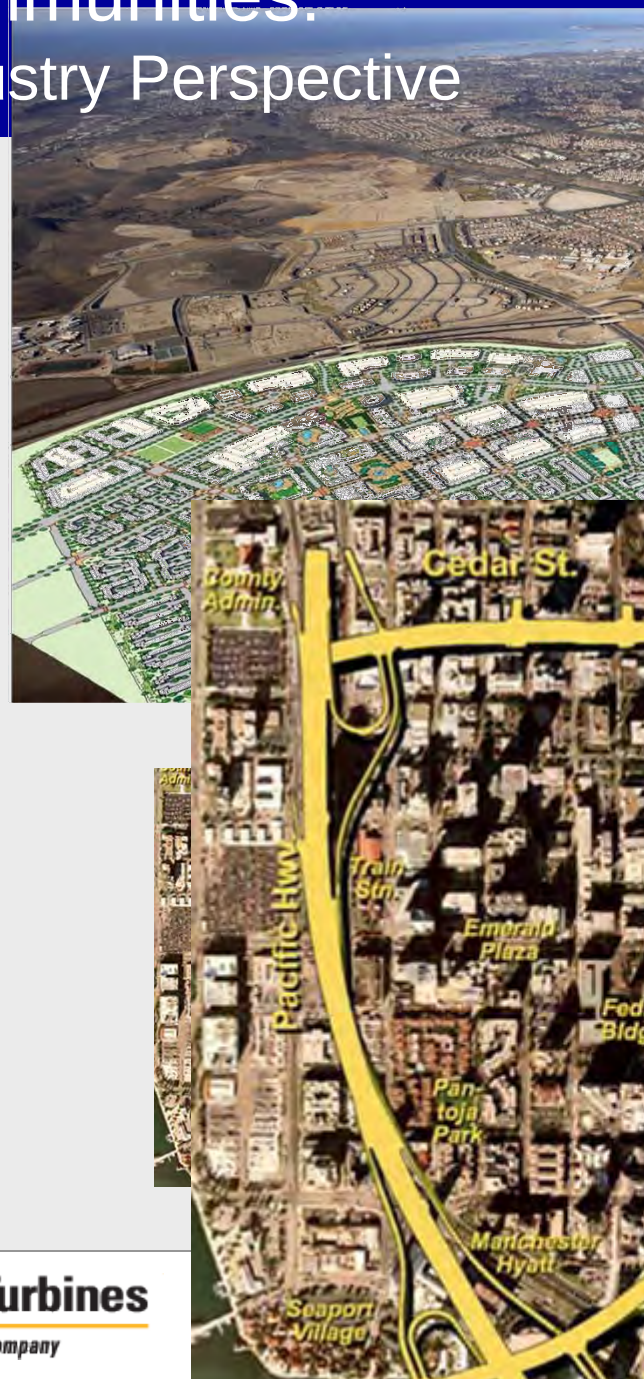


  - The Corky McMillin Companies
    - Molded their experience, ideas and principles with the framework set by the City to create the Sectional Planning Area Plan and Form Based Code for the project.



Building Greener Communities:
Real Estate Development Industry Perspective

- The Project…
  - 2,983 urban format multifamily homes
  - 3.5 million square feet of nonresidential uses
  - Integrates proposed bus rapid transit (BRT) system
  - 1 of 8 SANDAG Smart Growth Urban Centers in the county
  - Over 200 acres located in the heart of the Otay Ranch
  - LEED-ND Pilot Project



Building Greener Communities:
Real Estate Development Industry Perspective

- The Guiding Principles…
  - Market Based Plan
  - Flexible Implementation Structure
  - Compact Walkable Districts
  - Urban Design Standards
  - High Quality Public Realm
  - Authentic, Not Over Designed

Building Greener Communities:
Real Estate Development Industry Perspective

- The Challenges…
  - Sustainable solutions must be tailored to a specific project – it is not one size fits all
  - Sustainability often results in increased costs (infrastructure, public realm, parking, etc)
  - Financial benefits of sustainability not always recognized by the market or appraisers
  - The need to develop strong political will to overcome NIMBY-ism generated by increased density or reduced parking requirements
  - Need for creative and integrated regulatory environment – incentivize rather than penalize

Building Greener Communities:
Real Estate Development Industry Perspective

- The Results…
  - Building Model Analysis
    - Energy consumption can be reduced by 12.3% without the use of PV and by 30.0% with PV
    - Energy related CO2 emissions can be reduced by 12.1% without the use of PV and by 30.8% with PV
    - An annual utility cost savings of 11.3% for the EE package without PV and a savings of 32.3% with the PV option
  - Land Plan Analysis
    - An EUC resident will, on average, drive 1182 fewer miles than a person living in a standard single family development
  - Market barriers still exist which limit the implementation of some technologies

Building Greener Communities:
Real Estate Development Industry Perspective

Integration of Green Building Practices Within the Commercial Real Estate Sector

Darren Morgan, Associate Director, LEED AP

Tenant Representation Group

Cushman & Wakefield, Inc.

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Building Greener Communities:
Real Estate Development Industry Perspective

- Green Practices within the Commercial Real Estate Sector
  - Energy Efficient (High Performance) Buildings – The Current Landscape
  - Case Studies
    - Adobe Systems, Inc. – Greening the Corporate Campus
    - Cushman & Wakefield – LEED Portfolio Program – A Broader Approach
  - Local Observations and Potential Barriers Going Forward

Building Greener Communities:
Real Estate Development Industry Perspective

- Energy Efficient Buildings – The Current Landscape:
  - According to the U.S. Green Building Council, commercial buildings in the US account for:
    - 72% of electricity consumption
    - 39% of energy use
    - 38% of all carbon dioxide emissions
    - 40% of raw material use
    - 30% of waste output
    - 14% of potable water consumption
  - According to USEPA, as of December 2009, there were an estimated 97,000 commercial buildings in the U.S. with energy performance ratings (benchmarking) in place, representing 13.2 Billion SF.
    - As of December 2009, nearly 7,500 commercial buildings carry the Energy Star rating, representing over 1.4 Billion SF.

Building Greener Communities:
Real Estate Development Industry Perspective

- Energy Efficient Buildings – The Current Landscape:
  - As of December 2009, there were over 25,000 combined LEED certified and LEED registered projects in the United States (includes all LEED certification tracks).
  - Within California, there are currently 3,000 projects that have obtained or have registered interest in obtaining some form of LEED certification.
  - The number of projects pursuing the Energy Star rating and/or LEED certification in California (and nationwide) shows a substantial increase from 2009 and previous years.

Building Greener Communities:
Real Estate Development Industry Perspective

Case Study

Adobe Systems – Greening the Corporate Campus

- Corporate HQ - San Jose, CA. Three buildings, totaling 989,358 SF and a 938,473 SF parking structure.
- Over 2,300 local employees; one of the largest employers in San Jose.

Building Greener Communities:
Real Estate Development Industry Perspective

Case Study

Adobe Systems – Greening the Corporate Campus

- In January 2002, Governor Gray Davis asked all large electricity users to reduce consumption to 10% below their 1999 levels.
- At the time, Adobe actually surpassed the requested reduction of 10% and decided to aim for a 20% reduction below their 1999 levels.
- At the same time, Adobe began benchmarking its energy efficiency with USEPA's Energy Star program and subsequently achieved the Energy Star rating for all three buildings in May 2004.
- With the Energy Star success, Adobe made the decision to pursue LEED certification for all three buildings and achieved LEED Platinum certification for all buildings in 2006, becoming the first multi-building site occupied by one user to achieve this level of certification.

Building Greener Communities:
Real Estate Development Industry Perspective

Case Study

Adobe Systems – Greening the Corporate Campus

- Since embracing the Energy Star program and completing the LEED certification process, Adobe has realized significant improvements in energy and operating efficiencies.
  - Through these processes, Adobe implemented over 60 projects for a total investment of $1.3 million, earning over $389,000 in rebates, and saving over $1.2 million for a 121% return on investment in less than 2 years.
  - Adobe's Energy Star scores increased from the high 70s to the high 90s.

Building Greener Communities:
Real Estate Development Industry Perspective

Case Study
C&W – LEED Portfolio Program – A Broader Approach

- Through a Memorandum of Understanding (MOU) with USEPA, Cushman & Wakefield pledged its commitment to improving energy efficiency, resource management and reducing the carbon footprint of commercial properties C&W manages throughout the United States.

- Through a pilot program with the U.S. Green Building Council, C&W worked with several of its clients to combine 18 properties into one volume LEED certification under the LEED EB: O&M rating system.

- The 18 properties include owner-occupied and multi-tenant buildings across six states, comprising in excess of 8 million square feet.

Building Greener Communities:
Real Estate Development Industry Perspective

Case Study

C&W – LEED Portfolio Program – A Broader Approach

- Through the volume certification process, C&W worked with its clients to identify and put in place common best management practices at each of the properties, including:
  - Water use reduction
  - Decreased energy consumption
  - Increased waste diversion rates
  - Enhanced IAQ
- The Portfolio Program provides a stream-lined and cost-effective process for improving the environmental performance of commercial buildings on a larger scale.

Building Greener Communities:
Real Estate Development Industry Perspective

Local Observations & Potential Barriers Going Forward

- Ample programs and opportunities exist for improved environmental performance in commercial real estate; however, the initiatives need to be promoted and incorporated on a greater scale.

- Local, smaller companies and building owners have yet to embrace green development practices, due to misperceptions of the costs vs. benefits and an overall belief the process will be far too burdensome.

- Overall lack of knowledge of green building concepts on the part of all stakeholders involved in commercial real estate (i.e., developers, brokers, appraisers, lenders, contractors, architects, etc.) must be addressed to further stimulate wide-spread acceptance of green buildings.

Building Greener Communities:
Real Estate Development Industry Perspective

Observations & Potential Barriers Going Forward

- The majority of building owners investing in energy efficient buildings (new construction and existing buildings) involve larger, institutional ownerships and major corporations, leaving a significant quantity of buildings and spaces absent from the process.

- Current economic conditions, combined with the lack of capital and information specific to the benefits of green building practices (specifically with local ownerships and users), will continue to stunt the growth of the movement.

Building Greener Communities:
Energy Technology Industry Perspective

Energy-Efficient Gas Turbine Applications

David Schnaars

Manager, Environmental Strategies
Solar Turbines, Incorporated

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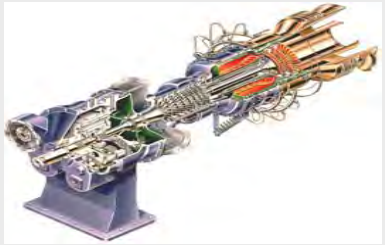
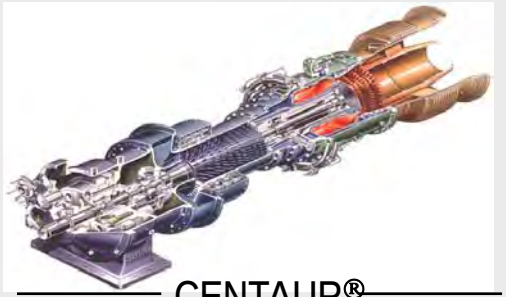
Building Greener Communities:
Energy Technology Industry Perspective

Capacity to meet the electrical demand of 1,000 to 17,000 homes



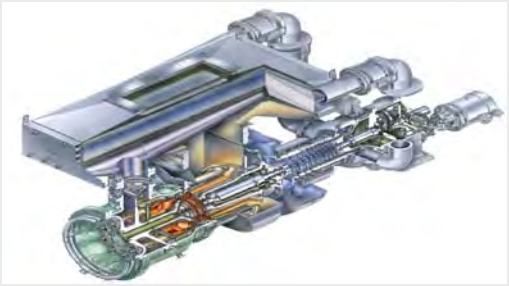
SATURN®

Saturn 20	1 210 kW



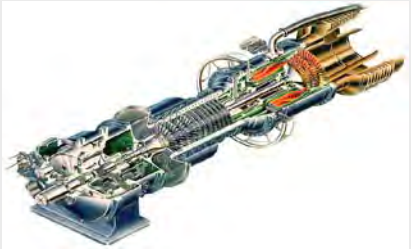
CENTAUR®

Centaur 40	3 515 kW
Centaur 50	4 600 kW



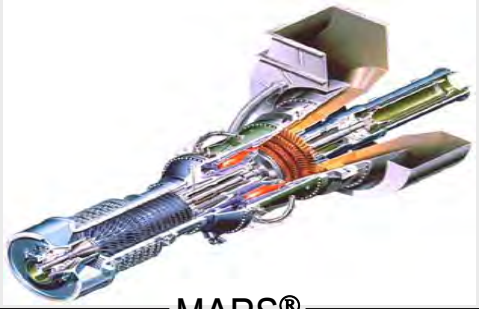
MERCURY™

Mercury 50	4 600 kW



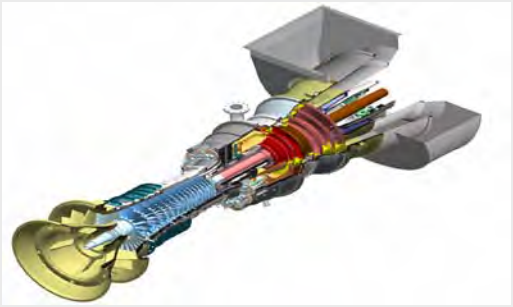
TAURUS™

Taurus 60	5 500 kW
Taurus 65	6300 kW
Taurus 70	7520 kW



MARS®

Mars 90	9 450 kW
Mars 100	10 690 kW



TITAN™

Titan 130	15000 kW
Titan 250	21745 kW

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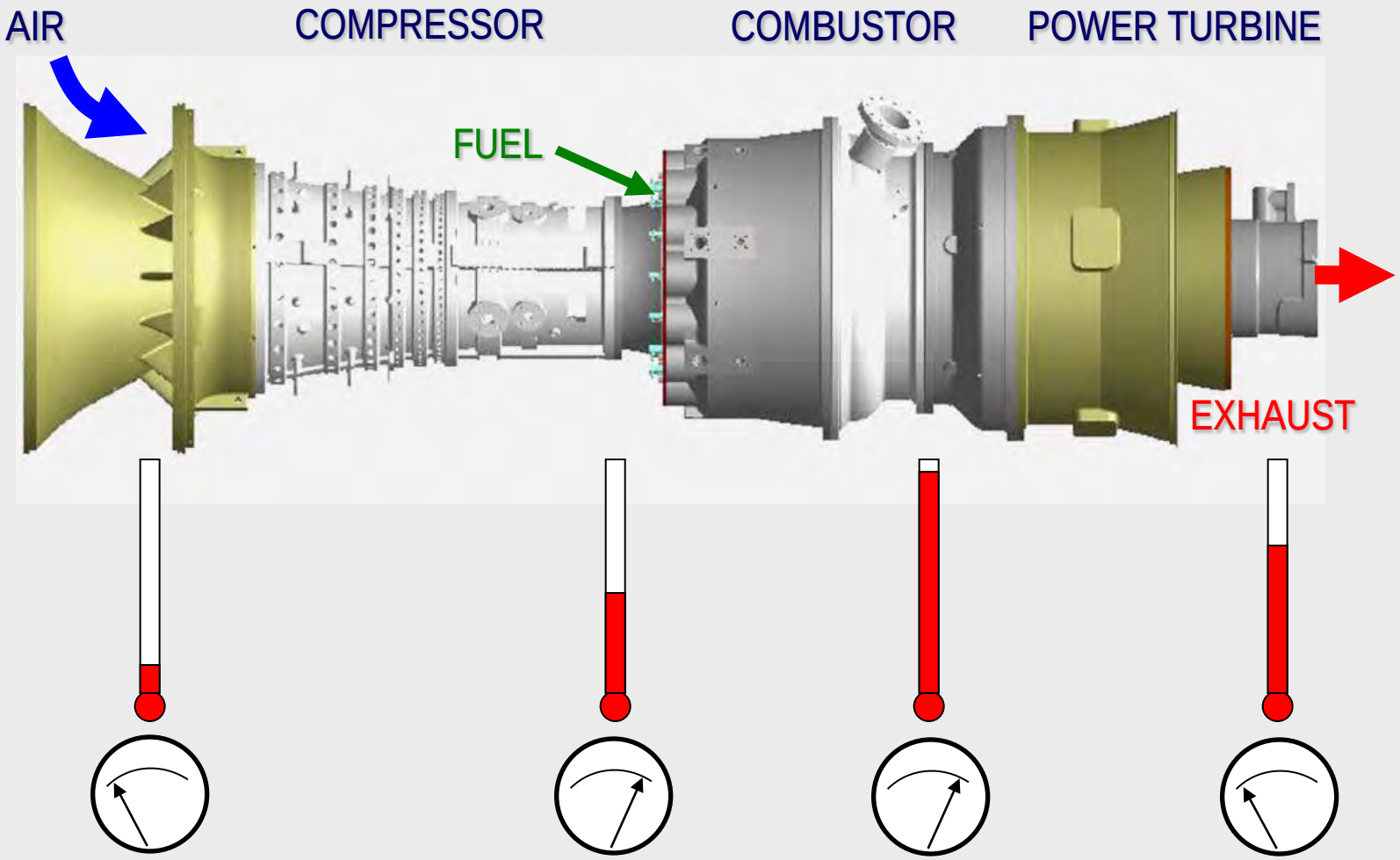
Building Greener Communities:
Energy Technology Industry Perspective

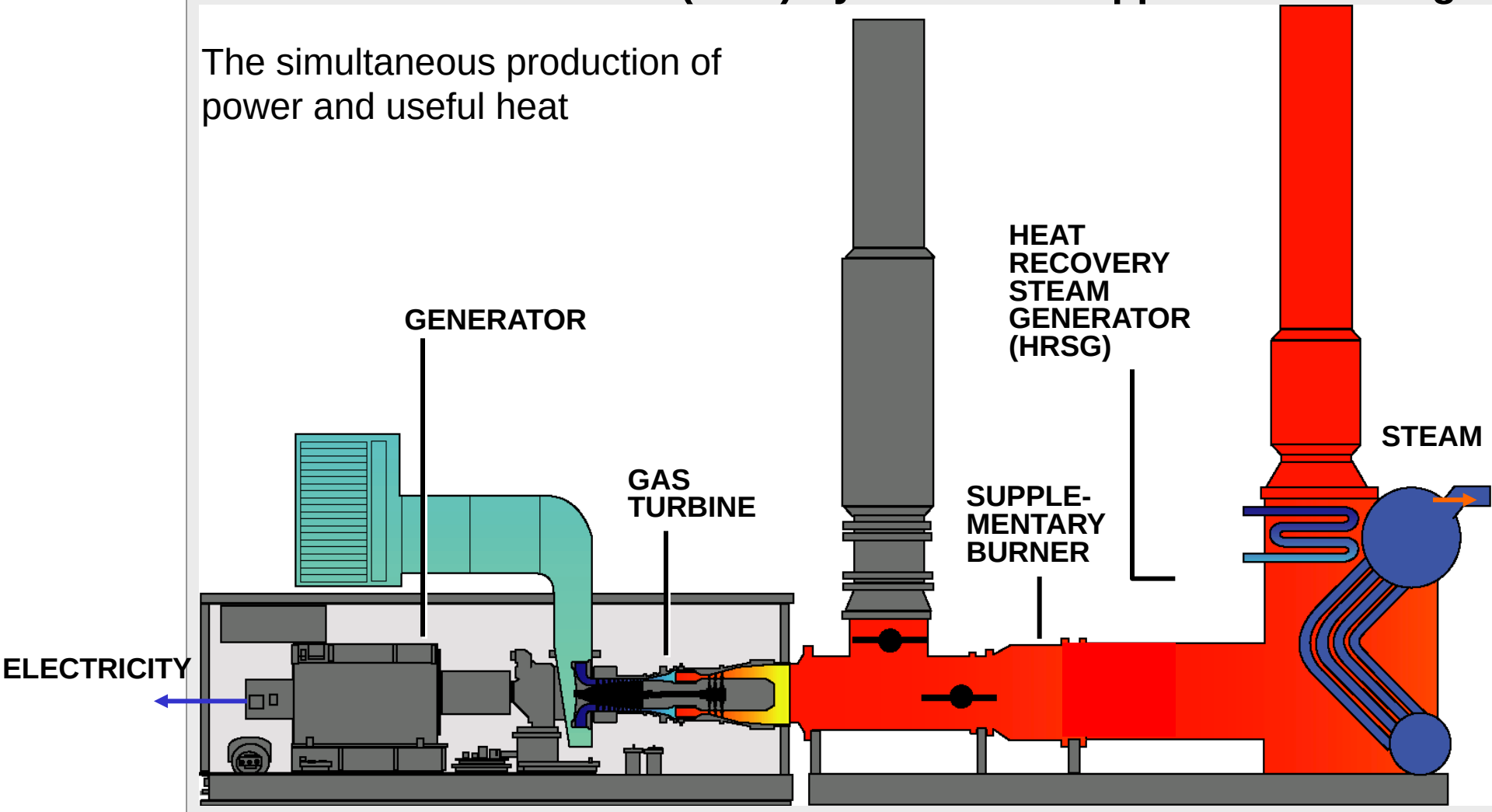
Gas Turbines 101



Building Greener Communities:
Energy Technology Industry Perspective

Combined Heat & Power (CHP) System with Supplemental Firing

The simultaneous production of power and useful heat



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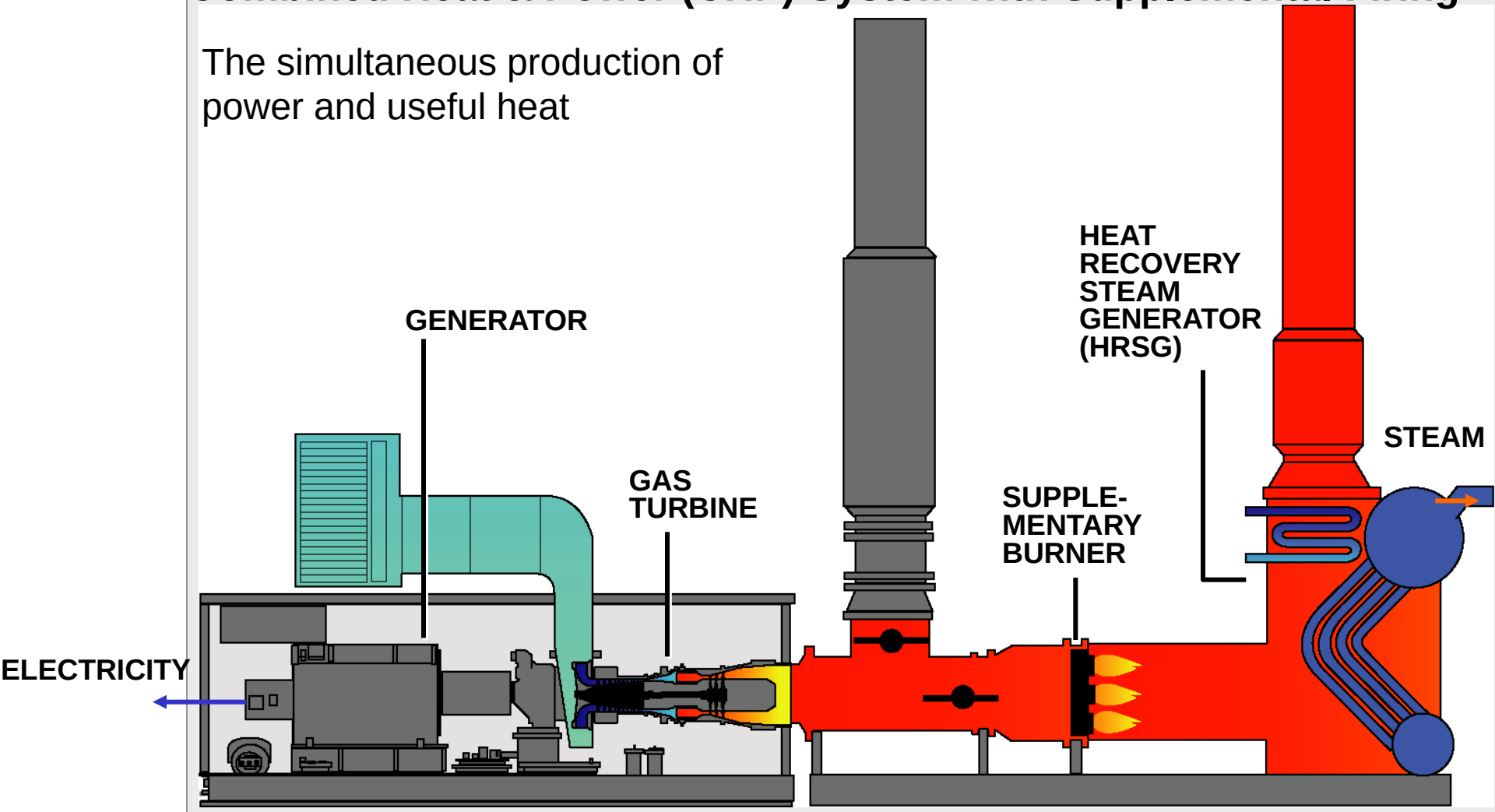
Combined Heat & Power (CHP) System with Supplemental Firing

The simultaneous production of power and useful heat



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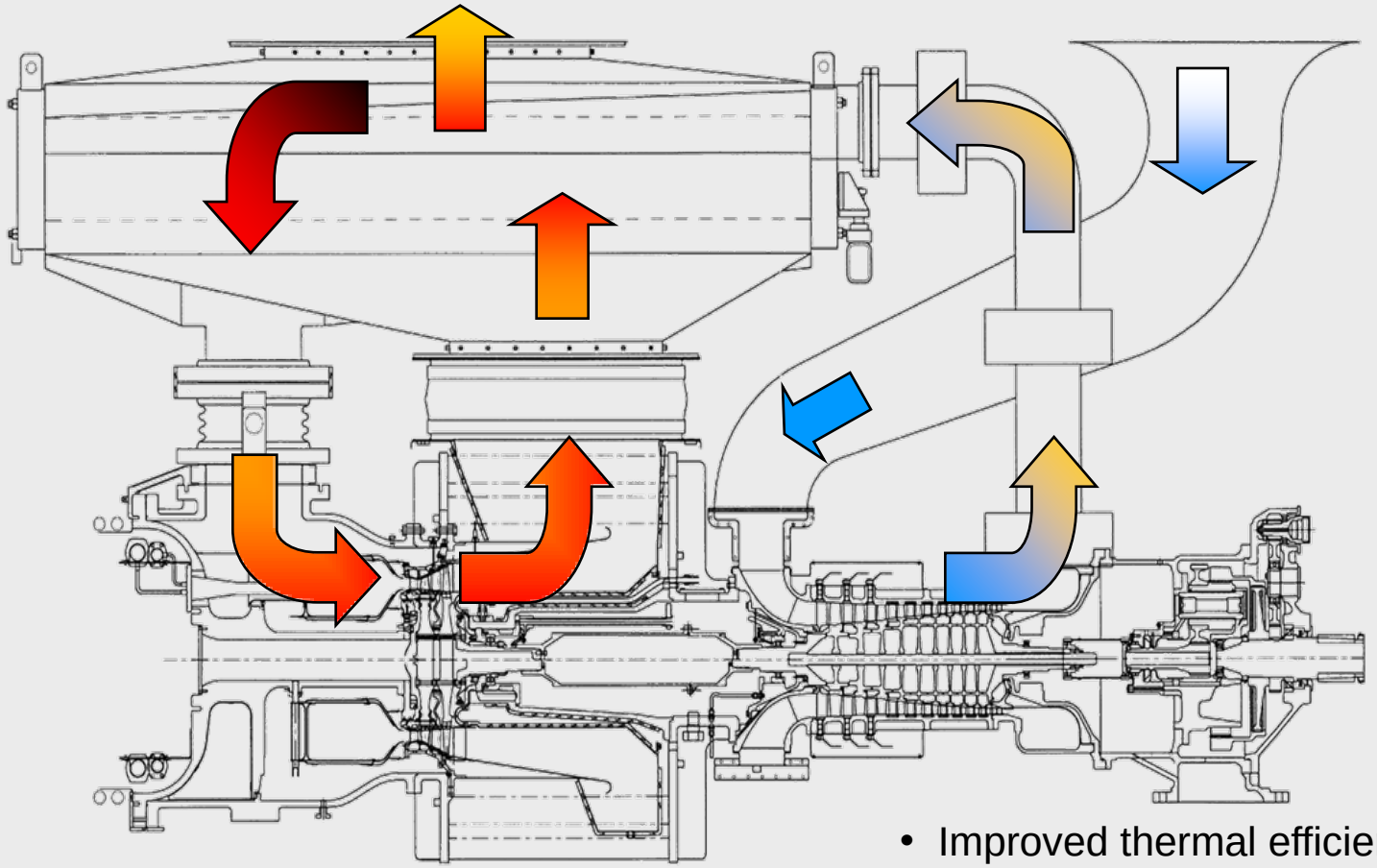
Recuperated Cycle Mercury 50



Turbine designed for recuperated cycle

- Improved thermal efficiency
- Lower emissions
- Lower system product costs

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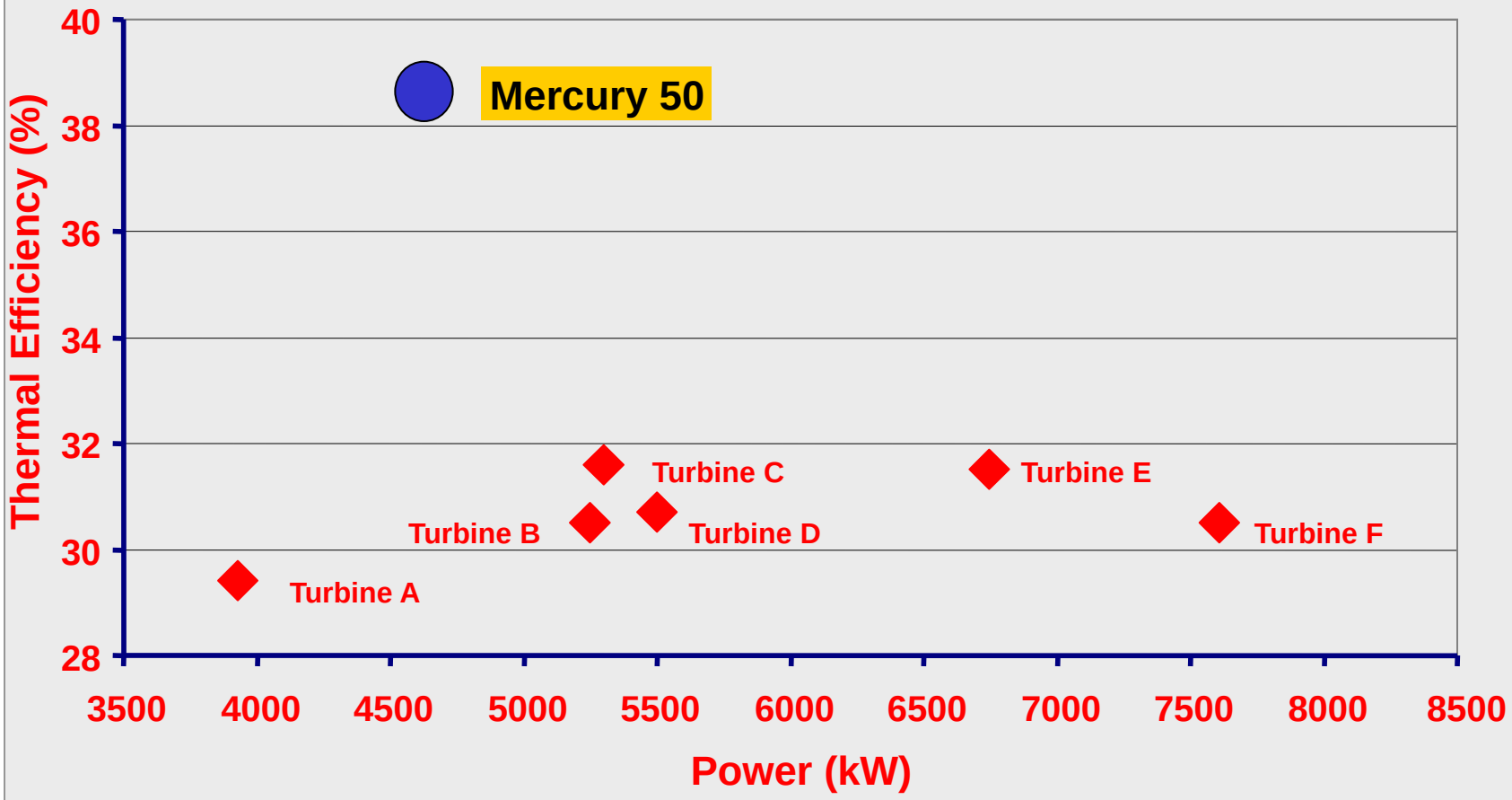
Efficiency Comparison



SOURCE: D&GTWW 2004

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Dell Children's Medical Center of Central Texas
Muller Energy Center of Austin Energy, Austin, Texas

1 Mercury 50R Generator Set

Energy Center provides power, heating and cooling to hospital

CHP Plant Allowed Hospital to Obtain LEED Platinum Status

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Emissions Reduction Comparison:

Dell Children's Medical Center

Pollutant	Typical Coal Plant	Austin Energy's Central Plant Fleet	Simple Cycle Peaking Plant	Combined Cycle Plant
CO_2 lb/MW-hr.	68%	40%	40%	8%
SO_2 lb/MW-hr.	99%	99%	50%	32%
NO_x lb/MW-hr.	98%	98%	78%	same

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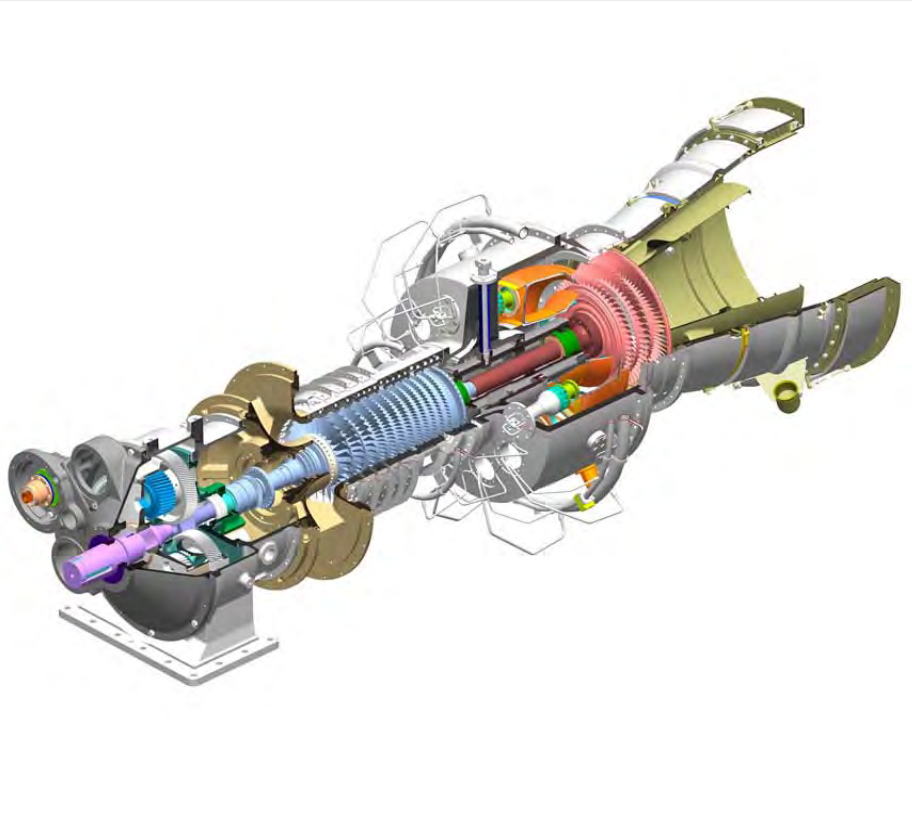
Mercury 50 - Bank of America

- **Provides All Heating, Cooling, Hot Water & Steam Needs of NYC's 2nd Tallest Building**
- **Provides for 35% of the Building's Electrical Load**
- **Building Uses 50% Less Energy than Conventional Skyscraper**
- **Expected to Achieve LEED Platinum Rating**

Taurus 65 Performance

- **Power: 6.3 MW**
- **Simple Cycle Thermal Efficiency: 32.9%**
- **CHP Thermal Efficiency: 84-92%**



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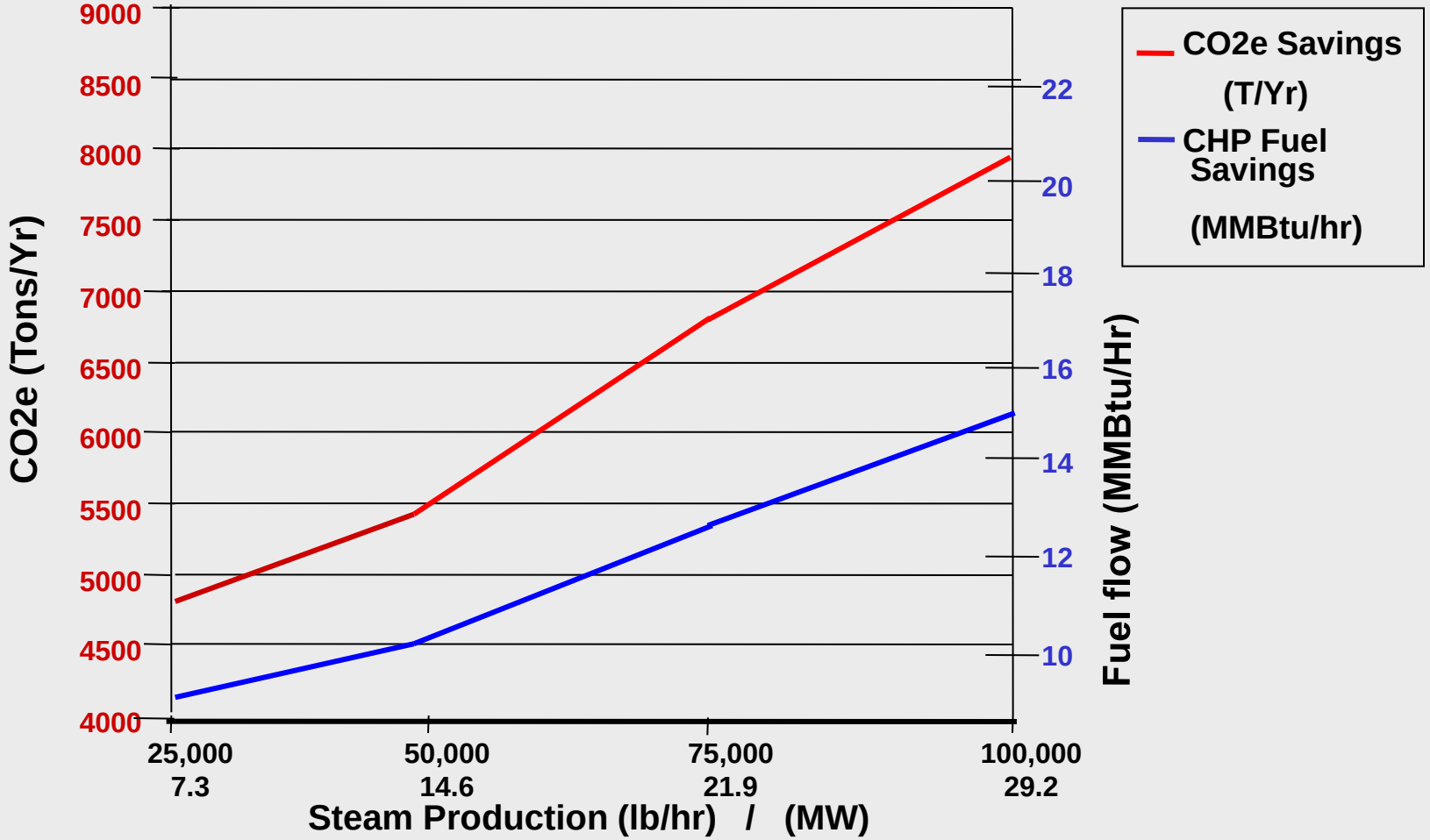
6.1 MW from Combined Cycle Power Plant with Steam from Conventional Boiler Compared to Taurus 65 CHP Plant



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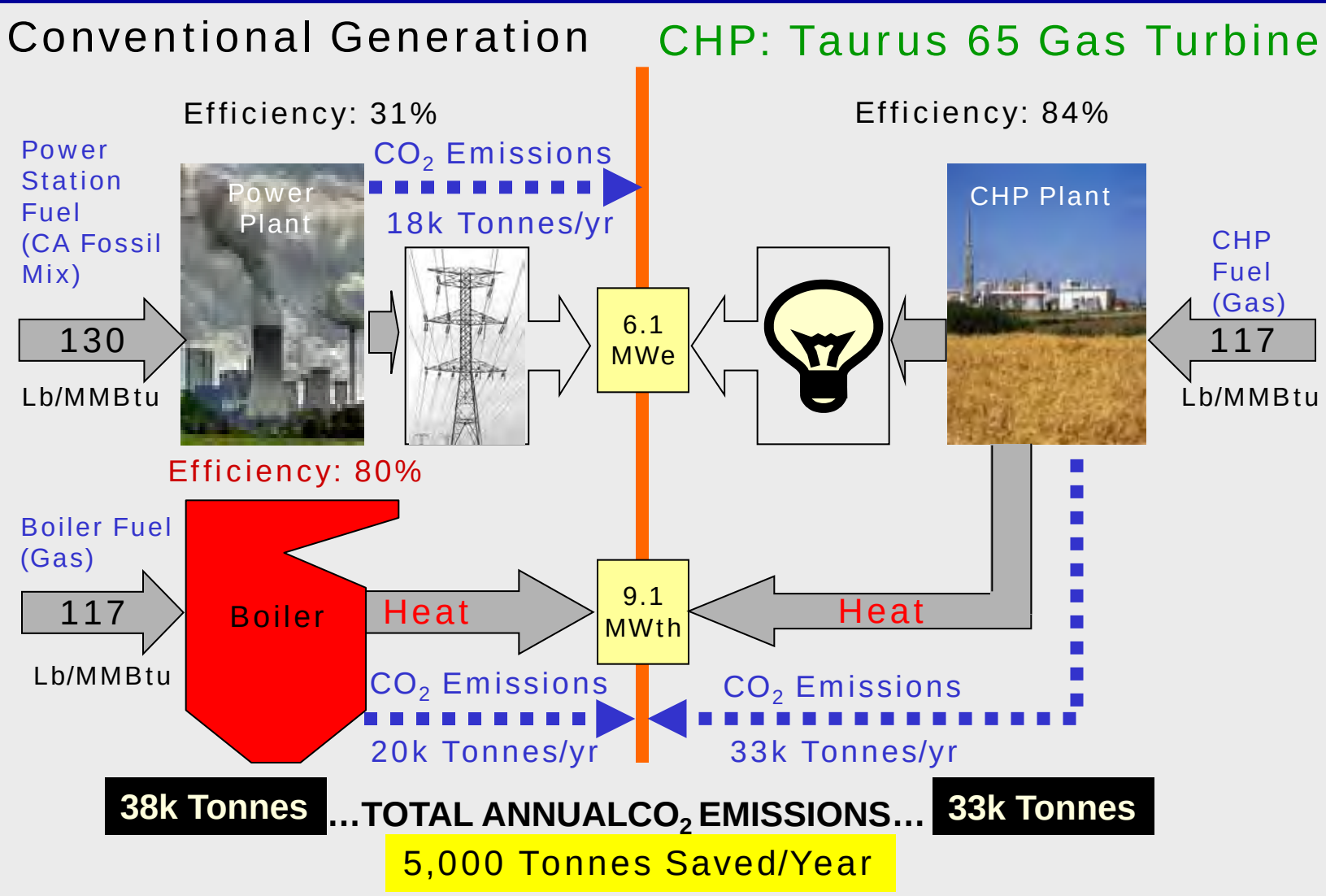

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4.6 MW Centaur 50
California Dairies, Tipton, CA

4.6 MW Mercury 50
San Diego VA Medical Center

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2 x 5.2 MW Taurus 60
San Diego State University

2 x 13.5 MW Titan 130
University of California
at San Diego

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2 x 3.5 MW Centaur 50
Cologne, Germany G-E-W

3.5 MW Centaur 40
Metro, Wisconsin Landfill

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Barriers to Deployment of CHP

- **Utilities are paid for the sale of electricity but are not compensated for its end use efficiency**
- **Indirect emissions reductions are not taken in to account**
- **Community developers may not be familiar with CHP systems and their benefits**
- **Designing systems that are effectively matched to varying thermal and electrical loads can be tricky**

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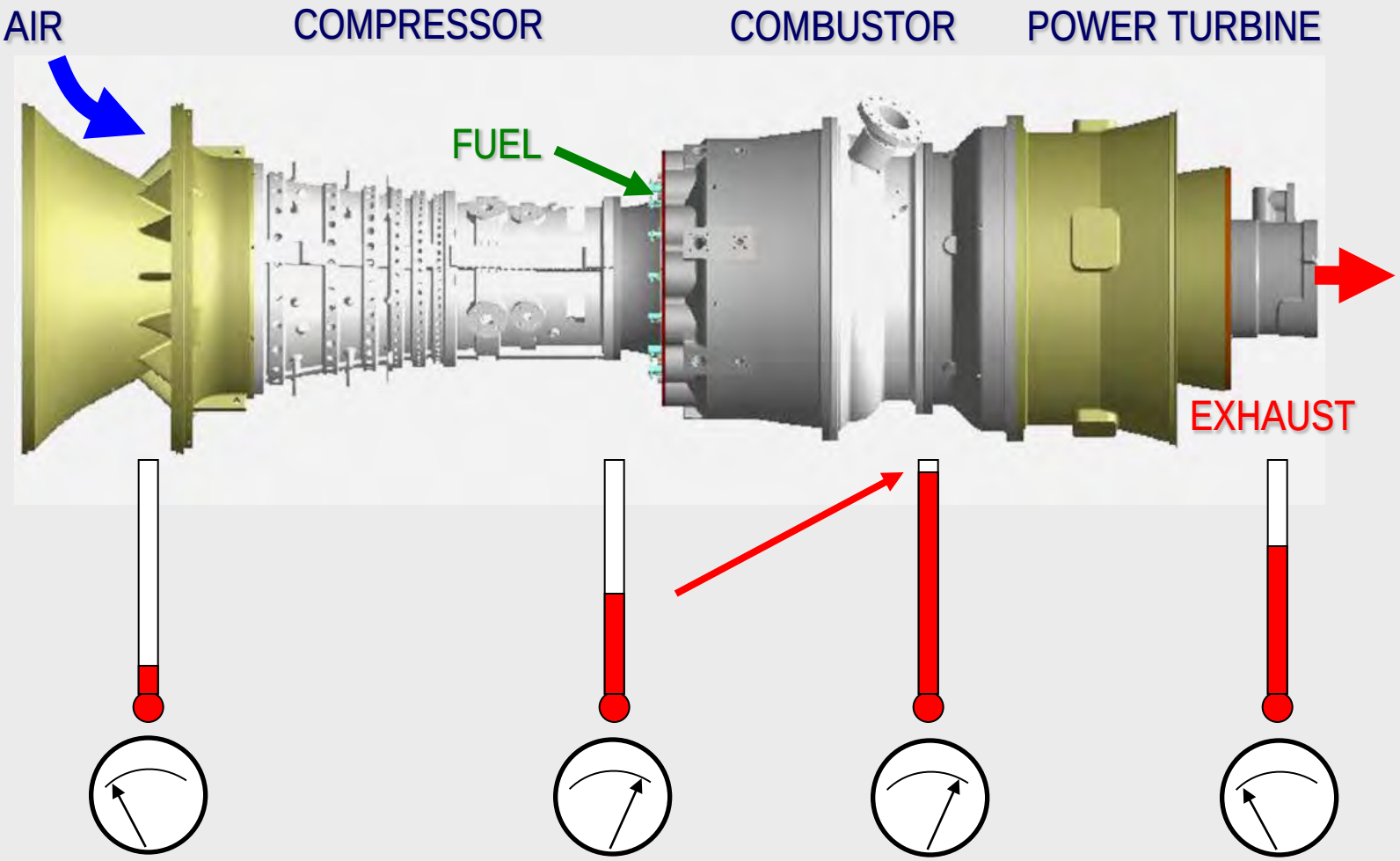
Gas Turbines 101



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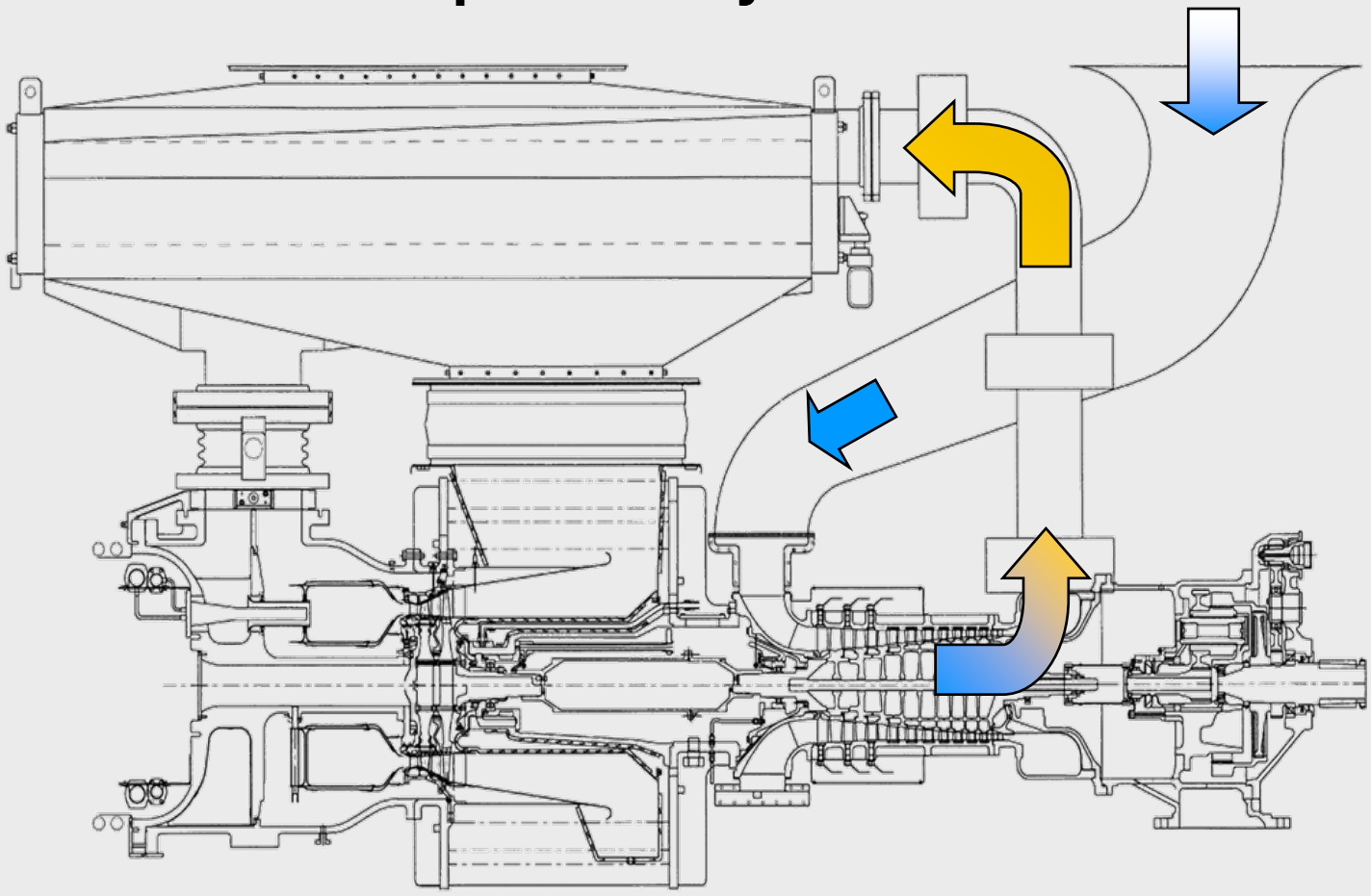
Recuperated Cycle



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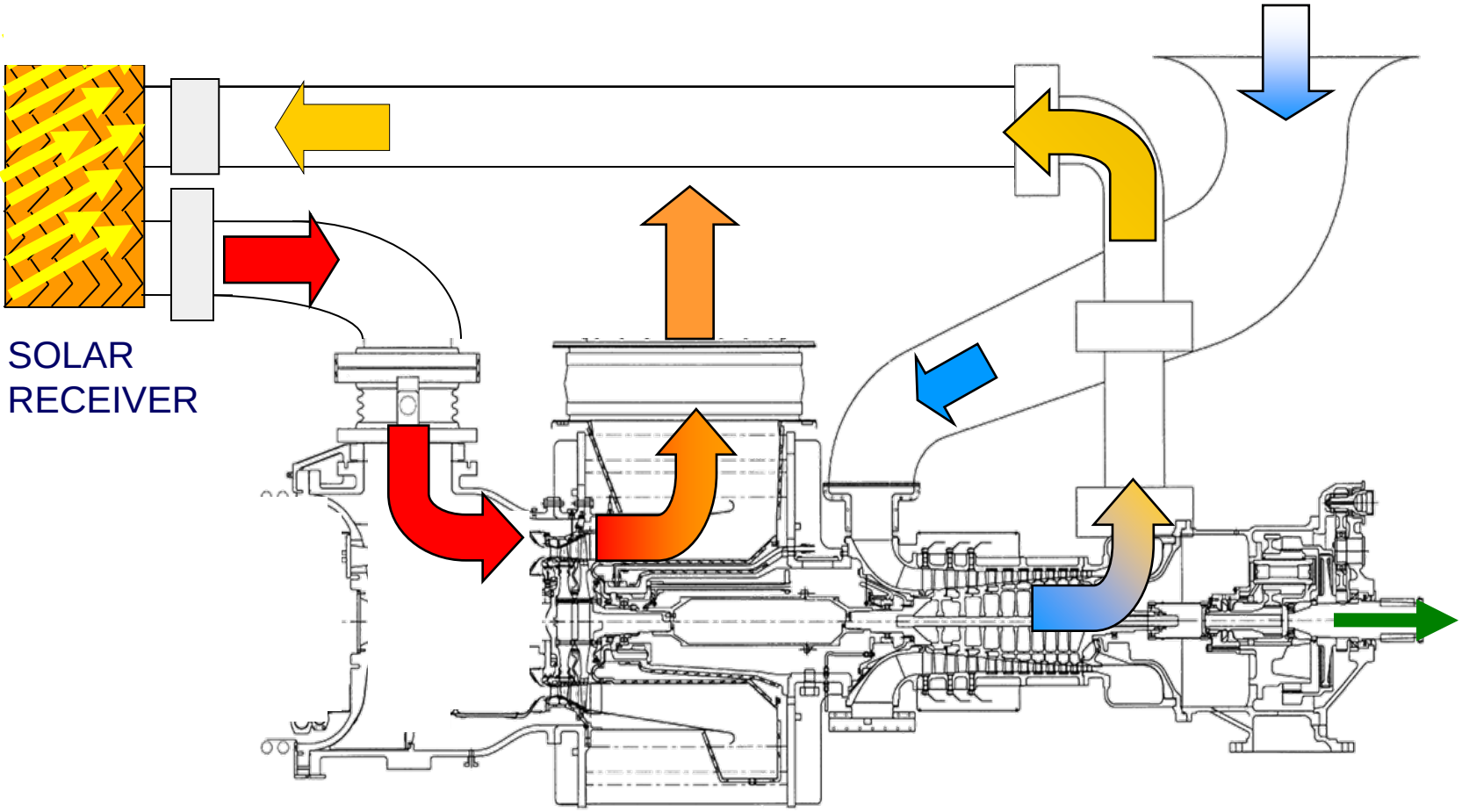
True “Solar” Mercury 50



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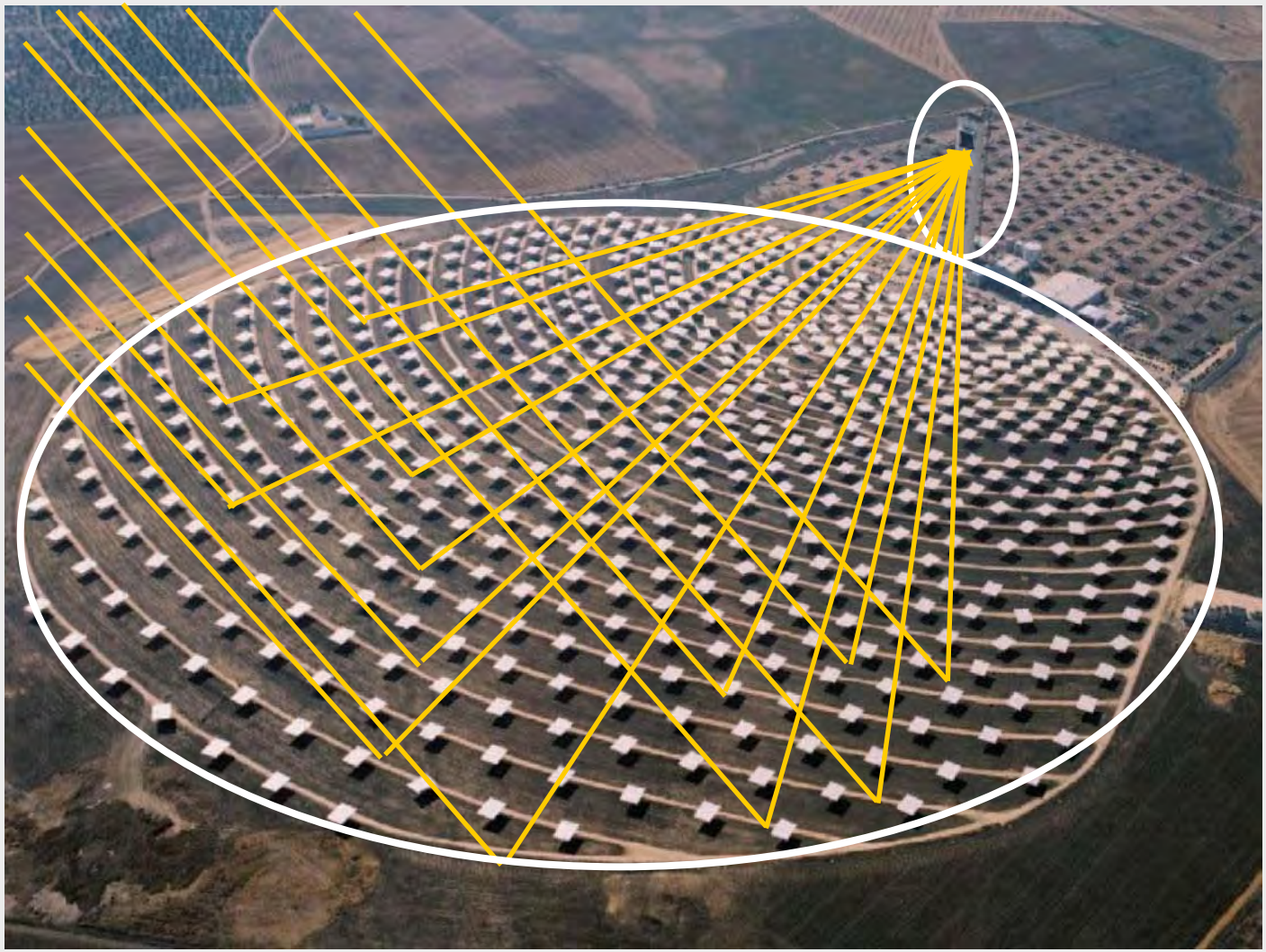

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Summary

- **Gas turbines can be deployed to provide clean and efficient combined heat and power (CHP)**
- **Community applications include district heating, college campuses, hospitals and commercial building clusters**
- **Benefit sharing and properly crafted legislation can foster wider deployment of CHP**
- **Solar is a local manufacturer with an interest in helping to build sustainable communities**

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Larisa Dobriansky

Co-Organizer

2010 CADER Conference

Open Forum Discussion

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Building Greener Communities in the San Diego Region: A Forum to Catalyze Collaboration

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