GHG & Energy Mgmt. @ Roche

D. Andrew Goldstone

Corporate Environmental & Safety Affairs

October 12th, 2006

Presentation Outline

- Company Background
- Inventory Management Plan & Reporting Process
- Corporate & Facility Management Process
- Energy Concepts
- Conclusions

Company Background

Roche

- Founded 1896 in Basel, Switzerland (HQ)
- 65,000 people (+/-) in 150 countries
- Discovery, development, and production of innovative diagnostic and pharmaceutical products
- Core businesses: Pharmaceuticals & Diagnostics
- *Recognition*
  - Fortune magazine's Best Companies to Work For in America
  - Listed on DJSI & FTSE4Good
  - Top 20 Employers (Science magazine),
  - No. 1 Company to Sell For (Selling Power)
  - One of **AARP's** Top Companies for Older Workers

Company Background

Roche U.S. Affiliates

- Facility Locations:
  - Palo Alto, CA
  - Pleasanton CA
  - Boulder, CO
  - Indianapolis, IN
  - Florence, SC
  - Nutley, NJ
  - Branchburg, NJ
  - Ponce, PR

North American Pharmaceuticals Headquarters in Nutley, NJ

North American Diagnostic Headquarters in Indianapolis, IN

Company Background

GHG Goal Setting

- Global GHG Goal
  - Energy Savings & GHG Savings (10% by 2008)
    - (ghg/$ sales)
  - New Goal → 10% reduction by 2010 (vs. 2005)
    - Indexed to # of employees

Achieved in 2005 !

- U.S. Roche Affiliates → EPA Climate Leaders Program
  - 10% Absolute Reduction (2008 vs. 2001)

CLIMATE LEADERS
U.S. Environmental Protection Agency

Company Background

Site Accomplishments

- Palo Alto
  - Over 30% reduction in electric and gas consumption
  - Annual savings over **$3,000,000**
- Nutley, NJ
  - 29% reduction in consumption
  - Annual cost avoidance = **$6,000,000**
- Pleasanton, CA
  - **$2,700,000** in annual savings compared to 2001 baseline
- Florence, SC
  - Achieved **$439,225** in savings in 2005 (just over a one-year payback)
  - Goal of 3-5% annual reductions

IMP & Reporting Process

Start up & QA

- 3rd Party Assurance of “key figures” since 1992
- Roche Global Reporting Protocol ≠ US Climate Leaders
  - Emission factors
  - Sources
- Unrolled Roche data to discover differences
- After learning process → IMP as documentation rather than tool
- Reporting Continuity: More manual the process, the more detailed the IMP
- Quality checks via conference calls → is this really your GHG trend?

Corporate & Facility Mgmt. Process

Corporate vs. Facility Level

- Differences may be company-specific
- Roche Corporate
  - Reporting & Program relationship mgmt. (ie, Climate Leaders)
  - Transfer Technology & Best Practices; Identify new opportunities
  - Spot internal obstacles to progress and resolve
  - Support facilities & ensure progress
- Roche Affiliates (Facility Level)
  - Identify, analyze & implement projects → Actually get the reductions!
  - Understand local energy demand and supply situation
  - Communicate success
  - GHG reporting to corporate

Corporate & Facility Mgmt. Process

Corporate—Establishing Program

- Program structure should fit company structure & culture
  - Centralized vs. Decentralized
  - Environmental vs. Engineering vs. Facilities
- Roche
  - Decentralized
  - Affiliates operating independently: “great solo efforts”
  - Two affiliates with 30-40% reductions pre-baseline

»» Focus on replicating existing successes across facilities

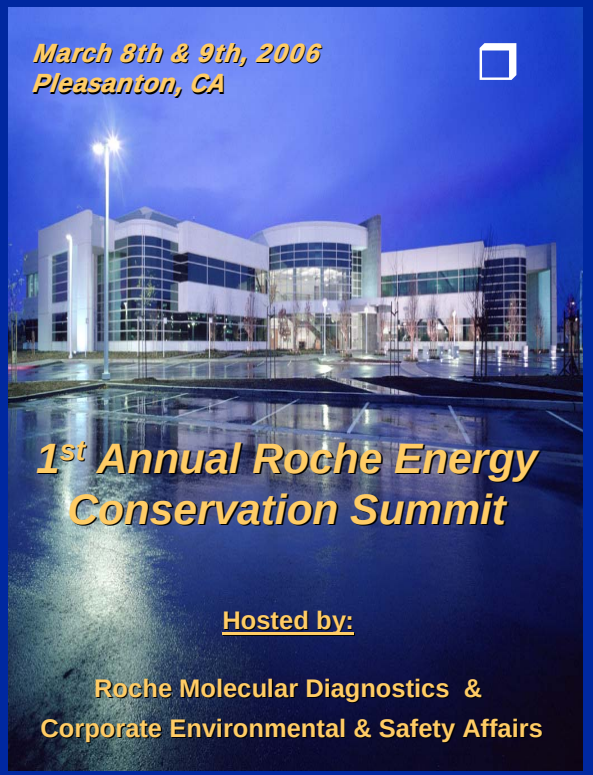
Corporate & Facility Mgmt. Process

Corporate—Establishing Program

- CESA establishes “Roche Energy Group”
  - Grass roots network of “energy champions”
  - Technology & Best Practice Transfer
  - Serve as a forum for introducing new opportunities
  - Direct Support to Sites

Corporate & Facility Mgmt. Process *Increased Collaboration & Support*

- Quarterly Conference Calls
  - Share & discuss practices, stories, and issues
  - Forum for honest & open discussion→ Internal references & peer support
- Email updates & Intranet site
  - Summarize calls
  - Internal projects & studies
  - External resources
- Direct Support (site visits; phone & email)
  - Discuss & Identify Opportunities & Priorities
  - Provide references, preferred vendors, research & analysis
  - Identify funding options



Corporate & Facility Mgmt. Process

"Best Practice" Corporate Energy Program Components

- Multiple Facilities
  - Transparent performance reporting
  - Top management accountable for results
  - Capital Funds
  - Best Practice Transfer
    - Annual Meetings
    - Conference Calls
    - Email/Newsletter/Intranet Site

Corporate & Facility Mgmt. Process

Corporate Next Steps

- Internal Awareness & Communications
- Global Energy Standard
  - Defines “energy process” (managerial standpoint)
  - Best Practices (existing assets)
  - New Construction & Major Renovations
  - Procurement Specifications
  - Integrate performance reporting w/ existing environmental reporting
- Innovative Financing
  - Budget Relief?
  - Leverage rebates and emerging “credit” schemes
  - 3rd party partnerships where practical

Corporate & Facility Mgmt. Process

Facility Level Fundamentals

- Formalize Program
- Buy premium efficiency equipment
- “Right-Size” your equipment
- Make sure it works as intended & is “optimized”
- Turn things “off” that don’t need to be “on”

Corporate & Facility Mgmt. Process

Facility Level Energy Program Components

1. Energy Champion / Energy Team

- Cross-functional

2. Goals

- Realistic, but inspiring
- Absolute or Indexed

3. Metering is Critical

- Targeting & monitoring
- You can't manage what you can't measure
- You need proof of savings to please finance

4. Projects

- Identify
- Evaluate
- Implement
- Track

5. Communicate Success & Create Awareness

6. Accountability & Reporting

Energy Tools & Concepts

Building Automation System Optimization (Pleasanton, CA)

- Economics of implementation
  - Initial Investment = $4,000 + 14 days training + 5 days to implement changes
- Results (2001 vs. 1999)
  - **52.1% electricity reduction**
  - **68.2% gas reduction**

  ***about 15% of the energy savings were related to this change in occupancy
- Electrical Cost Savings since 2000: **$1,533,882**
- Natural Gas Cost savings since 2000 : **$1,235,126**
- So what is being optimized?
  - Set points were adjusted to reduce combined cooling and heating of HVAC air.
  - Equipment operating scheduled and criteria reviewed
  - See slides in appendix for details

Energy Tools & Concepts

VFDs on Chiller *(Pleasanton, CA)*

- Retrofitted chiller to add a VFD to improve low to moderate load chiller efficiency.
  - –Cost: = **$54,848** (after rebate of $39,702)
  - –Annual Savings = **$40,000** (conservative estimate)
  - –Simply payback = 1.4 years
  - –IRR: 104%
  - –NPV: $147,232
- Roche's Palo Alto facility has installed almost 200 VFDs on applications such as pumps, motors, fans, and chillers (5 hp to 200 hp)

Energy Tools & Concepts

Cogeneration

- Nutley, NJ (10 MW)
  - Approx. $4 million in annual savings
  - 3 year simple payback
- Pleasanton, CA (375 kW)
  - Cost = $516,880 (net of $321,461 rebate)
  - Annual Savings: $220,000-$280,00
  - Current IRR: 39%
  - Current NPV: $682,000
- Multiple CHP projects under evaluation
- See chart in appendix
- Early Adopter of Cogeneration (mid 1980s)
  - DOE Partnership
  - 2 Facilities

375 kW Cogeneration unit in Pleasanton, CA

Energy Tools & Concepts

Cool Roofs *(Pleasanton & Palo Alto, CA)*

- Reflects & radiates away sun's energy
- Enhances roof longevity (indefinite if maintained)
  - It’s a roofing project (by $)
  - But if you aren’t thinking energy…
- Cost = $204,000
- Reduced HVAC cooling demand by 10% to 20%
- Alternative = White Paint (see chart in appendix)

Energy Tools & Concepts

Med-High Bay Lighting

- Change out HID (MH, HPS) for Fluorescents
  - T-8s are most efficient per watt
  - Paybacks have ranged from 1.3 to 2.7 years
  - Reduced consumption by about 50%
  - Increased quantity of light by about 50%
  - Eliminate fire risk of HID failure
  - ½ the replacement costs (longer rated life)
  - Better Quality of Light (much higher CRI)
  - Better Coverage; Better lumen longevity
- Retrofit piloted in Pleasanton → Replicated across all facilities

Energy Tools & Concepts

Hybrid Vehicles

- Roche is integrating hybrid vehicles into our sales fleet (178)
  - Toyota Prius
  - Ford Escape

DIANNE FEINSTEIN
CALIFORNIA

United States Senate
WASHINGTON, DC 20510-0504

October 7, 2004

Mr. George B. Abercrombie
President and CEO
Roche Pharmaceuticals
340 Kingsland Street
Nutley, New Jersey 07110

Dear Mr. Abercrombie:

I read your recent press release, "Roche Putting the Brakes on Greenhouse Gas Emissions with Hybrid Car Pilot Study," and I wanted to commend you and your company for taking the initiative to help improve the environment. I was so pleased to learn that Roche Pharmaceuticals will begin incorporating hybrids vehicles into its sales fleet, with the goal of one day replacing the entire fleet with alternative fuel vehicles.

I applaud your leadership in this area and hope that other companies will soon follow the excellent example that Roche Pharmaceuticals has set before them.

Sincerely,

Dianne Feinstein
United States Senator

Energy Tools & Concepts

Retro-Commissioning (RCx)

- A Building "tune up" (HVAC)
  - "A systematic and rigorous process to optimize building performance and ensure the building performs according to its design intent and its owner's and occupant's current needs"
- Different than "energy audit" → screens for "O&M based opportunities" and finds capital projects as part of the process
- US DOE Study of RCx covered over 30 million square feet
  - Median cost = **$.27 per sq. ft.**
  - **Median Whole Building Energy Savings = 15%**
  - **Median Payback = .7 years**
- Economics are ideal:
  - Targets Low-Cost Measures
  - Actionable Findings with Quick Paybacks

Energy Tools & Concepts

Retro-Commissioning (RCx) (Nutley, NJ)

- 4 Projects Completed in 2 Years
  - Over 553 Issues Identified
  - (5) Capital Projects Identified
  - Issue Resolution currently ongoing
  - **$305,000 in Estimated Annual Savings**
  - **Project Payback < 2 Yrs**
  - **18-19% whole building energy savings achieved**

Energy Tools & Concepts

New Construction Design

#	Measure	Implementation Cost (Net of Rebate)	Annual Savings	Simple Payback (years)
#2 of 10	Demand Controlled Ventilation	$ 20,000	$ 6,394	3.1
#6 of 10	VFD on 2nd Chiller; Parallel Staging	$ 23,395	$ 19,372	1.2
#7 of 10	Install Low Pressure Drop Air Delivery System for Labs	$ 33,500	$ 91,894	0.4
#8 of 10	Unoccupied Airflow Setback	$ 25,000	$ 102,427	0.2
Total		$ 101,895	$ 220,087	0.5

Energy Tools & Concepts

New Construction Design

Measure	Implementation Cost	Annual Savings	Simple Payback (years)
Use Supply Fan VFD to Minimize Fan Energy	$ 10,000.00	$ 47,782.00	0.2
Install Low Pressure Drop Air Filters	$ 100.00	$ 7,262.00	0.0
Install High Efficiency Supply Fans	$ 2,000.00	$ 4,962.00	0.4
Add Insulation + Cool Roof to Building Envelope	$ 24,500.00	$ 9,259.00	2.6
Total	$ 36,600.00	$ 69,265.00	0.5

Energy Tools & Concepts

Projects Moving Forward

- HFC & HCFC Phase-out
  - Large Capital Projects
  - Maximize efficiencies
- Cogeneration
  - 3 Projects in evaluation
    - One is likely to be a power purchase agreement (electricity & steam)
    - 2 are highly dependent on energy prices
- Solar Power Purchase Agreement
- Green Power Purchases??

Energy Tools & Concepts

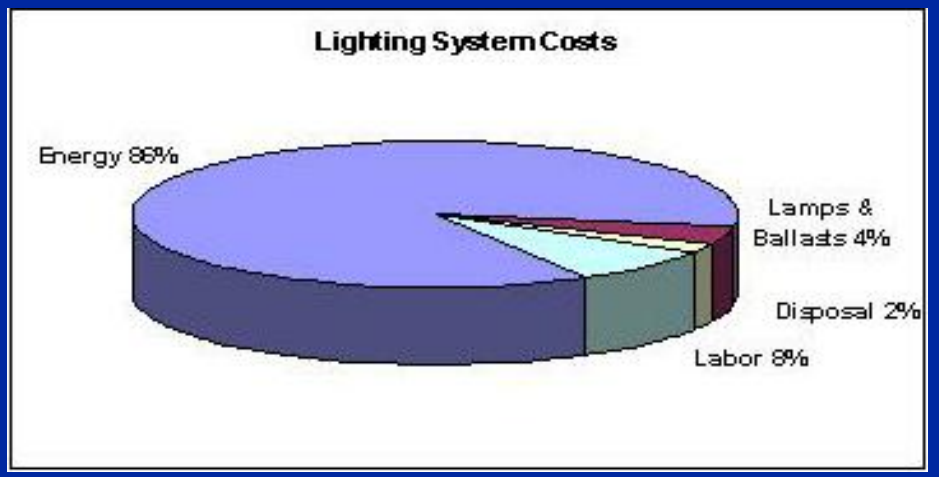
Use Free Resources

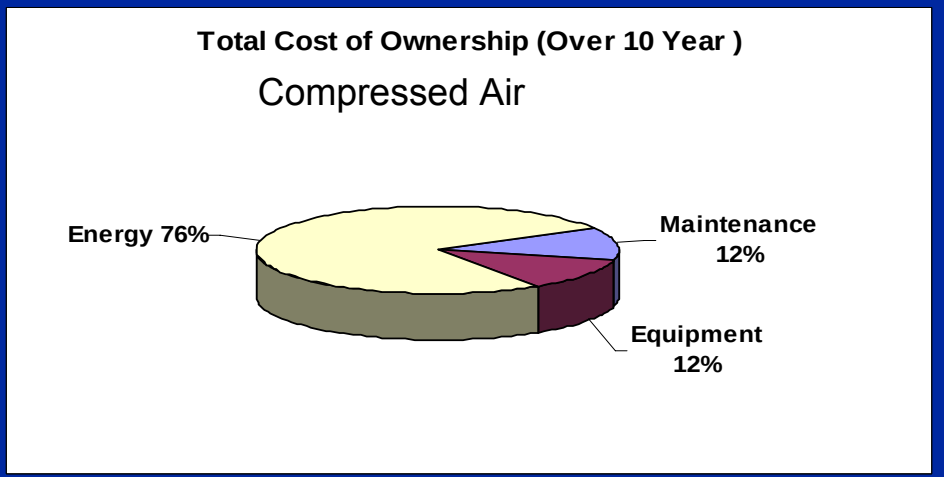
- EPA
  - Combined Heat and Power Program (CHP)
  - Landfill Methane Program
  - Energy Star
  - Climate Leaders
- Utility Incentives
  - Rebates
  - Design Assistance
  - Free Audits
- Other programs
  - California “Building Tune Up” program
  - DOE’s “Save Energy Now” audits
  - Other free audits

Energy Tools & Concepts

Understand "life-cycle costs"

- Energy makes up a large portion of life cycle costs
- Don't buy on first costs
- Simple paybacks are a bad standalone measure for financial impact
- Educate financial & procurement personnel





Energy Tools & Concepts

Understand "life-cycle costs"

Energy Systems Lifecycle Costs			
Area	**Energy**	**Capital**	**Misc.**
Lighting	**86%**	4%	10%
Compressed Air	**76%**	12%	12%
Pumping Systems	**75%**	n/a	n/a
Pumps	**50%**	10%	40%
Motors	**97%**	2%	1%
Fans	**n/a**	n/a	n/a
Chillers	**n/a**	n/a	n/a
"HVAC"	**30-50%**	n/a	n/a

Energy Tools & Concepts

Selling Energy Efficiency

- Illustrate the business case
  - Partner with finance to get the metrics right
- Emphasize co-benefits
  - Maintenance, environment, and anything else you can
- Latch on to existing company initiatives
  - Six Sigma, Cost-Cutting, or Lean initiatives
- Persistence!

Energy & GHG Mgmt. Systems

Conclusions & Takeaways

- Management systems and overall approach consistent with company culture and structure
- Corporate needs to listen to facilities → act on feedback whenever possible
- Each facility is unique, but many projects are replicable
  - Lead with the business case
  - Build momentum with easy wins
  - Communicate success
- Engaged and committed facility "energy champions" make everything go!

D. Andrew Goldstone

Andrew.Goldstone@Roche.com

973-235-5822

We Innovate Healthcare

Key Achievements & Projects

Building Automation System Optimization

(Pleasanton, CA)

- What is being optimized?

1. Set points were adjusted to reduce combined cooling and heating of HVAC air.
   - Supply air temperature for AHUs raised from 55 degree F (design) and reset based upon outside air temperatures → two fold effect, it reduced cooling (kWh), and reheating (Therms) demand.
   - HVAC economizer modes optimized to take advantage of “free cooling”.
   - Duct static set points that were set based upon all zones calling for cooling, were reset to reduce fan horsepower.
   - CO2 Sensors installed in Air Handler returns to ensure proper indoor air quality, while minimizing the amount of air requiring conditioning on extremely hot or cold days by modulating the outside air damper towards the closed position.

Key Achievements & Projects

Building Automation System Optimization (Pleasanton, CA)

- What is being optimized?

2. Equipment operating scheduled and criteria reviewed.
   - Initially, chillers set to run at all times, assuming a constant cooling demand.
     - After trial and error testing, no mechanical cooling was required when outside air temperatures were below approximately 64 degrees F. Temps in this region are below 64 degrees about 60% of the year, including occupied periods. Chiller run time was cut significantly by turning the chilled water plant off when outside air was below 64 degrees.
   - Boiler supply temps maintained at approximately 180 degrees, 24 x 7 assuming a constant reheat or heating demand for labs.
     - After trial and error, it was discovered that the boiler temperature could be set to 140 degrees at night, and no boiler damage would occur.

- Night set back modes for all equipment were evaluated and set to ensure equipment ran only when it was required (shut off completely or shifted to night mode in the case of labs).

Key Achievements & Projects

Cogeneration

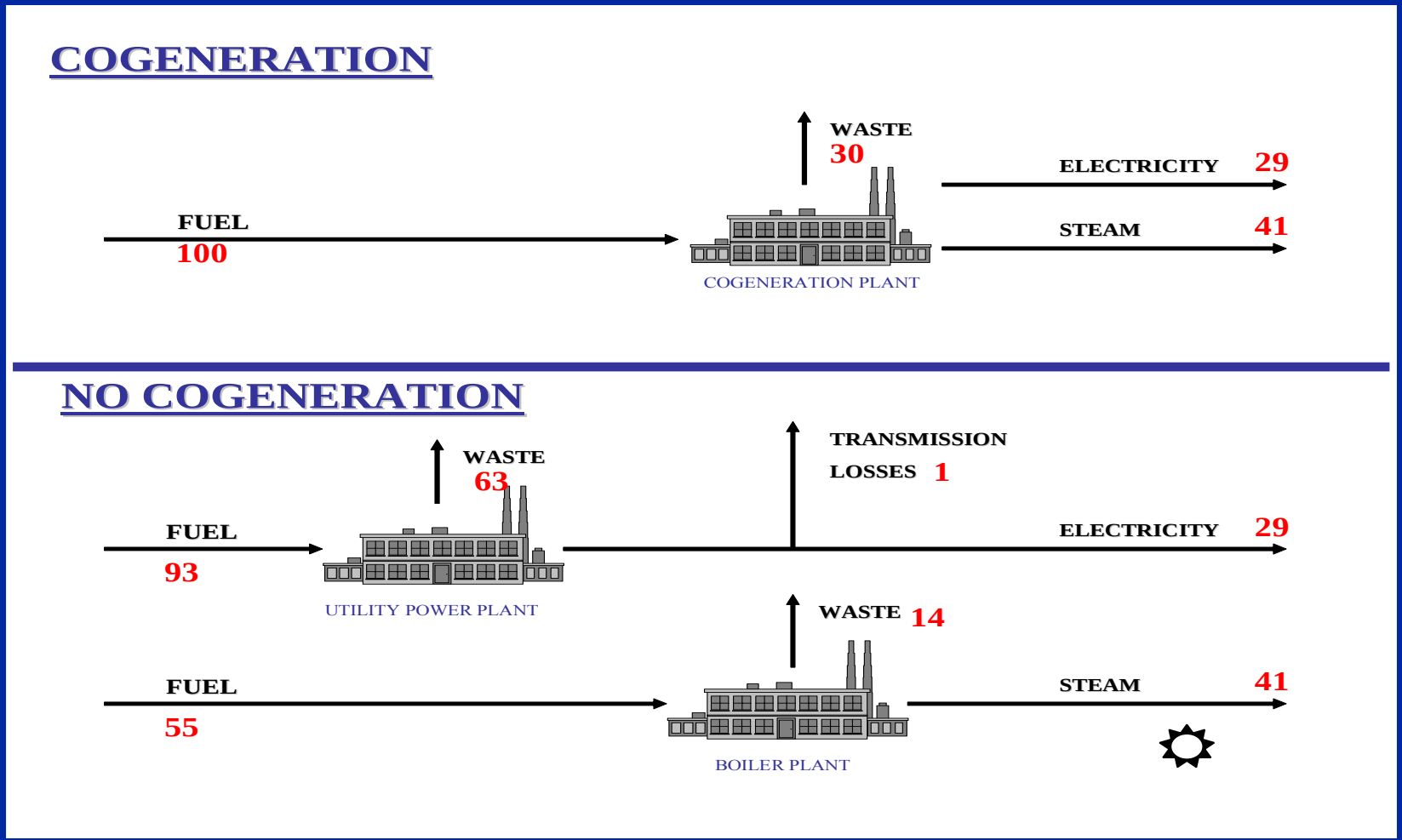
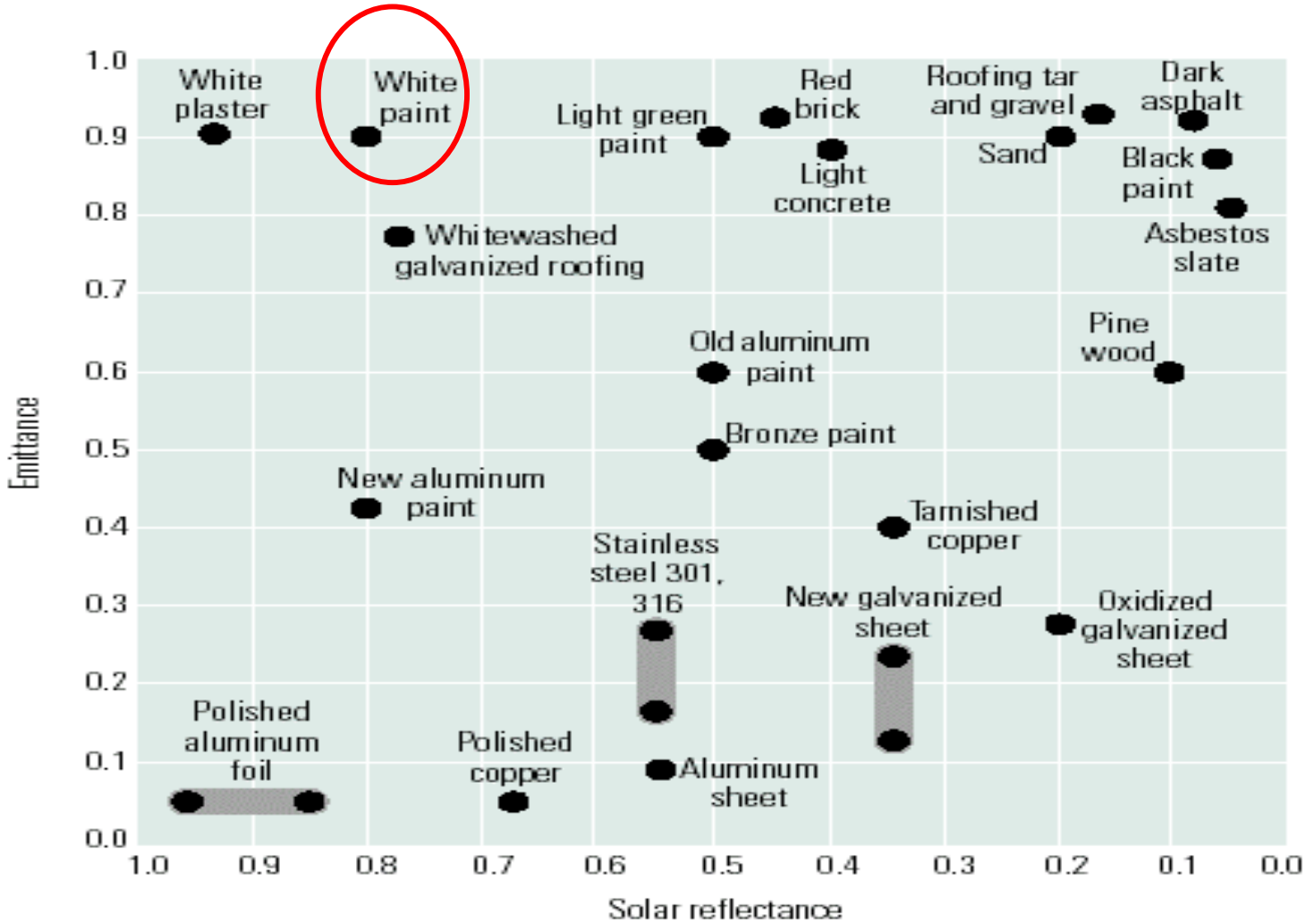


Figure 2: Reflectance and emittance of building materials

Even though many metals have a high solar reflectance, if emittance is low, the material will not reject heat effectively. For example, polished aluminum foil has a very high solar reflectance, but its emittance is low, so it retains heat. Note its placement in the lower-left portion of the graph. The best-performing roofing materials for cooling load reduction have both high albedo and high emittance, and therefore appear in the upper left-hand section.



Source: Florida Solar Energy Center [24]