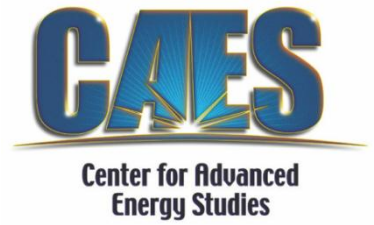

The Energy Policy Institute

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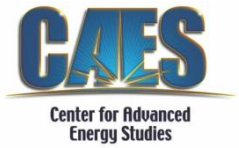
December 2011



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DECEMBER 2011

Acknowledgements

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Workshop Breakout Session Participants

Name	Organization
Johanna Bell	Edwards Mother Earth Foundation
David Bray	US Environmental Protection Agency, Region 10
Rick Brenneman	Woody Biomass Utilization Partnership
Bill Carlson	Carlson Small Power Consultants
Byron Defenbach	Intermountain Gas Company
Eric Erickson	The Amalgamated Sugar Company, LLC
Becky Evans	Idaho Department of Lands
Richard "Tiny" Furman	Idaho Department of Lands
Dean Johnson	Idaho Department of Lands
Jay Larsen	Idaho Technology Council
James Mizer	Glanbia Foods Inc.
Larry Moresco	CAES Energy Efficiency Research Institute
Daniel Osterberg	Boise State University
Glen Patrick	The Amalgamated Sugar Company, LLC
Anthony Perreira	City of Boise Public Works Department
Peter Richardson	Richardson & O'Leary, PLLC
David Salem	Brad Thompson Company
Sue Seifert	Idaho Office of Energy Resources
Dave Sjoding	Northwest Clean Energy Application Center
Rick Sterling	Idaho Public Utilities Commission
Lon Stewart	Centra Consulting
Don Sturtevant	J. R. Simplot Company
Matt Wiggs	Idaho Office of Energy Resources
Lisa Young	Snake River Alliance

1 Executive Summary

This document is the report of a one-day Combined Heat and Power (CHP) Workshop held on December 1, 2011 in Boise, Idaho. It articulates the findings derived from a plenary session and breakout groups conducted during the workshop. The workshop was organized by the Center for Advanced Energy Studies' Energy Policy Institute (EPI) at the request of the Idaho Office of Energy Resources. A total of fifty-one people attended the workshop, and twenty-four attended the breakout sessions. The workshop and breakout sessions included participants representing utilities; industry; consulting companies; environmental stakeholders; and local, state, and federal government agencies.

1.1 Purpose

The purposes of the workshop were to:

- Discuss the status of CHP technology in Idaho.
- Identify potential barriers that may hinder CHP projects in Idaho.
- Address why the barriers exist and propose potential solutions to these barriers.

1.2 Structure of Workshop

The workshop was made up of two parts. The first half of the workshop focused on panels. The day began with a CHP 101 presentation, which compared CHP to other technologies, focusing on renewables, and highlighted Idaho's potential for CHP. The second panel focused on CHP project experience in Idaho, and the last panel concentrated on the same issues at a more regional/national level. Each panelist addressed CHP from his organization's unique perspective.

During the second half of the workshop, participants were divided into two groups to partake in facilitated breakout groups. The participants were methodically distributed to ensure that each group contained an even number of representatives from utilities, government, industry, and other stakeholders. During the breakout groups, participants discussed the barriers to CHP projects in Idaho and formulated solutions that could potentially mitigate each barrier.

1.3 Panelists

The panelists at the workshop were chosen by EPI based on their professional backgrounds and the unique perspectives they brought to the workshop.

- **CHP 101**
  Dave Sjoding; *Manager, DOE Northwest Clean Energy Application Center*

- **Panel #1: CHP in Idaho**
  Don Sturtevant; *Corporate Energy Manager, J.R. Simplot Company*
  Eric Erickson; *Nampa Plant Engineer, The Amalgamated Sugar Company LLC*
  Karl Bokenkamp; *Director of Operations Strategy, Idaho Power Company*

- **Panel #2: CHP at a Regional/National Level**
  Dick Munson; *Senior Vice President, Recycled Energy Development*
  David Bray; *Senior Air Advisor, U.S. Environmental Protection Agency, Region 10*
  Bill Carlson; *Principal, Carlson Small Power Consultants*

1.4 Common Themes of the Workshop

During the breakout groups, participants were asked to discuss the biggest barriers that potentially inhibit CHP in Idaho. Although the two breakout groups conducted separate discussions, many common themes emerged, including:

- There is a lack of incentives to develop CHP.
- The definition of CHP is ambiguous.
- The price of power in Idaho is so low, can CHP compete accounting for the "spark spread," or the difference between the fuel cost for a CHP system versus just buying the electricity and/or heat on the market?
- There is a lack of communication between (and among) government agencies and utilities.

From an analysis of the presentations and breakout group discussions, it also became clear that CHP faces a number of more specific challenges. Multiple revenue streams from projects are often listed as a benefit, but multiple revenue streams mean more risk for a project if the overall project margin is thin (e.g. if a particular stream does not provide the return expected it can sour a project). In addition, ambiguity and lack of clarity is interpreted as more risk

financially or at least a heavier upfront investment to ensure the project will meet required approvals from permitting authorities and all parties involved. Projects require a significant degree of coordination among a number of interests for them to be viable. Project objectives need to align between the engineering design, environmental regulation, and the market size for electricity and/or byproducts. For example, what makes sense from an engineering efficiency standpoint in terms of electricity generation capacity may not match market needs, or vice versa. Finally, there has been significant generation capacity added between the 300 MW Langley Gulch natural gas plant coming online in 2012 and the success of wind projects over the last few years, so there is not a strong driver for new electricity generation within Idaho. CHP may be uniquely positioned to help meet new native demand as it arises. However, for CHP to achieve significant market penetration in Idaho it must be formally prioritized rather than reviewed on a case-by-case basis.

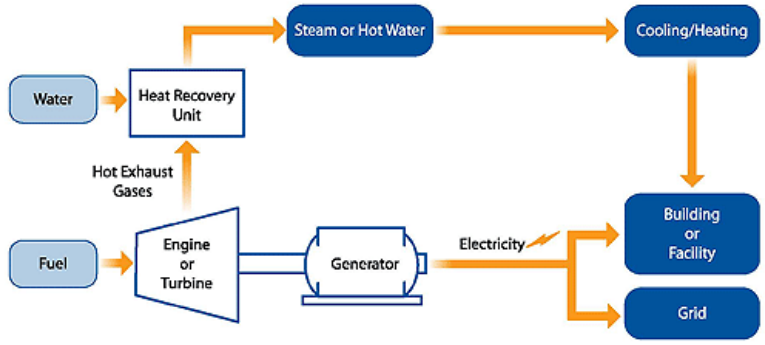
2 What is Combined Heat and Power, and How Does Idaho Rate?

Increasing energy demand, growing energy costs, constraints on traditional energy supply and delivery, and concern over climate change are triggering interest in renewable energy and energy efficiency (Shipley et al., 2008). Currently, the average power plant in the United States burns three units of fuel to generate one unit of power, an efficiency ratio that has not changed since the 1950s Eisenhower administration. Since heat and power constitute 69% of all fossil fuel carbon dioxide emissions in the United States, CHP could play a dominant role in reducing these emissions (Casten, 2008).

Combined heat and power is the technological opportunity in which a single fuel source is used to simultaneously produce useful heat and electricity. The fuel sources vary by site, and may include natural gas, biomass, biogas, coal, waste heat, or oil (U.S. Environmental Protection Agency, 2011). CHP provides a much greater overall efficiency than if heat and power were produced separately, with fuel efficiency rates typically exceeding 75%, as opposed to the 33% efficiency average of other large centralized power plants (U.S. Environmental Protection Agency, 2008, p. 2).

Figure 1:

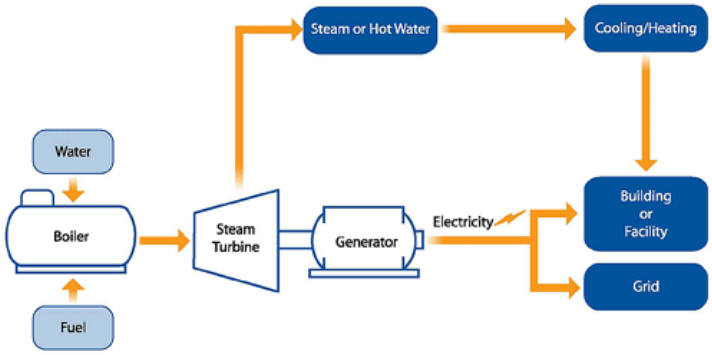
Gas Turbine or Engine with Heat Recovery Unit



Source: US Environmental Protection Agency

Figure 2:

Steam Broiler with Steam Turbine



Source: US Environmental Protection Agency

CHP systems are typically based on one of the two configurations above, but since projects vary in size and fuel source, CHP systems are customizable based on the specific needs of the end user.

2.1 Benefits of CHP

CHP systems are attractive because they provide many energy, environmental, and economic benefits that other systems cannot. Since the energy is produced precisely where it is needed, wasted heat is avoided and the system can reach maximum efficiency. Furthermore, CHP provides an alternative to building new electricity generation facilities, and their increased emissions as well as siting difficulties, to meet power demand growth in the region. Other benefits of CHP include:

- Improved fuel efficiency (lower energy costs).

- Proven to reduce methane, CO_2, SO_2, NO_x, and particulate matter.
- Provides business potential when electricity or carbon credits are sold.
- Potential to earn and sell Renewable Energy Certificates (RECs).
- Improved power quality and reliability.
- Eases strain on the transmission grid.
- Reduced dependence on foreign fossil fuels.
- Beneficial use of surplus waste and biomass.
- Mitigate or eliminate transmission line losses.
- No visible transmission lines mitigate viewshed impacts and public opposition.
- Improved energy cost predictability.
- Projects are flexible based on the needs of the end user.

Sources:
(International Energy Agency, 2007)
(Sjoding, 2011)
(Erickson, 2011)

2.2 Where is CHP most useful?

In order to achieve maximum efficiency, CHP plants are typically located near the end user so transmission losses can be mitigated. This requisite means that CHP is ideal for energy-intensive industries, including sites in food processing, pulp and paper, chemicals, and metals and oil refining sectors (International Energy Agency, 2007). Universities and hospitals are also prime locations for CHP as both need constant heat and power.

2.3 Rating Idaho's Incentives and Regulatory Market

The American Council for an Energy-Efficient Economy (ACEEE) has conducted a number of federally-sponsored CHP studies examining the role of incentives and regulatory environments in individual states, as well as rating states based on policies and outcomes. While Idaho does rate "good" on the financial incentives side (Kaufman and Elliott, 2010), it has performed below average in all of the analyses and scorecards because of "few in-place regulations designed specifically to support CHP" (Chittum and Kaufman, 2011, p. 38). There have been only two CHP projects totaling less than 4 MW total in the past ten years. According to ACEEE, an analysis of incentives and regulations in individual states around the country "suggest[s] that states should focus primarily on eliminating regulatory barriers, while using financial incentives to complement regulatory reform and encourage CHP development" (Kaufman and Elliott, 2010, p. 1). In this year's CHP scorecard and analysis, ACEEE included the following on the regulatory side of its analysis:

- Interconnection standards.
- Net metering policies.
- Output based emissions standards.
- Financial incentives.
- A Renewable Portfolio Standard or energy efficiency resource standard.
- Utility rates for standby power (Chittum and Kaufman, 2011, p. 4).

Idaho scored points only in financial incentives and standby power; the state handles interconnection and net metering on a rate case or case-by-case basis, and it has not adopted the other policies. Overall ACEEE rates Idaho's regulatory environment as "bad" (Kaufman and Elliott, 2010, p. 5-193), trumping the financial incentives.

While not rated or analyzed by ACEEE in this year's scorecard, authors note that CHP developers and practitioners listed the following as impediments to projects in a number of states around the nation:

- Low electric rates and resultant poor 'spark spread' and project economics.
- Utility business practices that stymie or stall CHP projects.
- Lack of access to adequate financing.
- Aversion to perceived risk and longer payback periods by potential host company/facilities.
- Lack of access to local markets for excess power.
- Lack of technical knowledge or general awareness of CHP technologies and benefits.
- Difficulty obtaining necessary permits (Chittum and Kaufman, 2011, p. 5).

3 Panel Presentations

Workshop attendees heard seven presentations from the aforementioned panelists. Below is a brief description of each of the seven presentations.

3.1 Dave Sjoding; *Northwest Clean Energy Application Center*

This CHP 101 presentation provided an overview of CHP technology while highlighting target markets for future CHP sites in Idaho including food processing plants, dairies, and district energy systems such as campuses and downtown areas. This presentation acknowledged that Idaho's current utilization of CHP includes 19 projects for a combined total of 218 MW, yet Sjoding pointed out that numerous studies have been conducted predicting CHP potential in Idaho. ICF International claims that CHP in Idaho could reach a potential 511 MW and a 2004

study led by the Oakridge National Laboratory claims that Idaho's CHP potential is near 1,643 MW. This presentation concluded by stating that the key to economically viable CHP projects is utilizing multiple revenue streams. (D. Sjoding, public presentation, December 1, 2011).

3.2 Don Sturtevant, *J. R. Simplot Company*

Working for one of the largest privately held food processors in the country, this presenter acknowledged that the J. R. Simplot Company could greatly benefit from CHP technology. Since industry is responsible for almost one-third of all national energy consumption, CHP could be utilized as more than an energy efficiency resource—it is a potential auxiliary business venture when excess electricity and byproducts are sold. Sturtevant's bottom line was that CHP improves a company's economic outlook to manufacture in America and provide stable jobs. (D. Sturtevant, public presentation, December 1, 2011).

3.3 Eric Erickson, *The Amalgamated Sugar Company LLC*

The Amalgamated Sugar Company LLC (TASCO) operates four sugar processing plants in Idaho and Oregon. Combined, the facilities produce 1.5 to 1.6 billion pounds of sugar annually. The Nampa facility is housed on 400 acres of industrial zoned property and primarily utilizes coal to produce steam for processing sugar. Erickson's presentation explored the results of a Nampa CHP feasibility study jointly conducted by TASCO, Idaho Power Company, and the Idaho Office of Energy Resources. The results of the feasibility study were that the project does not pencil out economically in its current structure, despite the engineering efficiencies, fuel savings, and significant reductions in harmful pollutants. This presentation highlighted the wide variety of potential revenue streams, even though Idaho is the only state in the Northwest that does not provide CHP-only incentives. Erickson noted Idaho's three largest opportunities as:

1) The availability of prime CHP locations in Idaho,
2) The opportunity for emission elimination, and
3) Future revenue streams

(E. Erickson, public presentation, December 1, 2011).

3.4 Karl Bokenkamp, *Idaho Power Company*

During this presentation, Bokenkamp agreed that CHP could be a meaningful addition to Idaho Power's energy portfolio; however the right opportunities are not always available. This presentation highlighted three main points regarding the application of CHP from the utility's perspective.

1) Economics: In order for projects to receive attention from a utility, they must be profitable.

2) CHP Projects are Unique: There is no single model that can be replicated at all potential CHP sites. This is why some projects are profitable while other similar ones are not.
3) The utility's decision to pursue projects is based on cost, price of coal, and the utility's need for power. (K .Bokenkamp, public presentation, December 1, 2011).

3.5 Dick Munson, *Recycled Energy Development*

Munson presented facts regarding the actual amount of carbon emissions from heat and power. He noted that CHP can play a major role in carbon reduction and provided three recommendations that may help promote the technology among industry and utilities alike.

1) Create Markets. CHP produces byproducts other than heat and electricity. Market the byproducts to maximize profitability.
2) Recognize the benefits. No line loss is an advantage of CHP, why isn't this considered added value?
3) Recreate the definition. CHP is not just an energy producer, it reduces pollution and serves as an energy efficiency mechanism. (Munson, D., public presentation, December 1, 2011).

3.6 David Bray, *U.S. Environmental Protection Agency, Region 10*

This presentation provided a valuable overview of EPA's recently updated air regulations. Bray stressed that revision of existing standards is challenging and can trigger legal action, and there are few drivers in the Pacific Northwest to support these revisions. For this reason, Bray also points out that although many opportunities for CHP exist, most new systems are constructed in the Eastern US. Ambiguous standards combined with a lack of incentives in the region contribute heavily to the underutilization of this technology. (D. Bray, public presentation, December 1, 2011).

3.7 Bill Carlson, *Carlson Small Power Consultants*

This presentation championed biomass as the best fuel source for CHP projects. States incentivize the use of specific fuels via tax credits to address issues such as air quality and forest health. Therefore, states with ready access to biomass (like Idaho) may benefit even more. Carlson provided other useful information, such as a recipe for a successful CHP plant and reasons why small scale projects are often the most advantageous. Carlson noted that CHP projects help companies to hedge risk from future fuel price volatility or environmental regulation (B. Carlson, public presentation, December 1, 2011).

4 Barriers & Recommendations

CHP has many obvious benefits, yet it only accounts for 12% of power production in the U.S. (Shipley, et al., 2008, p. 18). When examining the number of CHP projects throughout the region, it becomes apparent that Idaho lags behind most of its Northwest counterparts on an absolute basis.

Table 1:

CHP Projects by State

State	Number of CHP Sites	Capacity (kW)
Alaska	109	466,180
Idaho	19	218,465
Montana	19	113,215
Oregon	60	2,544,057
Washington	34	1,264,832

Source: Department of Energy, Combined Heat and Power Database

Despite similar geologic and social factors, Idaho has less than one-tenth the CHP capacity of Oregon. The fact that such disparity exists indicates that there are actual or perceived barriers that prevent CHP in Idaho.

4.1 Breakout Groups and Barriers

To reiterate, the purpose of the workshop was to acknowledge potential barriers that may prevent CHP in Idaho, and to discuss possible solutions. The participants identified the following as the most formidable barriers:

- Lack of knowledge about CHP.
- Necessity for leadership.
- Lack of coordination between and among government agencies, utilities, legislature, and task forces – tendency for one group to place responsibility for action on another.
- Market: The market is bounded by policy— current policies inhibit potentially profitable projects through ambiguity or lack of authority, providing the perception of more risk.
- Complexity and ambiguity in the avoided cost rate mechanism.
- Cost of implementation.
- Definition of CHP is not conducive to new project implementation.

- Lack of incentives for industry and developers.
- Disincentives for utilities.
- Price of power in Idaho. Can CHP compete with natural gas?
- No Renewable Portfolio Standard in Idaho.
- Federal policies are too stringent.
- Disagreement regarding Renewable Energy Certificate (REC) ownership; subject to individual rate cases rather than uniform standard.
- Idaho Power has surplus power at certain times of the year.

(For a complete list of all barriers mentioned in the breakout groups, see appendix.)

4.2 Policy Opportunities and Recommendations to Promote CHP

These opportunities and recommendations cover all potential actors, except where noted, and are not an agenda for EPI.

- Education campaign.
    - Tutorials for engineers provided by Office of Energy Resources, Center for Advanced Energy Studies, and/or non-profits.
- Better communication to investors about value of CHP.
- Government agencies incorporate CHP into mission (Department of Lands, etc.).
- Demonstration projects.
- Stakeholder outreach to neutralize opposition.
- Facilitate discussion.
    - Real conversation between standing state agencies such as Department of Lands, Department of Environmental Quality, Department of Agriculture, Department of Commerce, Universities, federal agency specialists.
- Organize a work session to build support.
    - Educate the legislature about CHP potential; assist with drafting bills and securing support.
- When state government fiscal situation improves, hire a CHP Specialist to act as a technical and coordinating resource.
- Another organization should hire a CHP outreach specialist who can act as a champion and advocate to PUC, legislature etc. Help convince utilities which projects are worthwhile.
- Promote transparency and fairness in avoided cost rates and RECs.

    - Advocate more open lines of communication between utilities and PUC.
    - Clarify REC ownership through legislation.
- Change the definition of CHP.
    - Defining CHP as a process does not necessarily benefit Idaho. Define CHP as an energy efficiency mechanism to obtain buy-in from utilities.
- Adopt a Renewable Portfolio Standard in Idaho.
- Create “right-size” incentives for the utility or developer through legislation; right-size incentives match what is needed rather than providing a potential windfall for the recipient.
- Create a path for selling extra electricity; gain better access to markets.

APPENDIX

Below is a full list of all barriers discussed during breakout groups.

1. Lack of knowledge about CHP. Developers do not know where to start.
2. Difficulty in competing with low natural gas prices in Idaho.
3. Lack of coordination and transparency within the market.
4. Lack of communication among and between government, utilities, developers, PUC, etc.
5. Definition of CHP is not conducive to new project implementation.
6. CHP is not recognized as a renewable technology.
7. High cost of biomass transport.
8. Local opposition.
9. Arduous permitting process.
10. Lack of coordination in government, industry, etc.
11. Lack of/inequitable incentives.
12. Idaho Power has surplus power.
13. Market is flooded by wind energy.
14. Best Available Retrofit Technology (BART) does not require energy efficiency.
15. It is difficult to get industries to buy-in because creating energy is not their core business.
16. No identifiable market to sell electricity.
17. Access to markets in the West.
18. Industries cannot shop around for best prices to market their projects--there is only one utility.
19. Industry sees risk in moving to CHP.
20. CHP can create more work.
21. Rigid federal policies are impeding new projects.
22. Complexity of the avoided cost methodology.
23. Utilities must coordinate and get little return.
24. PUC is constrained by laws.
25. Entanglement between the PUC and utilities.
26. Instability of regulations. They can change virtually overnight and kill project economics.
27. Renewable technologies are not diversified.

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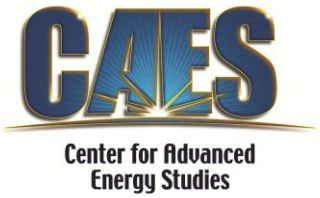

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