Management Procedure for Establishing a CHP System In Louisiana

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ABSTRACT

The objective of this research is to determine what permits and regulations are required in Louisiana for CHP implementations. A typical management procedure for the CHP adoption process is developed to provide an in-depth understanding of the difficulty and technical phases of CHP projects. A description of each phase in the procedure is provided. The air permit and utility interconnection procedures are discussed as they pertain to Louisiana.

Our research indicates that for air-permitting requirements, all emitted pollutants must be less than 15 tons per year and 5 tons per year per regulated pollutant for exemption. If the facility owner is not exempted, he or she must file an Air Permit Application, Emission Inventory Questionnaire, and Single Source Form with the Louisiana Department of Environmental Quality (DEQ). The interconnection procedure is initiated with an interconnection request, and the utility provider submits the appropriate application to the owner.

After the application is completed, the utility provider initiates a facility study. The interconnection agreement is completed after the facility study results are accepted by both parties. The operation of the system is tested by the utility provider before going online.

INTRODUCTION

Louisiana industry owners who are potential combined heat and power (CHP) adopters have a difficult task in connecting a CHP system to the utility grid and getting appropriate U.S. Environmental Protection Agency (EPA) or Louisiana Department of Environmental Quality (DEQ) permits. The numbers of CHP systems in Louisiana have not increased steadily over the years despite the increased awareness of global warming and increased government warnings of the need to reduce greenhouse gases. The regulated utility companies have not provided facility owners easy and manageable procedures to follow for grid connection. The regulated utility companies create additional costs for facility owners that make the implementation and economics of a CHP system less favorable. The state government air regulations are not easily found and are difficult to understand for potential CHP adopters. These problems account for the sparse CHP adoption in Louisiana.

The number of CHP systems implemented in Louisiana since 1942 is fewer than sixty [1]. The difficulty in implementation is due to the lengthy air permitting procedures required by the DEQ and EPA. The regulated utility companies also pose a significant barrier to CHP implementation in Louisiana due to the lack of regulation from the federal and state governments. Each utility company in Louisiana has different interconnection agreements, procedures, and equipment requirements that make it difficult for a facility owner to determine what is needed, and challenging to follow procedures and finance the stand-by fees, facility study fees, and additional equipment required.

The objective of this research is to develop guidelines on how to implement CHP systems in Louisiana. The appropriate permitting and utility interconnection agreements are studied first. Then, the timelines for the permitting and grid connection agreements are gathered. Our implementation process focuses on the air permitting and the utility interconnection agreements for rural Louisiana. A procedure to manage process is illustrated, including the appropriate steps for air permits and grid interconnection for small generators. The development of a how-to guide on CHP implementation in Louisiana provides insight on the procedures to follow for many potential CHP adopters in the state of Louisiana.

Our methodology involves researching current federal and Louisiana state policies that regulate the air permitting and utility regulation

for CHP systems. After the appropriate air permits and qualification for grid connection are identified, the next step is to locate appropriate contacts within the appropriate agencies. The final step is to interview the appropriate personnel to identify the procedures that each department follows to implement CHP systems.

MANAGEMENT PROCEDURE FOR CHP ADOPTION

The CHP adoption process typically followed by a facility owner is illustrated in Figure 1. The process can usually be completed within two to three years from the date of inception. The steps in the adoption process begin with a desire or a need to implement CHP, a feasibility study, preliminary work on the design, preliminary work on the permitting process and interconnection agreements, finalization of process, implementation, and the operation of the CHP system.

The entire CHP process may vary from state to state and may vary within a state due to variances in interconnection agreements and air permitting requirements. A potential adopter may receive net metering due to the type of fuel utilized in the process or may not need air permits due to the exhaust constituents released. Even though the permitting process and benefits may vary, the main adoption process will remain relatively similar.

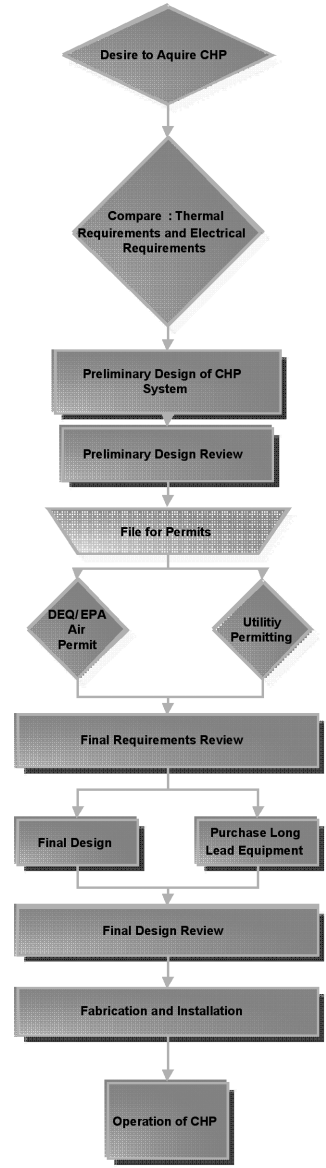

Figure 1. CHP Adoption Management Procedure

Desire for CHP

A facility owner may want to implement a CHP system to produce electricity

at a lower cost, to reduce the emission of greenhouse gases, or because the thermal needs of the facility are equal or greater than the electric needs. As one can easily see from Figure 2, the desire to implement a CHP system has benefits that exceed the costs. The benefits of CHP implementation include heat recovery and reuse, electricity generation (less any purchases of electricity from the utility provider), and profits from sales of excess electricity to the grid.

COSTS	*BENEFITS*
Capital Costs	Waste Heat Recovered and Used
Operation and Maintenance Costs	Electricity Generated
Fuel Costs	Less Purchasing
	Less Sales to Grid

Figure 2. Cost and Benefits Balance

After the facility owner has decided to pursue the CHP project, he must determine if there is a great enough economical advantage to implement a CHP system. The EPA's CHP website provides potential adopters with a non-technical qualifier web tool to assist with the qualification process [2]. The main goal of this web tool is to determine if the facility is a candidate for CHP. The determination of qualification will save the potential CHP adopter time and money before hiring an engineering firm to design a system if the facility is not a good candidate. The questions listed on EPA's Qualifier Web Tool include the following:

- Do you pay more than $0.06/kWh on average for electricity (including generation transmission and distribution)?
- Are you concerned about the impact of current or future energy costs on your business?
- Is your facility located in a deregulated electricity market?

- Are you concerned about power reliability? Is there a substantial financial impact to your business if the power goes out for one hour? For five minutes?

- Does your facility operate for more than 5000 hours/year?

- Do you have thermal loads throughout the year (including steam, hot water, chilled water, process heat, etc.)?

- Does your facility have an existing central plant?

- Do you expect to replace, upgrade, or retrofit central plant equipment within the next 3-5 years?

- Do you anticipate a facility expansion or a new construction project within the next 3-5 years?

- Have you already implemented energy efficiency measures and still have high energy costs?

- Are you interested in reducing your facility's impact on the environment?

As stated on the EPA's website, if a possible candidate has answered yes to at least three questions, then the candidate should feel confident to pursue the CHP project.

Compare Thermal Requirements and Electrical Requirements

Following the determination that a CHP system would provide benefits for the facility, the CHP owner would want to determine if a system would be within his budget requirements and simple payback periods before a CHP system is designed. The task of determining the CHP needs of the facility entails conducting a more detailed feasibility study. The facility owner will generally hire an engineering firm to perform the feasibility study to ensure that all necessary factors are considered. Depending on the engineering firm, the feasibility study may be conducted in two parts to reduce costs during each stage of the project.

The first stage of the feasibility study's goal is to assist a potential

adopter in determining simple payback period. Most engineering firms hired to conduct the feasibility study will have their own methods to calculate payback periods and gather data; however, the discussion of those methods available from EPA's CHP website are used to provide guidelines and information on the typical data gathered during this phase of the project. A level one or initial feasibility study begins with the determination of the goals expected to be achieved by the potential CHP adopter. The project goals, utility barriers and opportunities, regulatory barriers and opportunities, and budget limits are stated.

According to EPA's CHP website [2], a level one feasibility study should take approximately two to three weeks and may cost the owner anywhere from 0 to 10,000 dollars. The data gathered include utility invoices, operational hours, thermal needs, future building expansion, and future business growth. Economically successful CHP systems have thermal needs equal to the electrical needs. As a result, the level one feasibility study will determine the facility's thermal and electrical needs to make a decision if there is a justification for the CHP system.

It is imperative that a level one feasibility study is conducted before beginning the preliminary design of the CHP system because the identification of any utility and regulatory barriers that can prevent a system from being implemented can save the potential CHP adopter money. Any barriers that would prevent the CHP system from being implemented will stop the project at this point, and the potential CHP adopter would not spend any additional money on the project. However, those barriers that would impede or cause difficulty in the adoption process allow the engineering firm to establish approximate monetary values to overcome these barriers. At this point, if the expected costs to overcome the barriers and the anticipated system's payback period are within the budget, a preliminary design is conducted.

Preliminary Design of CHP System

This is a very important step to ensure that the most economical and optimized CHP system is developed. The preliminary design of the system is also referred to as a level 2 feasibility study by the EPA's combined heat and power website. A level two CHP feasibility study overview and checklist can be found at the EPA's combined heat and power website. The engineering firm will use electrical invoices to accurately determine electrical consumption if the facility has been operating

through the electric grid.

Access to current invoices is a much easier process, but in some instances, there are no current or past invoices to use; therefore, the consultant must use more sophisticated data gathering practices to accurately determine the needs. When determining the thermal needs, the base load is the measurement that most accurately represents the thermal needs of the facility. Since CHP is most cost effective when high heating and cooling needs exist, it is imperative that the measurements are accurately accessed [3].

In addition to the thermal and electric needs, there are some other important factors that need to be considered when conducting the preliminary design. It is important to determine where the heat and power are needed in the facility, the infrastructure of the building, and safety requirements during the preliminary design stage [4]. The consultant should identify any electrical cost reduction areas to design a more cost-effective and efficient CHP system. Furthermore, the location of fuel, electrical, and repair services needs to be gathered during the design. The fuel availability in the area is needed to determine what type of fuel the CHP should use. The ventilation and air requirements of the facility need to be taken into account. The maintenance requirements of the potential CHP systems need to be determined during this phase of the project to ensure that the facility owner is aware of potential maintenance schedules.

The data gathered are used to design a system that meets the facility's current and perhaps future energy needs. Based on the type of fuel available in the area, the prime mover is selected. The size of the generator is selected based on the electrical and thermal load of the facility. Basing the size of the system on the minimum base loads allows the CHP system to use a reduced size and cost. The preliminary design phase includes the estimation of exhaust constituents that will be emitted into the environment, the electrical energy that will be generated, and the percentage amount of waste heat recovered. These factors will be used to determine the overall efficiency of the designed CHP system.

Review of CHP System

Once the design of the recommend CHP system is complete, it is reviewed by the engineering design firm and the facility owner. The owner generally determines if the projected CHP cost is within his

budget. For a CHP system to be approved by the owner, there must be a specified return on investment. The review of the system allows the owner to decide if the project should be continued or terminated.

Filing for Permits in Louisiana

The acceptance of the preliminary design will initiate the permitting stage of the adoption process. The measurements of exhaust constituents provided during the preliminary design determine if filing for DEQ air permits is required or if the facility is exempted from an air permit. The selection of fuel during the preliminary design stage will assist the facility owner in determining whether he may qualify for net metering. Net metering is available for Louisiana CHP systems that use renewable fuel sources. Another important factor to consider during the preliminary review stage is tax benefits, if any exist in the state in which the system may be implemented. The acceptance of the CHP preliminary design allows the facility owner to begin completing the work on the preliminary permitting process. The utility interconnection agreement will begin during the permitting phase.

Air Permitting

The air permitting process in Louisiana is completed through the DEQ [6]. A minor source permitting is needed if the CHP system will emit more than 5 tons per year of any pollutant, and more than 15 tons per year of all regulated pollutants. Stack testing is required if the CHP system will emit more than 40 tons of NO_x in an attainment area and any amount in non-attainment areas. For facilities with the potential to emit 100 or more tons per year of pollutants, a 30-day public comment period is required. If the potential to emit more than 250 tons per year of a criteria pollutant exists, a facility must apply for major NSR/PSD permits.

The PSD is a prevention of significant deterioration in attainment areas. An NSR is a new source review for the release of 50 tons of NO_x in non-attainment areas. A review of the DEQ Louisiana's website further clarifies the air permit needs. Those facilities that emit fewer than 5 tons per year of any regulated air pollutant defined in the Federal Clean Air Act do not need an air permit. The Louisiana government passed ACT No. 918 in its regular session in 2003; this act further clarifies the exemption from an air permit. The content of ACT No. 918 can be viewed in full in [6]. The excerpt below is taken directly from the

act that qualifies exemption for a facility.

> (ix) Permitting regulations, with respect to air quality, requiring authorization to construct or operate any source for which facility-wide potential emissions are less than five tons per year for each of any regulated air pollutant as defined by the Federal Clean Act. 42 U.S.C. 7401 et seq…less than fifteen tons per year emitted of all such defined pollutants combined, and less than the minimum emission rate for each toxic air pollutant established pursuant to R.S. 30:2060, unless such source is required to obtain a permit pursuant to the Federal Clean Air Act, Subchapter V, 42 U.S.C. 7661 et seq.

Those facilities that do qualify for an exemption must submit a letter to the DEQ office in Baton Rouge stating that they qualify for an exemption under ACT No. 918. Exempted facilities are subject to inspections and therefore must maintain records demonstrating compliance with the exemption rules.

Those facilities that do not meet the exemption of an air permit may qualify for an exemption under the following conditions:

- The source emits, or has the potential to emit, no more than 5 tons per year of any regulated pollutants;
- The source emits, or has the potential to emit, less than the MER listed in LAC 33:III,5112, table 51.1, for each Louisiana toxic air pollutant;
- No enforceable permit conditions are necessary to ensure compliance with any applicable requirement; and
- No public notice is required for any permitting or other activity at the source.

The Louisiana Department of Environmental Quality provides assistance to small business owners requiring an air permit. To qualify for assistance, the following conditions must be met: 1) fewer than 100 employees, 2) independently owned, and 3) less than $2 million in gross profit. The potential CHP adopter can contact the SB/SCAP to schedule a pre-permit meeting. The meeting attendees include DEQ experts,

company representatives, and economic development staff. The purpose of the meeting is to discuss the permitting process and any potential problems that may arise during the process. The DEQ will also provide a potential time frame and a fee schedule for the process.

The pre-meeting can actually expedite the permitting process. The company representative will also be given the forms and the manual that outlines the permitting requirements. It is imperative for potential adopters to take full advantage of the assistance available to ensure full compliance with state air permit requirements. According to the Gulf Coast CHP website [1], the entire permitting process takes about 180 days on average, but does not have a specified upper time limit. Therefore, the permitting needs to start early in the design period.

Utility Permitting

Utility permitting in Louisiana varies depending upon the kilowatts that will be generated and the electric provider in the area. The state of Louisiana currently lacks any continuity among the electric providers in the stand-by rates and interconnection agreement requirements. Most of the electric providers have placed interconnection agreements on their websites to allow potential adopters the ability to download the information, but only a small portion of the required forms are listed. The potential adopter must phone the utility provider to locate appropriate personnel to assist him in determining the proper procedures. However, the availability of this information does not guarantee the electric provider will be willing to cooperate with the potential CHP adopter.

The Louisiana Public Service Commission (PSC) issued a docket in November 2005 relating to net metering and interconnection of net-metered systems [7]. Docket No. R-27558 requires publicly owned utilities, as well as rural electric cooperatives, to offer net metering to customers with CHP systems utilizing renewable fuel sources. The size for residential systems is different than for commercial systems. The website indicates that the residential size is 25kW, and the commercial system size is 100kW. However, net metering does not apply to CHP systems that use natural gas or diesel, only to systems that use renewable fuels such as wind, biomass, hydroelectric, and fuel cells.

The permits must be received from the EPA and the interconnection grid agreement must be completed before proceeding with the

purchase, installation, and/or operation of any CHP equipment. Failure to comply with these requirements can lead to rejection of the air permit from the EPA. The interconnection grid agreement must also be complete before the equipment can be connected to the utility provider's equipment.

Final Requirements Review

After the preliminary permitting process has begun with the electric utility provider, the facility owner can enter the final requirements stage. The final requirements stage allows the facility owner and the CHP system designer to make any final adjustments to equipment and implement any additional equipment required to fulfill permit requirements. During the final requirements stage, the owner may need to adjust the electric generating power, add synchronization equipment, or add equipment to further reduce exhaust constituents to ensure full compliance with regulatory and utility agreement requirements.

Upon accepting the final design review, the facility owner can begin purchasing equipment with a long lead time. Some of the CHP equipment may not be readily available within the general vicinity of the facility, and therefore will need to be ordered to ensure delivery time will coincide with expected implementation dates. The facility owner may order the equipment with the greatest lead time and or most expensive items first.

Final Design

The main goal of the final design state of the adoption CHP process is to develop an operational CHP system. According to the EPA's Combined Heat and Power Partnership website [2], the expected cost is approximately $1000-$2,500/kW installed, with a projected timeframe from three months to twenty-four months. The final permitting stages of the CHP adoption process are needed to ensure that all individual parts of the system are designed to appropriate specifications to ensure that utility and regulatory requirements have been meet.

The negotiation of fuel contracts, service agreement contracts for equipment, and compliance with permitting requirements may occur during this stage. The final design phase of the project will become more project management oriented as the efforts to implement the system become directed towards scheduling of personnel for installation, contract negotiations, cost management, and task scheduling.

Fabrication and Installation

The fabrication and installation phase of the project is usually completed by the engineering firm that designed the system and any other necessary personnel and OEMs. This phase marks the final stages of the process. The fabrication of the system needs to be completed to all blueprint and engineered specifications to ensure that all exhaust constituents that will be measured by the DEQ meet the expected measurements that were submitted during the air permitting submittals. The CHP system will be completed and connected during this phase of the project.

CONCLUSION

The successful implementation of a CHP system provides benefits to three distinct entities. The facility owner increases the facility's productivity through the decreased use of fuel, improved indoor air quality, decreased operating costs, and enhanced business continuity. The utility providers could use CHP systems as modular components to increase power production needs in population growth areas quickly and efficiently as distributed generations. Electric utility providers could further use CHP to develop additional revenue streams beyond the basic supply of electricity. The electric utility providers could recover the waste heat produced to sell thermal heat to nearby businesses. The global environment is greatly benefited through the direct reduction in CO_2 and NO_x emissions into the atmosphere.

The utility providers in Louisiana intentionally make the interconnection to their electric grid difficult by using various measures to make the project unaffordable. The electric company has been successful in the past years of over-engineering the CHP system by requiring relay switches, metering requirements, additional communication requirements, and many other types of equipment. The information needed to comply with the electric company is not easily located nor are the utility personnel easy to contact. The utility provider has not developed a standard procedure for interconnection of CHP systems.

The Louisiana DEQ's website contains a small portion of the vast information of the air permitting regulations. The information needed to understand the permitting process is located in many locations and not easily found by those seeking the necessary information. Further-

more, not all information is on the internet for viewing. The process was gathered through an interview with DEQ personnel.

Through interviews, phone conversations, and e-mails, we are able to determine what permits are required in Louisiana and the interconnection procedure with CLECO. The timeline for air permit acceptance is between one to two years from inception. The DEQ's air permit process is manual and outdated, which accounts for the lengthy time frame. The requirements for compliance with CLECO are an extensive listing that requires a lot of safety equipment to be purchased as expense to the customer. The lack of successful implementations of CHP in Louisiana is understandable after conducting the research to develop the guidelines for successful connection.

Future work in the area of permitting CHPs in Louisiana would be to develop the interconnection procedures for all electric utility providers in the state. To better serve potential CHP adopters, all appropriate guidelines should be detailed in an easy-to-follow method in a central location on the internet. In addition, the documentation of the actual air permitting and the interconnection agreement procedure would provide more in-depth knowledge into the problems of the process and the methods used to overcome the problems.

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