State of Illinois

Energy Efficiency

Technical Reference Manual

Combined Heat and Power

New Measure

John Cuttica, Stefano Galiasso, Shraddha Raikar,

Energy Resources Center

at the

University of Illinois, Chicago

~~10/10/2014~~11/21/2014

TABLE OF CONTENTS

Table 1 Work Paper Revision History

#	MM/DD/YY	Author, Company	Summary of Changes
1	10/08/2014	John Cuttica, Stefano Galiasso, Shraddha Raikar, Energy Resources Center	Include new measure in the TRM
2	11/21/2014		Reflects resolved comments and open issues from 11/18/2014 SAG Meeting

1 Overview

The Combined Heat and Power (CHP) measure is intended to provide electric and natural gas savings within the state of Illinois by the development and operation of CHP projects. This measure is applicable for Conventional CHP (Topping Cycle) systems as well as Waste Heat-to-Power (WHP) CHP (Bottoming Cycle) systems. Both electric and natural gas savings ~~are~~ can be associated with this measure.

Comment [CN1]: I have added my comments to Phil's. I also agree with all of Phil's.

Comment [PM2]: AG also agrees with NRDC comments. These should be viewed as joint/consolidated comments from both parties.

Comment [CN3]: As NRDC and the AG have previously stated, we think it is highly questionable that CHP will lead to natural gas savings. That is certainly not true at the site. Based on the current mix of electric generation at the margin on the electric grid, it is not even true using source energy.

Comment [EC4]: CN1, PM2 and CN3 withdrawn, CN5, CN6 and CN7 resolved with this edit

Comment [CN5]: Highly debatable statement. See comment above.

Formatted: Font: Bold

Formatted: Font: 10 pt

2 New Measure Characterizations

DESCRIPTION

The Combined Heat and Power (CHP) measure is intended to provide electric and natural gas savings within the State of Illinois by the development and operation of CHP projects. This measure is applicable for Conventional or Topping Cycle CHP systems, as well as Waste Heat-to-Power (WHP) or Bottoming Cycle CHP systems. This measure will reduce the total Btu of electricity and natural gas required to meet the end use needs of the facility. Depending on the application, the saved Btu can be converted into a combination of kWh and therms saved. In all cases the saved energy will account for any additional natural gas utilized at the site, required to operate the CHP system.

Comment [CN6]: Highly debatable. See above. - ignore

Comment [CN7]: Debatable whether that is appropriate. - ignore

This measure was developed to be applicable to the following program types: Retrofit (RF), New Construction (NC). If applied to other program types, the measure savings should be verified.

~~**APPLICABILITY**~~

~~The provisions of this CHP measure apply to customer facilities with a peak load of less than 3 MW at an individual site or less than 5 MW at the aggregate company level within a utility's service territory. Customer facilities with a peak load of 3 MW or more at an individual site or a peak load of 5 MW or more at the aggregate company level within a utility's service territory shall have complete flexibility to customize the full range of variables and algorithms used to evaluate their CHP projects, provided that these custom variables and algorithms are verifiable using data provided by the customer and are adequately documented by the customer.~~

Comment [EC8]: IIEC Edit removed since this is a utilty issue not a custome issue. This is a general question about applicability that will be discussed at the Dec 9th SAG meeting

DEFINITION OF EFFICIENT EQUIPMENT

Conventional or Topping Cycle CHP is defined as an integrated system that is located at or near the building or facility (on-site, on the customer side of the meter) that utilizes a prime mover (reciprocating engine, gas turbine, micro-turbine, fuel cell, boiler/steam turbine combination) for the purpose of generating electricity and useful thermal energy (such as steam, hot water, or chilled water) where the primary function of the facility where the CHP is located is not to generate electricity for use on the grid. An eligible system must demonstrate a minimum total system efficiency of 60% (HHV)[1] with at least 20% of the system's total useful energy output in the form of useful thermal energy on an annual basis.

Measuring and Calculating Conventional CHP Total System Efficiency:

CHP efficiency is calculated using the following equation~~algorithmalgorithm~~:

$$CHP_{\ Efficiency}(HHV) = \frac{\left[CHP_{thermal}\ \left(\frac{kBtu}{yr}\right) + E_{CHP}\ \left(\frac{kWh}{yr}\right) * 3.412\ \left(\frac{kBtu}{kWh}\right)\right]}{F_{totalCHP}\left(\frac{kBtu}{yr}\right)}$$

[1] Higher Heating Value

Formatted: Font: 10 pt

Where:

$CHP_{thermal}$ = Useful annual thermal energy output from the CHP system, defined as the annual thermal energy output of the CHP system that is actually recovered and utilized in the facility/process.

E_{CHP} = Useful annual electricity output- produced by the CHP system, defined as the annual electric energy output of the CHP system that is actually utilized to replace purchased electricity requires to meet the requirements of the facility/process.

$F_{totalCHP}$ = Total annual fuel consumed by the CHP system

For further definition of the terms, please see "Calculation of Energy Savings" Section below.

Waste Heat-to-Power or Bottoming Cycle CHP is defined as an integrated system that is located at or near the building or facility (on-site, on the customer side of the meter) that:

- Utilizes exhaust heat from an industrial/commercial process and converts that heat to generate electricity (except for exhaust heat from a facility whose primary purpose is the generation of electricity for use on the grid).
- Utilizes the pressure drop in an industrial/commercial facility to generate electricity through a backpressure steam turbine where the facility normally uses a pressure reducing valve (PRV) to reduce the pressure in their facility.
- Utilizes the pressure reduction in natural gas pipelines (located at natural gas compressor stations) before the gas is distributed through the pipeline to generate electricity, provided that the conversion of energy to electricity is achieved without using additional fossil fuels.

Since these type of systems utilize waste heat as their fuel, they do not have to meet any specific total system efficiency level (assuming they use no additional fossil fuel in their operation~~).~~ It additional natural gas is used onsite, it should be properly accounted for.~~)~~ These systems may export power to the grid.

DEFINITION OF BASELINE EQUIPMENT

Electric Baseline: The baseline facility would be a facility that purchases its electric power from the grid.

Heating Baseline (for CHP applications that displace onsite heat): The baseline equipment would be the boiler/furnace operating onsite~~, or a boiler/furnace~~ meeting the~~–~~ minimum standard defined in the boiler/furnace measures of the this TRM~~minimum federal standards, if the existing boiler/furnace is in need of replacement~~.

Cooling Baseline (for CHP applications that displace onsite cooling demands): The baseline equipment would be the chiller (or chillers) operating onsite, or a chiller (or chillers) meeting the minimum standard defined in the boiler/furnace measures of the this TRM ~~the minimum federal standards if the existing chiller is in need of replacement~~.

Facilities that use biogas or waste gas: facilities that use (but are not purchasing) biogas or waste gas that is not otherwise marketable, whether they are using biogas or waste gas only or a combination of biogas or waste gas and natural gas to meet their ~~heating/cooling~~cooling~~cooling~~cooling~~cooling~~energy demands are also eligible for this measure. If additional natural gas is purchased to fuel the CHP system, then the additional natural gas should be taken into account in the fuel savings calculations.

Comment [EC9]: Added text closes comment PM10

Comment [PM10]: What if they do use additional fossil fuel? Will they then be treated the same as topping cycle? Seems like would need a hybrid calculation that somehow gives credit to the "free" thermal energy that would otherwise be wasted, but count any additional usage.

Comment [SBJ11]: I'm not sure what you mean by the sentence referring to being in need of replacement.

Comment [EC12]: Updated to refer to the TRM measure for baseline

Comment [SBJ13]: Same as above

Comment [SBJ14]: Would only systems with chillers be considered? Could dx cooling be replaced?

Comment [EC15]: Edit provided to resolve PM17

Comment [SBJ16]: Why would facilities purchasing biogas not be eligible?

Comment [PM17]: Doesn't explain how or if you count non-purchased biogas as an energy input, or simply assume it is a waste product. Seems as if even if biogas is generated on-site, it would still likely be used in an alternative fashion to offset natural gas usage, so think we need to count it no matter what. Also, if they do purchase biogas I assume it is treated the same as natural gas that is purchased, which agree with, but should be explicit.

Formatted: Font: 10 pt

DEEMED LIFETIME OF EFFICIENT EQUIPMENT

Measure life is ~~20 years.~~ dependent on the technology selected and will be defined based on the system installed.

DEEMED MEASURE COST

Custom installation and equipment cost will be used. These costs should include the cost of the equipment and the cost of ~~installating~~installing the equipment. Equipment costs include, but are not limited to: prime mover, heat recovery system(s), exhaust gas treatment system(s), controls, and any interconnection/electrical connection costs.

The installations costs include labor and material costs such as, but not limited to: labor costs, materials such as ductwork, piping, and wiring, project and construction management, engineering costs, commissioning costs, and other fees.

Measure costs will also include the present value of expected maintenance costs over the life of the CHP system.

~~For screening purposes, the US EPA has published resources that provide average installation and equipment costs based on the CHP technology and system size. These resouces include "Catalog of CHP Technology"[2] and "Biomass Combined Heat and Power Catalog of Technology"[3].~~

LOADSHAPE

Use Custom Loadshape. The loadshape should be obtained from the actual CHP operation strategy, based on the On-Peak and Off-Peak Energy definitions specified in Table 3.3 of "Section 3.5 Electrical Loadshapes" of the TRM.

COINCIDENCE FACTOR

Custom coincidence factor will be used. Actual value based on the CHP operation strategy will be used.

Algorithm

CALCULATION OF ENERGY SAVINGS

i) Conventional or Topping Cycle CHP Systems:

Step 1: (Calculating total annual source fuel savings in Btu)

The first step is to calculate the total annual source fuel savings associated with the CHP installation:

$S_{FuelCHP}$ = Annual fuel savings (Btu) associated with the use of a Conventional CHP system to generate the useful electricity output (kWh, converted to Btu) and useful thermal

[2] ~~"Catalog of CHP Technologies" Oct 07,2014, http://www.epa.gov/chp/documents/catalog_chptech_full.pdf~~
[3] ~~"Biomass Combined Heat and Power Catalog of Technologies", Oct 07,2014, http://www.epa.gov/chp/documents/biomass_chp_catalog.pdf~~

Comment [PM18]: This seems low to me. CHP systems will likely be in place much longer. However, suggest we use a longer measure life (25-30yrs) but also include expected maintenance costs over this time period.

Comment [EC19]: Text added tp resolve PM18

Comment [SBJ20]: How will TRC be calculated. Shouldn't this section propose an incentive amount per btu saved?

Comment [PM21]: Don't understand this and suggest deleting. Above it says costs will be custom (*e.g.,* site specific). So why wouldn't we use those actual costs for screening? Don't think it is appropriate to use EPA default costs when doing custom project screenings. – SAG this can be deleted

Comment [EC22]: Agreed at SAG – text deleted

Comment [SBJ23]: Maybe this should be a custom measure instead of prescriptive.

Comment [SBJ24]: It would seem that operating strategy will have a large impact on chp efficiency and even whether the project would qualify for incentives.

Formatted: Font: 10 pt

energy output (Btu) versus the use of the equivalent electricity generated and delivered by the local grid and the equivalent thermal energy provided by the onsite boiler.

$= (F_{grid} + F_{thermalCHP}) – F_{total\ CHP}$

Where

F_{grid} = Annual fuel in Btu that would have been used to generate the useful electricity output of the CHP system if that useful electricity output was provided by the local utility grid.

$= E_{CHP} * H_{grid}$

Where

E_{CHP} = Useful annual electricity output produced by the CHP system, defined as the annual electric energy output of the CHP system that is actually utilized to replace purchased electricity required to meet the requirements of the facility/process.

$= (CHP_{capacity} * Hours) - E_{Parasitic}$

$CHP_{capacity}$ = CHP nameplate capacity

= Custom input

Hours = Annual operating hours of the system

= Custom input

$E_{parasitic}$ = The electricity required to operate the CHP system that would otherwise not be required by the facility/process

= Custom input

H_{grid} = Heat rate of the grid in btu/kWh, based on the average fossil heat rate for the EPA eGRID subregion and includes a factor that takes into account T&D losses.

For systems operating less than 6,500 hrs per year:

Use the Non-baseload heat rate provided by EPA eGRID for RFC West region for ComEd territory, and SERC Midwest region for Ameren territory. Also include any line losses.

For systems operating more than 6,500 hrs per year:

Use the All Fossil Average heat rate provided by EPA eGRID for RFC West region for ComEd territory, and SERC Midwest region for Ameren territory. Also include any line losses.

$F_{thermalCHP}$ = Annual fuel in Btu that would have been used on-site by a boiler or heater to provide the useful thermal energy output of the CHP system.

$= CHP_{thermal} \div Boiler_{eff}$

Comment [SBJ25]: Again, a custom input.

Comment [SBJ26]: Shouldn't this say the average natural gas heat rate. Where the average reflects the percentage of generation which is natural gas fired? For example, if the grid where 100 percent coal fired – there would be no natural gas savings associated with kWh generated by the CHP.

Comment [EC27]: Keep the average and comment PM28 withdrawn

Comment [PM28]: I believe that all systems should be using the marginal average heat rate for PJM or MISO. Seems that even if running 8760, the impact is on the margin. Generally speaking CHP systems should have very high operating hours so long as they are properly designed based on minimum thermal load, so think an overall annual marginal heat rate should be sufficient. I believe EPA or EIA reports marginal heat rates by ISO. However, going to Egrid I was not able to actually find heat rates. Would be good to see a link in doc so it is clear exactly what data is being used.

Formatted: Font: 10 pt

$CHP_{thermal}$ = Useful annual thermal energy output from the CHP system, defined as the annual thermal energy output of the CHP system that is actually recovered and utilized in the facility/process.

= Custom input

$Boiler_{eff}$ = Efficiency of the on-site boiler OR heater that is displaced by the CHP system or if unknown, the value stated in the boiler measure TRM.

= ~~Cutom~~Custom input

$F_{total\ CHP}$ = Total fuel in Btus consumed by the CHP system

= Custom input

Step 2: (Allocating the Btu savings between electricity and natural gas)

This step assigns the percentage of the Total Annual Fuel Savings ($S_{FuelCHP}$) calculated in Step 1 to either Electric Btu and/or Natural gas Btu savings. Step 3 will then provide the method to convert the allocated Btu savings to either kWh or therms.

- If a CHP application is serviced by both participating Electric and Natural Gas IOU[4], the CHP application will allocate the percent of the Total Annual Fuel savings to electricity ($\%_{Elec}$) and the percent to gas ($\%_{Gas}$) using the algorithms provided below.
- If a CHP application is serviced by a participating Electric IOU but is not serviced by a participating Natural Gas IOU, the CHP application will be able to claim only the Electric portion ($\%_{Elec}$) of the annual fuel savings calculated in Step 1 to electricity. Similarly, if a CHP application is serviced by a participating Natural Gas IOU but is not serviced by a participating Electric IOU, the CHP application will be able to claim only the Natural Gas portion ($\%_{Gas}$) of the annual fuel savings calculated in Step 1 to natural gas.

Determining the percentage allocated to electric versus gas:

$$Source_{fuels} = F_{grid} + F_{thermalCHP}$$

Where

$Source_{fuels}$ = Total electric and thermal source fuels displaced by the CHP system in Btu

F_{grid} = Annual fuel in Btu that would have been used to generate the useful electricity output of the CHP system if that useful electricity output was provided by the local utility grid.

$F_{thermalCHP}$ = Annual fuel in Btu that would have been used on-site by a boiler or heater to provide the useful thermal energy output of the CHP system.

[4] Investor Owned Utility. Electric Utilitities include ComEd and Ameren Illinois. Natural Gas Utilitites include Nicor, NorthShore, Peoples and Ameren Illinois

Comment [CN29]: May just want to clarify the language here to make clear that sometimes it is the existing boiler/heater that is being displaced; sometimes (e.g. in New Construction or at time of natural replacement) it is a new baseline boiler/heater.

Comment [EC30]: Comment added to point to TRM measure efficiency

Comment [SBJ31]: Step 2 and 3 seem to be overly complex. Why would the electric savings ever be different from E_{chp}? Similary, gas savings should be Fgrid + FthermalCHP. Please give an example why this would not be the case.

Comment [EC32]: PM33 still open and to be discussed at the Dec 9th SAG

Comment [PM33]: Don't understand this. If not using natural gas, then aren't the entire net btu savings allocated to the electric utility, rather than only the %elec?

Also, while a customer could be a municipal electric utility, don't understand how this would work because gas utility probably can't pay sufficient rebate without electric DSM funds. Are we anticipating that if a muni promoted CHP gas would still claim a share of the savings?

Note, AG and NRDC continue to oppose allocation of savings to gas utilities when actual site usage is going up.

Comment [SBJ34]: Previously defined

Comment [SBJ35]: Previously defined

Formatted: Font: 10 pt

We can now calculate the % allocation of electric and gas savings:

$$\%_{Elec} = F_{grid} \div Source_{fuels}$$

Where

$\%_{Elec}$ = % of total annual fuel savings ($S_{FuelCHP}$) allocated to electricity

And

$$\%_{Gas} = F_{thermalCHP} \div Source_{fuels}$$

Where

$\%_{Gas}$ = % of total annual fuel savings ($S_{FuelCHP}$) allocated to gas

Step 3: (Converting the allocated Btu Savings to equivalent kWhs for electric and equivalent Therms for natural gas)

ELECTRIC ENERGY SAVINGS:

Once we have calculated the electric allocation percentage ($\%_{Elec}$), we can calculate the electric kWh savings (ΔkWh):

$$\Delta kWh^{5} = \%_{Elec} * S_{FuelCHP} \div H_{eff\ CHP}$$

Where

$\%_{Elec}$ = % of total annual fuel savings ($S_{FuelCHP}$) allocated to electricity

$S_{FuelCHP}$ = Annual fuel savings (Btu) associated with the use of a Conventional CHP system to generate the useful electricity output (kWh, converted to Btu) and useful thermal energy output (Btu) versus the use of the equivalent electricity generated and delivered by the local grid and the equivalent thermal energy provided by the onsite boiler.

$H_{eff\ CHP}$ = Effective heat rate of the CHP system

= $(F_{total\ CHP} – F_{thermal\ CHP}) \div E_{CHP}$

Where

$F_{total\ CHP}$ = Total fuel in Btus consumed by the CHP system

$F_{thermalCHP}$ = Annual fuel in Btu that would have been used on-site by a boiler or heater to provide the useful thermal energy output of the CHP system

E_{CHP} = Useful annual electricity output produced by the CHP system, defined as the annual electric energy output of the CHP system that is actually utilized to replace purchased electricity required to meet the requirements of the facility/process.

[5] Electric savings, cannot exceed the useful electric output of the CHP system

Comment [EC36]: This is still an open issue. Could use 3412 as the conversion of the system HR from step 1. This is reflects a middle position. Additional investigation and discussion required.

Formatted: Font: 10 pt

NATURAL GAS ENERGY SAVINGS:

Once we have calculated the gas allocation percentage ($\%_{Gas}$), we can calculate the gas therms savings (ΔTherms):

$$\Delta Therms = \%_{Gas} * S_{fuel\ CHP} \div 100{,}000$$

Where

$\%_{Gas}$ = % of total annual fuel savings ($S_{FuelCHP}$) allocated to gas

$S_{FuelCHP}$ = Annual fuel savings (Btu) associated with the use of a Conventional CHP system to generate the useful electricity output (kWh, converted to Btu) and useful thermal energy output (Btu) versus the use of the equivalent electricity generated and delivered by the local grid and the equivalent thermal energy provided by the onsite boiler.

100,000 = Conversion factor for Btus to therms

ii) **Waste-Heat-to-Power CHP Systems :**

ELECTRIC ENERGY SAVINGS:

$$\Delta kWh = E_{CHP}$$

Where

E_{CHP} = Useful annual electricity output produced by the CHP system, defined as the annual electric energy output of the CHP system that is actually utilized to replace purchased electricity required to meet the requirements of the facility/process.

= Custom input

NATURAL GAS ENERGY SAVINGS:

$$\Delta Therms = F_{thermalCHP} \div 100{,}000$$

Where

$F_{thermalCHP}$ = Annual fuel in Btu that would have been used on-site by a boiler or heater to provide the useful thermal energy output of the CHP system[6]

100,000 = Conversion factor for Btu/hr to therms

SUMMER COINCIDENT PEAK DEMAND SAVINGS

$$\Delta kW = CF * CHP_{capacity}$$

Where

CF = Summer Coincidence factor. This factor should also consider any displaced Chiller

[6] If additiona natural gas is used onsite, it should be properly accounted for.

Comment [EC37]: Footnote added to resolve PM38

Comment [PM38]: Am confused by this. If the input to CHP system was waste heat, then any thermal output of CHP system is simply a subset (*i.e.*, less) of the already available thermal energy. In other words, no additional thermal energy is available.

Formatted: Font: 10 pt

capacity[7]

= Custom input

$CHP_{Capacity}$ = CHP nameplate capacity

= Custom input

Comment [PM39]: Presumably this refers to replacing an electric chiller with an absorber. In that instance, the additional electric savings from getting rid of electric chiller should count as electric savings, but the natural gas input to the absorber should be netted out of any gas savings.

Comment [EC40]: Footnote added to resolve PM39

Comment [SBJ41]: Again, with so many custom inputs, why isn't this just a custom measure?

WATER IMPACT DESCRIPTIONS AND CALCULATION

N/A

DEEMED O&M COST ADJUSTMENT CALCULATION

Custom ~~levelized~~leveled Maintenance costs that will be incurred for the life of the measure will be used**.** Maintenance costs vary with type and size of the prime mover. These costs include, but are not limited to:

- Maintenance labor
- Engine parts and materials such as oil filters, air filters, spark plugs, gaskets, valves, piston rings, electronic components, etc. and consumables such as oil
- Minor and major overhauls

For screening purposes, the US EPA has published resource guides that provide average ~~maintenence~~maintenance costs based on CHP technology and system size[8].

COST-EFFECTIVENESS SCREENING

For the purposes of screening the measure for cost-effectiveness, impacts on the local IOUs service territory should be evaluated instead of source savings. Each utility is responsible for cost-effeteness screening however, at a minimum the following components should be considered. Definitions for each term may be adjusted based on the screening methods deployed by a specific utility.

Comment [EC42]: Additional text proposed here to make this a guideline and not a formula. Each utility will perform their own cost effectiveness screening. Which would resolve the comments in this section

$$TRC = \frac{(E_{CHP} * A_{Energy}) + (\Delta kW * A_{Capacity}) + (F_{thermalCHP} * A_{Gas})}{CHP_{Costs} + O\&M_{Costs} + (F_{Total\ CHP} * A_{Gas})}$$

Comment [CN43]: You are missing avoided electric T&D benefits from the numerator in this equation. PM: See edits in redline below to add in T&D capacity and clarify about time periods.

Where

TRC = Total ~~Resourse~~Resource Cost Benefit Cost Ratio

Comment [PM44]: Might be good to actually define formulas for costs (denominator) and benefits (numerator) separately, since really what we care about is how to define each component and the net benefits. This simply combines all for a BCR.

E_{CHP} = Useful annual electricity output produced by the CHP system, defined as the annual electric energy output of the CHP system that is actually utilized to replace purchased electricity requires to meet the requirements of the facility/process.

A_{Energy} = Avoided electric energy costs (these would be an aggregate value that includes delivery, ancillary and T&D ~~losses~~marginal line losses, actual calculation will use

[7] If additiona natural gas is used onsite, it should be properly accounted for.

[8] "EPA Combined Heat and Power Partnership Resources" Oct 07, 2014, http://www.epa.gov/chp/resources.html

Formatted: Font: 10 pt

time-differentiated avoided costs by appropriate periods and impacts from the CHP system for each ~~periodperiod~~period ~~losses~~)

ΔkW = Summer coincident peak demand savings

$A_{Capacity}$ = Avoided electric capacity costs (these would be an aggregate value of hourly costs based on the loadshape of the CHP system, aggregate values will include generation, transmission and distribution capacity costs, and account for marginal line losses)

$F_{thermalCHP}$ = Annual fuel in Btu that would have been used on-site by a boiler or heater that is fired by natural gas to provide the useful thermal energy output of the CHP system.

A_{Gas} = Avoided costs of natural gas

CHP_{Costs} = CHP equipment and installation costs as defined in the "Deemed Measure Costs" section

$O\&M_{Costs}$ = CHP operations and maintenance costs as defined in the "Deemed O&M Cost Adjustment Calculation" section

$F_{TotalCHP}$ = Total fuel in Btus consumed by the CHP system

Comment [CN45]: Rather than the word "savings", shouldn't this say "output of the CHP system"?

Formatted: Font: 10 pt

3 Proposed Changes to Existing Measures

N/A

Formatted: Font: 10 pt

4 References

Please refer to the Chicago style for variances on format citations. Please upload any new references or calculation sheets to the Tracker item.

http://www.chicagomanualofstyle.org/tools_citationguide.html

EXAMPLES:

Paper presented at a meeting or conference (Including internal work papers)

Author Name, "Paper title" (paper presented at the annual meeting for the Organization Name, City, State, Month Day, Year).

Website

"Title," last modified Month Day, Year, URL

E-mail

Author Name, e-mail message to author, Month Day, Year.

Item in a commercial database

Author Name. "Source Title" Publisher, Year. Database Name

Book: Chapter or other part of a book

Author Name, "Chapter," in Title, City: Publisher, Year, page range

Book: Published electronically

Author Name, "Chapter," in Title, City: Publisher, Year, Accessed Month Day, Year. URL.

Journal Article in a print journal (Use this for program evaluations.)

Author Name, "Article Title," Journal Name edition (Year): page

Author Name, "Evaluation Title," Utility Name, Program or Measure Name (Date): page

Journal Article in an online journal

Author Name, "Article Title," Journal Name edition (Year): page, accessed Month Day, Year, dio:xx.xxxx/xxxxxx.

Formatted: Font: 10 pt

5 Stakeholder Comments

If adding comments to an existing work paper, add note in "Progress Notes" section of the tracker item stating *"(Author, Company) added comments to workpaper, (date)*". This will send an alert to VEIC and others that a new comment has been added.

Stakeholder Comments to Revision 1

~~Author, Company and Date:~~

Author, Company and Date: Philip Mosenthal, Optimal Energy on behalf of the Eric Robertson and Ali Al-Jabir, Illinois Attorney General's Office, 10/30/Industrial Energy Consumers (IIEC), October 24, 2014.

Comment:

See above redline and comments.

General Comment: The AG continues to oppose crediting a utility with savings that count toward meeting goals if the actual utility system sales will increase. We agree generally with the math, the issue is really one of allocation.

Also, we believe that some circumstances are not fully or properly covered regarding when either the thermal output is offsetting a different fuel than Natural Gas or the CHP system is fired by a different fuel. It appears even if a CHP system was oil fired and offsetting oil thermal load that the above proposal would still provide savings credit to the gas utility. We acknowledge with today's economics we may not see any oil fired systems, but it is possible and should be addressed.

IIEC's revisions to Section 2 of the proposed CHP measure are designed to recognize that large industrial customers are sophisticated users of electricity who possess the economic incentive, resources and expertise to adequately assess and analyze CHP opportunities at their sites. While the use of generic inputs and the formulas specified in the proposed CHP measure may be appropriate for smaller customers, such inputs and formulas may not be appropriate for large customer facilities with peak loads of 3 MW or more at an individual site or peak loads of 5 MW or more at the aggregate company level within a utility's service territory. Such large customers should be afforded maximum flexibility to customize all of the measure formulas and the variable inputs that are used to evaluate CHP opportunities at their sites, as long as the customers can adequately document the engineering studies and cost-benefit analyses conducted to justify the implementation of a CHP project at their sites.

Large industrial customers operate in very competitive business environments and are actively pursuing energy savings opportunities where such opportunities are cost-effective. As a matter of good business practice, such customers will not pursue a CHP project unless it is thoroughly analyzed through engineering and cost-benefit studies and unless the project can clear the internal return on investment hurdles that the customer has established within its company. Consequently, the requirement of using a more rigid, formulaic approach to the evaluation of CHP projects for such customers, as set forth in

Formatted: Font: 10 pt

the proposed CHP measure, is inappropriate, unnecessary and may inhibit the implementation of many cost-effective CHP projects.

IIEC's other revision to Section 2 is to include within the scope of the CHP measure generation from process gases that may not otherwise fit into the category of "biogas," but similarly constitute lower BTU content gas that otherwise has no marketable value and may be disposed of onsite, i.e. flared.

Also, the CHP measure should provide examples of the application of the proposed efficiency algorithm to prime movers to provide TRM users with a better understanding of the ~~algoritm~~algorithm and to provide a means of testing the algorithm.

Stakeholder Comments to Revision 2

Formatted: Font: 10 pt