CHP inclusion in the Illinois EEPS

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Once upon a time…

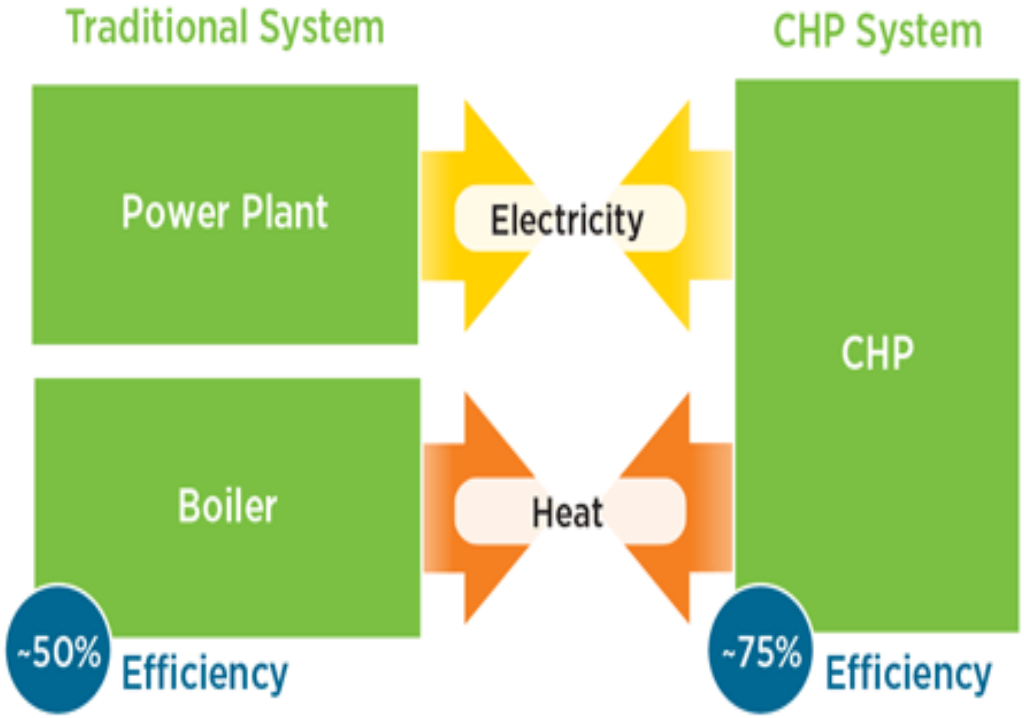
- Every story starts with a hero, and a purpose
- The hero was John Cuttica, former Director of the Energy Resources Center (ERC) at the University of Illinois at Chicago
- The purpose was to include CHP and WHP, two forms of extremely efficient power generation, into the IL Energy Efficiency Portfolio Standard (EEPS)

Is it efficiency?

- Can CHP be considered an efficiency measure?
  - YES!
- Why?
  - 220 ILCS 5/8-103 states:

"Energy Efficiency Project" also includes measures that reduce the total Btus of electricity and natural gas needed to meet the end use or uses consistent with Section 1-10 of the Illinois Power Agency Act.

A snapshot of how CHP works



CHP is significantly more efficient than traditional Electric + Heat Generation

Electric Grid ≈ 34% efficient

Boiler System ≈ 75% efficient

Together ≈ 50% efficient

CHP ≈ 75% efficient

Storyboard

1) ERC proposed a CHP pilot program to DCEO
2) DCEO asks ERC to design and propose a Pilot Program to the SAG
3) SAG feedback is incorporated
4) Pilot is designed and submitted for approval in the 3-year filing
5) CHP is conditionally approved: ICC orders SAG to include it in TRM
6) TRM process starts – highly debated
7) Subcommittee for CHP created, discusses CHP-specific issues
8) CHP is included in the TRM

The Stakeholder Advisory Group

CHP was a very contested measure.

The winning approach

- Based on CO2 equivalency
- Answers the question:
  - How much CO2 is produced via CHP to meet the end use?
  - How much CO2 is produced via baseline (e.g. Boiler + Grid) to meet the same end use?
  - The difference in CO2, converted in kWh and Btus using the baseline (i.e. Grid) CO2 intensity, is the savings

The winning approach

CHP efficiency is calculated using the following equation:

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

$CHP_{thermal}$
- 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.

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

The winning approach

Step 1: (Calculating Total Annual Source Fuel Savings in Btus)

$$S_{FuelCHP} = (F_{grid} + F_{thermalCHP}) - F_{total\ CHP}$$

$S_{FuelCHP}$ = 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/furnace.

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

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.

The winning approach

Step 2: (Savings Allocation to Program Administrators for Purposes of Assessing Compliance with Energy Savings Goals (Not for Use in Load Reduction Forecasting))

CHP Annual System Efficiency (HHV)	Allocated Electric Savings	Allocated Gas Savings
60%	65% of E_{CHP} (kWh)	No gas savings
>60% to 65%	65% of E_{CHP} (kWh) + one percentage point increase for every one percentage point increase in CHP system efficiency (max 70% of E_{CHP} in kWh)	No gas Savings
>65%	70% of E_{chp} (kWh)	2.5% of $F_{thermal}$ (useful thermal output of the CHP system) for every one percentage point increase in CHP system efficiency above 65%.

The winning approach

Step 2:

For systems participating in only an electric EEPS program:

CHP Annual System Efficiency (HHV)	Allocated Electric Savings	Allocated Gas Savings
60%	65% of E_{CHP} (useful electric output of CHP system in kWh)	No gas Savings
Greater than 60%	65% + one percentage point increase for every one percentage point increase in CHP system efficiency (no max)	No gas Savings

For systems participating in only a gas EEPS program:

CHP Annual System Efficiency (HHV)	Allocated Electric Savings	Allocated Gas Savings
60% or greater	No electric savings	2.5% of Fthermal (useful thermal output of the CHP system) for every one percentage point increase in CHP system efficiency above 60%.

What does it take?

- The whole process took over 18 months, and was very contested.
- Lessons learned:
  - Involvement from every stakeholder is essential from the start
  - CHP needs to be carefully explained to ALL stakeholders
  - Non-engineers don't fully understand the details, such as the difference between Lower and Higher Heating Value. But the devil is the details.
  - For complex measures, like CHP, there may be different point of views that are technically correct but may lead to different conclusions

Thank You!

Questions?

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