Program Name	**CHP Pilot~~Feasibility Studies~~**

Program Description	Combined Heat and Power ("CHP")~~—~~, energy saving technologies including both topping and bottoming cycle CHP, are eligible for the ComEd Smart Ideas for your business incentive programs. As an added incentive specifically for CHP projects, this CHP Feasibility Study Program ("Program") will co-fund feasibility studies and interconnection fees for eligible projects. ~~(Herein referred to as the "Program")~~This Program is~~ are~~ intended to stimulate the implementation of CHP projects by ComEd customers through enhanced visibility of the economics of site specific CHP projects. Because the economics of CHP project can vary substantially based on individual site electric and thermal loads, this Program will provide customers with the financial information needed to make an informed decision about CHP. The energy efficiency rider ("Rider EDA") will fund the CHP Feasibility Study Program. The Program will consist of the following:
	• Creation of a network of CHP Program authorized developers and engineering firms that would be approved to work with ComEd customers. Although developers and engineering firms not included in the network may work with ComEd customers to develop eligible projects, developers and engineering firms that participate in the network will benefit from ComEd training on the parameters of the ComEd CHP Program. Program administration would create an RFP to recruit CHP developers into the network. Criteria for inclusion into the network would be based on the following:
	  • Expertise / prior CHP project work
	  • Ability to recruit ComEd customers
	  • Price
	• The three phases of the Program are:
	  • **Screening phase**: Review program application, verify eligibility of the customer, perform energy efficiency assessment (Smart Ideas Opportunity Assessment or equivalent)
	  • **Feasibility phase**: CHP developers perform a feasibility study to include elements consistent with DCEO feasibility elements (See appendix A). Program to fund 50% of CHP developer / engineering firm fees up to $25,000.
	  • **Interconnection Phase**: Customer and CHP developer works with ComEd distribution on the interconnection of the CHP system to the ComEd grid. Upon completion, Program to fund 50% of interconnection fees up to $25,000.

Comment [O1]: This is needed to make it clear both CHP and WHP qualify.

Comment [O2]: This introductory language is needed to clarify how this Feasibility Program fits within the custom program.

Comment [O3]: This is needed to make it clear that developers/engineering firms are not required to be in the network in order to bring in a qualifying CHP project.

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	• Upon completion and operation of the CHP system, customers are eligible for incentives through the *Smart Ideas for Your Business* Custom incentive offer based on electric savings of the CHP project. Customers will submit a pre-application upon completion of the Feasibility Phase and a final application once the CHP system is operational. • ~~—~~Project savings are subject to ComEd's normal EM&V process that is led by independent evaluation. For transparency to aid project developers and uniformity in treatment of applications, ComEd will publish the parameters and framework used by the independent evaluator in this process.. • Projects must be cost-effective on Total Resource Cost ("TRC") basis. ComEd will review the project application and, working with the customer, will determine the project's cost-effectiveness. ComEd and the customer will integrate the independent evaluator in the review process and will defer to them for final acceptance of savings methodology, savings estimates, and evaluation procedures. The parties will develop an agreed upon project review process and will make best effort to abide by this timeline.
Program Duration	June 2014 through May 2017.
Collaboration	ComEd will plan on offering the Program as a *Smart Ideas for Your Business* program offer. ComEd will work closely with the gas companies on applicable incentives for CHP project installations. Allocation of energy savings for the projects is anticipated to be between 70% to 85% electric and 15% to 30% gas. Individual projects may vary based on the characteristics of the specific project. The energy savings split between electric and gas are based on the calculations from the DCEO pilot program methodology (See appendix B). We will continue to leverage opportunities from C&I education on this program and other joint gas program customer outreach and engagement activities.
Delivery Strategy	ComEd will issue an RFP for an implementation contractor to oversee the CHP developer network, the application process, and monitor project progress as reported by customers. This process may also involve ComEd's independent evaluator, who would in advance ~~—~~provide a framework for ~~feedback on~~ appropriate data gathering requirements and other critical aspects of project Measurement and Verification. Incentives beyond the Program and interconnection costs would be available through the traditional program infrastructure of ComEd.

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Target Market	This Program will target larger C&I customers in the ComEd service territory, generally those customer above 1000 kW in demand. Smaller CHP projects, although not qualifying for Feasibility Study and Interconnection co-funding, are nonetheless eligible for ComEd custom program energy savings incentives under the Smart Ideas for Your Business program.
Marketing Strategy	~~The Program will rely heavily on the CHP developer network to identify and obtain participants.~~ The ~~p~~Program will be actively ~~would also be~~ promoted through existing program channels and outreach efforts. The Program will also encourage the CHP developer network to identify and obtain participants.
Eligible Measures	CHP projects that meet the program eligibility requirements and have a TRC of 1.0 or greater. Program Eligibility Requirements: 1. Newly designed and constructed Conventional CHP systems with annual fuel use efficiencies of at least 60% (HHV) with at least 20% of the system's total useful energy output in the form of useful thermal energy. These systems will have a net zero annual export of power to the grid. System efficiency is calculated as: $$CHP\ AFUE\ (HHV) = \frac{\left[Useful\ thermal\ \left(\frac{kBtu}{yr}\right) + Useful\ electric\ \left(\frac{kWh}{yr}\right) * 3.412\ \left(\frac{kBtu}{kWh}\right)\right]}{F\ total\ CHP\ \left(\frac{kBtu}{yr}\right)}$$ 2. Existing engine or combustion turbine systems that are not presently outfitted with heat recovery capability that can be converted to a CHP system may be eligible
Program Targets	Energy savings from this Program will be included in the C&I Incentives Program for tracking and reporting purposes. Program costs will be included in the C&I Incentives Program costs.
Appendix A – Feasibility Study Scope	1. Table of Contents: 2. Site Description: • Primary business and operating schedule • Existing energy suppliers, terms, and applicable rates • The pressure and availability of natural gas (or other fuel to be utilized in the CHP system) • Reasons for the CHP consideration from a host customer

Comment [O4]: This is needed for clarification.

Comment [O5]: ComEd should make a commitment to actively promote this program itself as well as work with the CHP developer network.

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	perspective (why are you interested in CHP) • Facility energy use profile: a 12 to 24 month profile of electricity and fuel use, thermal loads, and costs (at a minimum please include the last 12 months of gas, electric, and steam (if applicable) bills as an appendix – not part of the 20 page limit). • Other site description info as deemed appropriate by applicant 3. Energy Efficiency Status of the Site: (part of the evaluation criteria is to provide credit to those applicants that can show that the proposed site is already an energy efficient building/facility) • Provide any data showing steps taken to improve the energy efficiency of the building/facility within the last 5 years. These might include but are not limited to upgrades in lighting/HVAC/thermal integrity; installation and operation of control systems/automated energy management systems; boiler or furnace tune-ups, steam trap maintenance/repair; or any other investments in energy efficiency. 4. Project Description: • Narrative of CHP rationale, subsequent technology selection process • List major equipment • Prime mover – capacity, electrical efficiency, vendor cut sheets can be submitted as an appendix (not part of the 20 page limit), estimated part load performance • Heat recovery equipment • Duct burners (if applicable) • Absorption chillers and/or desiccant dehumidifiers or other thermal recovery/use equipment being proposed as part of the project (if applicable). • Gas clean up equipment if required as part of the project • Estimated facility load profiles subsequent to CHP installation on a monthly basis • CHP useful electricity production (note any parasitic power requirements) • CHP provided heating/cooling (useful thermal energy production) • Grid supplied supplemental electricity requirements • Thermal loads supplied by on-site equipment (e.g., boiler and/or chiller) • Estimated CHP AFUE (HHV) and related calculations on an annual

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basis – should use the calculation method provided in the guidelines

- Any interactions with the local electric utility regarding interconnection of the CHP system with the local grid.
  - Include the type of grid being connected to (Radial or Network)
  - Define any estimated issues and how they will be resolved
  - Explain any financial impacts associated with interconnection (if applicable)
  - One line diagrams of interconnection requirements are recommended. Any one line diagrams can be submitted as an appendix (not part of the 20 page limit).
- Any required interactions with the local gas utility regarding gas pressure and/or distribution lines (issues, costs, status)
- Environmental Requirements
  - Define requirements and costs

5. Project Financials:

- CHP installed cost estimates – detailed breakdown
  - Major equipment
  - Engineering
  - Design
  - Construction
  - Permitting
  - Interconnection
  - Other
- Maintenance
  - Estimated fixed and variable costs for O&M (All projects will be required to have a 5 year maintenance contract on the prime mover (at a minimum) unless otherwise waived by the DCEO. The applicant will provide justification for such waiver to be granted.
  - An estimate of downtime that would occur due to routine maintenance must be included
- Electricity and fuel price assumptions
  - Electric supplier and rates before and after CHP (what specific tariffs, standby rates)
  - Fuel supplier and price

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	• Price escalation factors for grid electricity and fuel • Expected customer month by month savings and simple payback with and without incentives (show the effect of the project incentives on the simple payback) • Financing mechanism narrative (explain how the project will be financed) • 10 year cash flow analysis • Annual fuel and purchased power costs • Annual O&M costs • Annual operating savings • Assumed unit gas and electric costs & pertinent escalations • IRR and NPV • Sensitivity Analysis on simple payback based on varying • Electric prices • Fuel prices 6. Permitting Plan – a brief description of the necessary environmental and building permits or certificates that the customer needs to obtain must be provided. A schedule of realistic permit receipt dates are to be included 7. Metering Plan – A detailed metering plan shall be included outlining the steps that will be taken to measure system performance post-installation. After the system is installed, applicant must provide 12 months of hourly operational data demonstrating that minimum CHP AFUE was achieved. This shall be done by implementing appropriate metering as part of the system installation. Data collected should include, but is not limited to, fuel input (kBtu), useful electric energy output (kWh), useful thermal energy output (kBtu). All applicants are responsible for the monthly electronic delivery of requisite data. 8. Project Team – include an organizational chart listing all team members, including the project manager and any subcontractors and others involved in the CHP Project, showing their roles and responsibilities. Describe the qualifications of the Applicant and/or contractor's individual and combined expertise that will enable successful completion of the CHP Project. List related projects that have been undertaken and successfully completed by the Applicant and/or contractors. 9. Anticipated schedule – A detailed project schedule that includes design, engineering, permitting, interconnection, construction, start-up, commissioning and 12 month data collection must be provided. .

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Appendix B – DCEO energy savings split	DCEO savings split methodology: kWh savings = (The percentage of electric Btu fuel savings) ÷ Heff CHP (Btus/kWh) Where Heff CHP = (F total CHP – F thermal CHP) ÷ useful electric output of CHP system The percentage of savings for electric and gas will vary based upon the individual project. Examples of energy savings split for engines:

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S fuel CHP = F grid + F thermal CHP – F total CHP
F grid = E CHP X H grid
H CHP = (F total CHP – F thermal CHP) / E CHP
S CHP Elec = S fuel CHP / H CHP
S CHP gas = S fuel CHP / 100,000 Btu/therm

	Utility	ComEd			
				SWEEP Method	
		100	*633*	*1121*	*3326*
Units	**Assumptions**				
kW	CHP Capacity (kW)	**100**	**633**	**1121**	**3326**
yrs	Measure Life (years)	20	20	20	20
Hrs	Operating Hours (Hrs)	6,000	6,000	6,000	6,000
kwh	CHP electric output (annual)	600,000	3,798,000	6,726,000	19,956,000
therms	CHP Gas output (annual)	40,200	166,800	259,200	640,200
11.02%	w/ line losses (kWh)	666,120	4,216,540	7,467,205	22,155,151
	electric output in $/yr	$5,479	$34,681	$61,419	$182,228
	therm output in $/yr	$2,251	$9,341	$14,515	$35,851
	electric %	71%	79%	81%	84%
	Gas %	29%	21%	19%	16%
kWh	E CHP (kWh)	600,000	3,798,000	6,726,000	19,956,000
2%	Parasitic Loads (kWh)	12,000	75,960	134,520	399,120
	Total E CHP (kWh)	**588,000**	**3,722,040**	**6,591,480**	**19,556,880**
kBtu/kWh	Grid heat rate (kBtu/kWh) (Hgrid)	11.12	11.12	11.12	11.12
kBtu/yr	F grid (Fg) (kBtu/yr)	6,540,171	41,399,284	73,315,320	217,526,095
kBtu/hr	Usable Waste heat from CHP (kBtu/hr)	670.00	2,780.00	4,320.00	10,670.00
	Thermal Utilization	80%	80%	80%	80%
	Displaced thermal Eff	75%	75%	75%	75%
	Electric Efficiency % (HHV)	27.0%	34.5%	36.8%	40.4%
kBtu/yr	F thermal CHP (Ft) (kBtu/yr)	4,288,000	17,792,000	27,648,000	68,288,000
	Total CHP efficiency	**69.4%**	**70%**	**69%**	**71%**
kBtu/hr	Fuel Use by CHP (kBtu/hr)	1,264	6,260	10,394	28,090
kBtu/yr	F total CHP (Fc) (kBtu/yr)	7,582,222.22	37,561,670	62,361,717	168,539,287
kBtu/yr	S fuel CHP [Fg+Ft-Fc]	**3,245,949**	**21,629,614**	**38,601,602**	**117,274,808**
kBtu/kWh	H CHP [(Fc-Ft)/E]	5.49	5.21	5.27	5.02
kWh	kWh Savings (S CHP Elec)	**419,033.28**	**3,273,628.91**	**5,928,596.28**	**19,506,948.10**
kWh	kW Savings	95	601.35	1064.95	3159.7
Therms	Gas Savings (S CHP gas)	**9,453.01**	**45,894.45**	**73,789.31**	**192,793.86**
$/kW	Cost/kW	$2,900.0	$2,737.0	$2,289.0	$1,822.0
	Installation Cost	$ 290,000	$ 1,732,521	$ 2,565,969	$ 6,059,972
0%	Opportunity Cost	$ -	$ -	$ -	$ -
10%	Tax Credit (@10%)	$ 29,000	$ 173,252	$ 256,597	$ 605,997
	Total 1 time cost to Cust	**$ 261,000**	**$ 1,559,269**	**$ 2,309,372**	**$ 5,453,975**
$/kWh	Maintenance $	$0.024	$0.021	$0.019	$0.016
$/ Mmbtu/y	yrly maintenance	**$ 14,400**	**$ 79,758**	**$ 127,794**	**$ 319,296**

Examples of energy savings split for turbines:

Program Name	CHP Pilot~~Feasibility Studies~~

	S fuel CHP = F grid + F thermal CHP – F total CHP				
	F grid = E CHP X H grid				
	H CHP = (F total CHP – F thermal CHP) / E CHP				
	S CHP Elec = S fuel CHP / H CHP				
	S CHP gas = S fuel CHP / 100,000 Btu/therm				
	Utility	ComEd			
				SWEEP Method	
		3304	*7038*	*9950*	*20336*
Units	**Assumptions**				
kW	CHP Capacity (kW)	**3304**	**7038**	**9950**	**20336**
yrs	Measure Life (years)	20	20	20	20
Hrs	Operating Hours (Hrs)	6,000	6,000	6,000	6,000
kwh	CHP electric output (annual)	19,824,000	42,228,000	59,700,000	122,016,000
therms	CHP Gas output (annual)	1,179,600	2,066,400	3,141,600	4,669,200
11.02%	w/ line losses (kWh)	22,008,605	46,881,526	66,278,940	135,462,163
	electric output in $/yr	$181,023	$385,606	$545,151	$1,114,191
	therm output in $/yr	$66,058	$115,718	$175,930	$261,475
	electric %	73%	77%	76%	81%
	Gas %	27%	23%	24%	19%
kWh	E CHP (kWh)	19,824,000	42,228,000	59,700,000	122,016,000
2%	parasitic Loads (kWh)	396,480	844,560	1,194,000	2,440,320
	Total E CHP (kWh)	**19,427,520**	**41,383,440**	**58,506,000**	**119,575,680**
kBtu/kWh	Grid heat rate (kBtu/kWh) (Hgrid)	11.12	11.12	11.12	11.12
kBtu/yr	F grid (Fg) (kBtu/yr)	216,087,258	460,297,252	650,747,038	1,330,009,223
kBtu/hr	Usable Waste heat from CHP (kBtu/hr)	19,660.00	34,440.00	52,360.00	77,820.00
	Thermal Utilization	80%	80%	80%	80%
	Displaced thermal Eff	75%	75%	75%	75%
	Electric Efficiency % (HHV)	23.96%	28.91%	27.34%	33.25%
kBtu/yr	F thermal CHP (Ft) (kBtu/yr)	125,824,000	220,416,000	335,104,000	498,048,000
	Total CHP efficiency	**57%**	**62%**	**61%**	**63%**
kBtu/hr	Fuel Use by CHP (kBtu/hr)	47,050	83,063	124,175	208,681
kBtu/yr	F total CHP (Fc) (kBtu/yr)	282,301,703	498,380,962	745,049,012	1,252,085,991
kBtu/yr	S fuel CHP [Fg+Ft-Fc]	59,609,555	182,332,290	240,802,026	575,971,232
kBtu/kWh	H CHP [(Fc-Ft)/E]	7.89	6.58	6.87	6.18
kWh	kWh Savings (S CHP Elec)	**5,532,862.86**	**21,305,850.58**	**26,511,966.37**	**75,486,782.74**
kWh	kW Savings	3138.8	6686.1	9452.5	19319.2
therms	Gas Savings (S CHP gas)	**159,367.51**	**420,869.57**	**587,509.64**	**1,094,758.38**
$/kW	Cost/kW	$3,281.0	$2,080.0	$1,976.0	$1,518.0
	Installation Cost	$ 10,840,424	$ 14,639,040	$ 19,661,200	$ 30,870,048
0%	Opportunity Cost	$ -	$ -	$ -	$ -
10%	Tax Credit (@10%)	$ 1,084,042	$ 1,463,904	$ 1,966,120	$ 3,087,005
	Total 1 time cost to Cust	**$ 9,756,382**	**$ 13,175,136**	**$ 17,695,080**	**$ 27,783,043**
$/kWh	Maintenance $	$0.0101	$0.0123	$0.0120	$0.0093
$/ Mmbtu/y	yrly maintenance	$ 199,826	$ 519,404	$ 716,400	$ 1,134,749