



**Commonwealth Recycled Energy
Economic Development Alliance**

Promoting Marcellus Shale Gas-Fired Combined Heat & Power (CHP)

COMBINED HEAT & POWER (CHP)

***THE LOWEST COST MEANS OF USING MARCELLUS SHALE GAS
FOR ECONOMIC DEVELOPMENT WHILE CREATING AND RETAINING
PENNSYLVANIA JOBS***

Introductions

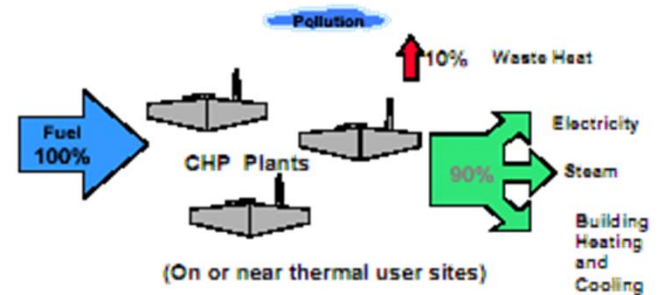
- **CREEDA – Being formed to assist PA realize the many benefits offered by using Marcellus Shale Gas fired Combined Heat & Power (CHP). CREEDA is an industry alliance incorporating PA gas utilities, engineering and construction companies as well as PA energy users**
- **Robert Pistor, Vice President UGI HVAC Enterprises, Inc.**
- **Gearoid Foley, Senior Advisor US DOE's Mid-Atlantic Clean Energy Applications Center**



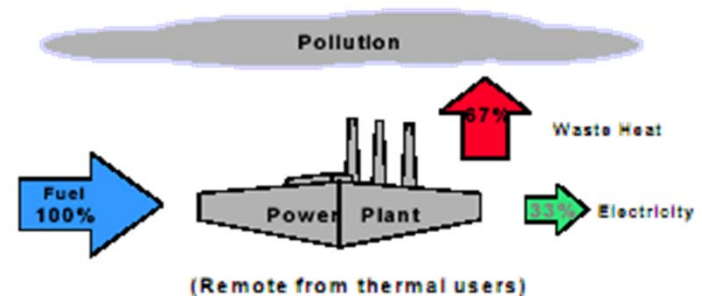
What is CHP?

- Combined Heat & Power or Cogeneration
- On-site generation of Power and Thermal Energy from a single fuel source
- ‘Conventional’ grid based generators are located remote from thermal applications while CHP plants are located close to thermal applications

Combined Heat and Power (CHP)



Conventional Generation



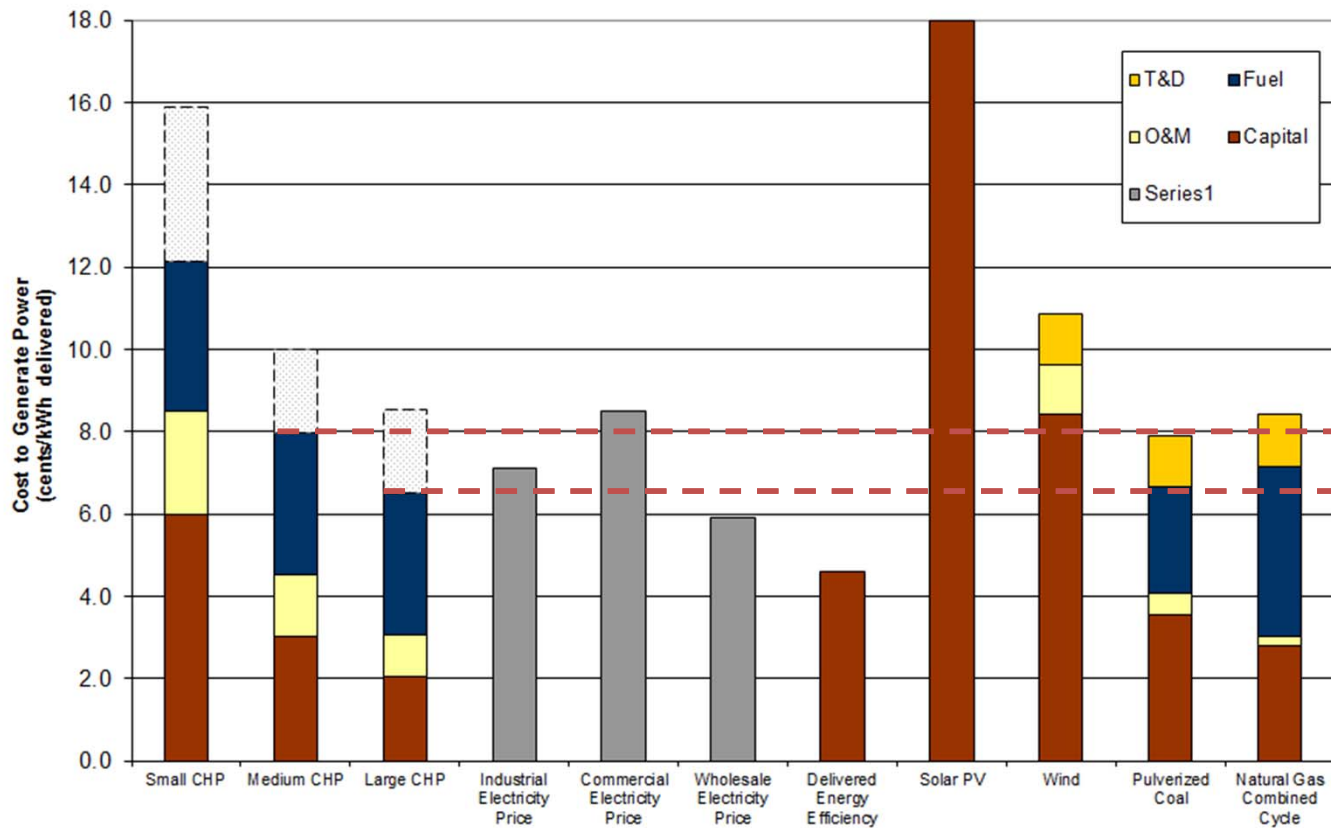
Benefits of CHP

- **Creates hundreds of new supplier, construction and engineering jobs and retains thousands**
- **Can provide immediate economic advantage on energy pricing for small and large businesses**
- **Delivers the lowest cost supply-side method of reducing carbon emissions**
- **Lowers the marginal cost of electric power**



Why CHP: PA Competitiveness

Cost of Delivered Electricity - Pennsylvania



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Why CHP: Job Creation & Retention

- **In-situ use of Marcellus Shale for combined heat and power generation allows manufacturers and large energy users to significantly lower the cost of energy**
- **New engineering and construction jobs are created in the development of Marcellus Shale and CHP plants**
- **Efficient use of Marcellus Shale Gas through CHP will provide a competitive advantage for existing and new energy intensive industries in Pennsylvania**

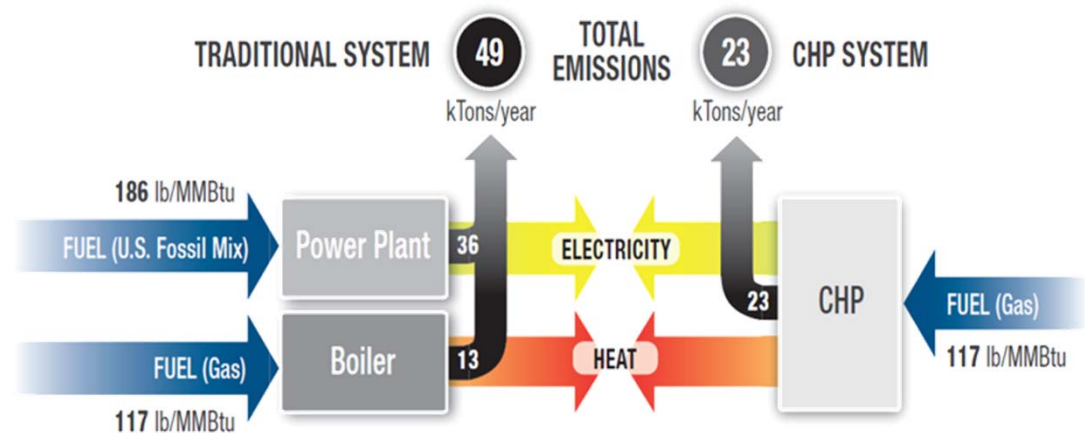
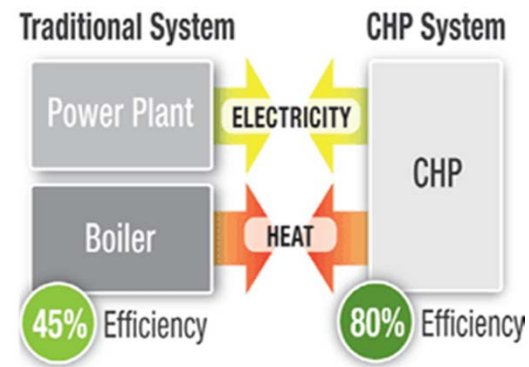


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Why CHP: Efficiency & Emissions

- **CHP uses 40% less primary energy versus grid power and natural gas boilers.**
- **CHP reduces carbon emissions by over 50% versus grid power and natural gas boilers.**



Why CHP: Low Cost Carbon Reduction

CHP uses 1.5% of the land area and removes 788% more CO₂ than Solar PV per dollar invested.

Category		1 MW CHP	1 MW Solar PV	CHP vs. PV
Annual Electricity Production	MWh	7,880	1,927	409%
Annual Heat Production	MW _{th}	7,802	0	∞
Footprint required	ft ²	1,500	100,000	1.5%
Cost	Million	\$2.40	\$4.60	52%
Shale Gas Utilization	CF	75,356,639	0	∞
Annual CO ₂ Savings	Metric Tons	4,625	1,722	269% ★
Portfolio Compliance Credit	\$/MWh	\$10.00	\$120.00	8% ★
Cost per Metric Ton CO ₂ Removed	\$/Metric Ton	\$17.04	\$134.29	13%
Metric Tons CO ₂ Removed per \$MM	Metric Tons	58,693	7,447	788% ★

Assumptions:

1 MW Reciprocating Engine, 34% HHV Electric Efficiency, 68% HHV Total Efficiency, Grid Emissions based on All Fossil Fuel Average



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CHP Pathway: Technical Potential

- **Technical Potential is a statement of PA sites that have electric and thermal loads suitable for CHP**
- **PA total CHP potential is 7.2 GW without Export and 11 GW with Export**
- **Technical Potential is developed by DOE using EIA, EPA and Hoover's Data**

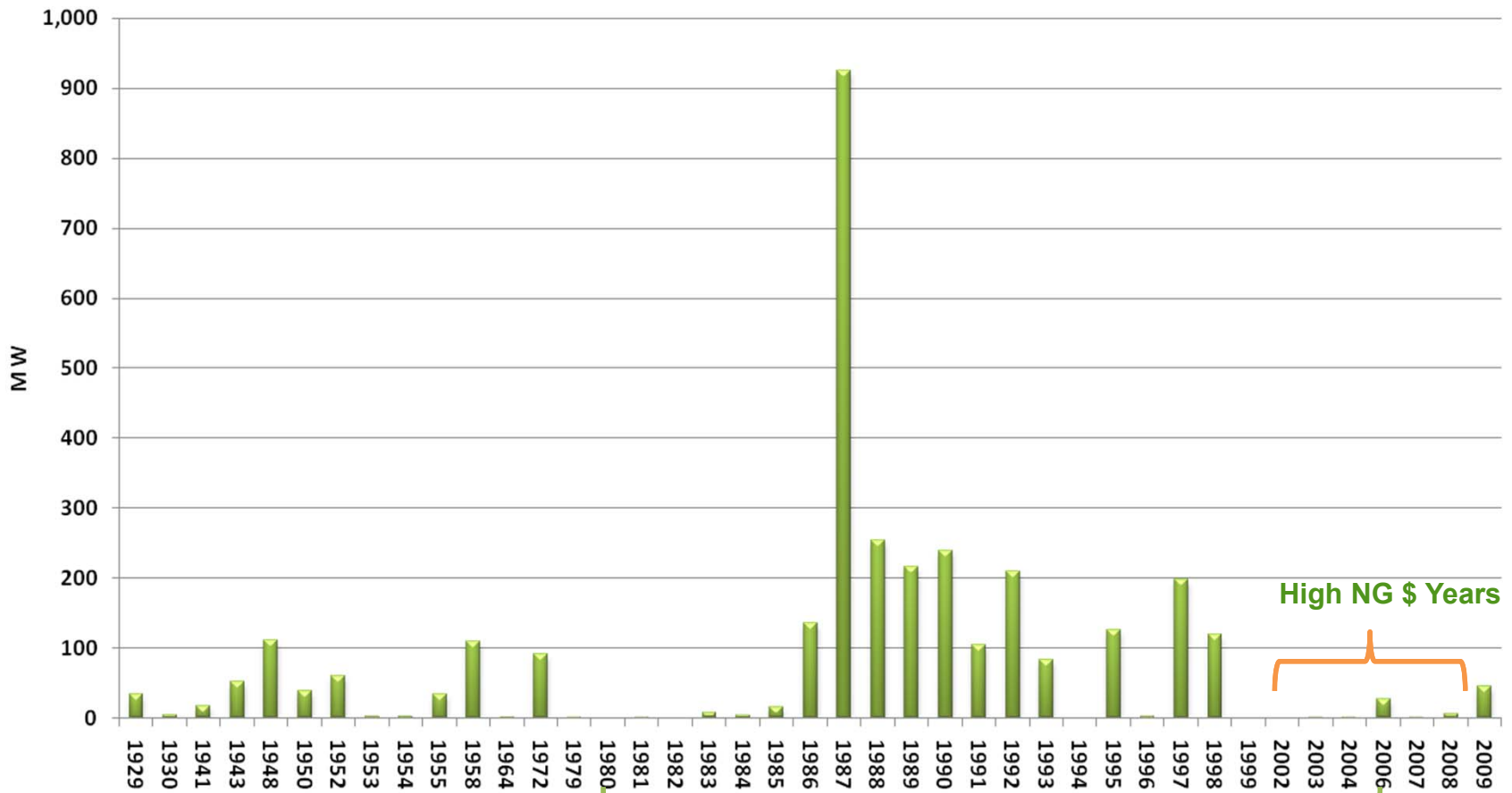


UGI HVAC Enterprises Inc.

- **UGI HVAC is a full MEP contractor operating in the Residential, Commercial and Industrial markets**
- **Since 2007; Revenues down 22.3% and M-HRS down 23.1% from historic highs**
- **To preserve jobs UGI HVAC embraced Weatherization and Solar development - Job retention sometimes forgotten but is significant. State and Federal incentive programs worked and have made a difference in employment in Pennsylvania**
- **Marcellus Gas fired CHP offer immediate benefit for PA Job Creation, Retention and a more competitive landscape for PA**



CHP History: PA CHP Installations by Date



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PURPA Years

Slide 11

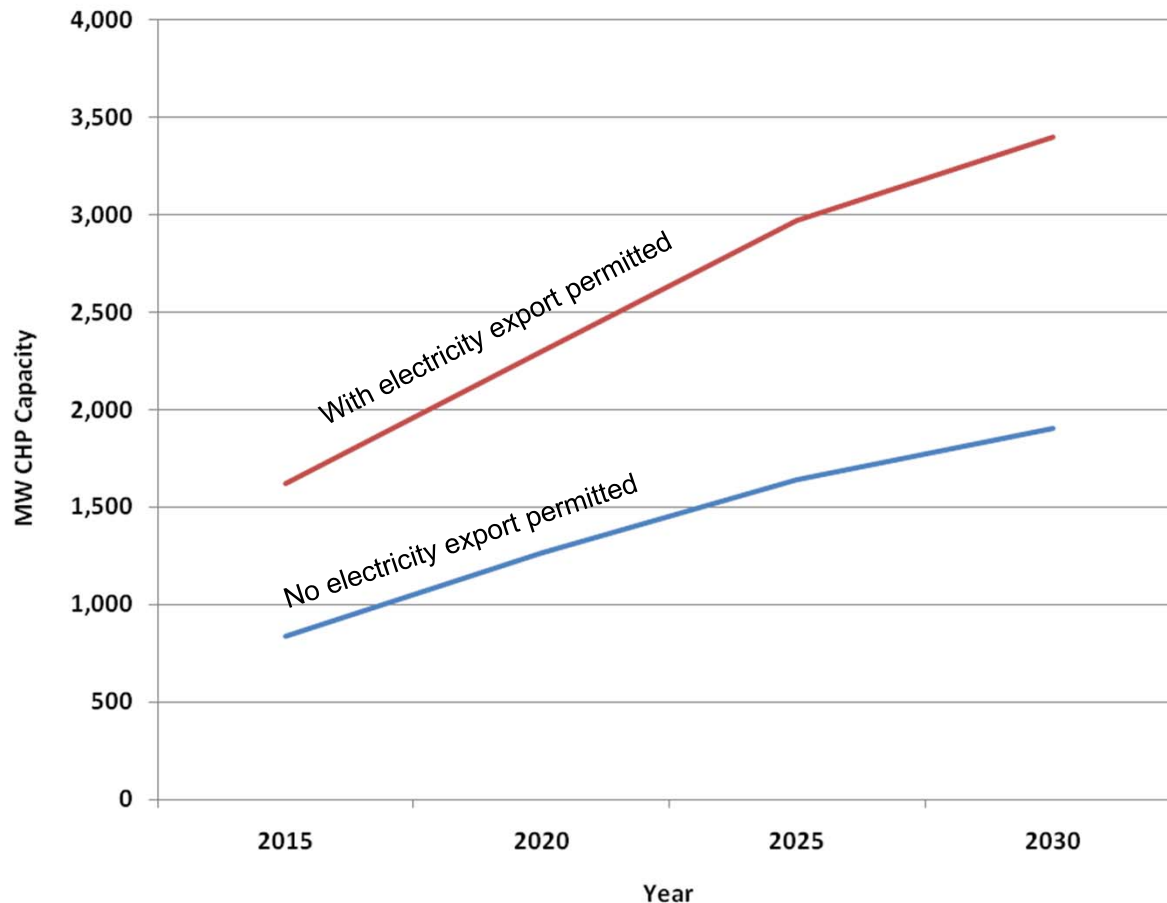
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To Jump-start CHP in the Commonwealth

- **CHP offers many benefits to both the owner and society including lower energy costs for all customers, lower healthcare costs for the state and significant job creation and retention for all.**
- **In order to realize the many benefits of Marcellus Shale Gas-fired CHP, the PA statutory framework needs to institute support measures specifically for CHP.**
- **Small to mid size businesses require incentives to embrace competitive advantages offered by products such as CHP.**



CHP Pathway: Multiple Incentive Cases Cumulative Market Penetration Results



Market penetration assumes state policy support providing \$450/kW capital grant, emission permit by rule and a loan guaranty program.

This program would yield between 500 and 1,000 direct jobs annually in the latter years of development.



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Proposed Support Delivery Mechanism

- **Continuation and Expansion of Alternative Fuel Incentive Grant Program (AFIG)**
- **\$600/kW for plants up to 3 MW**
- **\$300/kW for plants above 3 MW or \$10/MWh Alternative Energy Credit**
- **Capital Grant Funding Capped at \$1.0 MM/Project**

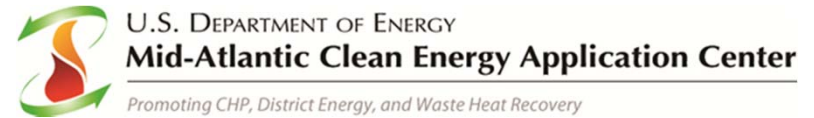


Proposed Support Delivery Mechanism

- **Permit by Rule – Standardized air permitting for compliant equipment with fixed schedules**
- **Standard Utility Power Grid Interconnection Rules – Standardized agreement with fixed schedule for up to 3 MW and above 3 MW to 30 MW**
- **Loan Guarantees – Government guaranteed commercial loans with minimum 15-year term**



Acknowledgement



The Alliance appreciates the technical, economic and environmental material provided by the U.D. Department of Energy’s Mid-Atlantic Clean Energy Application Center. “MA-CEAC”

The MA-CEAC believes “Marcellus Shale Natural Gas is a game changer that significantly enhances the economic, societal, and environmental benefits offered by Combined Heat and Power (CHP) in Pennsylvania. Low infrastructure investment, near-term realization, positive environmental impact and local job creation embodied in customer-based CHP make this an essential Marcellus Shale Gas utilization option.”



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