MoSEP Stakeholder Meeting

Kansas City Region – October 5, 2021

Combined Heat & Power:
A Key Part of Missouri's Energy Future

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CHP Technical Assistance Partnerships
CENTRAL

CHP directly supports the Core Values of MoSEP planning process

1. Assure secure, reliable and resilient energy infrastructure and supplies.
2. Enhance Missouri's competitive position in business retention, expansion and attraction through affordable rates and renewable energy options.
3. Develop diverse in-state energy resources.
4. Create opportunities for energy-related technological innovation and workforce development.
5. Ensure affordability and equity in access to energy resources, services and programs.
6. **Promote the efficient and environmentally sound use of energy.**

Summary and Action Report

Efficient & **Environmentally Sound**
Benefits of CHP—All Apply

- CHP is 25 – 35% overall more energy efficient than separate generation of electricity and heating/cooling
- NG-fueled CHP reduces pollutant emissions by 50% compared to coal-fueled electric generation
- CHP technology is highly reliable (85-99% available)
- CHP provides resiliency as a DER and can serve as the heart of microgrid
- CHP enables renewable energy growth by serving as baseload
- CHP technology is fueled by biogas NOW

Category	10 MW CHP	10 MW WHP	10 MW PV	10 MW Wind	10 MW NGCC
Annual Capacity Factor	85%	85%	24.9%	35.5%	57.6%
Annual Electricity, MWh	74,460	74,460	21,812	31,098	50,458
Annual Useful Heat Provided, MWh_{th}	97,505	None	None	None	None
Capital Cost, $ million	$20.2 m	$15.0 m	$17.8 m	$16.2 m	$10.0 m
Annual Energy Savings, MMBtu	360,420	787,597	230,720	328,938	200,693
Annual CO_2 Savings, Tons	**53,297**	**78,265**	**22,927**	**32,687**	**33,571**
Annual NOx Savings, Tons	45.4	39.6	14.5	20.7	32.0

CHP's Higher Efficiency Results in Energy and Emissions Savings Compared to Today's Grid (Average Fossil Generation)

https://attendee.gotowebinar.com/recording/8964655169094186509

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What Year Could CHP Become a Net Carbon Emitter Compared to the Grid?

eGRID Region	24/7 Baseload, 1 MW CHP	24/7 Baseload, 100-200 kW CHP	Daytime Operation, 1 MW CHP	Daytime Operation, 100-200 kW CHP
U.S. Average	After 2050	After 2050	After 2050	After 2050
WECC Southwest	After 2050	2048	After 2050	2047
WECC California	2030	2028	2030	2027
ERCOT All	After 2050	After 2050	After 2050	After 2050
FRCC All	After 2050	After 2050	After 2050	After 2050
MRO East	After 2050	After 2050	After 2050	After 2050
MRO West	After 2050	After 2050	After 2050	After 2050
NPCC New England	After 2050	After 2050	After 2050	After 2050
WECC Northwest	After 2050	After 2050	After 2050	After 2050
NPCC NYC/Westchester	2028	2026	2029	2028
NPCC Long Island	2030	2028	2031	2030
NPCC Upstate NY	2027	2025	2028	2026
RFC East	After 2050	After 2050	After 2050	After 2050
RFC Michigan	After 2050	After 2050	After 2050	After 2050
RFC West	After 2050	After 2050	After 2050	After 2050
WECC Rockies	After 2050	After 2050	After 2050	After 2050
SPP North	After 2050	After 2050	After 2050	After 2050
SPP South	After 2050	After 2050	After 2050	After 2050
SERC Mississippi Valley	After 2050	After 2050	After 2050	After 2050
SERC Midwest	After 2050	After 2050	After 2050	After 2050
SERC South	After 2050	After 2050	After 2050	After 2050
SERC Tennessee Valley	After 2050	After 2050	After 2050	After 2050
SERC Virginia/Carolina	2047	2044	2047	2045

Assumes linear progression to 2050 or 100% clean target year (2045 for CA, 2040 for NY)

For states with 100% targets, grid may continue to rely on gas and CC turbines for marginal generation up until target date.

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Thank you