Future of CHP in Indiana: Technical Potential and Implications of Standby Rates in Realizing this Potential

Presentation to the Indiana Utility Regulatory Commission

September 1, 2015

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U.S. Department of Energy
CHP Technical Assistance Partnerships
MIDWEST

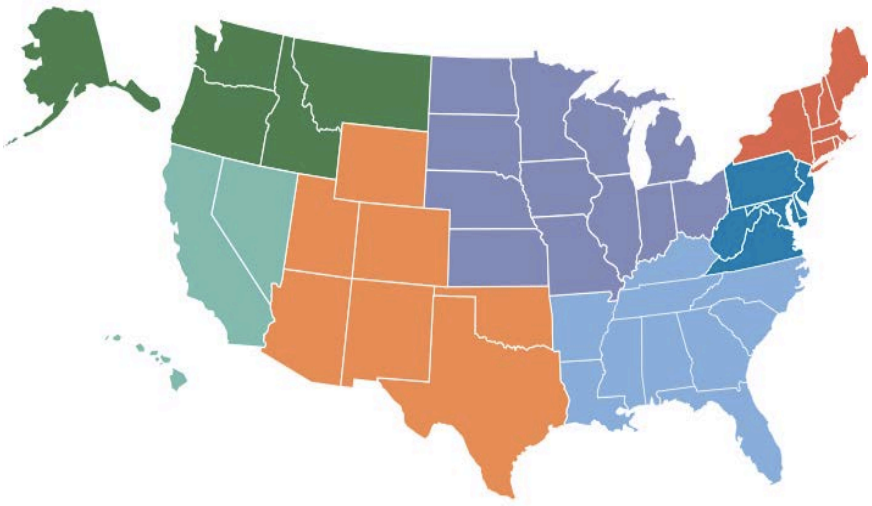
Agenda

- Who are the DOE CHP TAPs
- CHP Potential in Indiana
- Tariff Barriers to CHP – Overview of Standby Rates
- Conclusions & Next Steps

DOE CHP Technical Assistance Partnerships (CHP TAPs)

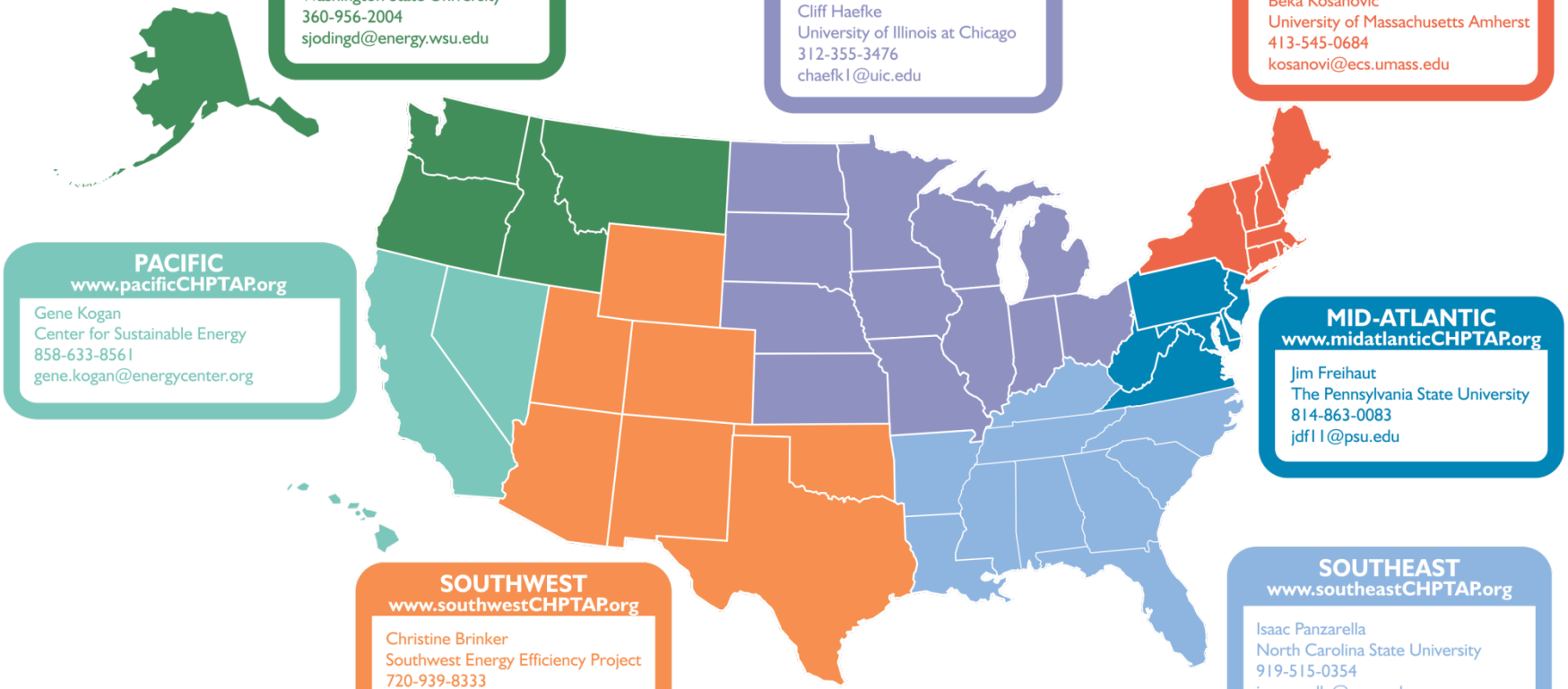
DOE's CHP TAPs promote and assist in transforming the market for CHP, waste heat to power, and district energy or microgrid with CHP throughout the United States. Key services include:

- **Market Opportunity Analysis**
  Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors
- **Education and Outreach**
  Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, end users, trade associations, and others.
- **Technical Assistance**
  Providing technical assistance to end-users and stakeholders to help them consider CHP, waste heat to power, and/or district energy or microgrid with CHP in their facility and to help them through the development process from initial CHP screening to installation.



www.energy.gov/chp

DOE CHP Technical Assistance Partnerships (CHP TAPs)



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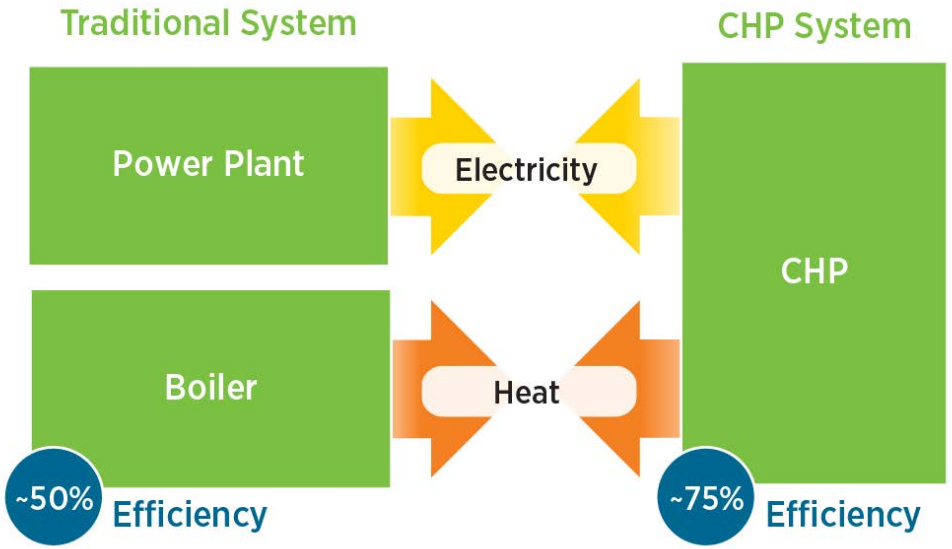
CHP: A Key Part of Our Energy Future

- Form of Distributed Generation (DG)
- An integrated system
- Located at or near a building / facility
- Provides at least a portion of the electrical load and
- Uses thermal energy for:
  - Space Heating / Cooling
  - Process Heating / Cooling
  - Dehumidification



CHP provides efficient, clean, reliable, affordable energy – today and for the future.

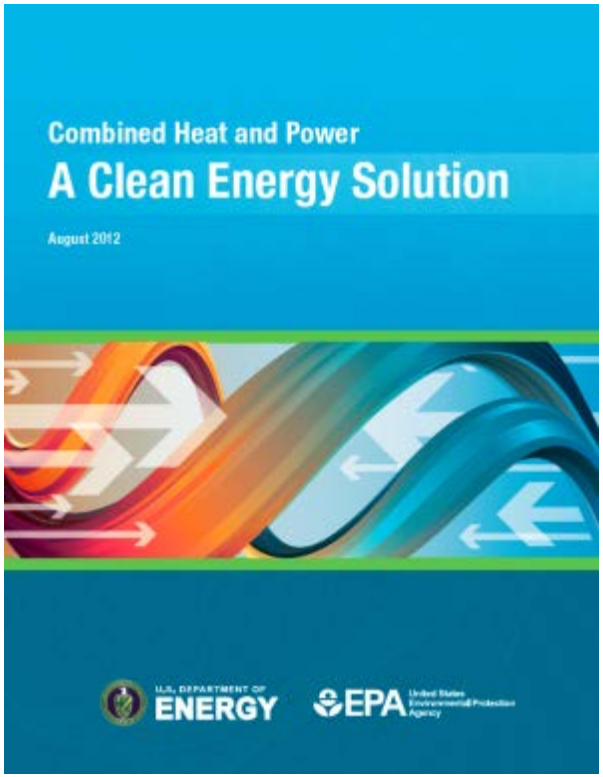
U.S. Department of Energy
CHP Technical Assistance Partnerships
MIDWEST

Source: http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

Emerging Drivers for CHP

- Benefits of CHP recognized by policymakers
  - President Obama signed an Executive Order to accelerate investments in industrial EE and CHP on 8/30/12 that sets national goal of 40 GW of new CHP installation over the next decade
  - State Portfolio Standards (RPS, EEPS, Tax Incentives, Grants, standby rates, etc.
- Favorable outlook for natural gas supply and price in North America
- Opportunities created by environmental drivers
- Utilities finding economic value
- Energy resiliency and critical infrastructure

DOE / EPA CHP Report (8/2012)



Executive Order: http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency
Report: http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

Installed CHP Summary – Indiana & U.S.

	Indiana		U.S.	
Org. Type	# of Sites	Installed CHP Capacity (MW)	# of Sites	Installed CHP Capacity (MW)
Agriculture	6	8.6	225	1,027.4
Amusement/Recreation	2	0.3	125	107.9
Chemicals	1	4.9	272	23,203.2
Colleges/Univ.	4	80.3	270	2,672.2
District Energy	1	3.4	49	2,626.4
Food Processing	4	26.6	253	6,726.2
Hospitals/Healthcare	2	3.5	221	856.7
Machinery	1	3.5	22	240.4
Misc. Education	1	1.1	5	4.7
Misc. Manufacturing	2	0.2	55	314.3
Primary Metals	9	1,492.0	54	4,120.4
Refining	1	660.6	104	15,998.2
Restaurants	1	0.1	14	2.2
Schools	1	1.8	252	68.7
Solid Waste Facilities	2	6.6	84	755.3
Transportation Equipment	3	29.6	24	1,270.9
Wastewater Treatment	1	0.1	211	707.4
Other	-	-	2,198	22,025.2
Total	42	2,323.1	4,438	82,727.9

Source: https://doe.icfwebservices.com/chpdb/

CHP in Indiana Facilities

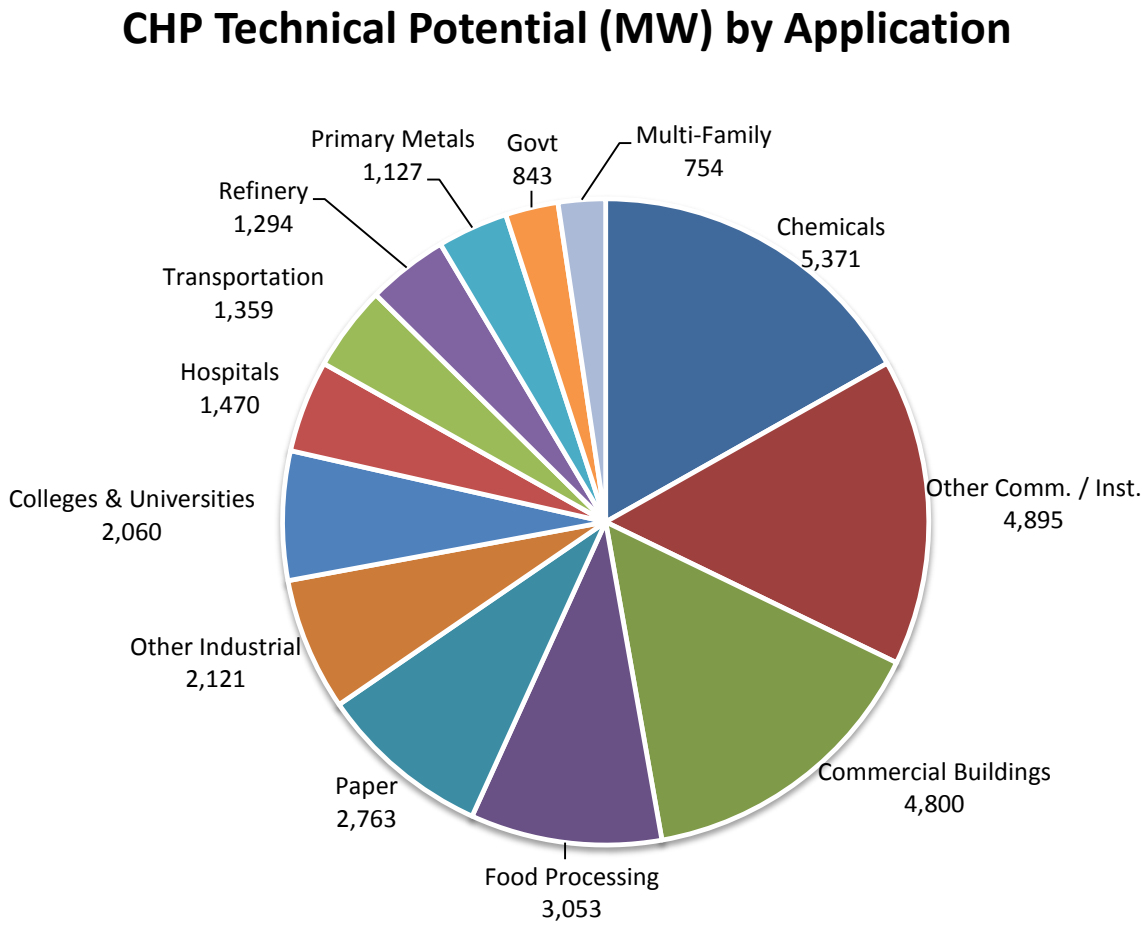
Largest CHP Users (Nationwide)
• Chemicals (23,203 MW)
• Petroleum Refining (15,998 MW)
• Commercial/Institutional (11,578 MW)
• Pulp and Paper (11,363 MW)
• Food Processing (6,726 MW)

Largest CHP Users (Indiana)
• Primary Metals (1,492 MW)
• Petroleum Refining (660 MW)
• Colleges / Universities (80 MW)
• Transportation Equipment (29 MW)
• Food Processing (26 MW)

Source: US DOE Combined Heat and Power Database, https://doe.icfwebservices.com/chpdb/

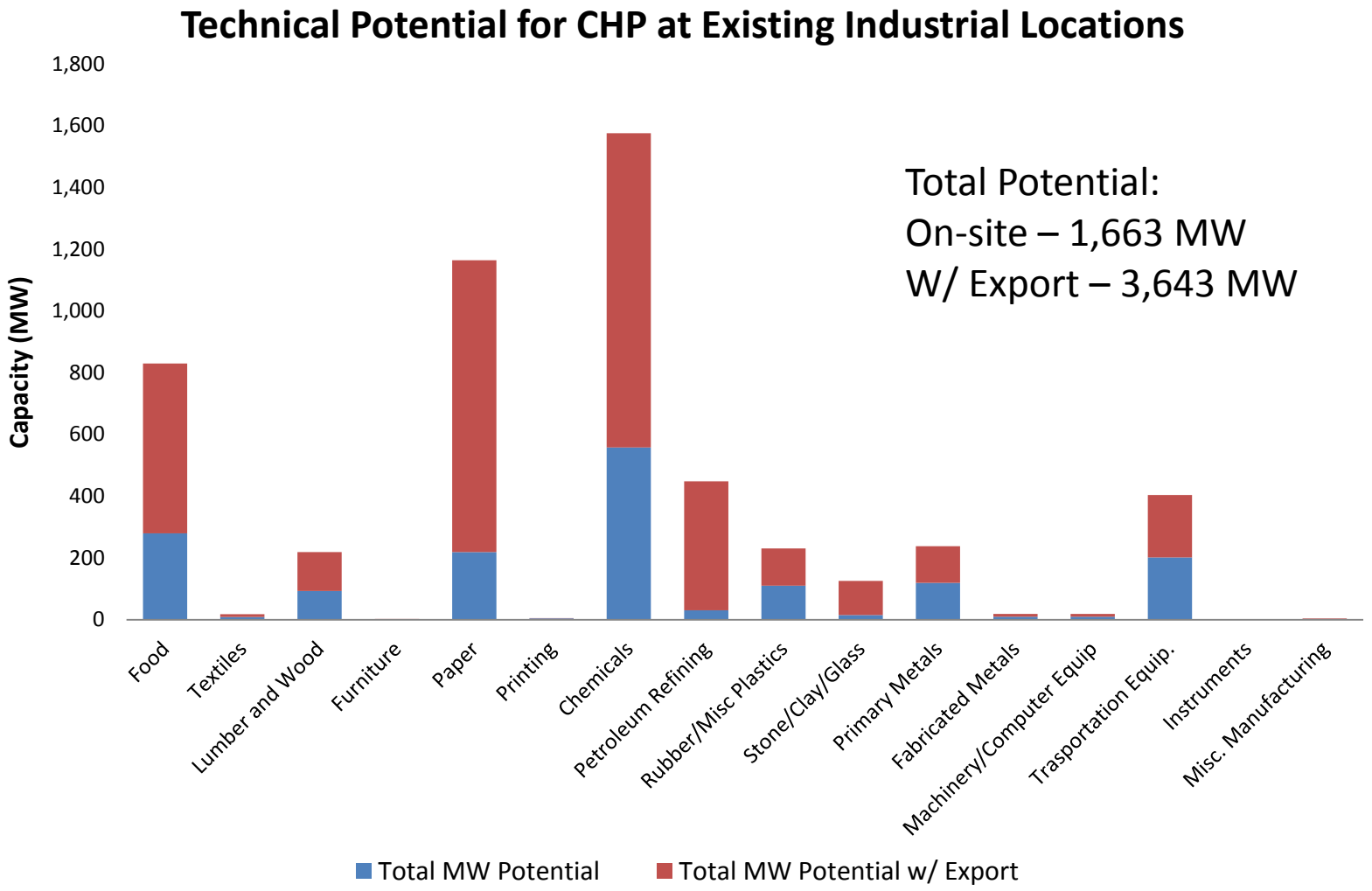
CHP Technical Potential

Midwest CHP Technical Potential



Source: ICF Internal Estimates 2015

Indiana CHP Technical Potential



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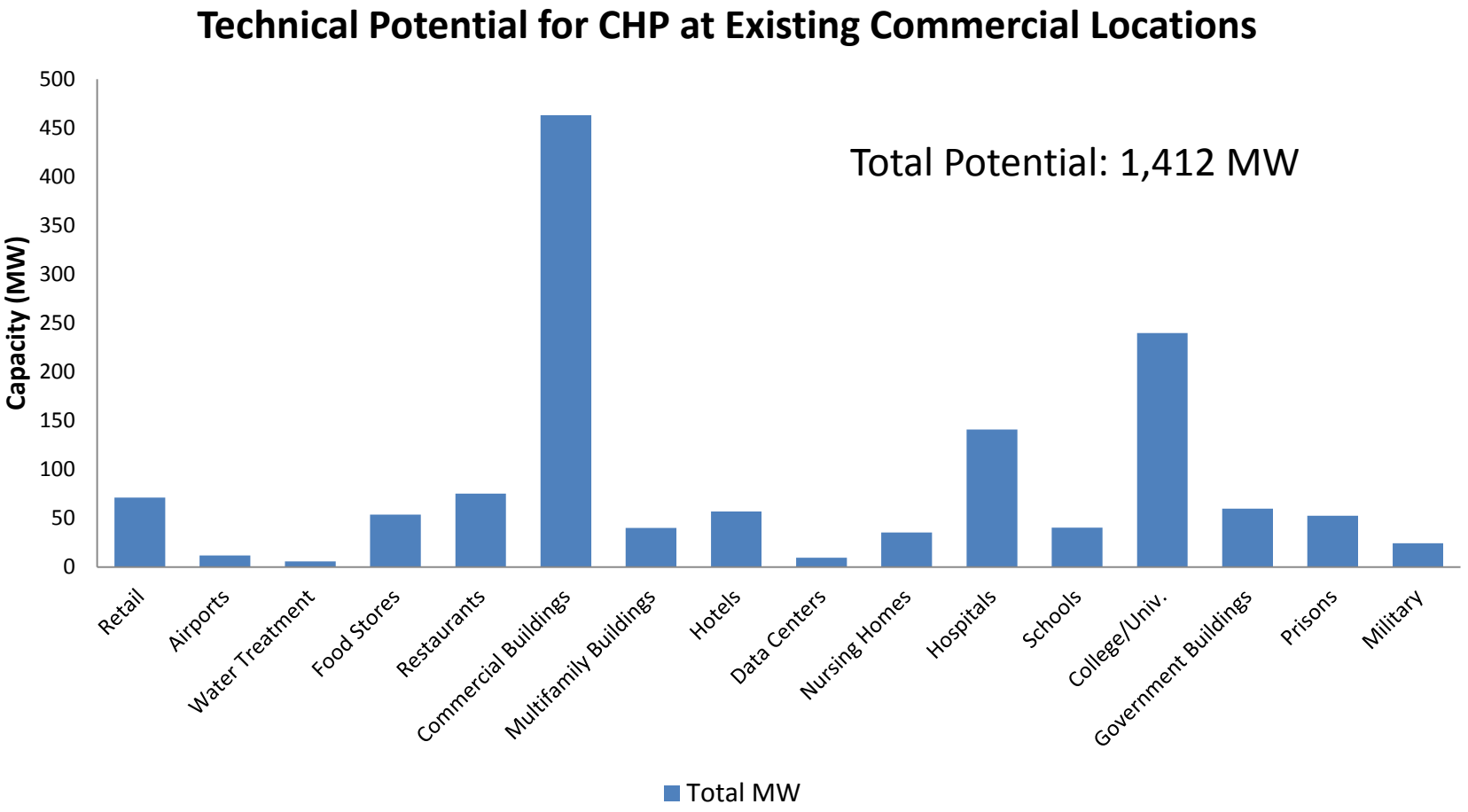
Source: ICF Internal Estimates 2015

Indiana CHP Technical Potential



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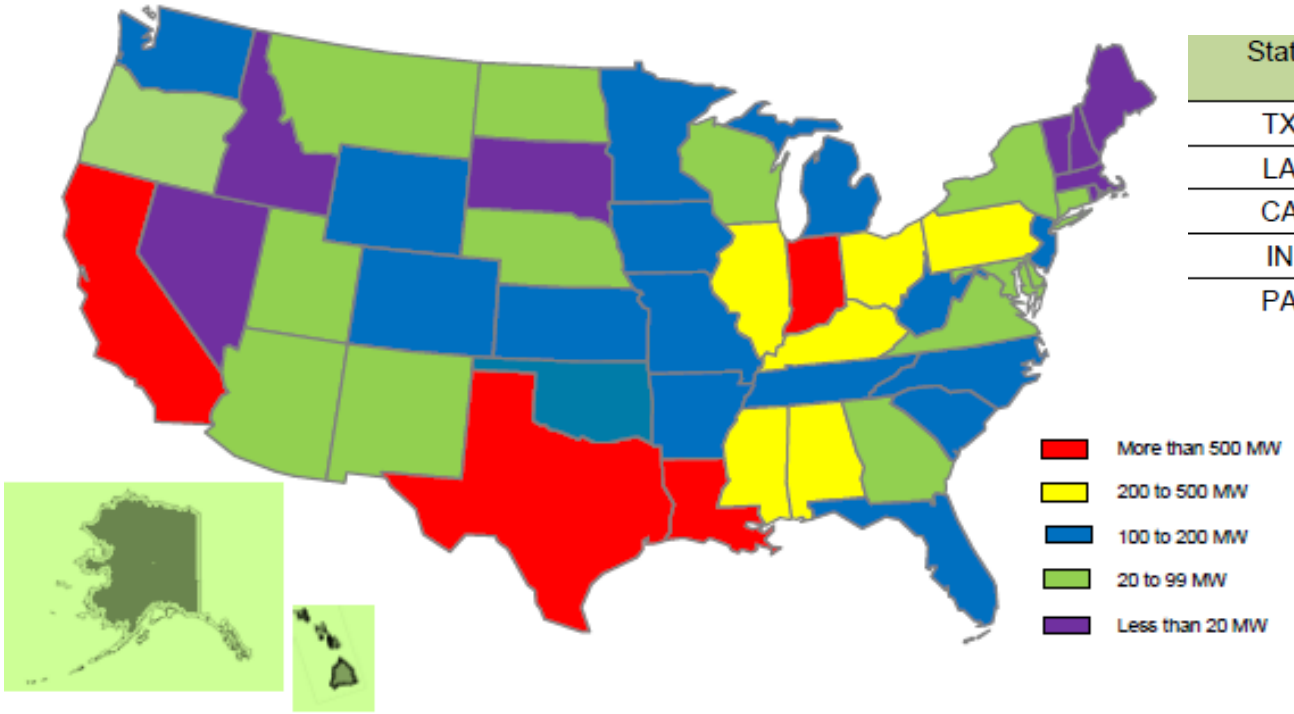
Source: ICF Internal Estimates 2015

Indiana CHP Technical Potential

Waste Heat to Power (WHP) Technical Potential In Indiana



State	Capacity (MW)	Share of Total
TX	1,515.19	17.1%
LA	883.8	10.0%
CA	763.4	8.6%
IN	501.4	5.7%
PA	482.6	5.5%

Average project payback is 3.5 years for Indiana WHP

Source: Oak Ridge National Laboratory, "Waste Heat to Power Market Assessment," March 2015. http://info.ornl.gov/sites/publications/files/Pub52953.pdf

Attractive CHP Markets

Industrial

- **Chemical manufacturing**
- Ethanol
- **Food processing**
- Natural gas pipelines
- **Petrochemicals**
- Pharmaceuticals
- Pulp and paper
- Refining
- Rubber and plastics

Commercial

- Data centers
- Hotels and casinos
- Multi-family housing
- Laundries
- Apartments
- Office buildings
- Refrigerated warehouses
- Restaurants
- Supermarkets
- Green buildings

Institutional

- Hospitals
- Schools (K – 12)
- **Universities & colleges**
- Wastewater treatment
- Residential confinement

Agricultural

- Concentrated animal feeding operations
- Dairies
- Wood waste (biomass)

Standby Rates

CHP and Utility Rates

What utility rates are we specifically talking about?

- PURPA Rates
- NEM Rates
- FITs
- Peak Shaving

Standby Rates can have a significant impact…

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Standby Overview

- Components of Rate Design
  - Full Requirements Customers
  - Standby Customers
- Rate Making Challenges
  - Fair Compensation
- Design Considerations & Examples
- Indiana Standby Rates

Components of Rate Design Principles

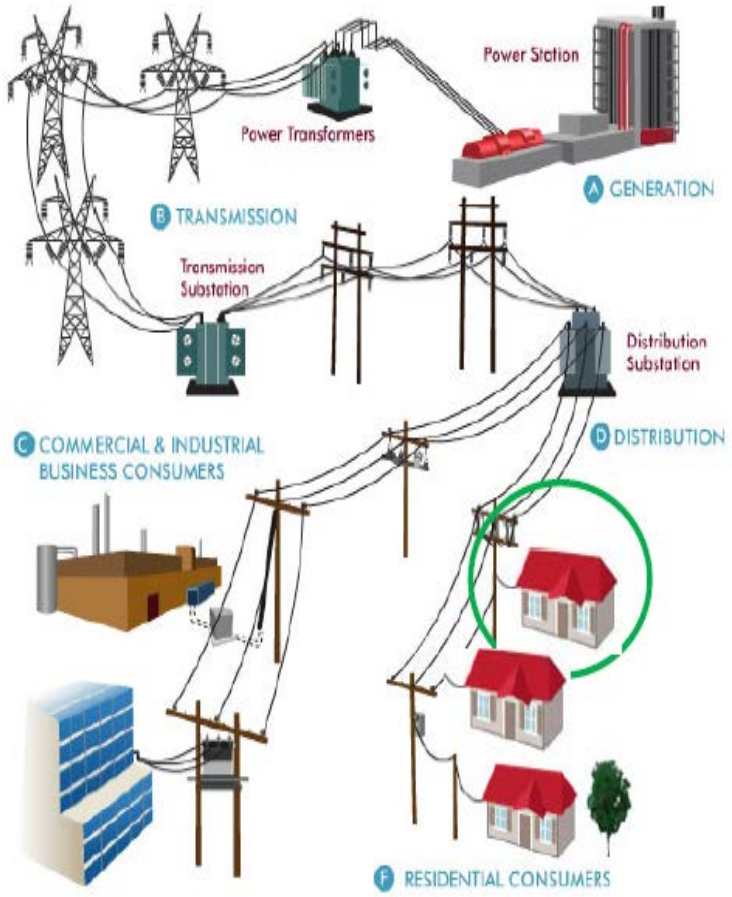
Individual Customers cost causation

- **Consider the components of full requirements service**
  - Local distribution service
  - Poles and Wires
  - Bulk Power
- **How does the individual customer affect each?**

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Components of Rate Design Principles

Local Distribution Cost



The only distribution costs that are attributable to any particular customer are the meter and service drop, and billing costs.

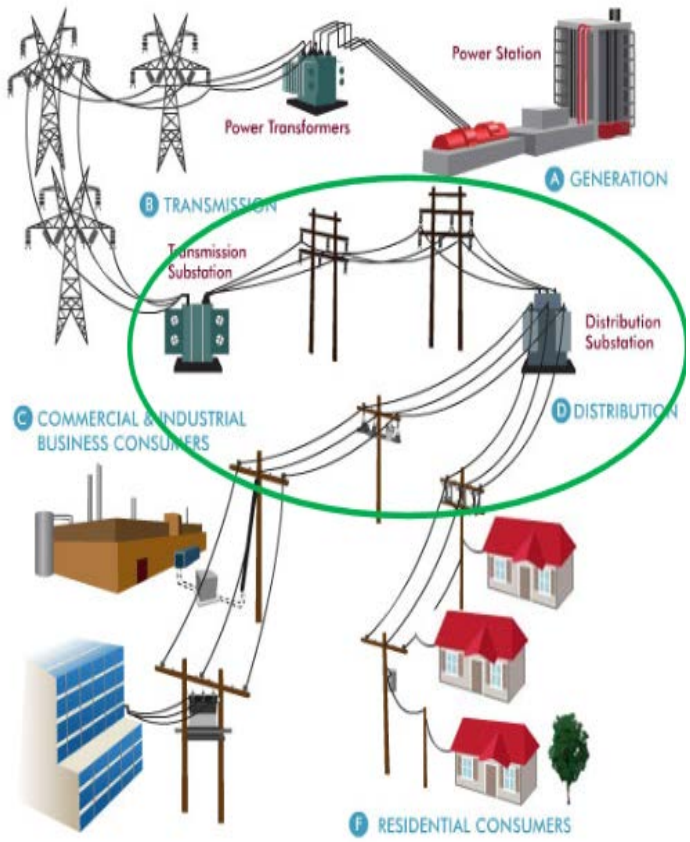
The transformer must be sized to the combined load of a few customers.

The rest is sized to combined load of many customers.

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Components of Rate Design Principles

Distribution Poles and Wires



The distribution infrastructure is sized to the combined loads of all customers.

Adding (or losing) a customer does not change these costs.

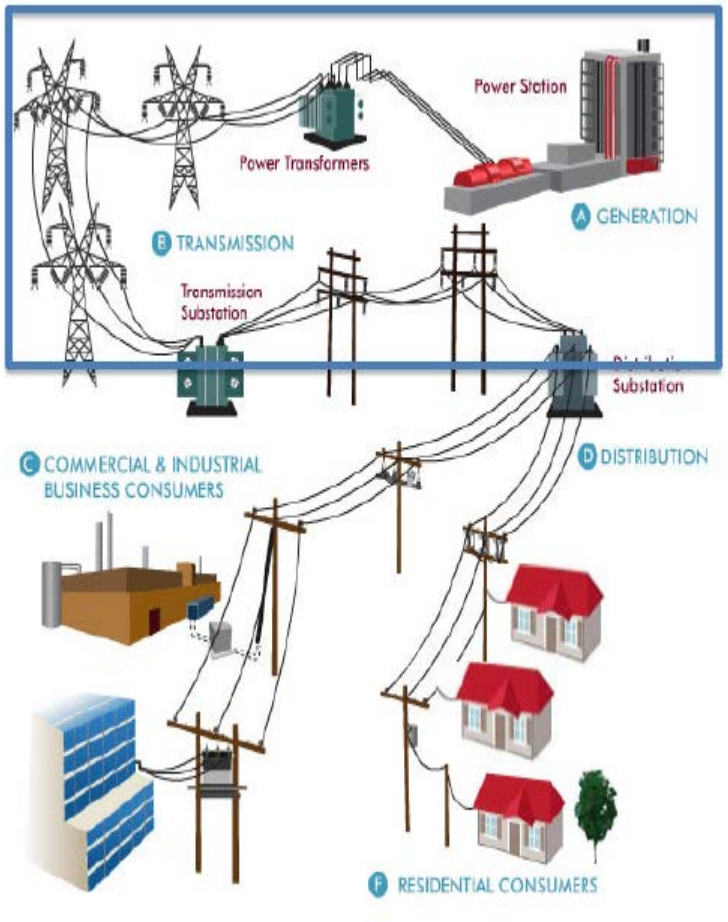
They are built to deliver electricity (kWh). All customers using them should share in the cost.

If combined peak demand changes, the system design would change.

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Components of Rate Design Principles

Recovery of Bulk Power Costs



Capacity requirements are driven by peak demand.

Baseload resources are built for energy.

Transmission is mostly associated with remote (baseload and renewable) generating plant.

The size of the bulk system is driven by the combine needs of all customers.

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Possible Components of A Standby Service Rate

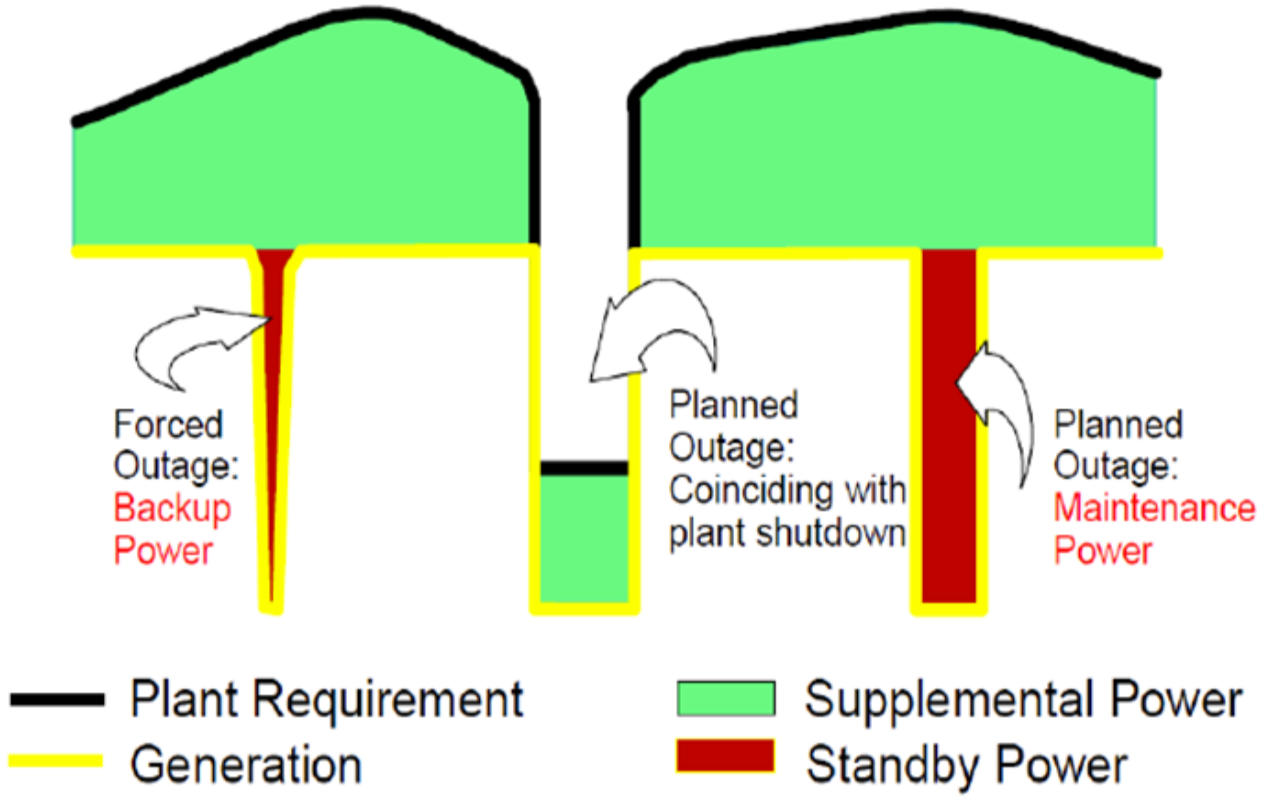
(also called Partial Requirements Service)

A set of retail electric services for customers with on-site, non-emergency generation

- *Backup power* during an unplanned generator outage
- *Maintenance* power during scheduled generator service
- *Economic replacement power* when it costs less than on-site generation
- *Supplemental power* - additional electricity supply for customers whose on-site generation does not meet all their needs
- *Delivery associated* with these energy services

Source: State and Local Energy Efficiency Action Network (SEEAction), "Guide to the Successful Implementation of State Combined Heat and Power Policies," March 2013

Example of a Self-Generator's Purchase Requirements



Source: Regulatory Assistance Project, Standby Rates for Combined Heat and Power Systems, February 2014

Traditional Utility Perspective

- Obligation to serve means standing ready to provide backup power when generator is not producing
- Utility maintains generation reserves and T&D facilities to do that, at a cost
- Failure to recover these costs from customer-generators results in a subsidy by other customers (or loss to utility)

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Rate Making Challenges presented by CHP

- Coincident outages are likely drivers of standby costs, not sum of individual customers' generators
- Use of standby service may not coincide with peak demand of the utility facility providing the service
- Individual lines and feeders may have substantial excess capacity during coincident outages (so no incremental cost), or they may be fully utilized and facing upgrades in the near future (and this changes over time)

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

On the Flip Side, there are benefits

- Where delivery system is facing upgrades:
  - Distributed generation may allow deferrals, in which case benefits my *offset* costs but this could be impacted by DG ownership
  - In some cases, these benefits my *exceed* costs
- Real net costs may be negligible, negative or unknown
- In some states public policy preference for less polluting energy sources is recognized as a benefit
- SO … Cost-causer principles for standby services are complex

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Fair Compensation Consideration

1. Value is a two (or more) way street
2. Consider all relevant sources of benefit and cost over the long term
3. Select & implement a valuation method
4. Cross-subsidies may flow either way

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Fair Compensation …

5. No more complicated than necessary
6. Support innovative power sector models
7. Keep incentive decision separate from rate design
8. Keep decoupling decision separate from rate design

Source: Regulatory Assistance Project, Designing Standby Rates Well, Standby Rates Workshop, Minnesota Department of Commerce, http://mn.gov/commerce/energy/images/RAP-DesigningStandbyRatesWell.pdf

Design Considerations for Standby Rates

- Reasonable balance between variable charges vs. contract demand or reservation charges
- Encouraging customer-generators to use electric services most efficiently and minimize cost they impose on the electric system
- Providing opportunities for customer-generators to avoid charges when they do not take service

14 MW biomass system, courtesy of MAN Diesel & Turbo North America, Inc.

Source: Regulatory Assistance Project, Standby Rates for Combined Heat and Power Systems, February 2014

Design Considerations...

- Load diversity – Generators won't all fail at the same time or during system peak
  - Shared T&D facilities are designed to meet demand by a pool of customers, not a single customer's need
  - This includes assessing renewable generation profile in aggregate
- Demand Charges
  - Daily as-used demand charges for backup power
  - Recognize on-peak vs. off-peak demand
- Opportunities for customer-generators to buy backup power at market prices and avoid utility reservation charge for generation service
- Option for customer demand response or storage to mitigate all or a portion of backup charges
- Option to self-supply reserves

Source: Regulatory Assistance Project, Standby Rates for Combined Heat and Power Systems, February 2014

Indiana Standby Rates

- Nipsco: Rider 676
  - Curtailable
  - Only available for larger customers (> 10 MW)
- Duke Energy: Multiple applicable Riders
  - Rider 80 (Interconnection)
  - Rider(s) 50, 51 (Parallel Operation)
  - Rider 23 (Peak Load Mgmt)
- Indiana Michigan Power (AEP)
  - Customers with DG/CHP facilities shall take service under Rider NMS, Tariff COGEN/SPP or by special agreement with the Company.
- Indy Power and Light: Multiple applicable riders
  - Rate CGS
  - Riders 10, 11, 12
- Vectern – Rate BAMP (Backup, Auxiliary and Maintenance Power)
  - Available for customers with greater than 1 MW load

Sources: Northern Indiana Public Service Company, Electric Service Tariff, Rider 676, Effective December 27, 2011; Duke Energy, Standard Contract Rider No. 51: Parallel Operation of Customer Owned Generation Capacity and Energy Credits ; Indiana Michigan Power Company, Schedule of Tariffs, Effective February 2013; Indy Power and Light, Contract Riders No 10, 11, 12, Effective March 30, 2010; Vectern Energy Delivery, Tariff for Electric Service, Rate BAMP, Effective May 3, 2011

Indiana Standby Rates

Nipsco:

Rider 676 only available to customers on rates 632 or 633 (Minimum load > 10 MW)

- No Reservation Charge
- Daily as-used standby demand charge
- No Ratchets
- Price discount for maintenance service
- Curtailable

For all other rate classes...

No standby service for customers ineligible for rates 632 or 633

- Standby demand subject to yearly ratchets
- Maintenance outage treated the same as a forced outage

Source: Northern Indiana Public Service Company, Electric Service Tariff, Rider 676, Effective December 27, 2011

Indiana Standby Rates

Duke Energy:

No specific standby rate but Customer has two options:

- Customers will be supplied supplemental, backup and maintenance capacity and energy *under the rates and charges and terms and conditions of the applicable retail rate schedule*.
- Special Contract – A special contract may be available for backup and maintenance capacity and energy at a negotiated rate.

Source: Duke Energy, Standard Contract Rider No. 51: Parallel Operation of Customer Owned Generation Capacity and Energy Credits

Indiana Standby Rates

AEP (Indiana Michigan Power):

Rider NMS

- Only available for Net Metering Customers (Renewable, generation under 1 MW)

Rider Cogen/SPP

- PURPA Rate
- Only for customers with generation < 100 kW

All other customers need to make special arrangements with AEP...

Source: Indiana Michigan Power Company, Schedule of Tariffs, Effective February 2013

Indiana Standby Rates

Indy Power and Light:

Rate CGS

- Prices for avoided rate purchase by company

Riders 10 – 12: Back-up, maintenance and supplemental power rates will be calculated at the same rate as the existing service.

- Demand Ratchet
- Backup and Maintenance service priced the same

Source: Indy Power and Light, Contract Riders No 10, 11, 12, Effective March 30, 2010

Indiana Standby Rates

Vectern:

Rate BAMP:

RATES AND CHARGES

The monthly Rates and Charges for service hereunder shall be:

Customer Facilities Charge:	$100.00 per month
Capacity Charge:	
Backup Power	
-firm	$6.21 plus 120% of the capacity component in the current Rate CSP, per kVa of Rated Capacity.
-non-firm	$6.21 per kVa of Rated Capacity, plus $2.98 per kVa of Billing Demand.
Auxiliary Power	The Capacity Charge of Customer's applicable Rate Schedule, per kVa of Billing Demand
Maintenance Power	The applicable Demand Charge per kVa currently in effect for Rate LP, exclusive of any minimums.
Transmission Voltage Discount (for delivery at 69kV or higher)	$2.34 per kVa of Billing Demand or Rated Capacity.
Energy Charges:	
All kWh used (Backup)	100% of Company's hourly incremental energy costs, per kWh, inclusive of any variable production charges.
All kWh used (Auxiliary and Maintenance)	The Energy Charge and Variable Production Charge and the Fuel Cost Adjustment in Appendix A of Customer's applicable Rate Schedule.

Source: Vectern Energy Delivery, Tariff for Electric Service, Rate BAMP, Effective May 3, 2011

Conclusion & Next Steps

Lots of CHP Potential!

- Industrial: 1,663 MW on-site… 3,643 MW with export
- Commercial: 1,412 MW
- Waste Heat to Power CHP: 501 MW

CHP can…

- increase energy reliability
- reduce costs to Indiana customers
- help Indiana keep industry/jobs in the state
- potentially attract new industry/jobs into the state with favorable CHP policies

Conclusion & Next Steps (cont.)

- Standby Rates may be adding additional costs to CHP Projects
  - Analysis of current standby rates could provide better understanding of impact on CHP technologies
  - Indiana stakeholder process could provide opportunity for input on impact of standby rates on potential CHP customers investment decisions
- Midwest CHP TAP can provide direct technical assistance to specific CHP projects in Indiana

Thank You

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