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Greenhouse Gas Credits and Renewable Energy Incentives for Coal Mine Methane Projects

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Coal Mine Methane Outreach Program
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U.S. EPA Coalbed Methane Outreach Program

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Overview

- Carbon Credit Incentives
  - Introduction to GHG Registries
  - CMM Project Eligibility
  - Overview of GHG Registries
  - Registry Comparisons
- Renewable Energy Incentives
  - Renewable Energy Portfolio Standards
  - States that Include CMM
  - Overview of State Policies
  - Variation in RCEs Prices

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Carbon Credit Incentives

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Introduction to GHG Registries in U.S.

- Coal mine methane (CMM) projects can generate a significant number of greenhouse gas (GHG) emission reduction credits (100,000s per year)
  - Considered medium-to-large projects
- Carbon credits traded in the voluntary offset market typically require use of third-party GHG registries
  - In 2010, 66% of all voluntary carbon offset transactions were listed with GHG registries, up from 50% in 2009 (and 30% in 2008)
- CMM projects may be eligible to register carbon credits under several voluntary GHG registries in U.S.:
  1. Climate Action Reserve (CAR)
  2. Voluntary Carbon Standard (VCS)
  3. Chicago Climate Exchange (CCX)
  4. American Carbon Registry (ACR)

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Project Eligibility

- Each registry has its own rules regarding project eligibility, additionality, and registration
- Eligibility parameters include:
  - Project start-up date and registry listing date
  - Origin of methane (i.e., active vs. abandoned mines, surface vs. underground mines)
  - End utilization technology (i.e., electricity generation vs. pipeline sales)
  - Additionality (e.g., technical, institutional, and financial barriers)
  - Monitoring and metering techniques

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1. Climate Action Reserve (CAR)

- Non-profit registry based in California
- Launched in 2008
- Project-specific protocols:
  - Currently 12 protocols including coal mine methane
- Project eligibility based on Protocol's performance standard (no additionality tests added)
- Offset credits: Climate Reserve Tonnes (CRTs)
  - 1 CRT = 1 tonne carbon dioxide equivalent (CO_2e) credits
- Four protocols accepted into California Air Resources Board Cap-and-Trade Program

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CAR's CMM Project Protocol

- Version 1.0 issued on 7 October 2009
  - Issues credits only for destruction of CH_4 that would otherwise have been emitted to the atmosphere
    - Includes electric power generation, on-site usage, and flaring
    - Unlike CDM projects, CMM projects capturing CH_4 to generate electricity only receive credit for CH_4 destroyed but no additional credits for displacing grid-based electricity (can add 10%)
  - Does not consider projects that send CMM off-site through a commercial pipeline
- Version 2.0 remains under development
  - Working group came to impasse in 2011 over establishing performance standard tests for projects that send gas to pipelines
  - In August 2011, CAR deemed the current data available for analysis to be insufficient to further develop performance standards
  - In September 2012, CAR plans to use US EPA GHG reporting data from 2010 to conduct additional analyses

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CAR CMM Projects

- Registered projects:
  - VAMOX Demonstration Project at Jim Walter Resources No. 4 Mine in Alabama (2009)
  - Green River Trona Mine Methane Destruction and Utilization Project in Wyoming (2010)
- Listed projects:
  - Verdeo McElroy VAM Abatement Project in Pennsylvania
  - Green Holdings Enlow VAM Abatement Project in Pennsylvania
- As of October 2011, 145,639 CRTs have been issued for registered projects (<1% of CAR total)

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2. Verified Carbon Standard (VCS)

- The first multiple registry system within the voluntary carbon market
  - APX Inc. in North America
  - Caisse des Depots in Europe
  - Markit in the U.S., United Kingdom, and Asia Pacific regions
- Launched in 2006
- Uses Clean Development Mechanism (CDM) methodologies established in the Kyoto Protocol rules
- Provides a framework to develop new VCS methodologies or revise existing CDM methodologies
- Offset credits: Verified Carbon Unit (VCU)
  - 1 VCU = 1 tonne CO_2e

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VCS CMM Methodology

- Uses CDM's consolidated methodology ACM0008
  - August 2010 - Version 7 included surface mines
- Project types include pipeline sales, boiler use, electricity generation, flaring, and VAM
- Must use CDM Tools:
  - Additionality, flaring, electric grid EFs, fossil fuel use
- Modifications to the CDM methodology:
  - March 2009: includes surface mine methane (SMM) projects – *VMR0001*
  - August 2010: includes abandoned mine methane (AMM) projects – *VMR0002*

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VCS CMM Projects

- As of October 2011, 46 registered CMM/AMM/SMM projects
  - 2 SMM and 3 AMM projects in the United States
  - 2 CMM projects in China and 1 AMM project in UK
  - 38 projects in Germany (including 18 AMM projects), accepted:
    - As “renewable energy” projects (energy produced from CMM/AMM is considered renewable energy by German law) and allowed under the VCS V1 standard from 2006
- As of October 2011, ~842,000 VCUs have been issued for the 5 registered CMM projects in U.S.

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VMR0001 or ACM0008 V.7

- VMR0001 is inconsistent with latest ACM0008 Version 7 for SMM projects
  - ACM0008 - CMM pre-drainage wells must be mined through or enter zone of influence to be eligible for credits
    - Proposed for small surface mine in Philippines
  - VMR0001 - CMM pre-drainage wells must demonstrate connectivity with mine face (e.g. increased air content) to be eligible for credits
    - In case of PRB mines where wells may be shut in 3-5 years ahead of the mining face advance, VMR0001 allows for crediting to be realized much earlier (years) than ACM0008 methodology

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3. American Carbon Registry (ACR)

- The first private voluntary GHG registry in the U.S.
- Launched in 1996 as a non-profit
- Developed standards and methodologies for forestry, livestock, landfill, oil & gas, and carbon sequestration
- Joined Winrock International in 2007
- Has no CMM-specific methodology, but considers methodologies from other standards (if consistent with the ACR Technical Standard):
  - CDM, VCS, & U.S. EPA Climate Leaders
- As of 1 October 2011, there are zero CMM projects registered
- Four protocols accepted into California Air Resources Board Cap-and-Trade Program

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4. Chicago Climate Exchange (CCX)

- Operated as a cap-and-trade system from 2003 - 2010 requiring members to make legally binding commitments to reduce emissions
- Offset credits: Carbon Financial Instrument (CFI)
  - 1 CFI = 100 tonnes CO_2e
- An early leader in U.S. GHG registries, but uncertainty as to acceptance into a federal cap-and-trade system led to a CFI price collapse in early 2009
  - Less than 30,000 tonnes were registered in 2010
  - Less than 5,000 tonnes were registered in 2011
- Since January 1, 2011, CCX operates as a GHG registry and trading platform only for its established protocols

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CCX CMM Projects

- 11 projects registered through 2009
  - 5 international projects in China and Germany
  - 4 AMM projects
- CMM project offsets registered: 18 million tonnes CO_2e
  - Represents 22% of all offsets registered at CCX

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Comparison of CMM Methodologies

Project Start Date and Location

Registry	Project Start Date	Coal Mine Type	Eligible Project Locations
CAR	Must be listed within 6 months of project start date	Underground	U.S.
VCS	Must be validated within 24 months of project start date	Underground, surface, and abandoned	Worldwide
ACR	On or after 1 January 2000	Underground, surface, and abandoned	Worldwide
CCX	On or after 1 January 2003	Underground and abandoned	U.S. and non-Annex 1 countries

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Comparison of CMM Methodologies

CH_4 Utilization Technology

Registry	CH_4 Utilization Technology		
	Combustion/destruction on site by approved technology (e.g., electric power generation unit, boiler, heater, flare)	Sell directly to pipeline	Destruction of VAM by approved destruction device (e.g., thermal oxidizer)
CAR	X		X
VCS	X	X	X
ACR	X	X	X
CCX	X	X	

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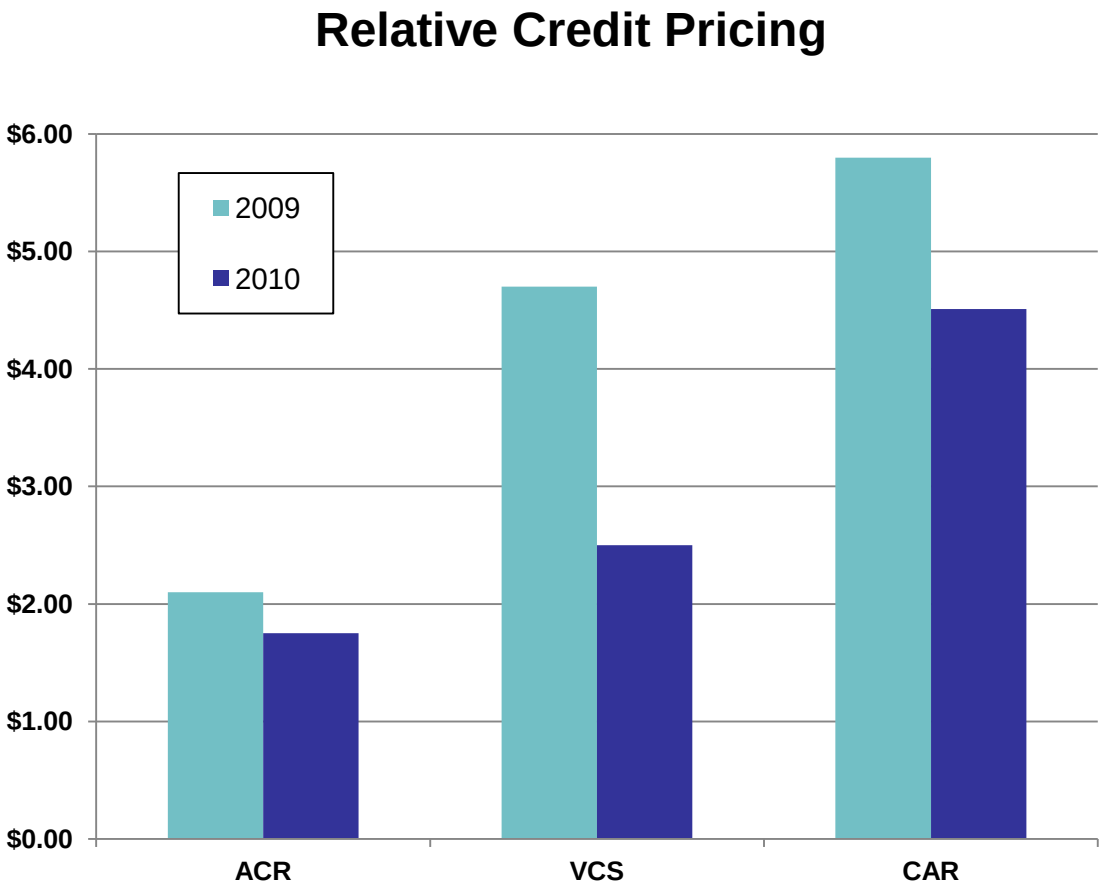
Value of Voluntary Carbon Credits



Source: New Carbon Finance and Evolution Markets

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GHG Market Trends and Observations

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- Most large U.S. CMM projects registered with CCX in 2006 through 2008 (before price collapse)
  - GHG market pioneers CCX no longer an alternative
- Expect $4-5/tonne price in U.S. voluntary market to remain flat in near term
  - Too low to incentivize VAM projects
- Future direction of CMM project offsets:
  - Eventual inclusion into ARB ($8-10/tonne)
  - Inclusion into Western Climate Initiative
    - Protocol review process nearly finalized
    - State of Utah a WCI Partner

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Renewable Energy Incentives

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Renewable Energy Portfolio Standards

- RPS: a state policy that requires electricity providers to obtain a minimum percentage of their power from renewable energy resources by a certain date
- Several states have Alternative Energy Portfolio Standards
- 29 states have RPS policies in place
  - 3 of these states accept CMM as an alternative or renewable energy source including:
    - Pennsylvania, West Virginia, Ohio
- 8 states have RPS or clean energy goals
  - Indiana (Clean Energy Portfolio Goal) accepts CMM
  - Utah (Renewable Portfolio Goal) accepts CMM

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Regulations in 11 Coal Mining States

State	% of CMM Emissions (UG)	State RPS?	Type of RPS	CMM included?	RPS or Goal %	Year
West Virginia	27%	Yes	Renew & Alt Energy	Yes	25%	2025
Alabama	17%	**No**				
Pennsylvania	16%	Yes	Alternative Energy	Yes	18%	2021
Colorado	10%	Yes	Renewable Energy	No	30%	2020
Kentucky	7%	**No**				
Illinois	5%	Yes	Renewable Energy	No	25%	2025
Virginia	5%	Yes	Renewable Energy	No	15%	2025
Utah	4%	Yes	Renewable Energy	Yes	20%	2025
Indiana	3%	Yes	Clean Energy	Yes	15%	2025
New Mexico	3%	Yes	Renewable Energy	No	20%	2020
Ohio	2%	Yes	Alternative Energy	Yes	25%	2025

Note: These 11 states represent 99% of CMM emissions from underground coal mining

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Renewable Energy vs. Alternative Energy

- States typically define renewable energy sources similarly and will include sources such as:
  - solar-electric, solar thermal energy, wind power, hydropower, geothermal energy, fuel cells, and certain biomass energy
- Alternative energy sources vary from state to state and may include sources such as:
  - waste coal, advanced coal technology, synthetic gas, demand side management, and solid waste conversion technologies
- Pennsylvania and Ohio group renewable energy and alternative energy sources together in their state plans, while West Virginia keeps them separate
- Utah has only renewable energy standards
- Indiana uses “clean energy” standard

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Renewable & Alternative Technologies

Technologies	Pennsylvania	West Virginia	Ohio	Utah	Indiana
Solar photovoltaic or other solar electric energy	X	X	X	X	X
Solar thermal energy	X	X	X	X	X
Wind power	X	X	X	X	X
Qualifying hydropower	X	X	X	X	X
Geothermal energy	X	X	X	X	X
Biomass energy	X	X	X	X	X
Biologically derived methane gas	X	X	X	X	X
Landfill methane gas	X	X	X	X	X
Fuel cells	X	X	X		X
Coal mine methane (Abandoned)	X	X	X	X	X
Coal mine methane (Operating)	X	X	X	X	X
Waste coal	X	X			
Demand-side management	X		X		X
Distributed generation system	X				
Distributed combined heat and power (CHP)			X		X
Advanced coal technology		X	X		X
Natural gas from coal gasification or liquefaction		X			
Natural gas that displaces electricity from coal					X
Synthetic gas		X			
Integrated gasification combined cycle		X			
Tire-derived fuel		X			
Recycled energy		X			
Generation III advanced nuclear power			X		
Certain solid waste conversion technologies			X		
Energy efficiency improvements			X		X
Compressed air				X	

Source: DSIRE (Database of State Incentives for Renewable Energy)

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Pennsylvania's AEPS

- Created by S.B. 1030 on November 30, 2004
- Electric distribution companies and electric generation suppliers must supply 18% of electricity using alternative energy resources by 2020
- The standard includes 2 categories of alternative energy resources:
  - **Tier I**: *coal mine methane*, wind, photovoltaics, biomass, geothermal, solar-thermal energy, etc.—must supply 8% of electricity by May 31, 2021
  - **Tier II**: waste coal, distributed generation systems, municipal solid waste, large-scale hydro, etc .—must supply 10% of electricity by May 31, 2021

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West Virginia's RPS

- Enacted June 2009
- Utilities with >30,000 customers must supply 25% of retail electric sales from alternative and renewable sources by 2025
  - 10% from 2015 – 2019
  - 15% from 2020 – 2024
  - 25% by Jan. 1, 2025
- The standard does not require a minimum contribution from renewable energy resources (i.e. the standard could be met using alternative energy resources)
  - Renewable: solar-electric, solar thermal energy, wind power, fuel cells, geothermal, etc.
  - Alternative: *coal bed methane*, coal technology, natural gas, waste coal, etc.

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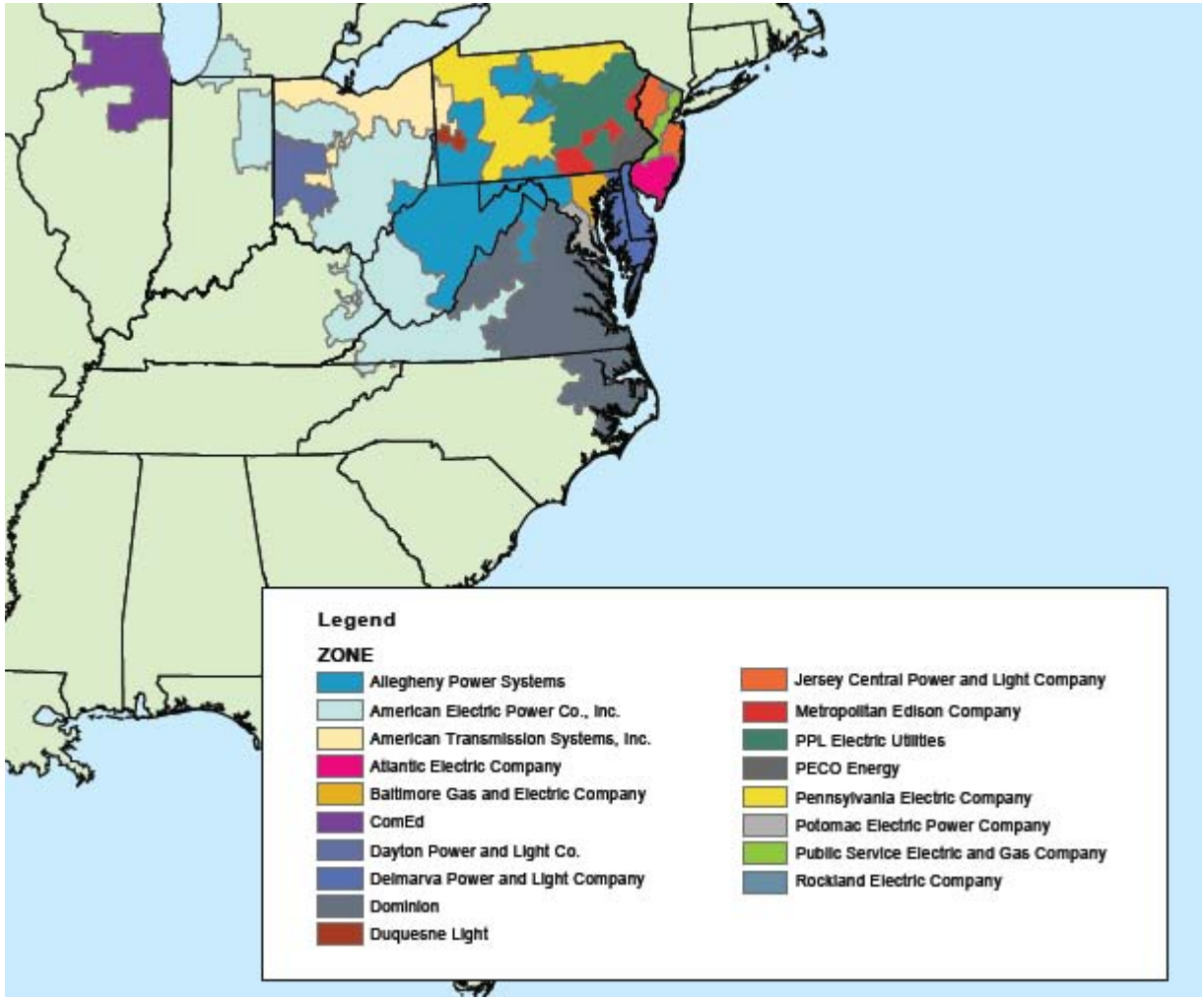
PA and WV accept RCEs from PJM Zone



Note: CMM projects in Virginia and eastern Kentucky could be included

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Ohio's RPS

- Enacted by S.B 221 in May 2008
- Utilities (all retail electricity providers except municipal utilities and electric cooperatives) must provide 25% of their retail electricity supply from alternative energy resources by 2025 (with at least 12.5% from renewable energy resources)
- Alternative energy resources include both:
  - Renewable energy resources: CMM emitted from *abandoned coal mines*, solar photovoltaics, solar thermal technologies, wind, geothermal, biomass, landfill gas, etc.
  - Advanced energy resources: *CMM from operating or abandoned coal mines,* clean coal, generation III advanced nuclear power, fuel cells, etc.
- CMM was not included in the original 2008 law but added as part of amendments in July 2009

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Utah's RPG

- Enacted by S.B. 202 in March 2008
- More of a renewable portfolio goal (RPG):
  - "To the extent that it is *cost-effective* to do so…..renewable energy certificates in an amount equal to at least 20% of adjusted retail electric sales"
  - Cost effectiveness determined by utilities based on risk, reliability, long-term, and short-term impacts
- Eligible renewable sources:
  - solar, wind, biomass, hydroelectric, *coal mine methane from an abandoned coal mine or from a coal degassing operation associated with a state-approved mine permit* (added in 2010)
  - Sources can be located within the geographic boundary of the Western Electricity Coordinating Council (WECC)

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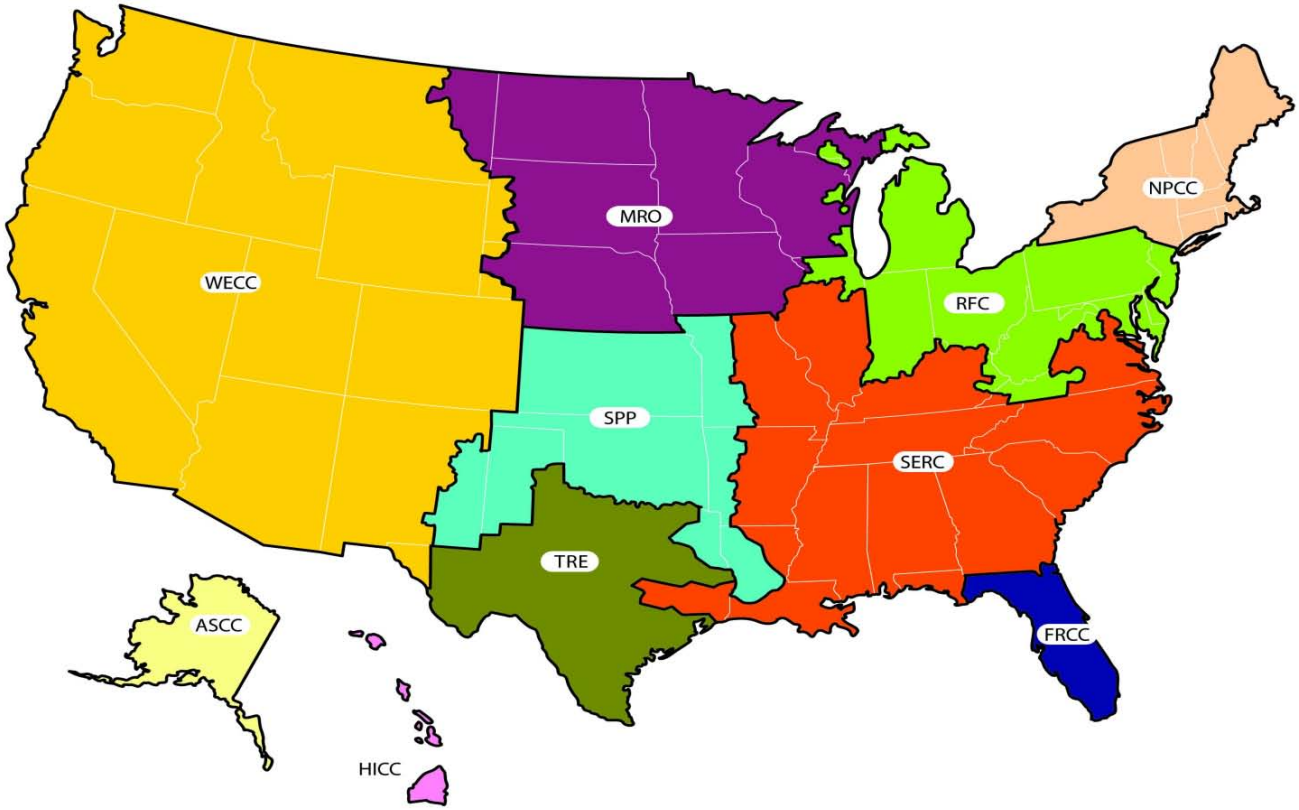
WECC includes 11 Western States



Source: U.S. EPA eGRID 2010 Version 1.0

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Indiana's CPS

- A clean energy portfolio standard (CPS) based on voluntary goals enacted by S.B. 251 in May 2011
- Goal for public utilities to supply 10% clean energy by 2025 based on 2010 levels
- Eligible technologies for clean energy: solar, photovoltaic cells and panels, organic waste biomass, hydropower, hydrogen, *coal bed methane*, etc.
- 50% of qualifying energy must come from within the state
- Program rules to be adopted by January 2012

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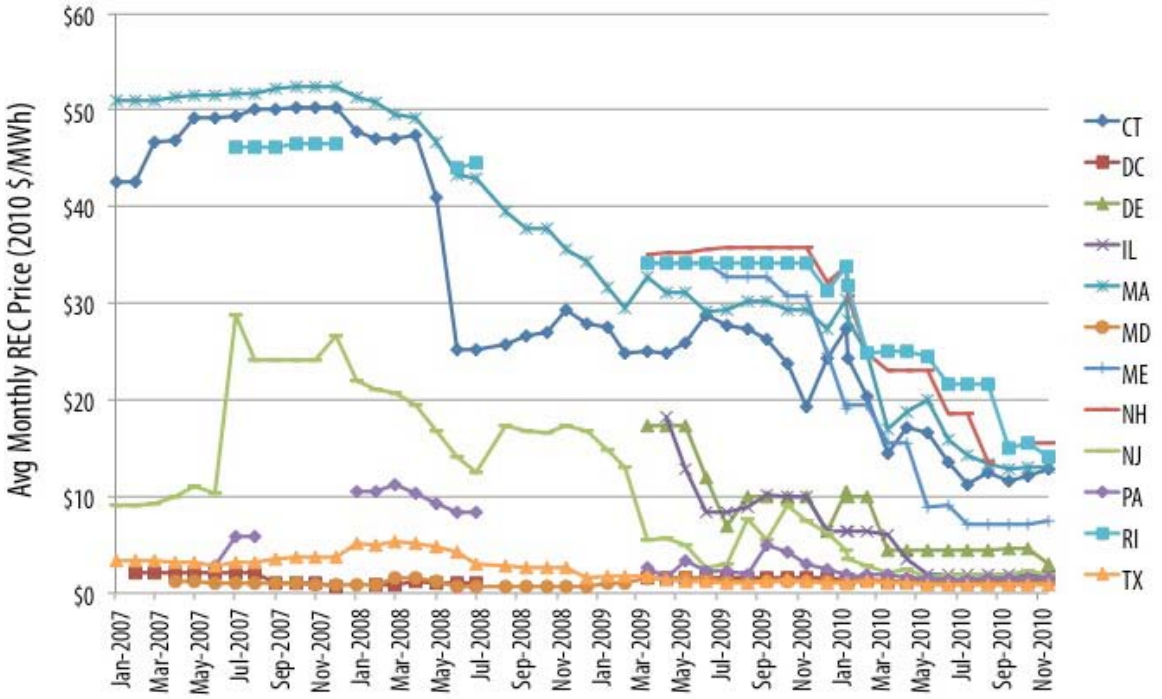
RECs Prices Vary from State to State

Typical compliance RECs range from $10-$30/MW-hr

<u>Factors that affect price:</u>

- Resource quality
- Electricity prices
- Cost-effectiveness
- RPS demand



Source: U.S. DOE Green Power Network

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RECs Incentives Conclusions

- CMM projects typically do not generate electricity in the U.S.
  - As a result, RECs may have limited application
  - May see more AMM projects generate electricity
- States with 48% of CMM emissions do not have RPS or do not include CMM as eligible source
  - CMM advocates need to place more focus toward state RECs programs

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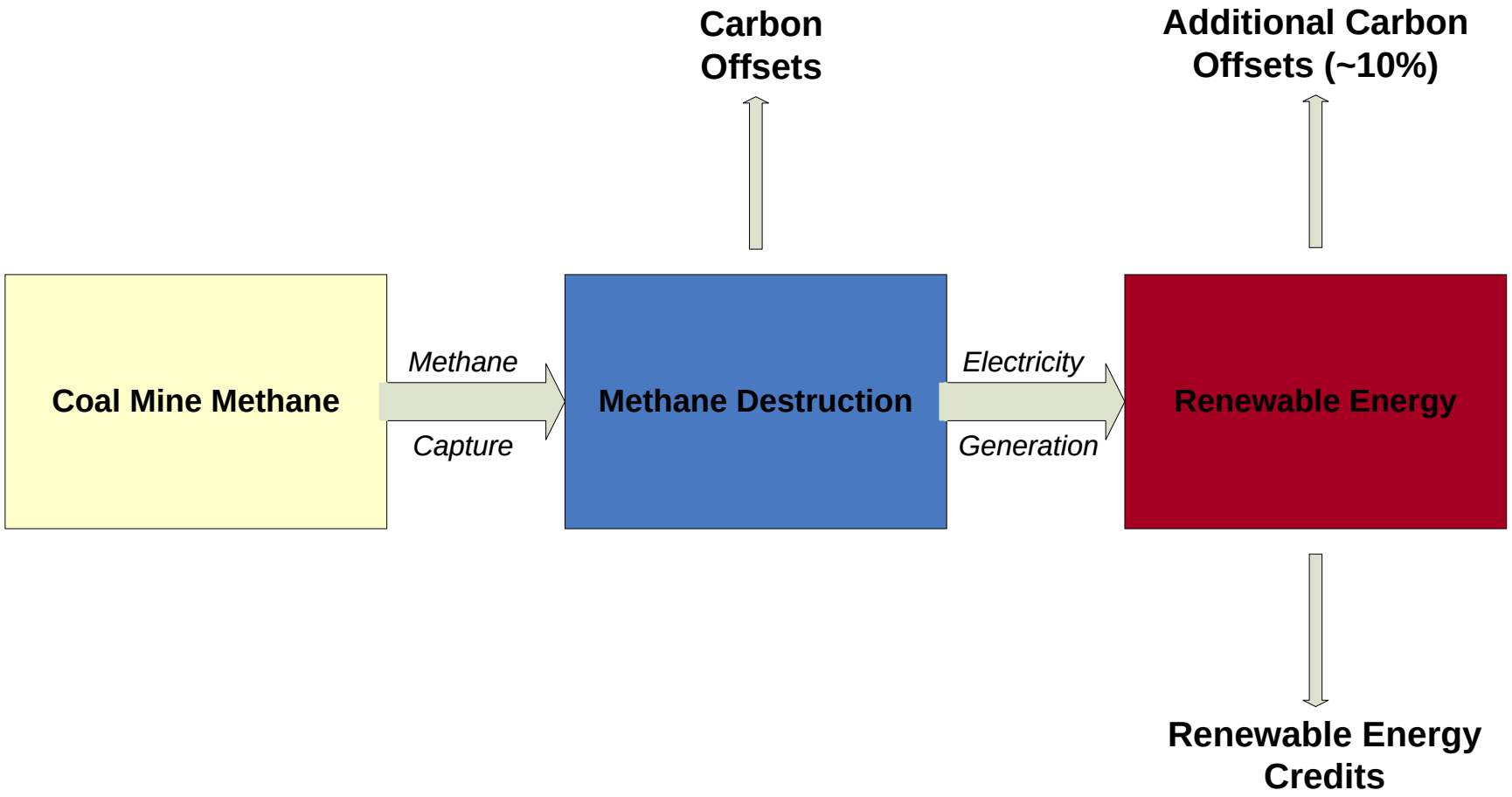
RECs vs Carbon Credits



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RECs vs Carbon Credits

- **Which adds more value?**
  - Depends on several factors:
    - Compliance RECs price ($10-$30/MW-hr)
    - Voluntary RECs price ($1.00-$2.00/MW-hr)
    - Carbon price ($4-$5/metric ton CO_2e)
    - Need CO_2 emissions factor of electric grid to determine the equivalence
      - Calculate combined margin using CDM elec. grid tool
  - 1 Carbon Credit may equal 1.0-2.5 RECs in U.S.
  - In *voluntary* RECs markets, carbon credits typically adds more value
  - In *compliance* RECs markets, RECs add more value

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Questions?

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