

International Experience with Policies to Support AMM Projects

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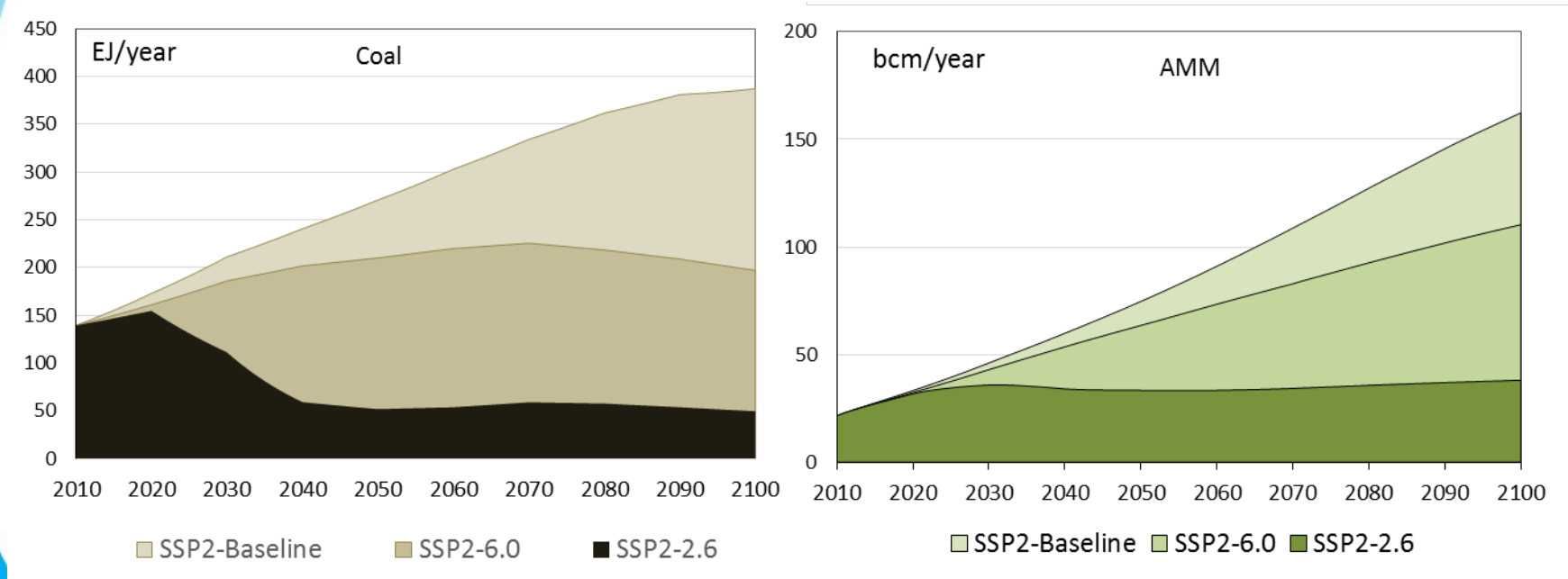


Why is AMM Policy Important?

- Abandoned mines are a significant source of methane emissions
- AMM policy is often overlooked, but appears critical to project success
- Proper legal and regulatory framework and defined ownership rights can facilitate AMM utilization
- Incentives or tax policies can promote AMM utilization

Coal Production and AMM Emissions: Baseline and Policy Scenarios

- AMM increases faster than underground coal production
- AMM emissions grow even if coal production declines



Policy Support and Inventories

- With limited incentives to reduce AMM emissions, AMM emissions may not be tracked carefully
- Ironically, lack of tracking can also lead to less interest in addressing AMM

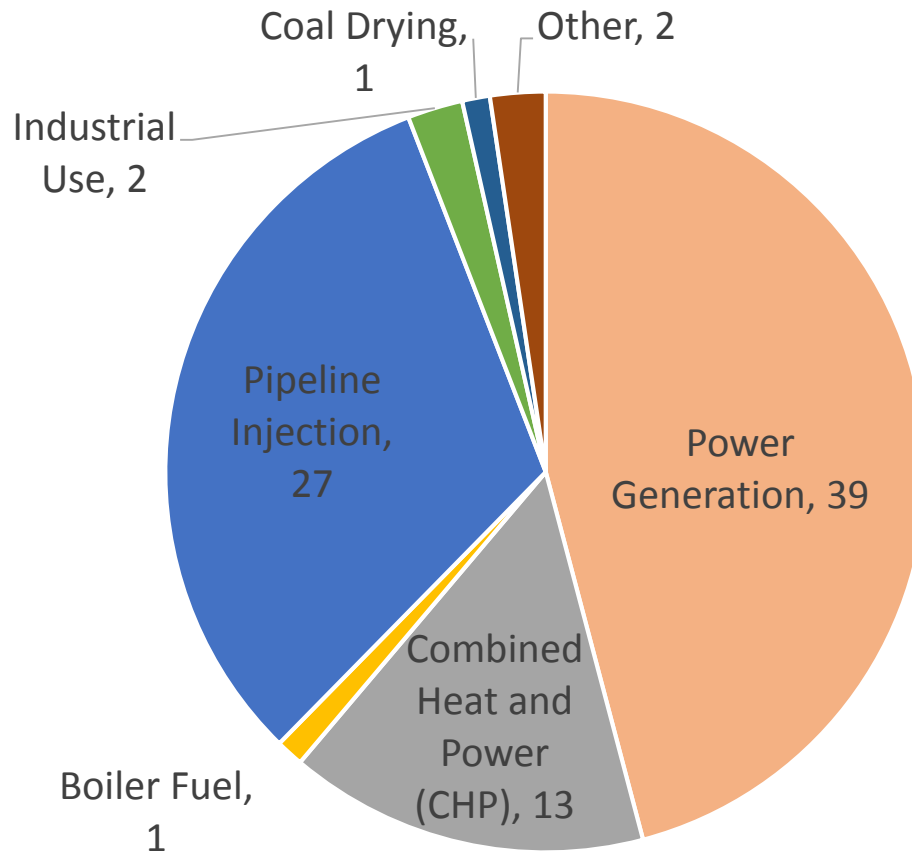
	AMM emissions coefficient, kg CH ₄ /Mt coal	Average mine depth in 2010, m
Australia	28	500
Germany	11	1150
United Kingdom	25	850
United States	46	373
China	3	456
Ukraine	0.4	730

AMM coefficient is a ratio of reported AMM emissions in 2010 to cumulative underground coal production in 1961-2010





Case Studies

- Many countries have operational AMM projects
- Germany, the United Kingdom, Australia, and the United States can provide valuable lessons for other countries
- AMM utilization rates in these countries are from 29% to 99%

Operational AMM Projects Around the World



AMM Case Studies: Key Findings

Country	AMM utiliz. rate	Royalties	Key Policies
Germany 	99%	10%	<ul style="list-style-type: none"> • Clear gas rights and licensing process • Feed-in tariffs/market premium for AMM
UK 	58%	Taxes instead	<ul style="list-style-type: none"> • Clear rights and licensing procedures • Fairly high taxes • AMM exempted from climate change levy
Australia 	31%	10%	<ul style="list-style-type: none"> • AMM is not defined as a resource • Flaring is prohibited
US 	29%	12.5%	<ul style="list-style-type: none"> • Royalty relief (some states) • AMM in Renewable Portfolio Standards (some states) • Carbon offsets

Based on draft PNNL paper on AMM policies, scheduled for release later this year

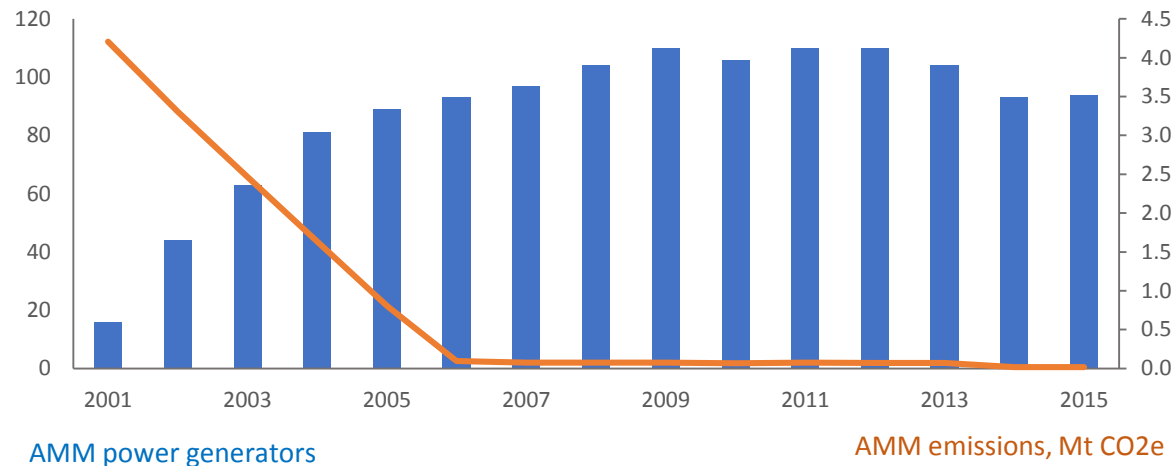
Case Study: Australia

- No national legislative framework regarding AMM ownership and licensing
- AMM is not defined as a resource in national and state regulatory framework
- No incentives for AMM production
- AMM projects only in New South Wales*
- Royalty rate is 10% of petroleum gross value at the wellhead (NSW)

* Source: GMI database of CMM projects. Number of projects.
Accessed September 2018. <http://projects.erg.com/cmm/projects/ProjectFind.aspx>

Case Study: Germany

- Rights to CMM are provided to coal companies
- Feed-in-tariff (and later market premium incentives) for AMM
- Germany has the largest number of active AMM projects
- Active AMM projects utilized up to 99% of AMM

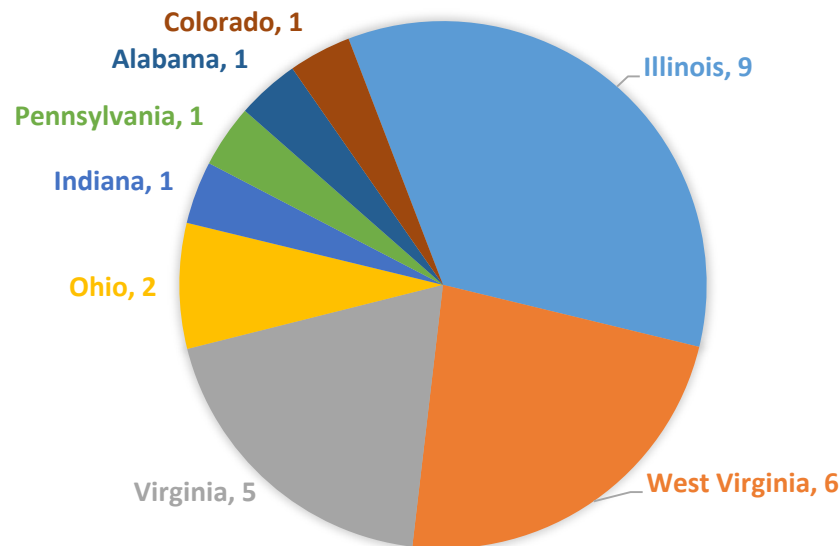


Case Study: United Kingdom

- Government owns the methane associated with coal
- Oil and Gas Authority auctions rights to methane recovery
- Tax benefits for AMM utilization (Climate Levy)
- Active AMM projects in the UK utilize about 58% of total methane emissions from abandoned mines
- No more active underground mines after December 2015

Case Study: United States

- Federal lands: government issues coal leases without AMM rights
- Private lands: the coal owner has the AMM rights
- No federal incentives to promote AMM utilization
- Several states define AMM as a renewable energy source, creating financial incentive



Key AMM Policy Actions for Success

- Enact clear procedures for obtaining AMM ownership rights
- Allow for transfer of methane rights from the mine to the gas developer
- Consider including AMM as a renewable energy resource
- Set royalties at a low level to encourage investments
- Offer reduced taxes or other incentives to support AMM projects