
ANOTHER STEP FORWARD

Incentivizing Environmentally Responsible Development of Marcellus Shale

A Penn Strategies White Paper
Prepared by Christine Kight
February 2018



McConnell's Mills State Park, Image Credit: Clean Water Action

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Summary:

Incentivizing compliance to higher environmental standards allows The State of Pennsylvania to make progress both economically and environmentally.

1. The benefits of Natural Gas are far-reaching, and have a positive national and global, economic and environmental impact.
2. Natural Gas has significantly boosted Pennsylvania's wages, employment rate, and tax revenues, and reduced our cost of doing business and cost of living.
3. Clean Natural Gas offers Pennsylvania some important environmental benefits including replacing coal, lowering our carbon footprint and stabilizing renewable energy.
4. Ineffective management of natural gas wastewater has compromised our water quality, and projections indicate looming amounts of produced water will *demand* a sustainable treatment solution.
5. Regulatory initiatives have made an improvement but have proven challenging to enforce.
6. WMGR123 and 25 PA Code §78 offer strong standards, and Pennsylvania can expect continued environmental improvement in response to *full* compliance.



Summary:

Incentivization of more expensive but more robust wastewater treatment will offer The Commonwealth superior environmental outcomes and reduce the future financial burden of reclamation.

7. Third-party multi-stakeholder certification offered by the CRSD offers an even higher standard and another impetus for environmental improvement.
8. Environmental Incentivization offers a synergistic approach which is both more effective and less expensive to enforce.
9. Penn Strategies proposes a scalable tax rebate and / or credit for oil and gas producers that utilize CWTs which offer Full De-Wasting Treatment. We *also* ask for an additional tax incentive for producers whose wastewater treatment complies with CRSD standards.
10. Adoption of *both* recommended incentivization strategies will proactively protect the Commonwealth from mounting environmental repercussions, and future reclamation expense.

ENERGY REVOLUTION



1: The benefits of Natural Gas are far-reaching and have a positive national and global economic and environmental impact.

According to a joint report from The Hamilton Project and the Energy Policy Institute at the University of Chicago, “The United States is in the midst of an energy revolution. The North American shale boom has unlocked vast quantities of natural gas, upending domestic electricity markets and enabling rapidly growing export volumes.”¹

An article in The New York Times entitled U.S. Boom in Natural Gas Could Ripple From the Arctic to Africa suggests, “A shale gas drilling boom over the last decade has propelled the United States from energy importer to exporter, taking the country a giant leap toward the goal of energy independence declared by presidents for half a century.”²

ECONOMIC BENEFITS



2: Natural Gas has significantly boosted Pennsylvania's wages, employment rate, and tax revenues and reduced our cost of doing business and cost of living.

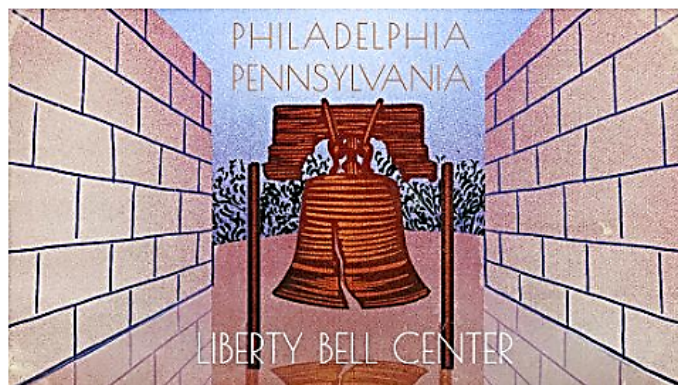
This boom has played an important role in Pennsylvania's economic growth as "Pennsylvania accounts for 19 percent of total U.S. natural gas production, and 76 percent of total Marcellus Shale production"³ making Pennsylvania the nation's second-largest natural gas producer for the fourth consecutive year.⁴

According to The Pennsylvania Department of Labor and Industry, the result has included over 50,000 new jobs⁵ with an average annual pay roughly \$20,000 more than the average state salary.⁶

Oil and natural gas companies are also prime public revenue generators, paying heavy business taxes and more than \$1 billion in impact fees since 2012."⁷ This revenue

has supported more than 600 grants that funded critical community projects in all 67 counties.⁸

And an expectation of continued positive impact is reasonable, as the availability of affordable, reliable energy makes Pennsylvania more attractive by lowering both the cost of living and the cost of doing business – a change already reflected in The State’s 12 rank leap in CNBC’s Cost of Doing Business ranking between 2016 and 2017.⁹



George Kavallines | CNBC

Category ↕	Score ↕	2017 Rank ↕	2016 Rank ↕
Cost of Doing Business	286	21	33
Infrastructure	160	38	35
Workforce	155	34	34
Economy	136	34	42
Quality of Life	143	30	29
Technology & Innovation	160	10	12
Education	133	10	21 (Tie)
Business Friendliness	72	28	35
Access to Capital	88	5 (Tie)	12
Cost of Living	17	34 (Tie)	35
Overall	1350	23	33

Image Credit: CNBC's America's Top States for Business 2017

ENVIRONMENTAL BENEFITS



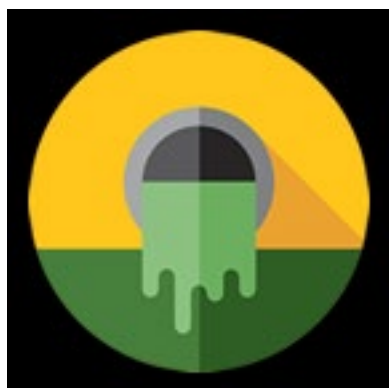
3: Clean Natural Gas offers Pennsylvania some important environmental benefits including replacing coal, lowering our carbon footprint and stabilizing renewable energy.

Marcellus development has also resulted in some important environmental benefits to Pennsylvania. Natural gas, “the cleanest of the fossil fuels has already begun displacing coal, the dirtiest fossil fuel, in U.S. power plants”¹⁰ a fact especially relevant as Pennsylvania remains the 3rd largest coal-producing state.¹¹

Total CO₂ emissions have been lowered “in the state's power sector by about 30%,”¹² progress that is imperative to tackle Climate Change.

And natural gas is an ideal stabilizing companion to the fluctuations inherent to renewable energy sources such as wind and solar, as well as a bridge fuel, offering a path to even more environmentally-friendly solutions.¹³

ENVIRONMENTAL REPERCUSSIONS



4: Ineffective management of natural gas wastewater has compromised our water quality, and projections indicate looming amounts of produced water will *demand* a sustainable treatment solution.

Despite these benefits, this good news for Pennsylvania is not without repercussions.

One of these unassailably, has been a negative impact on Pennsylvania's water quality,¹⁴ chiefly as a result of ineffectively managed unconventional oil and gas wastewater including hydraulic fracturing water, flowback, produced water, spent drilling fluids and gathering line condensate.

While Centralized Waste Treatment plants (CWTs) aim to rehabilitate Pennsylvania's 1.7 billion gallons of wastewater, many facilities dedicated to treating the wastewater provide only limited treatment, leaving many of the pollutants intact.¹⁵ And CWTs that offer the best results, utilize a more expensive process that many producers may shun.

Other alternatives include the costly business of trucking wastewater to Ohio, or disposing of it in Pennsylvania's own 11 deep injection wells with undetermined environmental consequence.¹⁶

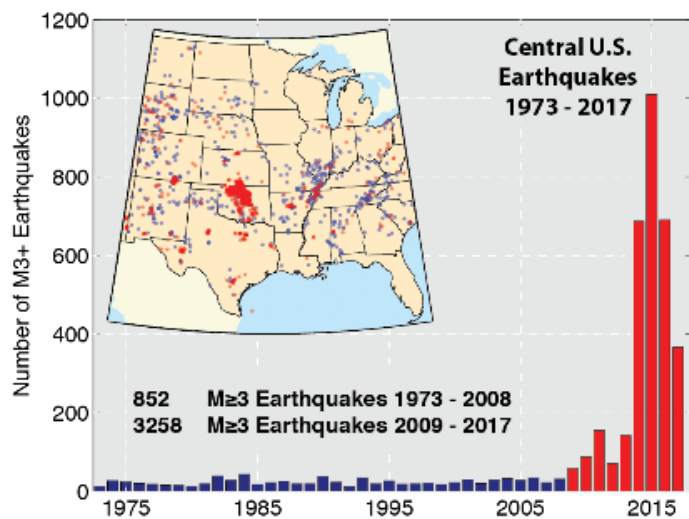


Image Credit: USGS 2017

These challenges have already led producers in the region to innovate towards reuse, a practice in which flowback water is “trucked to a treatment facility and treated, and then trucked to another well pad, where it is stored in lagoons or tanks until it is reused.”¹⁷

More than 90% of wastewater is repeatedly reused in this manner, resulting in increasingly dirty water.

Northeast Production Takeaway Projects

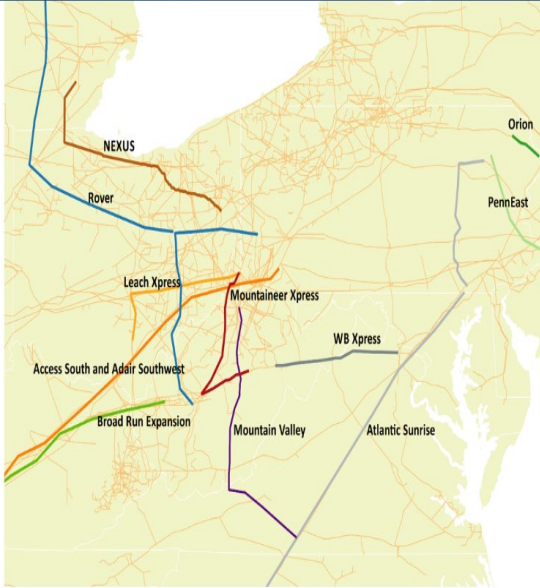


Image Credit: Energy Ventures Analysis, 2018 Outlook for Gas Pipeline Capacity in the Northeast

What's more, projections indicate that wastewater treatment issues will only *continue* to grow as Northeast Pennsylvania's production ramps up, with the addition of the Atlantic Sunrise and Penn East projects.¹⁸

As Pennsylvania achieves a new sustainable production peak, the level of *possible* reuse will drop, rendering reuse ineffective for managing the residual wastewater produced in the state.

This shift from a drilling focus to a production focus, will *demand* a sustainable treatment solution.

REGULATORY IMPACT



5: Regulatory initiatives have made an improvement, but have proven challenging to enforce.

Vigilant legislators have successfully impacted this problem. According to a Penn State Study there *has* been “a significant drop in the amount of contaminants released into surface waters following the voluntary ban on discharge of Marcellus waste requested by the Pennsylvania Department of Environmental Protection, which began in 2011, suggesting that tighter regulations of wastewater do help.”¹⁹

This voluntary ban has since become law and issued as final. Additionally, The Pennsylvania DEP recently promulgated even tighter revisions to Chapters 78 and 78a of the oil and gas regulations.²⁰

Unfortunately, these measures have proven challenging to fully implement and have not yet done all the good they can.²¹

REGULATORY POTENTIAL



6: WMGR123 and 25 PA Code §78 offer strong standards, and Pennsylvania can expect continued environmental improvement in response to *full* compliance.

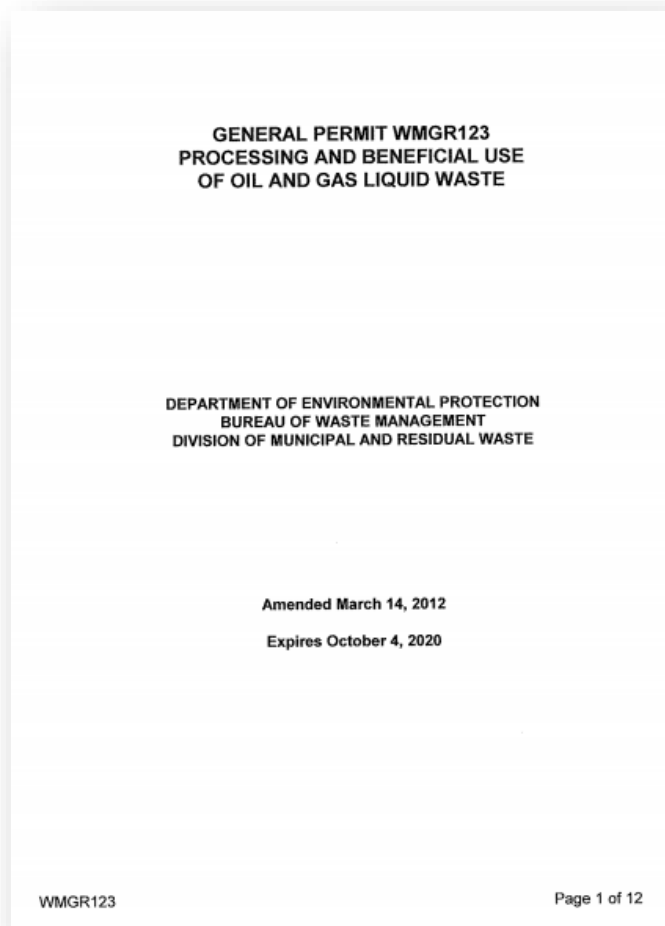
The success noted in the aforementioned Penn State Study is most likely tied to the 2011 draft publication of the Residual Waste Beneficial Use General Permit (WMGR123). A revised permit was enacted in 2012 after approximately 80 comment submissions were considered. The revision also consolidated into one, WMGR119, WMGR121 and the previous version of WMGR123.

Appendix A of the revised permit establishes water quality criteria that, if met, allow the processed water to be managed, stored and transported as freshwater and requires regular testing for 39 constituents, including strontium, barium, total dissolved solids and radiation.

Furthermore the permit encourages using the closed-loop process, which recycles brine, flowback water, drilling

muds and stormwater to minimize water withdrawals and impacts on Pennsylvania's valuable water resources.²²

Finally, the permit classifies the wastewater that does not meet the freshwater criteria as residual waste -- a classification of industrial waste, and details its management, storage and transportation.



WMGR123 and §78 offers strong standards and Pennsylvania can expect continued environmental improvement in response to *full* implementation and compliance.

CERTIFICATION POTENTIAL



7: Third-party multi-stakeholder certification offered by the CRSD offers a higher standard and another impetus for environmental improvement.

In addition to upholding WMGR123, certification by The Center for Responsible Shale Development offers another layer of protection to Pennsylvania's waterways.

"From mining to forestry, third-party multi-stakeholder certification has been used to address the negative consequences of economic activities, as well as persistent gaps in their governance calling for greater accountability, transparency and inclusivity."

According to Matthew Bach for The National Geographic, certification offers benefits over other forms of regulation, such as codes of conduct or reporting standards, because it doesn't rely on goodwill but rather includes the assurance of assessment and sanction.²³

The Center for Responsible Shale Development is a non-profit organization comprised of environmental and gas industry leaders committed to driving continuous innovation and improvement of shale development practices within the Appalachian Basin, with the goal of protecting the environment and the communities affected by the shale gas industry.

GUIDING PRINCIPLES



Through advancing environmental excellence where shale gas development occurs, we can improve the net social benefit of energy.



Aggressive standards and demonstration of their results will raise performance expectations throughout the industry and society.



The best interests of society are advanced by collaboration and leadership among interested parties representing diverse points of view.



Independent, third-party certification programs for responsible operators allow shale gas developers the opportunity to earn public trust and support, and to differentiate themselves by their superior environmental attributes.



Industry demonstrates leadership by practicing the highest level of environmental performance; environmental and community organizations demonstrate leadership by insisting on it.

Through the CRSD, companies can seek certifications in Air & Climate, Water & Waste, or both. Certification is based on the Center for Responsible Shale Development's 15 initial performance standards that were developed to reflect leading industry practices.²⁴

THE CASE FOR INCENTIVIZATION



8: Environmental
Incentivization
offers a
synergistic
approach which is
both more
effective and less
expensive to
enforce.

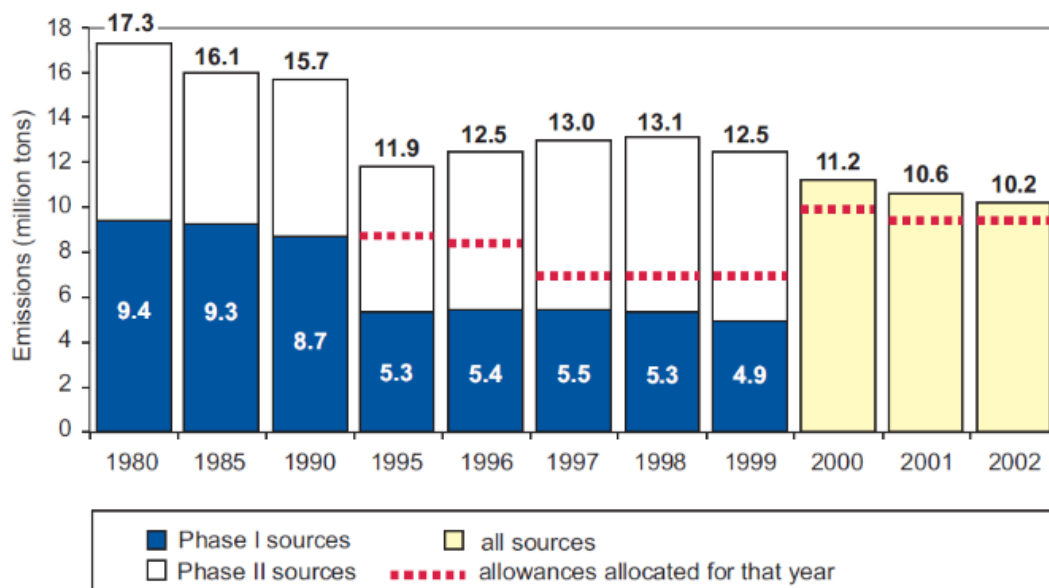
There are scores of studies weighing the effectiveness of sanction and incentive, which taken together, point to a shrewd synergy between the two.²⁵ Newer research on organizational innovation and corporate change also points to “purpose” as a factor that must be taken into consideration to direct long-term change. Both individuals and corporations will embrace change that supports progress towards their objectives.²⁶

Acknowledging that a primary purpose and responsibility of corporations and their agents is to create profit, it is sensible to establish environmentally supportive “catalysts” which allow them to serve this purpose *while* fulfilling their overarching duty to do so with conscientious deference to environmental preservation.

According to an EPA report, “Over the last 20 years, and particularly during the past decade, economic incentives have

been increasingly used to control pollution and improve environmental and health protection.” The report goes on to state that “incentives generate benefits beyond what is possible with traditional regulations,” that they “provide impetus for technological change” and that they provide cost savings relative to traditional regulatory approaches.

SO₂ Emissions under the Acid Rain Program



An example of a successful EPA Incentive Program

Image Credit: EPA

“One study estimates potential savings of widespread use of economic incentives could reach \$45 billion annually.”²⁷

A COLLABORATIVE PROPOSAL



9: Penn Strategies proposes a scalable tax rebate and / or credit for oil and gas producers that utilize CWTs which offer Full Dewasting Treatment. We also ask for an additional tax incentive for producers whose wastewater treatment complies with CRSD standards.

Given these facts, Penn Strategies proposes that a tax rebate or credit be offered to oil and gas producers in Pennsylvania for utilizing more robust and accordingly more expensive treatment alternatives.

Specifically, we imagine a plan which incentivizes these companies to bring their wastewater to Centralized Waste Treatment plants that provide full de-wasting treatment capability and therefore result in the attainment of the dewasting standards in WMGR123 Appendix A.

These incentives should be based on a sliding scale according to the quantity of water treated.

Penn Strategies also advocates an additional incentive for oil and gas producers in Pennsylvania who choose a CWT that is certified by The Center for Responsible Shale Development.

These two strategies *together* create the strongest level of protection for Pennsylvania's water, for the health and safety of its citizens and for responsible and sustainable economic growth both statewide and nationally.

APPENDIX A:

The following maximum concentrations were derived from drinking water standards, water quality standards for rivers and streams, and typical values observed in fresh water rivers and streams.

Constituent (All metals as total)	Limit (Maximum unless otherwise specified)
Aluminum	0.2 mg/L
Ammonia	2 mg/L
Arsenic	10 µg/L
Barium	2 mg/L
Benzene	0.12 µg/L
Beryllium	4 µg/L
Boron	1.6 mg/L
Bromide	0.1 mg/L
Butoxyethanol	0.7 mg/L
Cadmium	0.16 µg/L
Chloride	25 mg/L
COD	15 mg/L
Chromium	10 µg/L
Copper	5 µg/L
Ethylene Glycol	13 µg/L
Gross Alpha	15 pCi/L
Gross Beta	1,000 pCi/L
Iron	0.3 mg/L
Lead	1.3 µg/L
Magnesium	10 mg/L
Manganese	0.2 mg/L
MBAS (Surfactants)	0.5 mg/L
Methanol	3.5 mg/L
Molybdenum	0.21 mg/L
Nickel	30 µg/L
Nitrite-Nitrate Nitrogen	2 mg/L
Oil & Grease	ND
pH	6.5-8.5 SU
Radium-226 + Radium-228	5 pCi/L (combined)
Selenium	4.6 µg/L
Silver	1.2 µg/L
Sodium	25 mg/L
Strontium	4.2 mg/L
Sulfate	25 mg/L
Toluene	0.33 mg/L
TDS	500 mg/L
TSS	45 mg/L
Uranium	30 µg/L
Zinc	65 µg/L

WMGR123

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Image Credit: General Permit WMGR123
Appendix A

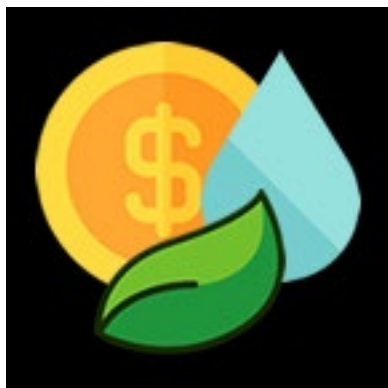
CONCLUSION



10: Adoption of both recommended incentivization strategies will proactively protect the Commonwealth from mounting environmental repercussions, and future reclamation expense

The benefits to The Commonwealth of taking these recommended actions are numerous.

1. These actions will show that The Commonwealth is serious about protecting water quality.
2. These actions are both environmentally friendly *and* business friendly, offering a responsible and sustainable path for supporting the benefits of Marcellus Shale development to both the Commonwealth and the country.
3. These actions proactively offer an alternative to new threats stemming from induced seismicity resulting from injection well disposal.²⁸
4. These actions will ultimately save The Commonwealth money, despite incentivization costs, by reducing future reclamation expense.



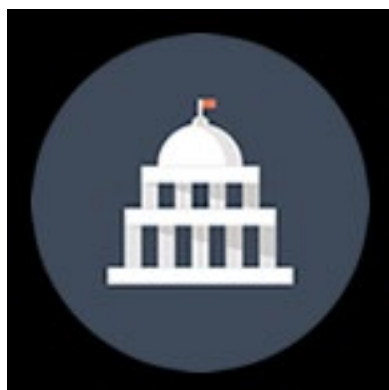
Penn Strategies invites further discussion of these matters and to assist with a strategy for their implementation.

We can also offer connection to regional experts and advisors

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“Advanced treatment of produced water or flowback fluids from NG well drilling is ESSENTIAL to protect our streams and groundwater. Advanced treatment systems that can avoid the cost of trucking those wastewaters to OH or Western PA deep injection wells, and the ultimate environmental and geologic impacts of that disposal, are yet to be fully understood.” - Jerry S. Walls, FAICP - Professional Planner

ABOUT PENN STRATEGIES



Penn Strategies is
working to improve
life for all
Pennsylvanians.

Penn Strategies mission is to create economic opportunity for Pennsylvania's businesses and communities. With offices in Watsontown and Harrisburg, we provide economic development planning, grant writing, lobbying, public relations, consulting services and government and regulatory liaison to municipalities, corporations and organizations who are working to improve life for all Pennsylvanians.

Our team of professionals collectively offers many decades of diversified and robust experience, and strong relationships at the local, state and national level. We offer a documented track record of success and a resolute commitment to personal and thorough service to each and every one of our clients.

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