Adverse impact notification sent to Joint Commission on Administrative Rules, House Committee on Appropriations, and Senate Committee on Finance (COV § 2.2-4007.04.C): Yes ☐ Not Needed ☒

If/when this economic impact analysis (EIA) is published in the *Virginia Register of Regulations*, notification will be sent to each member of the General Assembly (COV § 2.2-4007.04.B).

Virginia Department of Planning and Budget

Economic Impact Analysis

4 VAC 25 •170 Geothermal Energy Regulations
Department of Mines, Minerals and Energy
Town Hall Action/Stage: 4767 / 7846
May 1, 2017

Summary of the Proposed Amendments to Regulation

As the result of a periodic review,[1] the Department of Mines, Minerals and Energy (DMME) proposes to: 1) raise the geothermal exploration, production, and injection well permit application fee from $75 to $600, 2) allow professional engineers to do work that currently only registered surveyors may do, 3) increase the required lengths for cement plugs of wells, 4) require that the permanent sign marking the location of each abandoned well include the date the well was plugged, 5) give owners and operators additional time to submit documents and notifications, 6) require that all documents and notifications be submitted electronically, and 7) amend other language for improved clarity. There is no geothermal energy development in the Commonwealth currently.[2]

Result of Analysis

The benefits likely exceed the costs for all proposed changes.

[1] See http://townhall.virginia.gov/l/ViewPReview.cfm?PRid=1540
[2] Source: Department of Mines, Minerals and Energy

Estimated Economic Impact

Background

Unlike most energy sources that require heat to be manufactured by humans, geothermal energy utilizes the natural heat of the earth and its tectonic processes. In order to access this energy, wells are drilled into areas below the earth's crust where there are aquifers of already heated water, or steam. As pressure increases deeper into the earth, water is unable to turn into steam as it is heated because there is so much pressure. As a result, 'superheated water' is produced at very deep depths of the earth. As wells are drilled into the rock that houses this water, its steam is converted into mechanical energy for utilization.[3]

The utilization of energy from geothermal wells releases greenhouse gases trapped in the earth core such as carbon dioxide, hydrogen sulfide, methane, and ammonia.[4] These emissions are lower than those associated with the use of fossil fuels, for which the adoption of geothermal energy sources is considered to have the potential to mitigate global warming and have a favorable impact on the environment.[5] An analysis by the Argonne National Laboratory concluded that geothermal waters pose a large potential risk to water quality, if released into the environment, due to high concentrations of toxics including antimony, arsenic, lead, and mercury, but that the risk of release can be virtually eliminated through proper design and engineering controls.[6]

Application Fee

DMME proposes to raise the geothermal well permit application fee (currently $75) to match the $600 fee charged for oil and gas well permit applications. Unlike for oil and gas, the agency has never received a permit application for geothermal energy. Thus the cost in terms of staff time of processing a geothermal energy well permit application, as well as regulating the industry for environmental protection, would likely be equal or greater per permit processed than

[3] Berrizbeitia, Luis D. "Environmental impacts of geothermal energy generation and utilization." Indiana University, 2014.
[4] Axtmann RC. "Environmental Impact of a Geothermal Power Plant." Science. 1975;187(4179):795-803.
[5] Glassley WE. "Geothermal energy: renewable energy and the environment." Boca Raton: CRC Press; 2010.
[6] Clark CE, Harto CB, Sullivan JL, Wang MQ. "Water use in the development and operation of geothermal power plants." Argonne National Laboratory, 2011.

for oil and gas staff. Raising the geothermal fee to match oil and gas well permit application fee would better reflect the cost incurred.

There is the possibility that the higher fee might discourage the pursuit of some geothermal energy drilling for some potentially marginally profitable wells; but given the overall cost (at least tens of thousands of dollars) of drilling, the higher fee would not likely be the deciding factor in most cases. Additionally, the benefit of helping ensure adequate protection of the water supply and air quality through paying for DMME staff to check that proper procedures and designs are followed likely exceeds the cost.

Surveying and Plat Certification

Under the current regulation, the location of production and injection wells must be surveyed and the plat certified by a registered surveyor. DMME proposes to allow professional engineers (PEs) to do this work as well. PEs are allowed to do such work for gas and oil permit applications under the Virginia Gas and Oil Board Regulations. Allowing PEs to do this work may be beneficial in that it expands the pool of qualified people who may be available. This could perhaps save time and cost for a firm seeking to extract geothermal energy.

Cement Plug Lengths

The regulation requires that any drilling well completed as a dry hole from which the rig is to be removed be cemented. This is for environmental protection. As described in the Background section of this document, geothermal waters pose a large potential risk to water quality, if released into the environment, due to high concentrations of toxics including antimony, arsenic, lead, and mercury. The cement plugs help prevent this contamination from occurring from wells that are no longer in use.

Under the current regulation, a cement plug not less than 50 feet in length must be placed immediately above each producing formation; and a plug not less than 20 feet in length must be placed at or near the surface of the ground in each hole. DMME proposes to require that both plug lengths be 100 feet in order to reduce the risk of pollutants entering the water supply. The agency estimates that the additional cost per plug of the longer required lengths would be less than $200 per plug. To the extent that the longer required plugs would significantly improve environmental protection, then the benefits likely exceed the costs of this proposal.

Abandoned Well Signage

The exact location of each abandoned well must be marked by a piece of pipe not less than four inches in diameter securely set in concrete and extending at least four feet above the general ground level. A permanent sign of durable construction must be welded or otherwise permanently attached to the pipe, and shall contain the well identification information. DMME proposes to require that the permanent sign specify the date the well was plugged. This proposal has inconsequential cost and may provide valuable information. Thus it likely produces a net benefit.

Document Submission

Under the current regulation, each well operator, owner, or designated agent, within 30 days after the completion of any well, shall furnish to DMME a copy of the drilling log. The agency proposes to allow up to 90 days for the delivery of drilling log. The extra time may allow potential geothermal well operator and owners to use staff time more efficiently.

Additionally, DMME proposes to require that all documents and notifications be submitted electronically. It is very likely that any potential firm that has the financial wherewithal to invest at least tens of thousands of dollars to pursue geothermal energy would have the capability and preference for electronic submissions. Thus this proposal would likely not have significant impact.

Businesses and Entities Affected

DMME has never received a permit application for geothermal drilling or well construction. The proposed amendments would apply to businesses, which engage in drilling for geothermal resources or construction of a geothermal well in Virginia, or those that operate, own, control or are in possession of any geothermal well.

Localities Particularly Affected

There have been no known geothermal wells in Virginia, and there are no known locations currently considered likely for development.[7] Thus, there are no localities known to be particularly affected.

[7] Source: Department of Mines, Minerals and Energy

Projected Impact on Employment

There is no current employment in the Commonwealth associated with geothermal energy. The proposed amendments are unlikely to significantly affect that.

Effects on the Use and Value of Private Property

The proposed amendments are unlikely to significantly affect the use and value of private property.

Real Estate Development Costs

The higher permit application fee and the increased required lengths for cement plugs would moderately increase the cost of developing land for geothermal energy extraction. The proposal to allow PEs to do surveying and plat certification may moderately reduce such costs.

Small Businesses:

Definition

Pursuant to § 2.2-4007.04 of the Code of Virginia, small business is defined as "a business entity, including its affiliates, that (i) is independently owned and operated and (ii) employs fewer than 500 full-time employees or has gross annual sales of less than $6 million."

Costs and Other Effects

No small businesses in the Commonwealth currently participate in the geothermal energy industry. The proposals to increase the permit application fee and to increase the required cement plug lengths would moderately increase costs for any potential future businesses that did choose to drill for geothermal energy in Virginia. The proposal to allow PEs to do surveying and the plat certification could moderately reduce costs.

Alternative Method that Minimizes Adverse Impact

There is no alternative method that would minimize the adverse impact while still maintaining the intended level of safety and environmental protection.

Adverse Impacts:

Businesses:

No businesses in the Commonwealth currently participate in the geothermal energy industry. The proposals to increase the permit application fee and to increase the

required cement plug lengths would moderately increase costs for any potential future businesses that did choose to drill for geothermal energy in Virginia.

Localities:

The proposed amendments do not adversely affect localities.

Other Entities:

The proposed amendments do not adversely affect other entities.

References

Axtmann RC. “Environmental Impact of a Geothermal Power Plant.” Science. 1975;187(4179):795-803.

Berrizbeitia, Luis D. "Environmental impacts of geothermal energy generation and utilization.” Indiana University, 2014.

Clark CE, Harto CB, Sullivan JL, Wang MQ. “Water use in the development and operation of geothermal power plants.” Argonne National Laboratory, 2011.

Glassley WE. “Geothermal energy: renewable energy and the environment.” Boca Raton: CRC Press; 2010.

Legal Mandates

General: The Department of Planning and Budget has analyzed the economic impact of this proposed regulation in accordance with § 2.2-4007.04 of the Code of Virginia (Code) and Executive Order Number 17 (2014). Code § 2.2-4007.04 requires that such economic impact analyses determine the public benefits and costs of the proposed amendments. Further the report should include but not be limited to: (1) the projected number of businesses or other entities to whom the proposed regulatory action would apply, (2) the identity of any localities and types of businesses or other entities particularly affected, (3) the projected number of persons and employment positions to be affected, (4) the projected costs to affected businesses or entities to implement or comply with the regulation, and (5)the impact on the use and value of private property.

Adverse impacts: Pursuant to Code § 2.2-4007.04(C): In the event this economic impact analysis reveals that the proposed regulation would have an adverse economic impact on businesses or would impose a significant adverse economic impact on a locality, business, or entity particularly affected, the Department of Planning and Budget shall advise the Joint Commission on Administrative Rules, the House Committee on Appropriations, and the Senate Committee on Finance within the 45-day period.

If the proposed regulatory action may have an adverse effect on small businesses, Code § 2.2-4007.04 requires that such economic impact analyses include: (1) an identification and estimate of the number of small businesses subject to the proposed regulation, (2) the projected reporting, recordkeeping, and other administrative costs required for small businesses to comply with the proposed regulation, including the type of professional skills necessary for preparing required reports and other documents, (3) a statement of the probable effect of the proposed regulation on

affected small businesses, and (4) a description of any less intrusive or less costly alternative methods of achieving the purpose of the proposed regulation. Additionally, pursuant to Code § 2.2-4007.1, if there is a finding that a proposed regulation may have an adverse impact on small business, the Joint Commission on Administrative Rules shall be notified.

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