

APPENDIX C: Trends in Mining Activity

C.1 - The Importance of Pennsylvania’s Bituminous Underground Coal Mining Industry

The coal industry in Pennsylvania directly employed 5,458 workers in 2017 with 3,837 employed in underground bituminous mining (Figure C-1). This represents more than 10 % of coal mine employees in the United States with 53,051 total employed and 31,487 employed in underground coal mining. Since 2001, Pennsylvania labor hours for underground coal mining have averaged 11.8 % of the total U.S. labor hours (Figure C-2). These data demonstrate the prominent role coal plays in the lives of Commonwealth citizens.

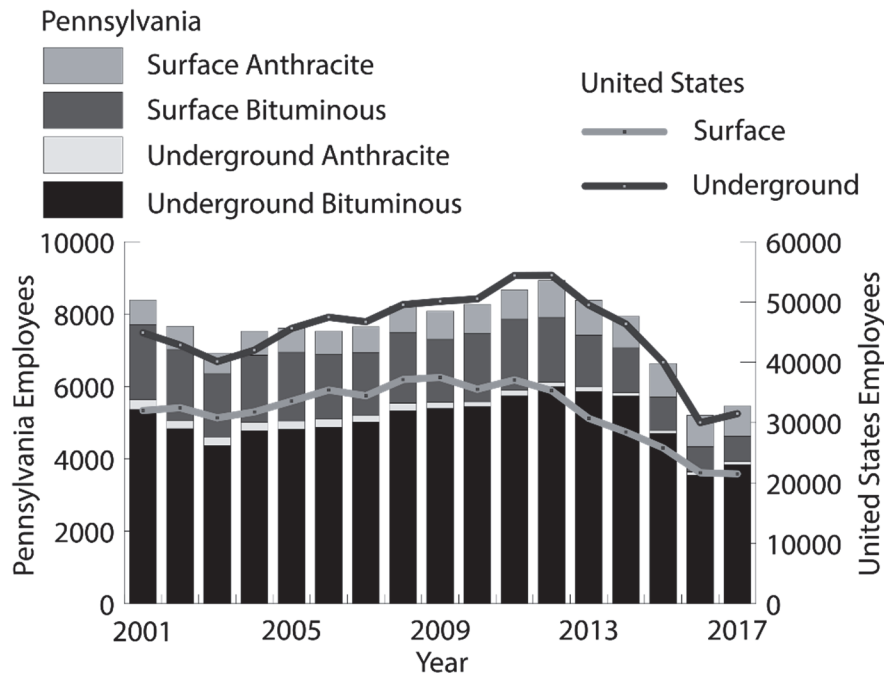


Figure C-1. Coal mine employees for Pennsylvania and the United States (2001-2017). Data from U.S. Energy Information Administration.

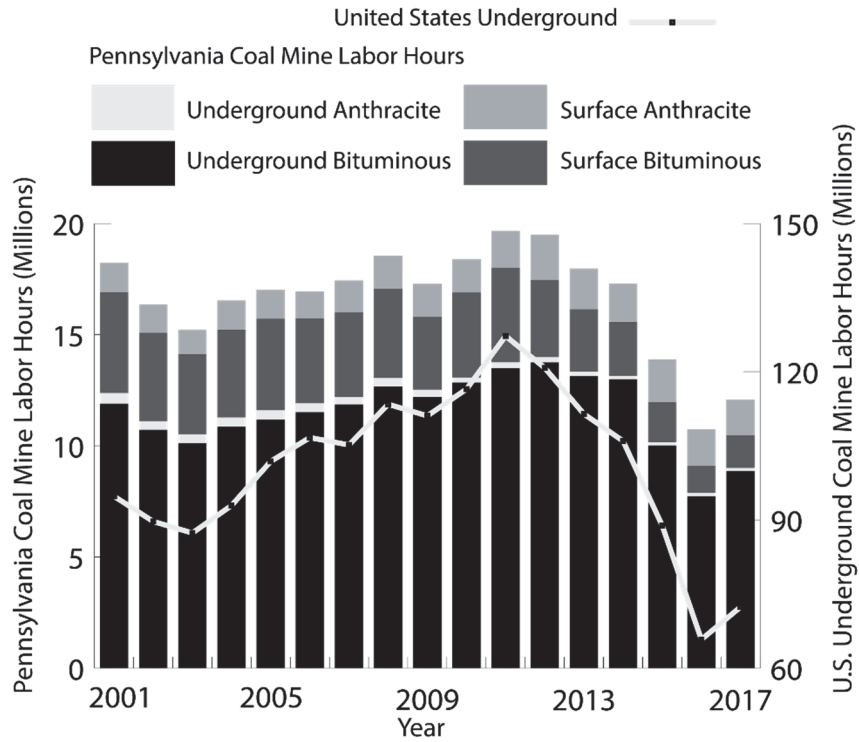


Figure C-2. Coal mine labor hours for Pennsylvania and the United States (2001-2017). Data from U.S. Energy Information Administration.

C.1.A - Trends in U.S. Coal Production since the 1950s

Over the last 70 years, U.S. coal production has undergone significant changes. Production hovered between 500 and 600 million tons after World War II before continuously rising to almost 1.2 billion tons in 2008 (Figure C-3). Since then production has fallen to approximately 750 million tons (U.S. Energy Information Administration 2018a).

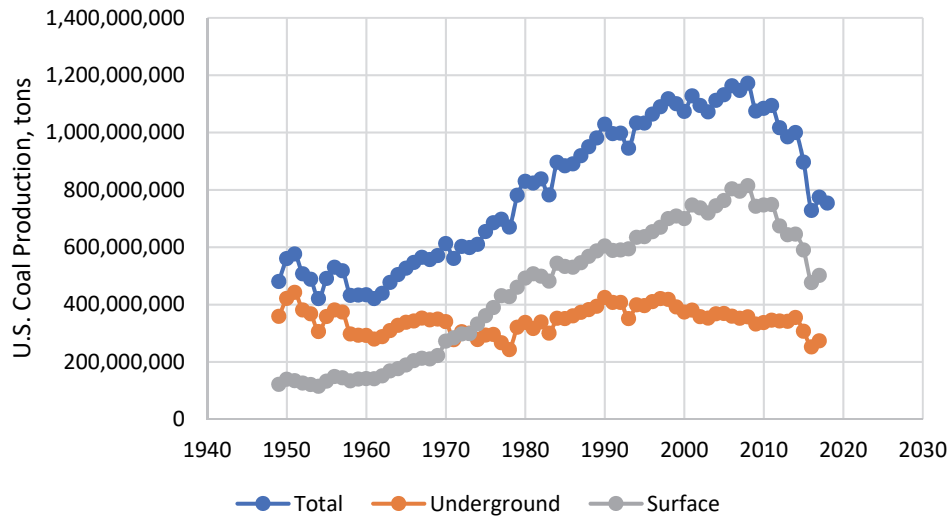


Figure C-3. U.S. Coal production as reported by the Energy Information Agency.

U.S. underground coal mining reached a high of approximately 420 million tons in 1997. It gradually dropped to approximately 355 million tons in 2014, then falling sharply to approximately 273 million tons in 2017. Since 2014, underground coal mining production has dropped by 23 %. In comparison, U.S. surface coal mining dropped 39 % from 2008 (815 million tons) to 2017 (501 million tons).

Over the last decade, U.S. electric generation from large scale utilities has shifted dramatically away from coal and towards natural gas and renewable energy sources (Figure C-4). Renewables (includes solar and hydroelectric) now contribute 17.1 % and natural gas 35.1 % of the total megawatts of power consumed in 2018 (U.S. Energy Information Administration 2018b, Table 1.1). Of particular note are the successes in shale gas production driving down the cost of natural gas and resulting in less electric generation from coal.

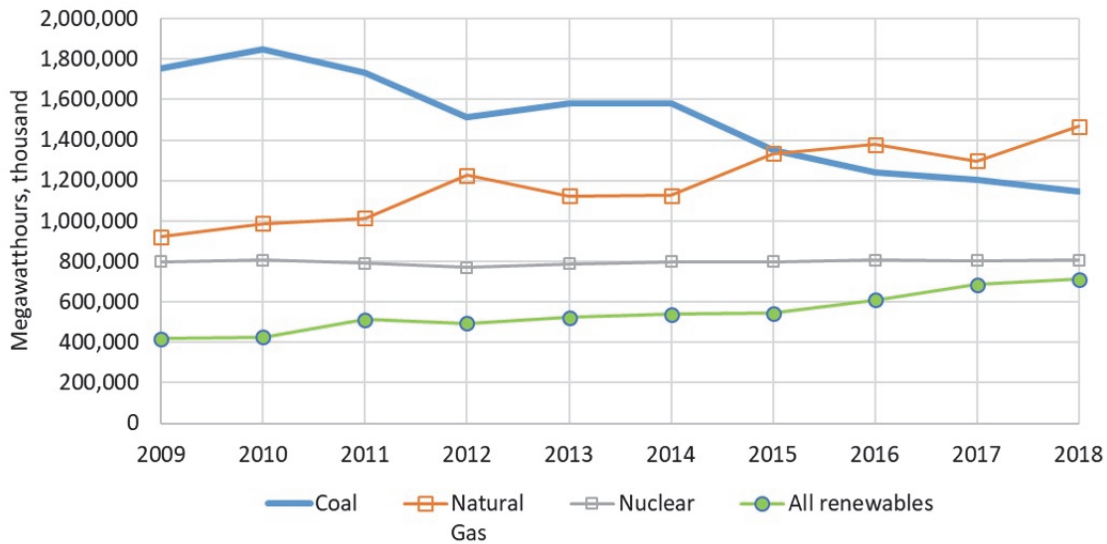


Figure C-4. New Generation by energy source for large scale utilities in the U.S. (U.S. Energy Information Administration, 2018b).

C.2 - Underground Bituminous Coal Mining’s Historical Role in Pennsylvania

Coal has been extracted in western Pennsylvania for over 200 years. Coal production trends, since the enactment of Act 54 25-years ago, demonstrate the continued importance of Pennsylvania’s underground bituminous coal industry and the need to continue assessment of subsidence impacts and associated mitigation and repair. In 1994, Pennsylvania produced 57.6 million tons of bituminous coal, 69 % from underground mines (Figure C-5). In 2017, Pennsylvania produced 47.2 million tons, 92 % from underground mines. These data also show that Pennsylvania bituminous coal production fell by 22 % while the underground mining sector actually rose by 9 %. These data suggest that underground bituminous coal mining remains a significant industry. So, when bituminous coal mining creates subsidence impacts, the protection of Act 54 for local property owners is as relevant today as it was in 1994.

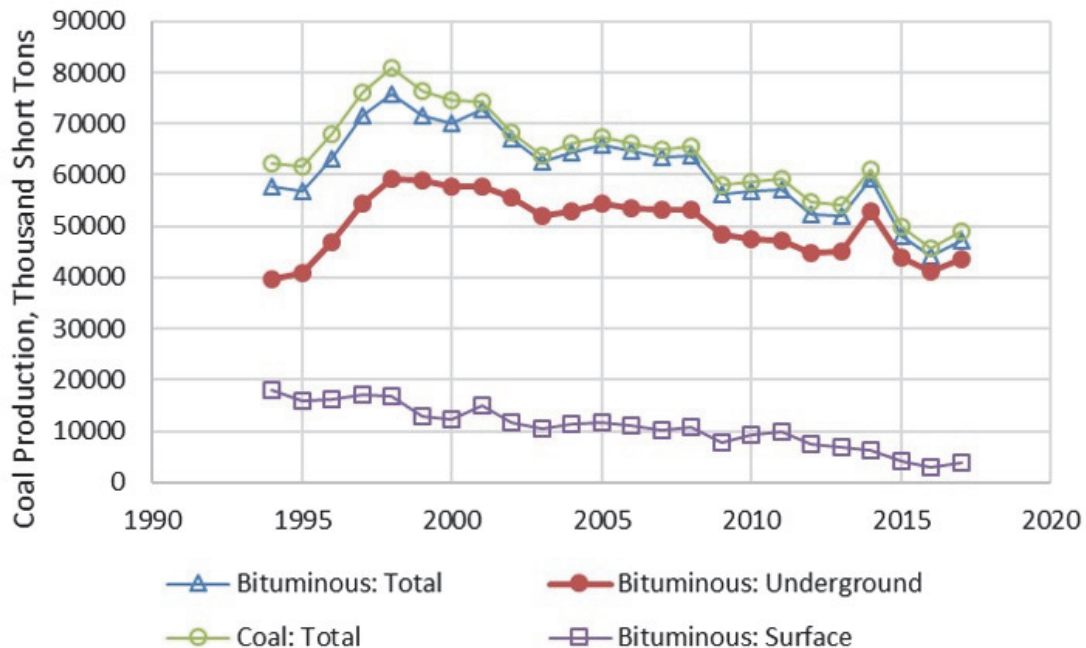


Figure C-5. Pennsylvania coal production with a focus on underground bituminous.

Data from the U.S. Energy Information Agency rank Pennsylvania 3rd in U.S. coal production. Over the last 25-years, the most underground bituminous coal was produced in 1998 with 59.1 million tons. Since then coal production has slowly declined. It is also apparent that bituminous surface mining continues to decline, producing just 3.7 million tons of coal in 2017.

C.3 - Future of Pennsylvania underground bituminous coal

The amendments to the Act 54 legislation require the “ongoing” compilation of subsidence impact data. While much coal has been mined, there remain approximately 952 million tons of recoverable reserves at producing mines and 9,753 million tons of estimated recoverable reserves of bituminous underground coal in Pennsylvania (U.S. Energy Information Administration 2018a, Table 15). Therefore examination of future coal mining is warranted, to enable better planning for ongoing administration of mining regulations.

Pennsylvania has one of the most important natural energy resources in the world, the Pittsburgh Coalbed. It has been mined extensively for over 150 years and there are still considerable reserves available for future longwall mining (for more on this subject, see Appendix E). Pennsylvania longwall mines are among the most productive in the U.S. In the absence of mining conditions that have the potential to negatively impact any mining operation, e.g. abundant natural gas production at historically low prices, Pennsylvania longwall mining operations should remain a competitive contributor to electric power generation in our region for at least the next 20 years.

Another asset for Pennsylvania is its substantial reserves of high-quality, metallurgical-grade coal. Metallurgical coals are typically low in ash, sulfur, and phosphorus and are distinguished

from other coals by the strong, low-density coke product produced from them. Coke is important in the steel making process. Metallurgical coals are often associated with coal rank. Typically the medium-to-low rank coals are popular metallurgical grades. Pennsylvania mines extracting Allegheny Formation coalbed found in Armstrong, Cambria, Clearfield, Indiana, Jefferson, and Somerset Counties (Section 3.B.6) largely sell their coal as metallurgical grade. These operations use the room-and-pillar mining method as it allows for flexible mine design over a wide range of extraction heights and overburdens. The demand for metallurgical coal is expected to remain strong over the next decade (U.S. Energy Information Administration, 2018a).

Lastly, the opportunities for exporting coal are favorable as world consumption of coal is not declining. In fact, with the exception of China and the U.S., other major coal producing countries like Australia, Indonesia, and Russia continue to expand production (Figure C-6). Under current conditions, the U.S. is exporting 108.5 million tons of coal (U.S. Energy Information Administration, 2018a) or approximately 14 % of its total production. EIA estimates that the U.S. has 22 % of the world's proven coal reserves, more than Russia (16 %), Australia (14 %), China (13 %) and India (9 %). These conditions create the potential for increased future demand for export coal.

In summary, Pennsylvania has significant reserves of coal and possesses a strong longwall mining component within the electric generation market as well as a significant capacity to supply metallurgical grade coal for steel production. World demand for U.S. coal has recently shown signs of growth and has the potential to increase in the future.

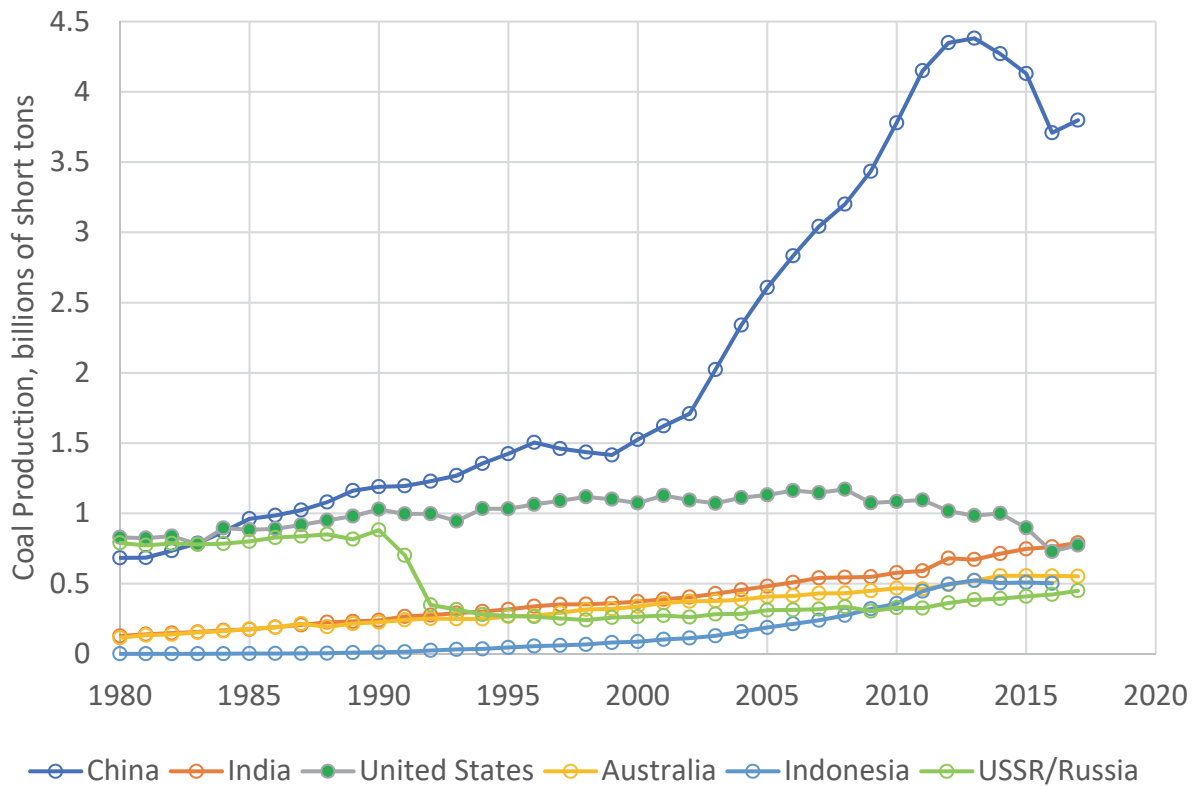


Figure C-6. Coal production from the major producing nations.

References

U.S. Energy Information Administration (2018a) “Annual Coal Report,” U.S. Energy Information Administration, 67 p.

U.S. Energy Information Administration (2018b) “Annual Energy Review,” U.S. Energy Information Administration, 67 p.