SES EnCoal Energy (SEE)

Business Case for SES Gasification Technology (SGT) in Poland

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SES EnCoal Energy sp. z o.o. (SEE) is the joint venture company established between EnInvestments sp. z o.o. and Synthesis Energy Systems, Inc. for the purpose of promoting and developing SES's Gasification Technology (SGT) throughout Poland. Since 2015 SES has worked with EnCoal Gasification, a wholly owned subsidiary of EnInvestments, to assist companies in Poland with applying SGT to provide lower cost energy solutions. SEE is now building on this effort to move the first projects intending to utilize SGT into engineering and construction. Projects now underway by SEE are primarily focused upon syngas applications in the power, fuels and chemicals sectors.

There are several converging factors that establish Poland as a prime market for SGT success, per the International Energy Agency's Poland 2016 Review from the "Energy Policies of IEA Countries," published in January 2017. These may broadly be attributed to the European Union energy and environmental policies that are viewed as restrictive to Poland's current coal-dominant power generation, resulting in an inability to sustain the growing domestic energy requirements. Subsequently, an increased demand for natural gas (NG) and liquefied natural gas (LNG) has been created, however there are price volatility and energy security concerns associated with long-term cross-border supplies of these fuels. This culminates in a need to reinforce Poland's coal industry with new technology that will allow clean and responsible utilization of Poland's substantial domestic coal resources. Approximately 80% of Poland's current electricity demand (158 TWh annually) is coal-based, with a government outlook to remain coal dependent (at least 60%) for power production through 2050 and beyond. Poland is ranked as having the ninth-largest coal supply in the world (in an area 2.2x less than the State of Texas).

As with other SGT platform regions, the supply of natural gas is constrained in the Polish market. There have been investments made to build new LNG terminals along Poland's northern Baltic coast, and proposals to establish additional natural gas pipelines from Norway. However, Poland is eager to diversify its energy reserves, with Russia's state-owned Gazprom supply contracts servicing 60% of Poland's natural gas demand, ending in 2022. Today, the landed price of the natural gas is volatile (approximately 7.40 USD/MMBTU) and controlled by non-Polish entities, presenting market opportunities to establish energy independence through the production of competitively priced syngas, based on low-cost coal, coal wastes, biomass, municipal waste and refuse-derived fuel (RDF). From SES's commercial operations in China, SGT has demonstrated syngas costs in the range of 3-5 USD/MMBTU, which may be even lower with the use of waste products, while achieving up to 85% cold gas efficiency (meaning that 85% of the coal's energy is retained in the produced syngas).

Since November 2015, the "Law and Justice" (Prawo i Sprawiedliwość or PiS) conservative political party has had the majority influence in Poland. Under the PiS government, many pro-coal policies exist, however the party must also abide by EU laws and regulations. Poland, like much of Eastern Europe, relies on the coal industry as a major driver in their local economies.

The government is engaged with the strong mining unions in Poland, which employ over 100,000 workers and indirectly impact populations three times more in related industries, who are fighting to keep the coal industry alive, with competitive wages in Poland. We believe that SGT offers the Polish government a solution to responsibly utilize the coal resources in an EU-compliant manner, while winning the favor of the pro-coal populous.

Several coal mines have been shuttered throughout the region due to their inability to produce useable, high quality coal for power production at a competitive price. Beginning in 2018, EU legislation has put an end to the ability to use coal wastes ("mules") as fuel in the after-market heating industries, due to the unregulated nature of these applications. At this same time, materials with heating values greater than 6.5 GJ/ton (mules have a typical heating value of 8-9 GJ/ton) cannot be discarded as waste and are piling-up throughout the region. SGT is gaining support from the local municipalities, due to its unique abilities to use the coal waste, along with other low-rank fuels and wastes, to produce low-cost syngas for use in the energy and chemicals markets, while minimizing the waste coal stockpiles and keeping the local populations employed in the related industries.

The European Union has adopted rigorous policies regarding energy production and environmental protection. While the EU is heavily influenced by France's pro-nuclear and Germany's pro-renewable (wind) energy technologies, Poland has demonstrated a desire to make use of their indigenous coal resources in an environmentally friendly manner that meet the EU's environmental regulations. While respecting these EU reforms, Poland recognizes that they must continue to utilize their coal-based power investments and seek cooperative advanced technologies that can keep them in compliance.

Conventional renewable technologies (wind, solar and hydro) are challenged in the Polish market, as they must be made to compete without government subsidy (as they are viewed as a competitor to coal) and the wind and solar peak output has not been very high in the region. SGT, as a transition technology, offers the ability to utilize Poland's abundant coal in an environmentally responsible manner, offers many features of the renewable technologies, and a potential for deeper integration with the other renewable technologies in the future. The EU has publicly established coal gasification as an acceptable technology in the role of waste-to-energy in the circular economy ("Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions," European Commission, Brussels, COM (2017) 34 final, 26-01-2017).

Environmental regulatory focus in Poland remains strong in the areas of polluting emissions and air-born particulates, however there has also been a substantial shift in interest around carbon intensity. Even with much of the final regulatory framework around permitted limits, the classification of waste materials, and the sources and accounting methods for carbon emissions not being finalized, proposed projects must have a developed strategy for carbon dioxide (CO_2). Coupled with SGT's current carbon capture readiness, SEE intends to deliver projects that achieve future EU regulatory requirements through incorporation of the latest carbon utilization strategies and configurations that will result in minimized carbon emissions. SEE plans to continuously partner with new technology organizations in Poland and the United States to make its projects available to build and demonstrate novel technologies related to the reduction or elimination of CO_2 emissions.

SGT has been introduced to Poland's Ministry of Energy and has been the focus of multiple studies by government funded institutions (The Institute for the Chemical Processing of Coal or IChPW, and The Central Mining Institute or GIG). Due diligence trips have been attended by officials and industry leaders to visit SES's licensed commercial operations, and such trips have demonstrated the success of twelve gasifiers across five plant locations for the production of methanol and fuel gas.

In summary, SGT provides the following advantages for the Polish market:

- SGT enables the responsible use of Poland's coal, using EU accepted coal gasification technology, with industry leading performance, fuel flexibility, and reduced costs.

- SGT is the only commercially proven technology that can utilize Poland's waste coal, without expensive preparation or loss of energy, to produce high value syngas products for the power and chemicals markets.

- SGT produces competitively priced syngas, which can be used as an alternative to expensive imported natural gas and LNG, providing Poland energy independence with reduced price volatility.

- SGT is feed flexible, with the ability to co-feed a variety of coals, coal waste, biomass, municipal wastes and refuse-derived fuel into the gasifier, minimizing carbon intensity and providing substantial economic benefits via fuel hedging over the life of the project.

- SGT is environmentally friendly, with SO_x, NO_x and Particulate Matter near NG levels; less water consumption than competing gasification technologies; recyclable ash and marketable by-products.