



RIVERVIEW
— ENERGY —

Direct Coal Hydrogenation

Oct 2018

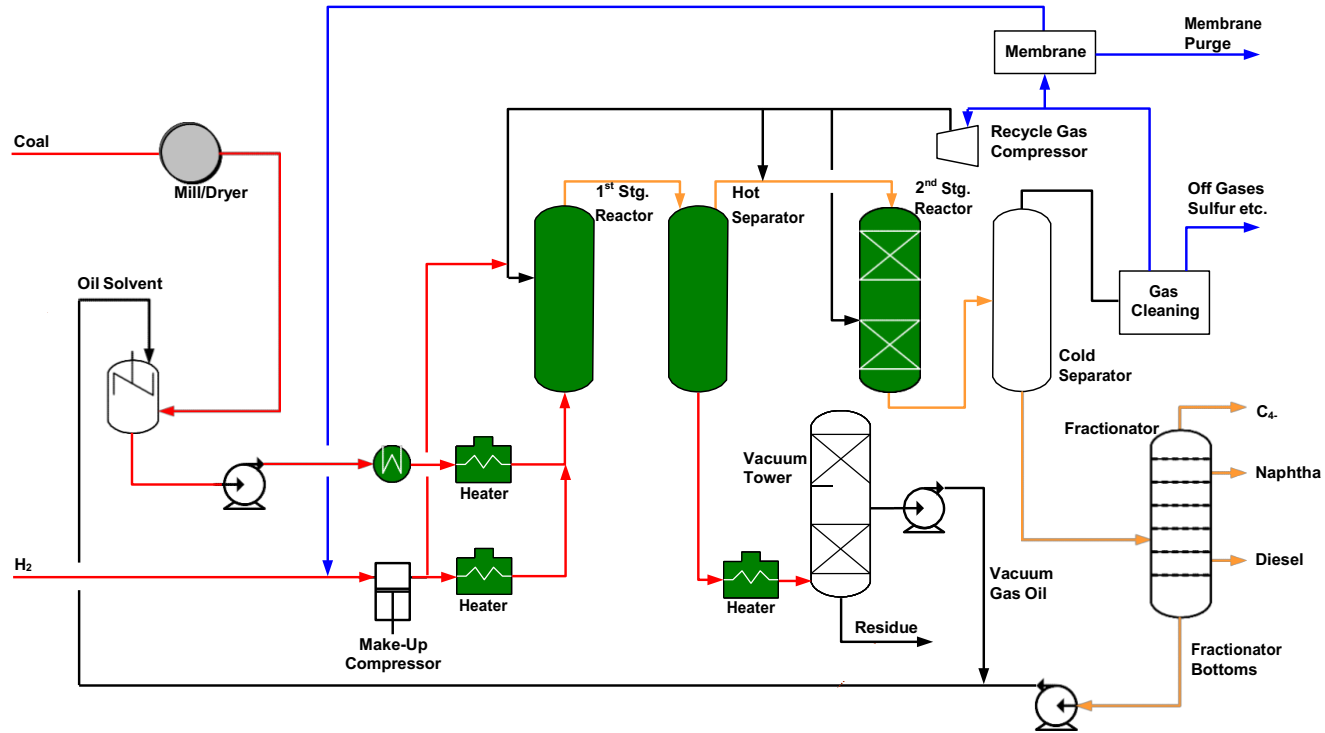


Background

- **Riverview Energy Corporation** is a developer of Direct Coal Hydrogenation (DCH) projects in the United States.
- Riverview's first project will be a 22,000 bpd refinery located in Spencer County, Indiana. This facility will use the Veba Combi-Cracking (VCC).
- The VCC technology was originally developed by Veba Oel and was the recipient of the Nobel prize in chemistry in 1911.
- VCC is based on a hydrogenation process developed and perfected by Friedrich Bergius (known as the Bergius Process).
- It is a simple, once-through process for **direct** conversion of coal to valuable liquid products. The process does not require combustion or gasification making it more efficient and cost effective.



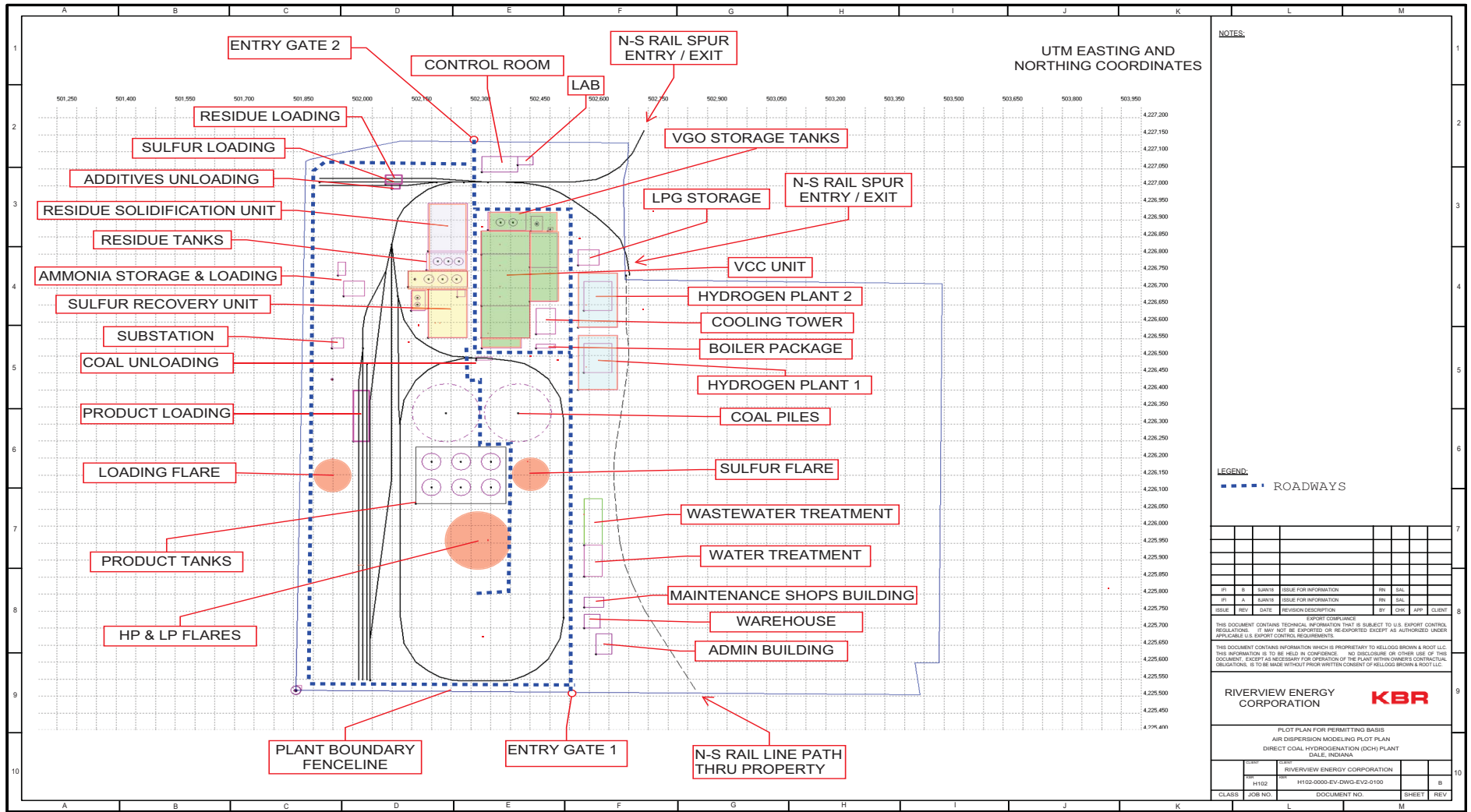
Riverview Energy – VCC Direct Coal Hydrogenation Technology



Source: KBR



Riverview Energy – Preliminary Plot Plan





Proven Technology

- There are currently 3 plants operating at scale today in the world using VCC technology:
- China – two plants in operation using a variety of feedstock including coal, resid and Coal Tar. Both plants operate **at scale (20,000 bpd)**.
- Russia – One plant operating **at scale (50,000bpd)**.
- Testing facility in China – to test feedstocks and yields.



The Opportunity

- The United States consumes close to 20 million barrels of liquid fuels per day and is projected to sustain or increase this demand over the next 25 years. The United States spends roughly \$333 billion annually importing oil, close to 2% of its Gross Domestic Product
- Riverview Energy Corporation is developing a state of the art *Direct Coal Hydrogenation facility* in southwest Indiana, with the capacity to convert large quantities of locally sourced high sulfur coal and natural gas, into clean liquid fuels and other valuable by-products. A transformative project that will create jobs (2000 construction, 230 long term operations, 1500 ancillary jobs in various industries such as mining and hospitality) and a long-term, clean use of America's most abundant energy resources; Coal and Natural Gas
- The Facility will use 1.6 million metric tons of coal annually.
- The Facility will produce approximately 4.8 million barrels of **ultra low sulfur diesel** and 2.5 million barrels of naphtha annually. These are both highly attractive products, with significant demand in the United States and internationally. The plant will be the first of many in our strategy to reposition the mining infrastructure in U.S. coal producing regions, away from power generation and into liquid fuel production



The Opportunity

- The project exploits the substantial gap between the prices of crude oil, on the one hand, and coal and natural gas on the other. The spread between oil and coal has averaged \$12.44 per million Btus over the past ten years. Forecasts by the Energy Information Agency (“EIA”) imply that this trend will continue, with the spread widening to more than \$17 per million Btus by 2030
- The project will promote U.S. energy security by displacing imported petroleum-derived gasoline and diesel fuels. This will result in economic gains for US consumers and potential national security benefits. The project is firmly aligned with the Federal Government's economic policies and directives to stimulate job creation in the energy sector
- DCH is a truly clean coal technology. It removes high-sulfur coal from the power-gen stream and upgrades it into a **Clean Air Choice Fuel**



Clean Air Choice Fuel® - ULSD

- ULSD is considered a Clean Air Choice® fuel by the American Lung Association
<http://www.cleanairchoice.org/fuels/ulsd.cfm>
- **Why is Ultra Low Sulfur a Clean Air Choice®?**
ULSD fuel enables the use of cleaner technology diesel engines and vehicles with advanced emissions control devices, resulting in significantly improved air quality. **Annual emission reductions will be equivalent to removing the pollution from more than 90 percent of today's trucks and buses**, when the current heavy-duty vehicle fleet has been completely replaced in 2030.
- According to the EPA, Testing by engine manufacturers and regulatory bodies have found the use of emissions control devices in conjunction with ULSD can reduce the exhaust output of ozone precursors and particulate matter to near-zero levels.^[2]
- According to EPA estimates, with the implementation of the new fuel standards for diesel, nitrogen oxide emissions have been reduced by 2.6 million tons each year and soot or particulate matter will be reduced by 110,000 tons a year.
- By 2020, new shipping regulations will require Ultra Low Sulfur fuels be used in all ships navigating the high seas (seas greater than 12 miles from shore).



Riverview Energy – Product Characteristics

• Naphtha

Specification	
Flow (Sm ³ /hr)	48.7
Flow (BPSD)	7353
Sulfur Content, ppmw	<1
Specific gravity	0.745
RVP, bar(a) (psia)	0.50 (7.3 psia)
H ₂ S content	Copper strip negative
ASTM D86 LV%	
IBP, 1%C	26
5%, C	57
10% C	63
30% C	78
50% C	94
70% C	112
90% C	130
95% C	135
FBP - 98%C	147

Diesel

Specification	
Flow (Sm ³ /hr)	94.26
Flow (BPSD)	14369
Sulfur Content, ppmw (ASTM D-5453)	<10
Specific gravity (ASTM D-1298)	0.848
Cetane Index (ASTM D-4737)	45
Flash point C (ASTM D-93 PM)	56
Water content, ppmw (ASTM D-1744)	<100
H ₂ S content	Copper strip negative
ASTM D86 LV%	
IBP 1%,C	156
5%, C	190
10% C	201
30% C	232
50% C	255
70% C	278
90% C	320
95% C	334
FBP - 98% C	349



Riverview Energy – Other Regulatory Issues

Impact Study	<ul style="list-style-type: none">• Working with DOE requires impact studies (NEPA review)
Draft EPA Regulations	<ul style="list-style-type: none">• In June of 2015 the Environmental Protection Agency released draft regulations designed to reduce CO₂ emissions from power generation. These regulations are under review by the new administration• If implemented, these regulations will make it virtually impossible for new electric power plants to burn coal.• The DCH Facility will not be a net generator of electricity (as opposed to Fisher-Tropsche-based technologies) and according to IDEM would not be subject to power generation requirements.• Riverview has not received any indication from KBR or IDEM that these rules will affect the plant.
CO₂ Regulation	<ul style="list-style-type: none">• There is currently no legislation in effect, or being contemplated, that would subject the DCH Facility to a carbon tax.• However, our financial advisor has made provision for such a tax in the sensitivity analysis of the financial model.



Riverview Energy – Economics

