



Reliance Petcoke Gasification Complex

Mission Energy Foundation Gasification Conference-2022

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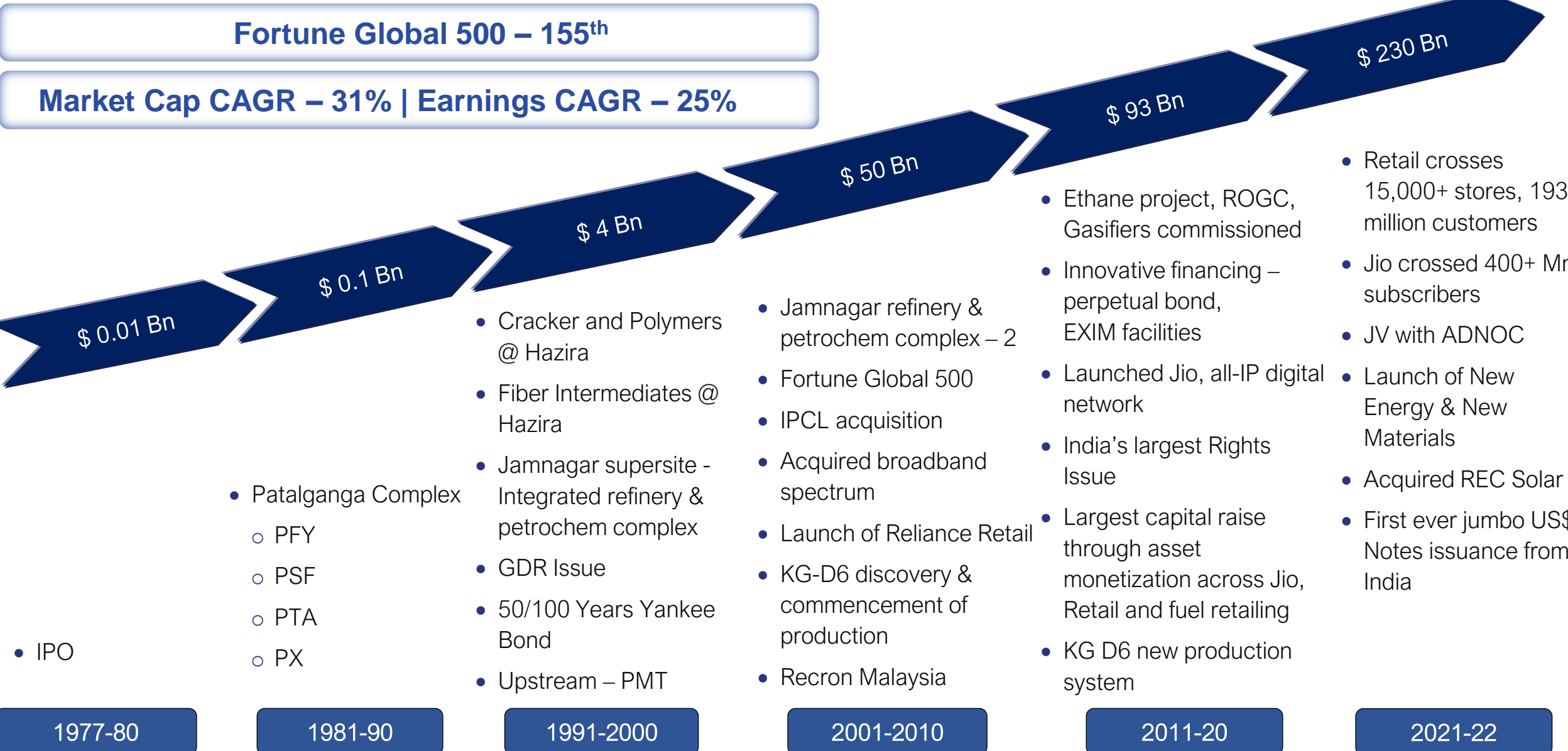


Three mega growth engines and a strong liquid balance sheet

Phenomenal Growth Journey – Now A Top 100 Global Company

Fortune Global 500 – 155th

Market Cap CAGR – 31% | Earnings CAGR – 25%



Note: CAGR since IPO



Opportunity to accelerate New Energy and New Materials businesses based on RIL's vision of clean and green development

- **Integrated Solar Photovoltaic module factory**
 - Establish and enable at least 100GW of solar energy by 2030
- **Advanced Energy Storage Battery factory**
 - Collaborate with global leaders in battery technology to achieve the highest reliability round-the-clock power availability
- **Electrolyser factory**
 - Manufacture modular electrolysers of highest efficiency and lowest capital cost
- **Fuel Cell factory**
 - Fuel cell uses oxygen from the air and hydrogen to generate electricity, emitting non-polluting water vapour

Deploy next-gen technologies to combat climate change



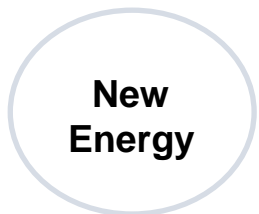
- **Best-in-class** digital services with pan-India all-IP mobile and FTTH connectivity
- Focus on **subscriber ramp-up, enterprise solutions, narrow-band IoT** and scaling-up of digital platforms



- Reliance is well-placed to leverage its online ecosystem and offline network to **maximize the reach across India's consumption strata**
- **JioMart** to create value for entire retail ecosystem by **partnering with** small merchants, kiranas and farmers



- **World-class, integrated O2C platform to sustain growth and profitability** through demand and commodity cycles
- O2C to maximize downstream, reduce transportation fuels and **create clean and green energy platforms**

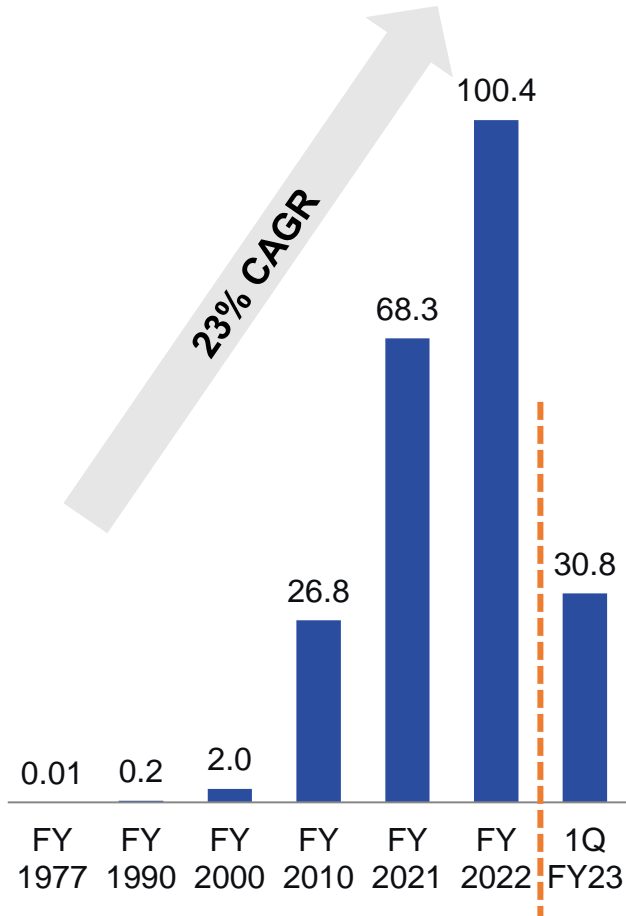


- Next big value creation engine – **New Energy and New Materials business**
- Technology and innovation focused partnerships in New Energy to achieve **Net Carbon Zero** by 2035

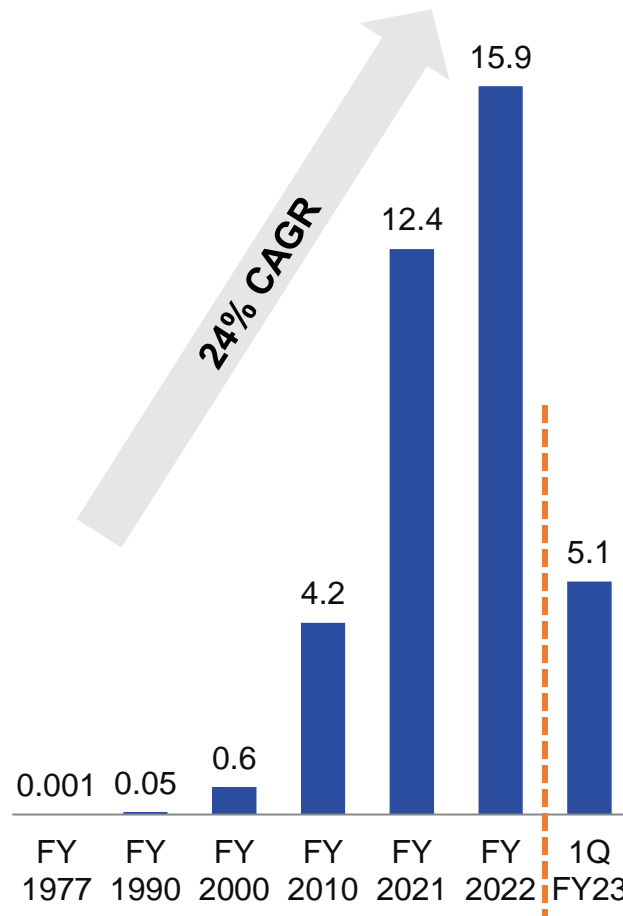
Multiple engines of growth with focus on consumers and technology

Robust and Consistent Earnings

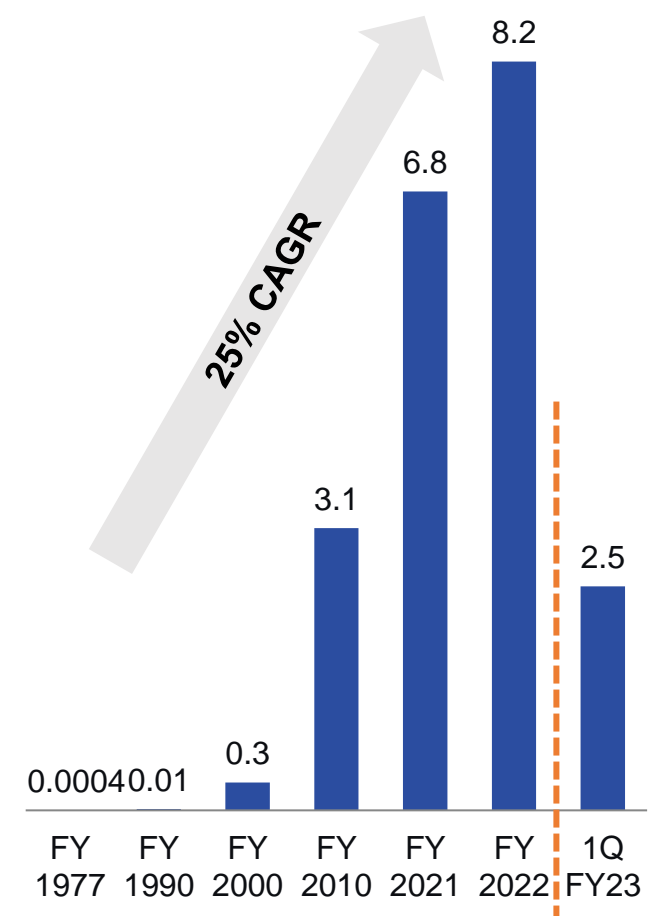
Revenue (US\$ Billion)



PBDIT (US\$ Billion)



Net Profit (US\$ Billion)

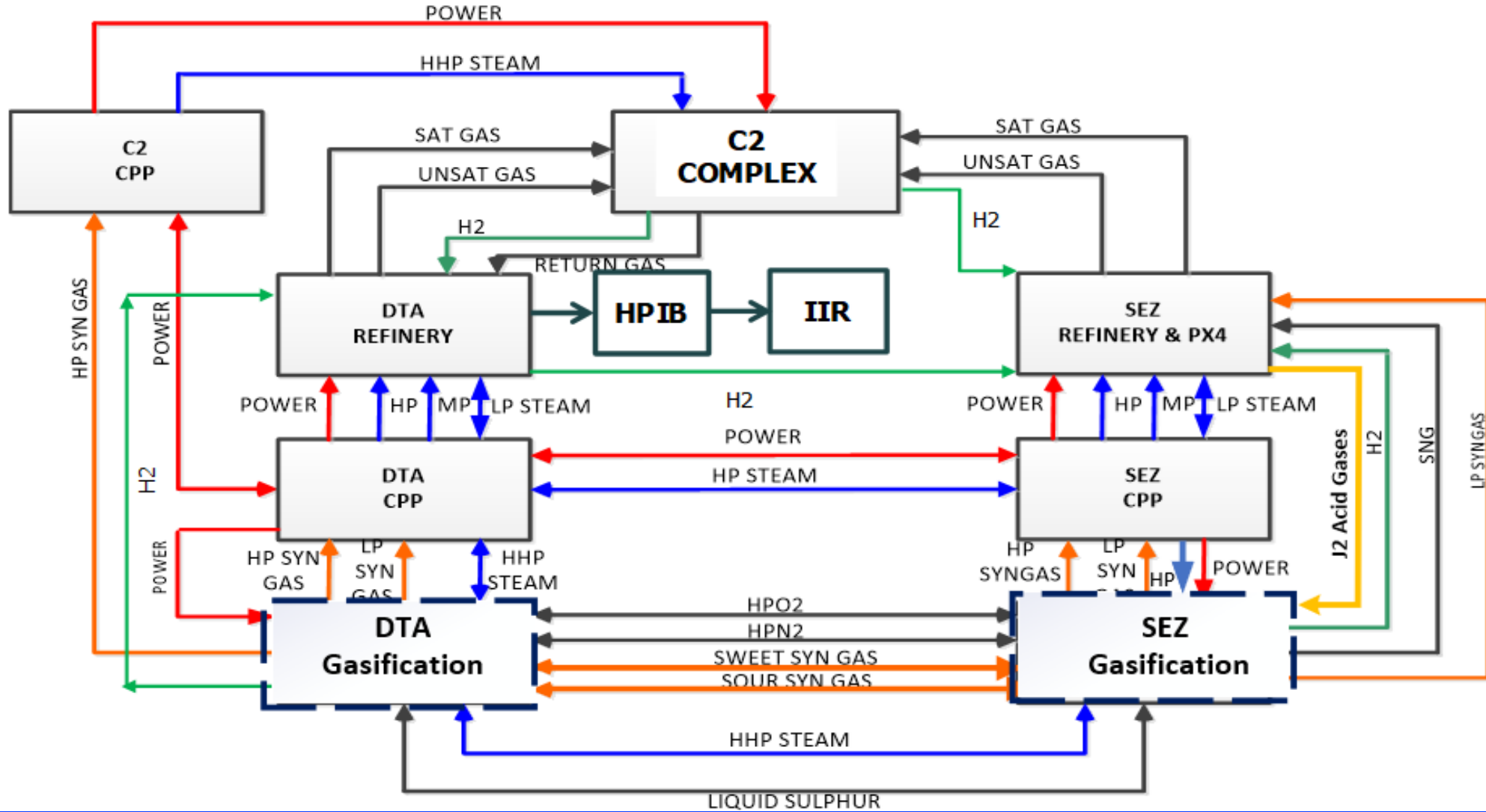


Why Gasification Project ?

- **Substitute high-cost LNG imports**, with syngas
- Insulate Jamnagar energy cost, from price volatility
- **Exploit price delta between natural gas and petcoke/coal.**
- Syngas available for fuel /H₂ - Utilize RFG feed gas to recover C₂+C₃ for advantage pet-chem feed
- Boost Jamnagar GRM
- **Transform “Jamnagar” into “bottomless” refinery**

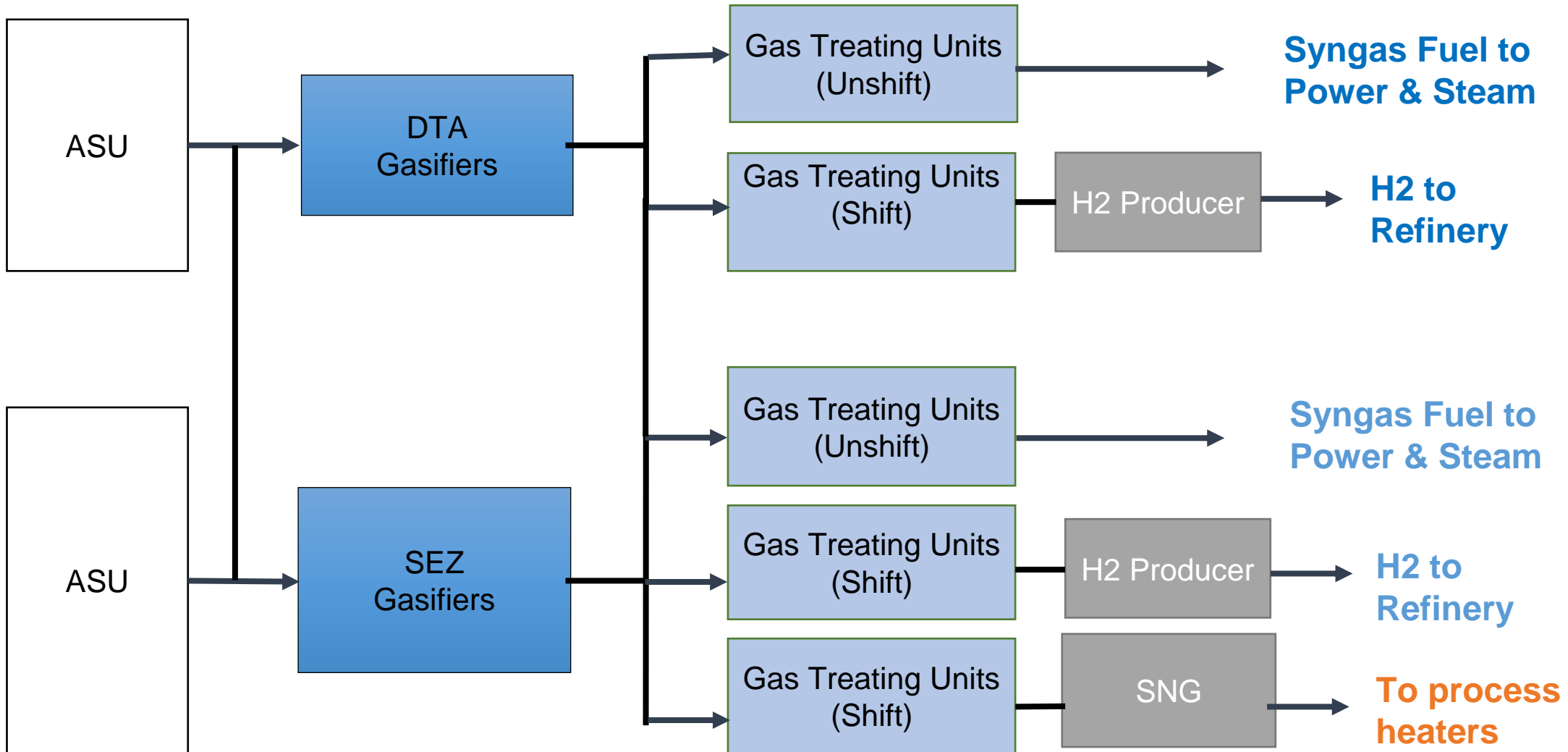
Gasification unlocks value addition to Pet-chem

Overview - Gasification Integration with Jamnagar Complex



Unique Integration leads to sustainable Energy / Cost Advantage

Overview - Gasification Complex BFD



World's largest Gasification complex – Equivalent to large size Refinery



ASU

- World's Largest ASU Trains
- Flexibility to maximize LIN or LOX



Gasifier

- World's Largest Pet coke Gasifier
- Flexible feed : 100% Pet coke / Blend of Pet coke & Coal
- 2 Stages for High Carbon Conversion

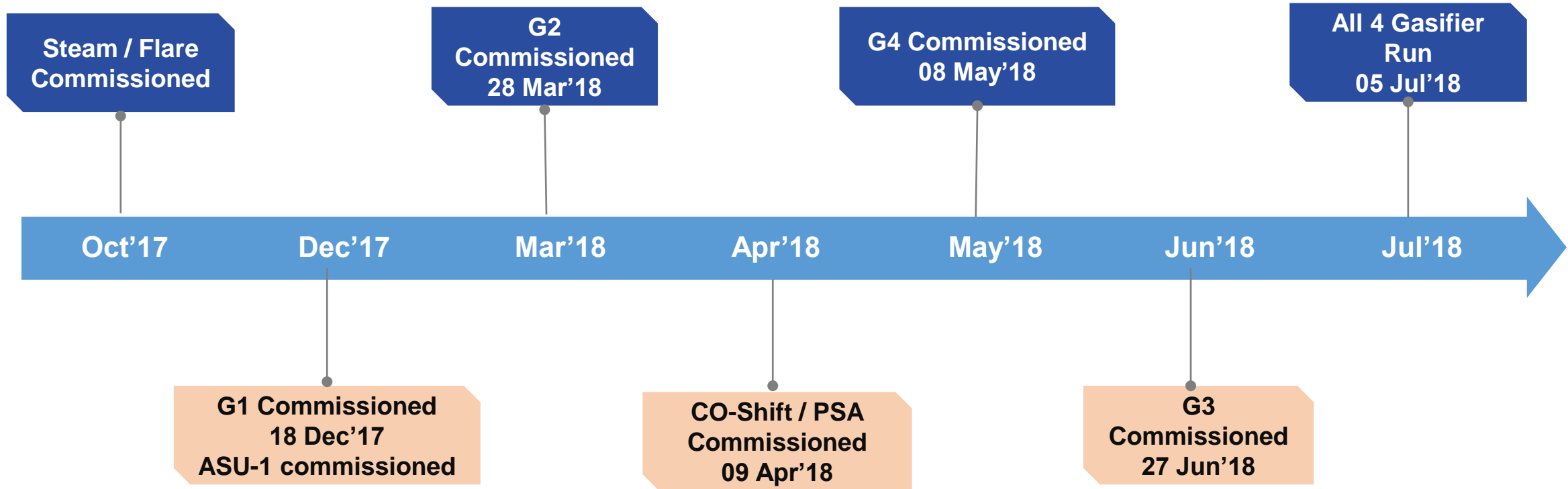


AGR

- Largest AGR in the world

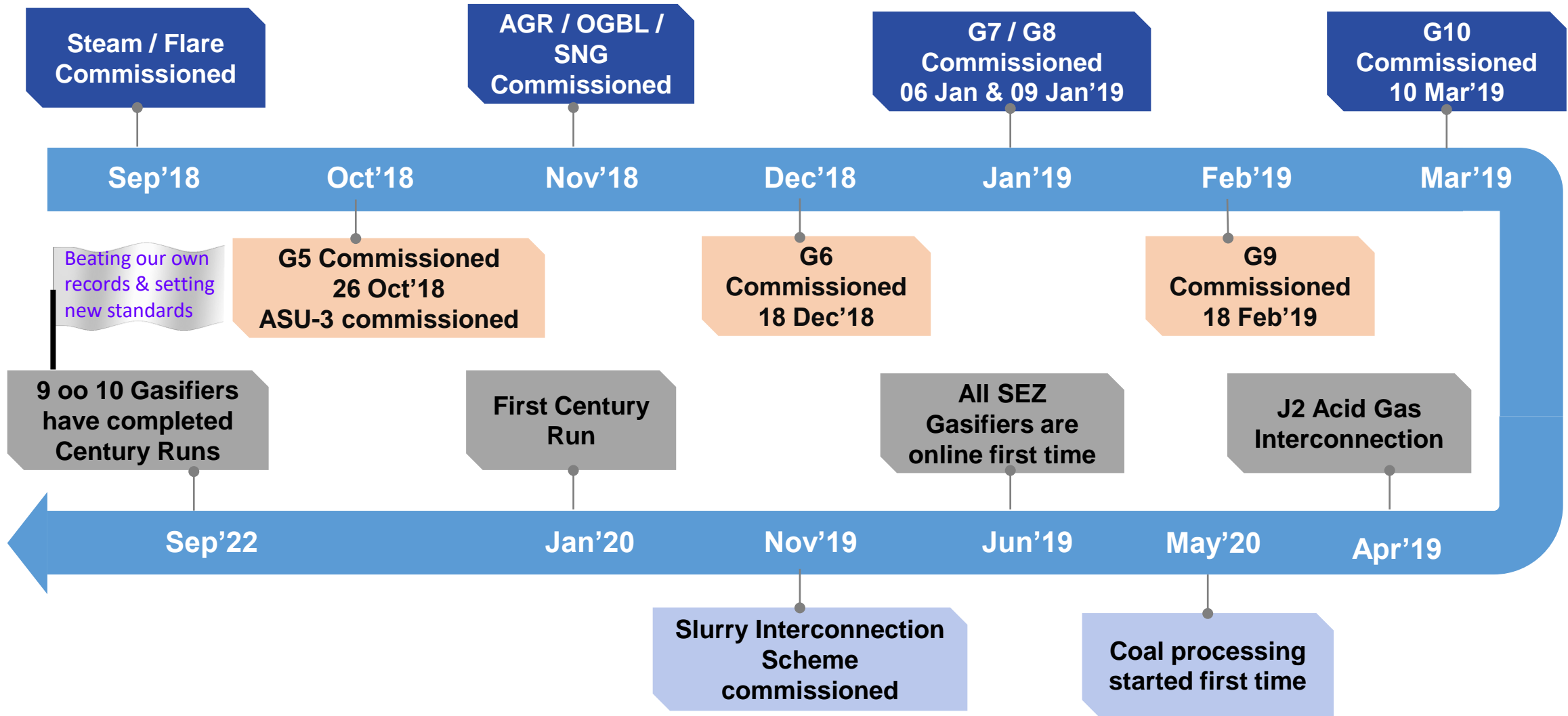
AGR – Rectisol unit with CO₂ capture ready design

Transition - DTA PCG Complex Commissioning

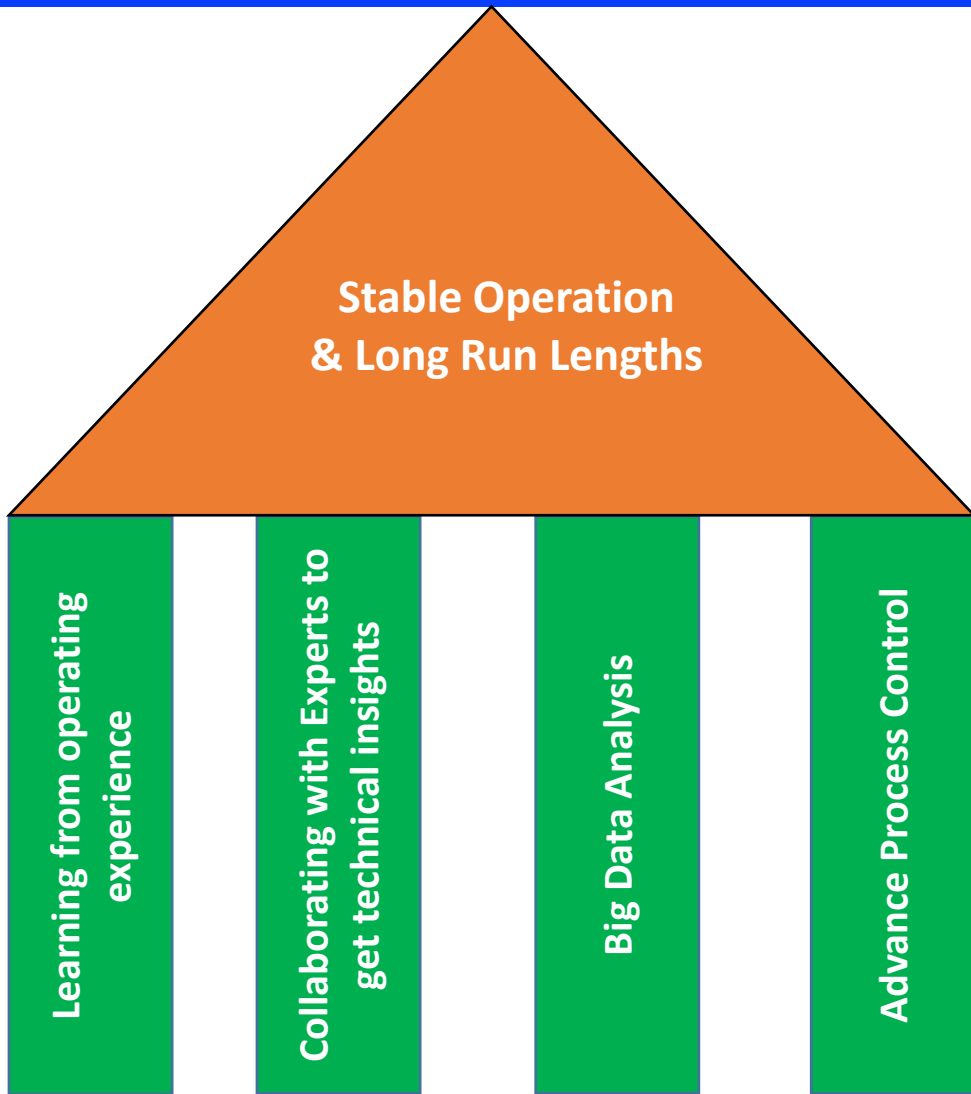


Challenges faced during commissioning were overcome and lessons learnt were documented

Transform -SEZ PCG Complex Commissioning



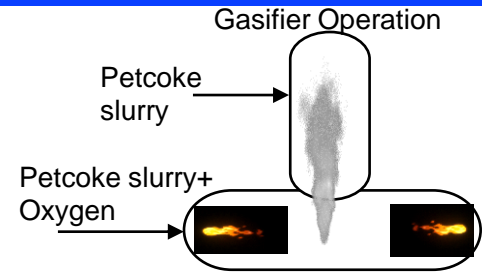
Perseverance & Resilience of PCG Team - Transforming Operation



- ❖ Four pillars which helped in achieving stabilized operation of Gasifier are
 - ❖ Learning from own operating experience
 - ❖ Collaborating with experts to get technical insights
 - ❖ Big Data analysis
 - ❖ Advance Process Control
- ❖ Documentation of learning from each Pillar is helping us to train the next Generation of Engineers
- ❖ Commissioning to stable operation was achieved in a short span of 2 years

Combination of operating experience+ fundamental knowledge+ Advance analytics/controls is the foundation of stable Gasifier operation

Pillars of Achieving Stable Operation and Long Run Lengths



Vision
Develop a window of Good Operating Zone

Learning from operating experience

- ❖ Analysed initial Gasifier operation Run parameters
- ❖ Developed a window of Good Operating Zone (GOZ)
- ❖ We keep learning to improve the future and unlearn things which did not work

Strong Fundamental Understanding of Ash Chemistry

Vision
Understand in depth the ash chemistry and the handles available to control the composition to minimize ash deposition

Collaborating with Experts to get technical insights

- ❖ Collaborated with international experts on Ash chemistry and Gasifier
- ❖ Converted the Fundamentals into best best operating practices

Big Data Analysis

Vision
Develop "World-Class" Big Data Analytics System for Gasifiers which will be used for value added monitoring , decision making and optimization

Big Data Analytics

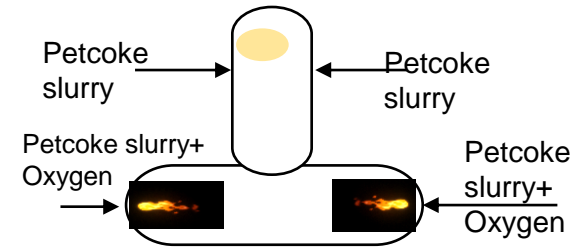
- ❖ 155 Descriptive, Predictive & Prescriptive Analytics models are running at every 0.5 hrs to 5hrs frequency and are tracking variables alerting events early. Data is taken from Data Lake
- ❖ These models are being maintained to match changes in operating practices/regimes

Advance Process Control

Vision
Fully utilize the operating margins to maximize the profit

Advance Process Control

- ❖ Optimizing the Gasifier process parameters with tighter and finer controls
- ❖ Total complex has 1000+ MVs which the APC uses to optimize CVs. Performance reports are generated every shift
- ❖ Our inhouse experts implemented APC in a time frame of 1.5yrs which includes the peak COVID time



Avoiding Ash Deposition in Reactor 2nd Stage

- ❖ Consistent feed quality with right Gasifier 1st stage temperature
- ❖ Fundamental understanding of ash deposition mechanism and translating it to operating conditions
- ❖ Gasification technical team is trained to run and analyse the ash chemistry models

Operating HTHR (Boiler) at Right Temperature

- ❖ Understanding ash chemistry and eutectics and then optimizing the HTHR inlet temperature has reduced the ash deposition and damages to tubes
- ❖ In house CFD experts modelled different operating conditions to understand the dynamics of ash+gas flow to HTHR
- ❖ 8 to 10 sets of different experiments were done in plant to understand the ash deposition mechanism

Improved Char Filter Performance

- ❖ From fundamentals understood the char filter failure mechanism
- ❖ Did necessary changes in the plant to avoid damage to the filter element by foreign particles
- ❖ Optimized process parameters to reduce the pulsating shocks on filter elements
- ❖ Tried filter elements of different metallurgy and structure to increase strength and life

Flexible operation

- ❖ Interconnected various rotatory and static equipment to achieve operation flexibility
- ❖ This helped in continuously running the Gasifier even if an equipment goes for maintenance
- ❖ Interconnection schemes with slurry hydraulics were prepared by in house experts & tools

Our Core Strengths

Continuously Enhancing Operation Team Competency

- ❖ Training operation crew continuously on OTS models to handle various scenarios
- ❖ Updating the SOP in regular intervals based on operating experience
- ❖ Documenting the changes done in plant for future references

Planning Operation and Maintenance (O&M)

- ❖ Rigorous planning by the planning & O&M team helps to maintain the plant shutdown & startup schedule
- ❖ Continuous efforts of O&M team helps in completing the shutdown activities as per plan
- ❖ Close coordination between planning and maintenance team increases the plant availability

Online Machine Learning Models for Predictive analysis

- ❖ Online ML based predictive models helps in taking early actions
- ❖ These models are developed by our in-house Big Data Team.
- ❖ The alerts generated helps in taking corrective actions and in planning any maintenance activities

Technical Support

- ❖ Site technical, R&D and COE team are continuously working to take Gasification to the next level
- ❖ Document the learnings from world experts and suggests modification & prepare Gasifier run plans
- ❖ Provides support in trouble shooting issues and optimizing operating parameters to reduce specific consumption

Profit Improvement Opportunities

- ❖ Continuously Identifying opportunities to increase the profitability by asset sweating and rerouting streams for process optimization and heat integration has helped in increasing the profit margins

Safety

- ❖ Gasification Complex has achieved 923 Safe Man days and 30.5 MMHrs without any HSEF Incident in FY 21-22
- ❖ Won ROSPA International Safety Award, UK in GOLD category for excellence in HSE System.
- ❖ Won BSC- British Safety Council Award for excellence in HSE System..

Syngas Production –Blending of torrefied Biomass with petcoke slurry.

Vanadium, Nickel Recovery from Gasification Cinder

Syngas allows Flexibility to produce Acetic Acid, Methanol and Ethanol

Will provide Feed for derivatives like Vinyl Acetate Monomer, Acetic Anhydride, Ethyl Acetate

PCG Complex – One of the Driving factors of O2C

Thank You