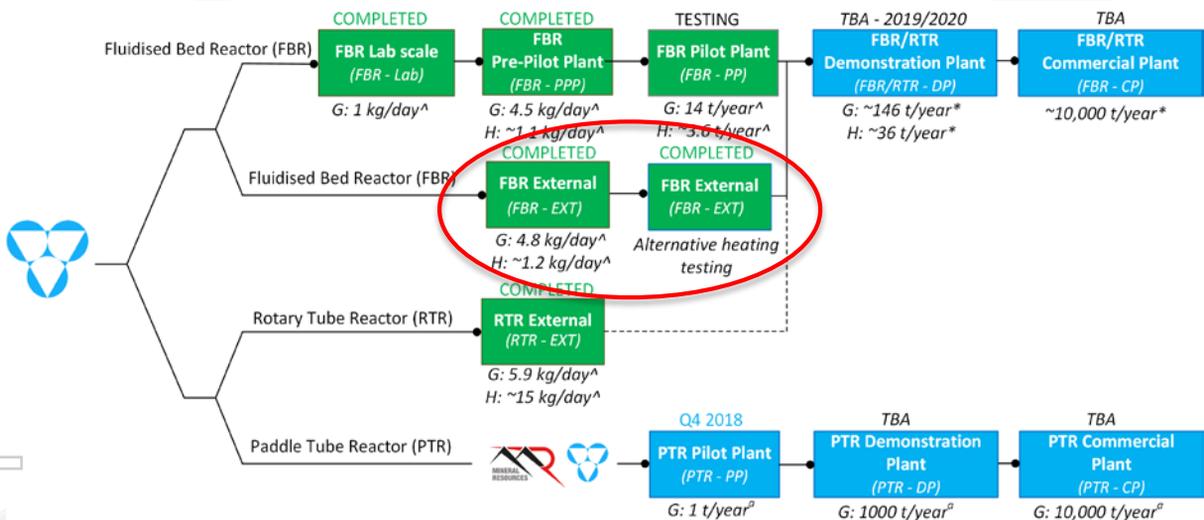


## INDEPENDENT TESTING OF HAZER PROCESS COMPLETED

- **Successful testing and validation of the Hazer process in a third party operated Fluidized Bed Reactor system.**
- **Hazer's proprietary Fluidised Bed Reactor design shown to out-perform the third party's un-optimised reactor design by more than 600% in nominal capacity.**
- **Successfully testing of alternative heating methods, with validation of critical engineering design parameters required for scale-up design.**

**PERTH, AUSTRALIA 18 SEPTEMBER 2018:** Hazer Group Limited (ASX:HZR) has successfully trialled the Hazer process in an independently designed and operated 'external' Fluidized Bed Reactor, referred to FBR-EXT. The FBR-EXT is representative of a typical FBR design in industry.



<sup>A</sup> Actual equivalent product capacity rate achieved (unpurified)

<sup>\*</sup> Nominal product target capacity (unpurified)

<sup>°</sup> Nominal graphite target capacity (purified)

G: Graphite nominal capacity

H: Hydrogen nominal capacity

Figure: The External FBR (circled in red) contributes to the overall development of a commercial pathway.

The purpose of the independent testing was to:

1. Obtain input from a FBR specialist on the operability and scale-ability of the Hazer process.
2. Provide a performance comparison against the proprietary design Hazer FBR pilot plant (FBR-PP).
3. Produce comparative bulk graphite samples.
4. Assess alternative heating methods.

## Independent testing results

The independent trials were undertaken by FBR scale-up specialists, Roundhill Engineering Pty Ltd, who tested the Hazer process using their unmodified inhouse FBR testing rig (FBR-EXT) at their NSW facilities. The system was operated in continuous fashion, with the catalyst injected and the graphite ejected during operations.

Average production rates of circa 6kg/day, equating to circa 4.8 kg/d, 80% by weight graphite product and circa 1.2 kg/d hydrogen content production, were achieved. The largest production run produced approximately 1.5kg of graphite.

Over the three separate runs, the fluidisation operation was shown to be very robust and stable; two key requirements for large scale fluidization plants.

“Similar to the Hazer FBR Pilot plant, the external FBR did not experience any significant operating difficulties or issues with de-fluidisation or sintering using the Hazer process. The testing duration of each run was therefore only limited by the planned operating hours, and thus technically could have continued to operate for a longer duration,” said Chief Technical Officer, Dr Andrew Cornejo.

## Performance Comparison with Hazer FBR Pilot Plant

A comparison of the external FBR rig with Hazer’s internal FBR pilot plant is shown below for the same input ratio of methane and catalyst

	External FBR rig	FBR Pilot Plant
	<i>Achieved</i>	<i>Achieved (ongoing)</i>
<i>Reactor size (diameter)</i>	100 mm	75 mm
Graphite - Nominal capacity	4.8 kg/d	29 kg/d
Graphite - Single run production	1.5 kg	12.4 kg
Graphite - Maximum purity	80% by wt	80% by wt
Hydrogen - Nominal capacity	~ 1.2 kg/d	~ 8 kg/d
Hydrogen - Maximum purity	Not tested <sup>^</sup>	49% by vol

<sup>^</sup>Estimate of average hydrogen concentration ~30%vol

“We are encouraged by these results as they demonstrate we are on the right track with our own FBR design. Despite our own in-house FBR Pilot Plant reactor being physically smaller than the external FBR rig its nominal production rate was shown to be more than 600% higher. This demonstrates the progress of our technical team in developing the Hazer proprietary process design,” said Dr Cornejo.

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## Testing of Alternative Heating Methods

Part of this independent testing was to validate gas fired heating as an alternate to electrical heating systems, as gas may provide for lower operating costs and hence improved commercial economics.

As for many industrial processes, the Hazer Process requires heat energy input to facilitate the chemical reaction and drive process unit operations. Heat input is commonly achieved either through electrical heating such as in the FBR Pilot Plant or gas fired heating, and the selection is generally determined by availability, cost, practicality and efficiency of the heat delivery method.

Two alternative heating methods were assessed during this testing:

1. Simple indirect gas fired heating - full reaction and continuous operation, and
2. Novel indirect fluidized bed combustor concept - heat transfer testing.

The simple indirect gas fired testing was successful at maintaining the required reaction temperatures across the reactor bed. This is important for scalability, efficiency and product quality. In addition, separate trials also confirmed improved thermal design parameters required to design and optimise reactor size and reduce capital costs at larger production scales. These trials have provided engineering parameters that will be used to optimise future commercial size FBR designs.

“These alternative reactor tests are valuable to further de-risk the commercial design by providing relevant design parameters. As a consequence of these trials, reactor capacities can potentially be increased significantly from initial assumptions, requiring less reactor units for a specific production target and therefore also allowing for potential capital cost savings at larger scales of production,” Dr Cornejo concluded.

## ENDS

### ABOUT HAZER GROUP LTD

Hazer Group Limited (“Hazer” or “The Company”) is an ASX-listed technology development company undertaking the commercialisation of the Hazer Process, a low-emission hydrogen and graphite production process. The Hazer Process enables the effective conversion of natural gas and similar feedstocks, into hydrogen and high quality graphite, using iron ore as a process catalyst.

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