

### Developmental Status of Compact NG Fuel Processor for the Residential PEMFC System in KIER

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KIER has been developing a compact fuel processor to supply hydrogen rich gases to a PEMFC for residential co-generation system. Our fuel processor capable of delivering about 2.0 Nm<sup>3</sup>/hr hydrogen with dual pipe geometry (O.D. 265mm × H 700mm, 38liters) features integrated structure of steam reformer, water gas shift converter, preferential oxidation unit as CO clean up, and auxiliary components such as flow control units. The composition of product gas typically contains 73.6% H<sub>2</sub>, 2.8% CH<sub>4</sub>, 1.8% CO, and 21.7% CO<sub>2</sub> under the operating conditions of S/C ratio of 2.5. The fuel processor shows the highest thermal efficiency of 73% at HHV. Both high and low temperature shift converters are employed to reduce CO content below down to 1% and the preferential oxidation unit removes CO less than 5 ppm, which is the prerequisite CO limit condition of reformed gas for the PEMFC stack. Our fuel processor is connected to the PEMFC stack to test the performance and reliability of the total system. It has been demonstrated that the total system is operated for three days without any failure of fuel cell voltage. Further studies are ongoing for improving thermal efficiency.