

## AEIL (HK) Newsletter 1.1.11

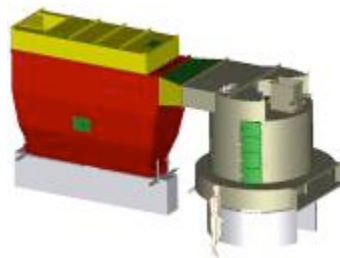
### Australian Commercialisation Project – AEI CHR infinity- suitable for 5kw HFC

AEIL (HK) continues to work with the Australian License owner, Alternative Energy Australia Pty Ltd to commercialise a product. The project is currently fully funded by AEIL (HK) using our 100% owned Australian subsidiary company AEI Pty Ltd. Primary contractor is Ivan Winters of Ingenia is employed by AEIML (HK). Ivan has great experience providing engineering support for certifying new products. Ivan has signed confidentiality, non-disclosure and assignment of IP to AEIL (HK) agreements.

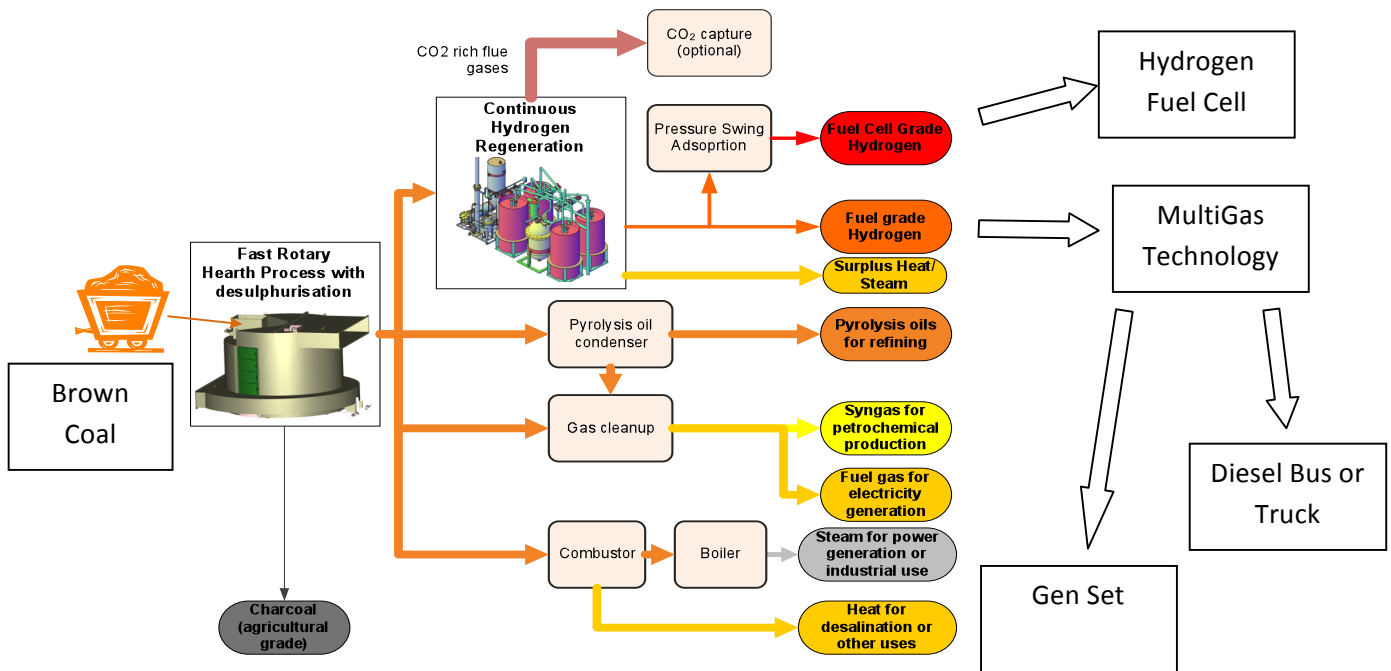
### Case Study – Brown Coal - Proposed Integrated CHR™ with FRH™ Pilot Showcase

Over the 2010 Christmas holiday period AEIL (HK) has continued to support the development of the larger system in Mackay working through Wayne Brown and Dr. James Joyce

Alternative Energy International Limited has patented the continuous hydrogen regeneration (AEI CHR™) process for the production of hydrogen and hydrogen rich gases from low quality feedstocks. It is envisioned that the AEI CHR Infinity™ process could be used to produce clean hydrogen from lignite (brown coal) using partner technologies such as the JJA FHR.



A partner organization have developed technology for processing solid fuels to extract the usable hydrocarbons though low temperature fast pyrolysis/gasification, which yields an agricultural grade char product.



- It is considered that FRH process can be modified and tuned to partition most of the Sulphur and a significant proportion of the Nitrogen to the char product, where it has value as a fertilizer replacement.
- In summary the FRH process can take a low grade solid fuel and prepare a clean gas for utilization by other processes such as CHR.

Brown coal is a difficult fuel to use efficiently and cleanly, due to high moisture, ash and other inorganics such as sulphur and nitrogen. The key features of brown coal (lignite) are:

- High moisture content: Up to 50% by weight as delivered
- High ash content: Up to 25% by weight as delivered
- Ash characteristics : Low sintering temperature (<<1000 deg C)
- Sulphur content Up to 3% by weight as delivered
- Nitrogen content Up to 1.5% by weight as delivered
- Heating value 10 – 15 MJ/kg as delivered

The conventional technologies for brown coal utilization are very capital intensive. Many of the alternative technologies are even more expensive. The AEI technology options provide a pathway that is less cost intensive while providing a more diverse mix of potential revenue streams.

	Conventional technology	Current alternatives	AEI Technology
<b>Summary description</b>	Large pulverized fuel fired furnaces for ranking (steam) cycle power generation. Post combustion capture of SOx and NOx.	Integrated drying gasification combined cycle (IDGCC), or other dewatering technologies	Fast Rotary Hearth (FRH) and Continuous Hydrogen Generation (CHR)
<b>Thermal efficiency to product (LHV basis)</b>	<35% to electricity	<40% to electricity	>65% to hydrogen enriched product gases. >75% to syngas

<b>Technical features</b>	Large foot print Operational challenges due to fouling of heat transfer services.	Large foot print Complex set of unit processes gas cleanup and gas turbine Cannot be economically viable below 100 MW	Moderate foot print Suitable for a large range of scales (sub MW and above). FRH is a simple technology in comparison to IDGCC
<b>Other features</b>	Wet or dry ash in fine oxide powder or slurry form plus slag lumps from furnace tubes	Fine oxide ash powder, difficult to handle. Can integrate into post combustion CO <sub>2</sub> capture.	Reduces cost of post use capture of CO <sub>2</sub> . Ash handled as a granular solid char
<b>Products</b>	Heat Steam	Heat Steam Syngas	Heat Steam Syngas / fuel gas Pryolysis oils Hydrogen Charcoal
<b>Relative capital cost</b>	High	Very high	Moderate

AEI's technologies have undergone significant development; however they have not been adapted for brown coal. AEI have a nominal 50 kg per day CHR research and development unit located in Mackay and a modified 150 kg system to be completed in 2011. These would use the off-gases from the equivalent to 200 kg/hr of brown coal. A staged research and development plan is suggested to adapt AEI's technologies for pilot scale demonstration of brown coal to hydrogen.

# AEI CHR™ CASE STUDY – Generic Sewerage Plant

## Sewerage Plants

*With the addition of an anaerobic digester conventional sewerage plants can capture methane.*



**Aeration Basins** supply large amounts of air to the mixture of primary wastewater and helpful bacteria and the other microorganisms that consume the harmful organic matter.

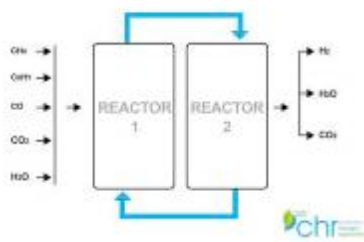


**Final Settling Basins** allow the clumps of biological mass to settle. This activated sludge can be returned to aeration basins or pumped to the anaerobic digester



**Anaerobic Digester** primary and activated sludge's are **anaerobically digested** (decomposed by bacteria without the presence of air)

## AEI CHR™ uses mixed hydrocarbon as a feedstock to produce hydrogen



AEI CHR™ uses a range of optional, and locally available and renewable feedstock to produce hydrogen, water (steam) and carbon dioxide. Optional feedstock can include:

- **Methane**
- **Mixed hydrocarbon's**
- **Biogas and Syngas**
- **Biomass gasification products**

## AEI CHR Infinity™ lowers global warming and can qualify for carbon credits

Methane is 26 times more global warming than carbon dioxide

Hydrogen burns in conventional engines and hydrogen fuel cells without producing any carbon by-product.



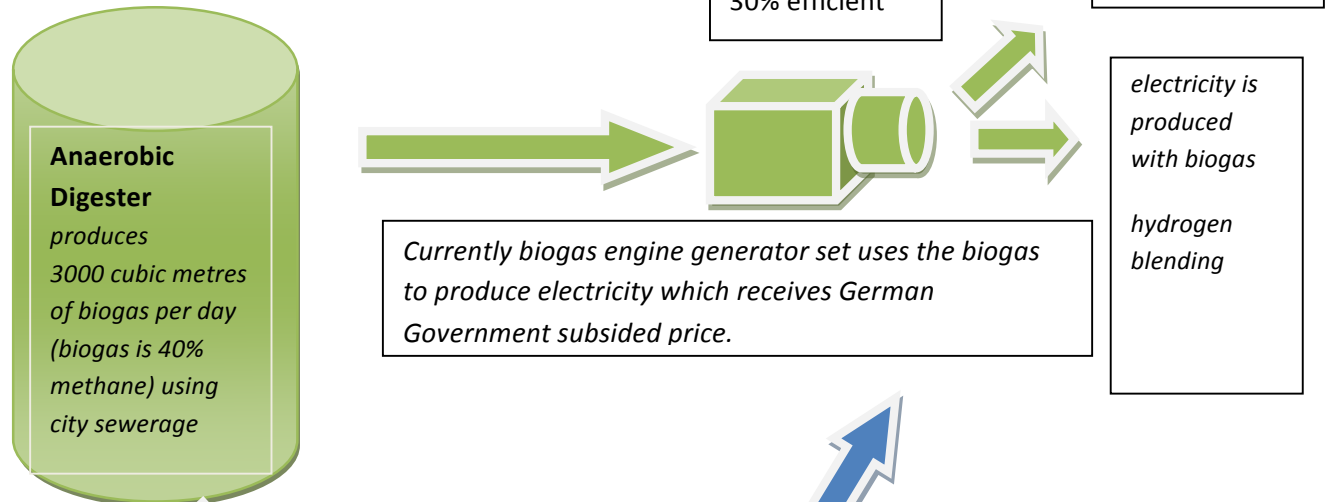
## Hydrogen produced by AEI CHR Infinity™ can be used with a hydrogen fuel cell

It is possible to produce ultra pure hydrogen using AEI CHR Infinity™ that can supply a hydrogen fuel cell. Hydrogen fuel cells can use up to 80% of the energy value of hydrogen directly into electricity with no global warming pollution.



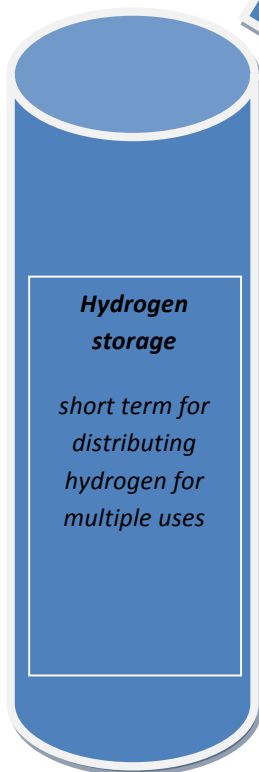
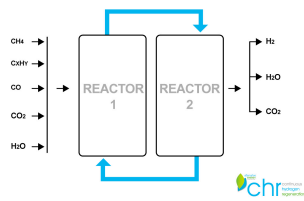
# City of Celle Case Study (small German town of 70,000)

## CURRENT



## PROPOSED

AEI CHR Infinity™  
Produces Hydrogen using sewerage



## OPTIONS

1 Hydrogen is blended with biogas to improve efficiency and lower emissions

2 Hydrogen is blended with diesel to power a diesel generator to improve efficiency and lower emissions

3 Hydrogen is blended with diesel to fuel a diesel vehicle to improve efficiency and lower emissions

4 AEI CHR Infinity™ hydrogen can meet Hydrogen Fuel Cell purity and produce electricity at 60% efficiency

1  
2  
3  
4

Recent testing by AEI has demonstrated that old diesel engines can be restored to EU emissions certification using gas injection.

