



Complementary Hydrogen Project

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<https://ines.mn/>

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ASX:EXR

Highlights

1. Elixir's Mongolian subsidiary, GOH Clean Energy LLC has been pursuing various initiatives to **pursue hydrogen (H2) opportunities in Mongolia**, including deploying a SODAR to measure green H2 feedstock: renewable energy resources
2. Elixir considers **Mongolia** is **one of the best locations** in the world **to produce green hydrogen**:
 - Adjacent to **very large potential Chinese H2 markets** such as Inner Mongolia's steel mills (which produce 6 times total Australian steel production)
 - **Ultra low cost of delivery** – by pipeline not boat
 - **World class renewables** – wind and solar
 - Very **few competing land uses**
3. Elixir's current **natural gas related skills** and assets in Mongolia are **highly complementary** to this **new clean energy** venture
4. Elixir is progressively **engaging with relevant stakeholders** to build competitive foundations to participate in an **emerging massive new energy industry** in a strongly advantaged location



Introduction – Hydrogen 101

- Hydrogen (H₂) is the most common element in the universe - but very rare as an element on Earth
- Hydrogen is common as a constituent of molecules readily available on Earth such as water and methane
- H₂ can be obtained by separation processes from these. It is not a primary fuel source
- Hydrogen is therefore an energy carrier or vector – e.g. it can be used to move and store renewable electricity
- Combusting H₂ produces heat (similar to hydrocarbons such as CH₄) which can be used to generate electricity, be used in industrial processes such as steel-making, etc
- The key attractive feature of using H₂ as an energy source is that its combustion does not produce greenhouse gases like CO₂ – only water (H₂O)
- In the absence of Government policies to reduce greenhouse emissions, H₂ only currently serves niche markets such as oil refining
- However, wide-spread international targets to meet net zero targets will require such Government policies – hence H₂ is widely forecast to become a major part of the global energy mix in the decades to come



Introduction – the Colours of Hydrogen (H₂)



¹H Hydrogen 1.00794

The 3 main ways to produce H₂ are illustrated:

- In descending current cost
- In ascending pollution levels

Net zero by 2050 targets are predicted to require massive clean H₂ production

GREEN Electrolysis



Most desired (but costly) form of H₂ production - using **electrolysis** powered by **renewable electricity**



Electrolysis



Renewables

BLUE Steam



Hydrogen produced using **fossil fuels** but CO₂ is **captured/sequestered**

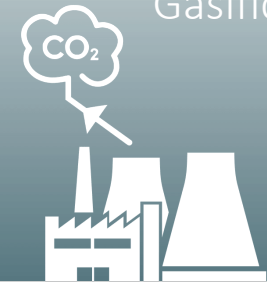


Natural Gas



Gasifier

GREY Gasification



How H₂ is produced today – from **fossil fuels** but CO₂ is **emitted**



Coal



Gasifier

Predicted Hydrogen Uses

Inevitable



Uncompetitive

Inner Mongolian Steel Mills are an excellent target market for Mongolian H2

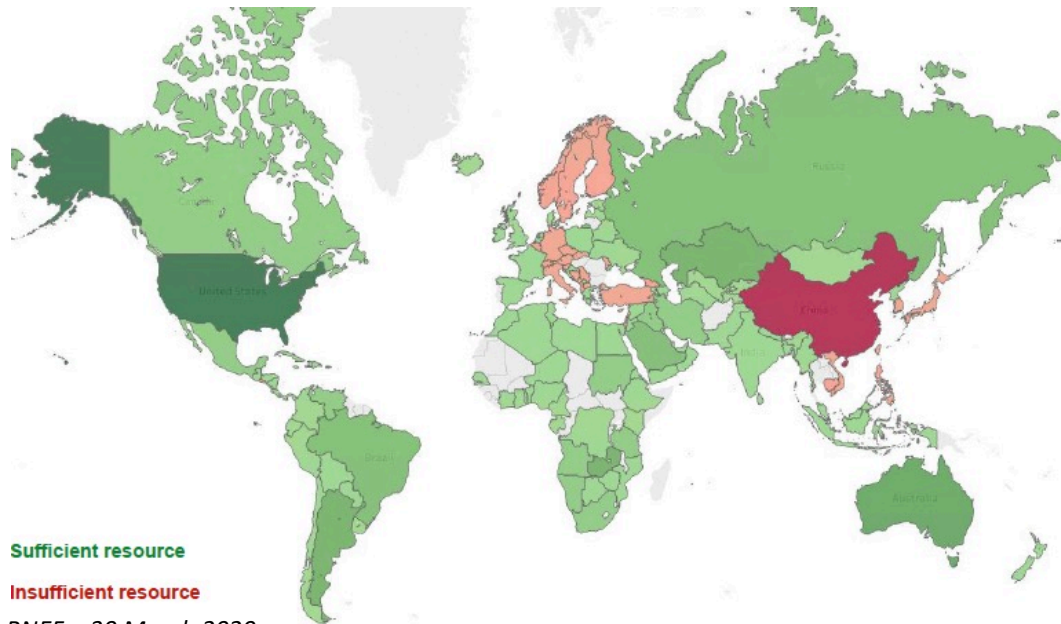
- 01 Fertiliser | Food industry | Methanol | Hydrocracking | Desulphurisation
- 02 Long-haul aviation | Shipping | Steel | Chemical feedstock | Seasonal power shortage
- 03 Medium-haul aviation | Long-distance trains | e-Fuels, specialist vehicles | Local CO2 remediation
- 04 Long distance trucks & coaches | Coastal & inland vessels | High-temperature industrial heat
- 05 Short-haul aviation | local ferries | Commercial heating | Island grids | Clean power inputs
- 06 Light aviation | Rural & regional trucks | Mid/Low-temperature industrial heat | Domestic heating
- 07 Metro trains & buses | H2FC cars | Urban delivery | 2/3 –wheelers | Bulk e-Fuels | Power system balancing

Source: Leibreich Associates



Chinese H2 Market Opportunities

- Elixir's key strategic rationale for exploring for CH₄ in Mongolia is the locational advantage that gives in supplying the World's largest energy importer to its South
- Bloomberg New Energy Finance concluded that China's population size and geographical nature means in the long term it have to import renewable energy – directly as electricity or as green H₂



Sinopec plans to spend \$4.6 bln on hydrogen energy by 2025

Reuters - 30 August 2021

PetroChina sets up \$1.5bn clean-energy investment fund

Nikkei Asia – 20 April 2021

Chinese oil giant CNOOC adds green hydrogen to energy transition plays

Globuc – 23 September 2020

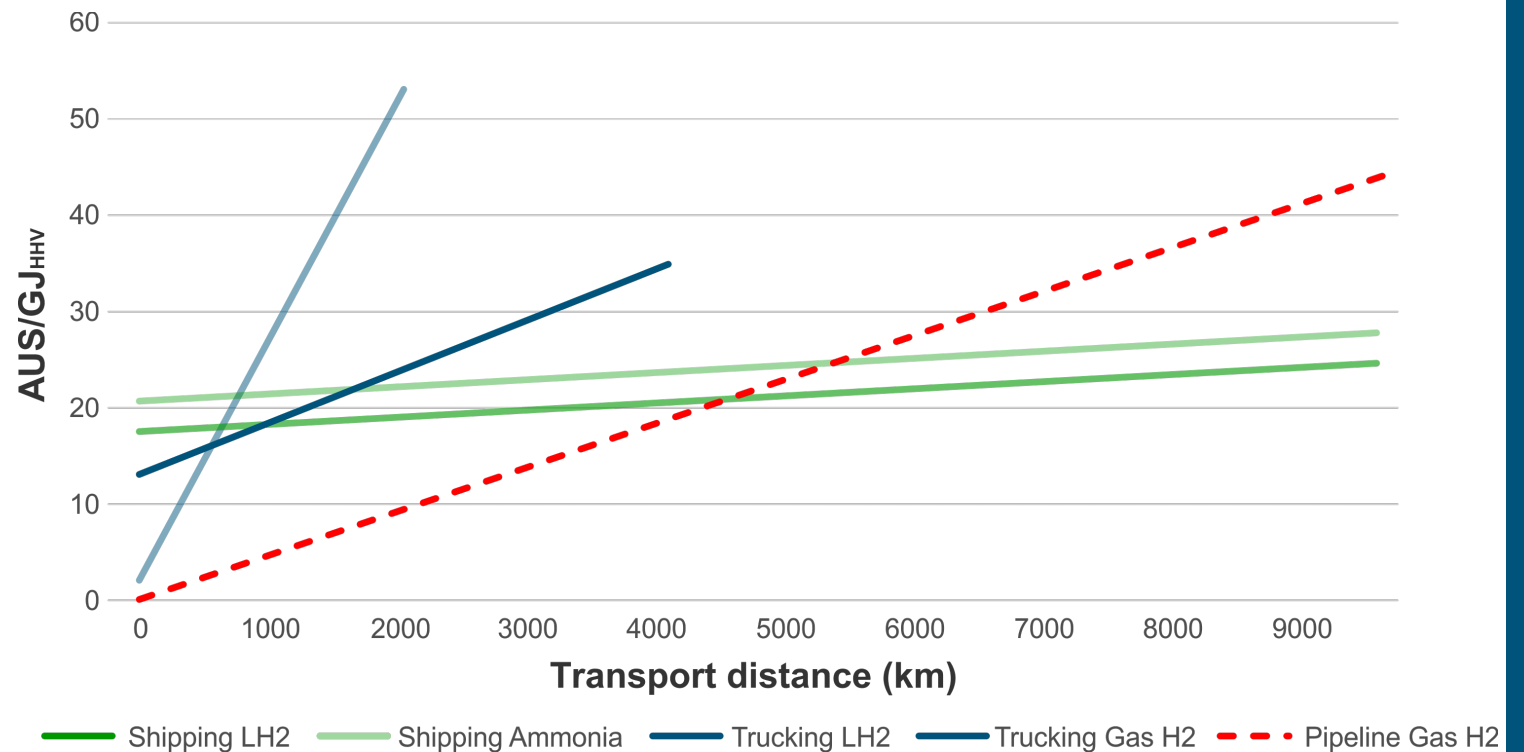


Hydrogen Delivery Costs

- Around 2/3 of the cost of producing green H2 are the cost of renewables
- Shipping H2 by boat costs multiples (~\$20/GJ) of shipping the same energy as CH4 (~\$5/GJ)
- The delivered cost of H2 is therefore all about the quality of renewable energy **and the cost of delivery**
- Access to markets by pipeline is massively advantaged over seaborne supplies – **Mongolia can supply H2 to Chinese markets by pipeline**

Cost of gas-to-gas hydrogen transportation, including conversion and reconversion - 2030s

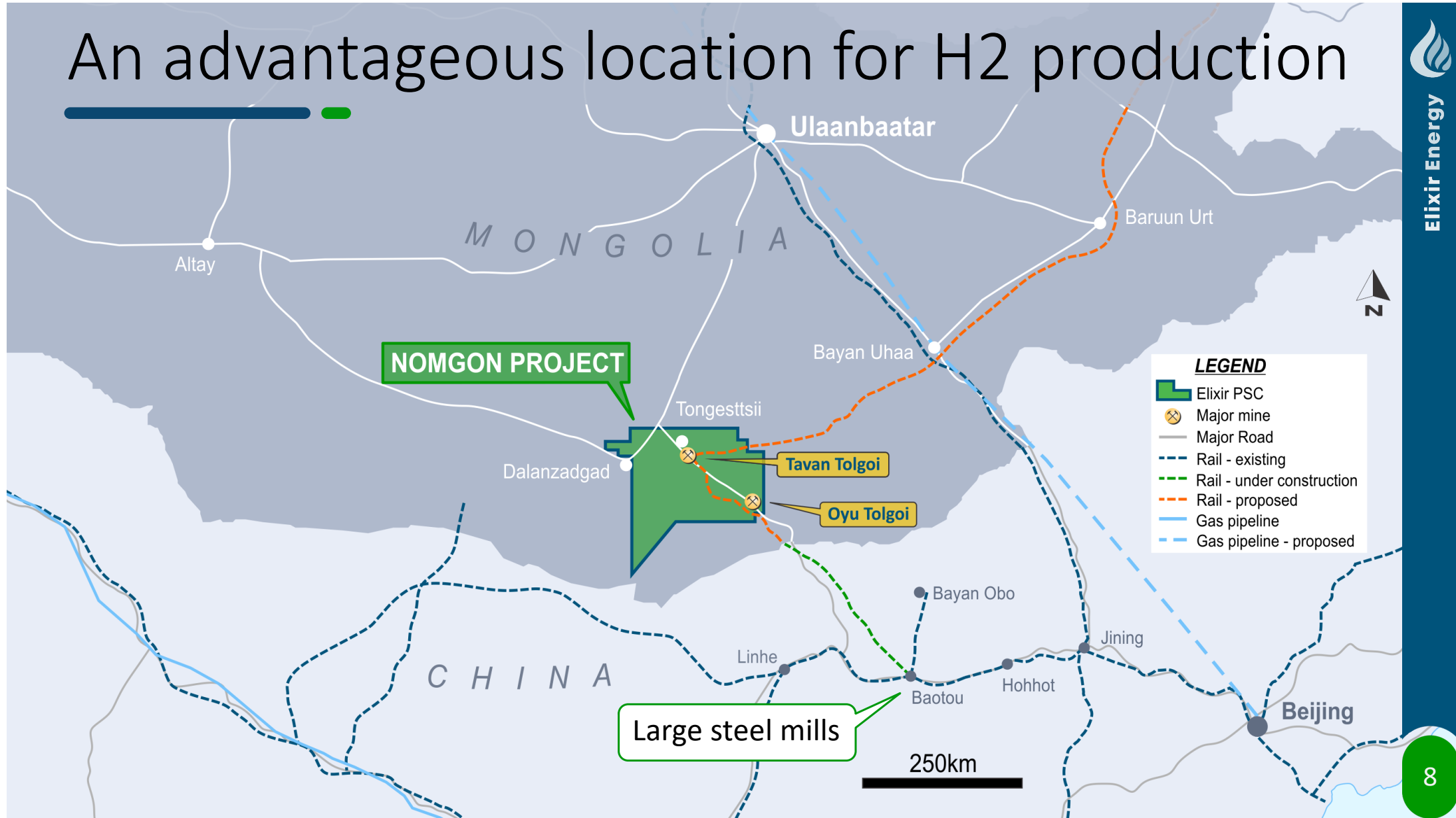
For hydrogen production of ~15PJ/year



Source: Rystad Energy research and analysis commissioned by Elixir Energy -



An advantageous location for H2 production

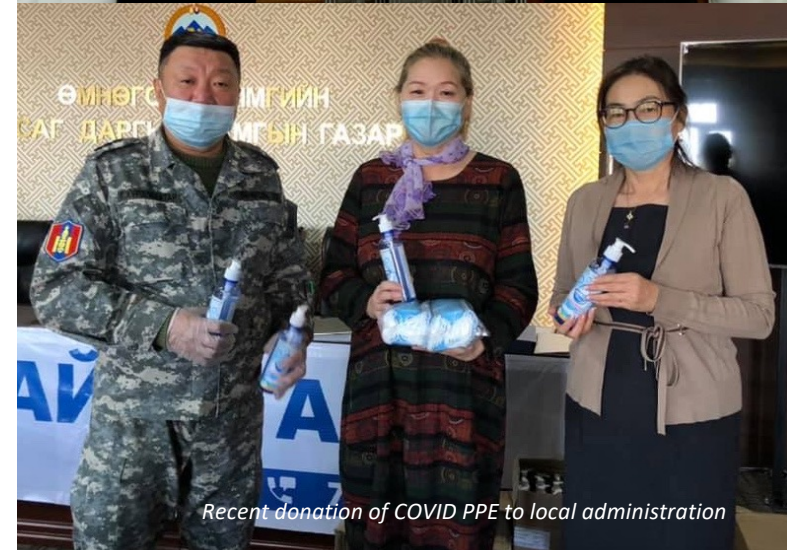


Complementary Capabilities

- Elixir's natural gas related operations in Mongolia require:
 - Good relationships with multiple levels of Government
 - Ongoing effective engagement with different energy related Ministries and regulators
 - Ensuring local communities are supported and their potential concerns addressed
 - At present – an ability to work with COVID related restrictions
 - The Company's existing staff, relationships, knowledge and goodwill therefore provide it with a very strong growth platform
- Although water costs are a trivial part of total green H2 costs, water from CBM production could be used as feedstock for green H2
- If CCS proves viable in coal seams – CBM could produce blue H2



Minister G Yondon (right) presenting the award to our Country Manager, Mr B Achitsan

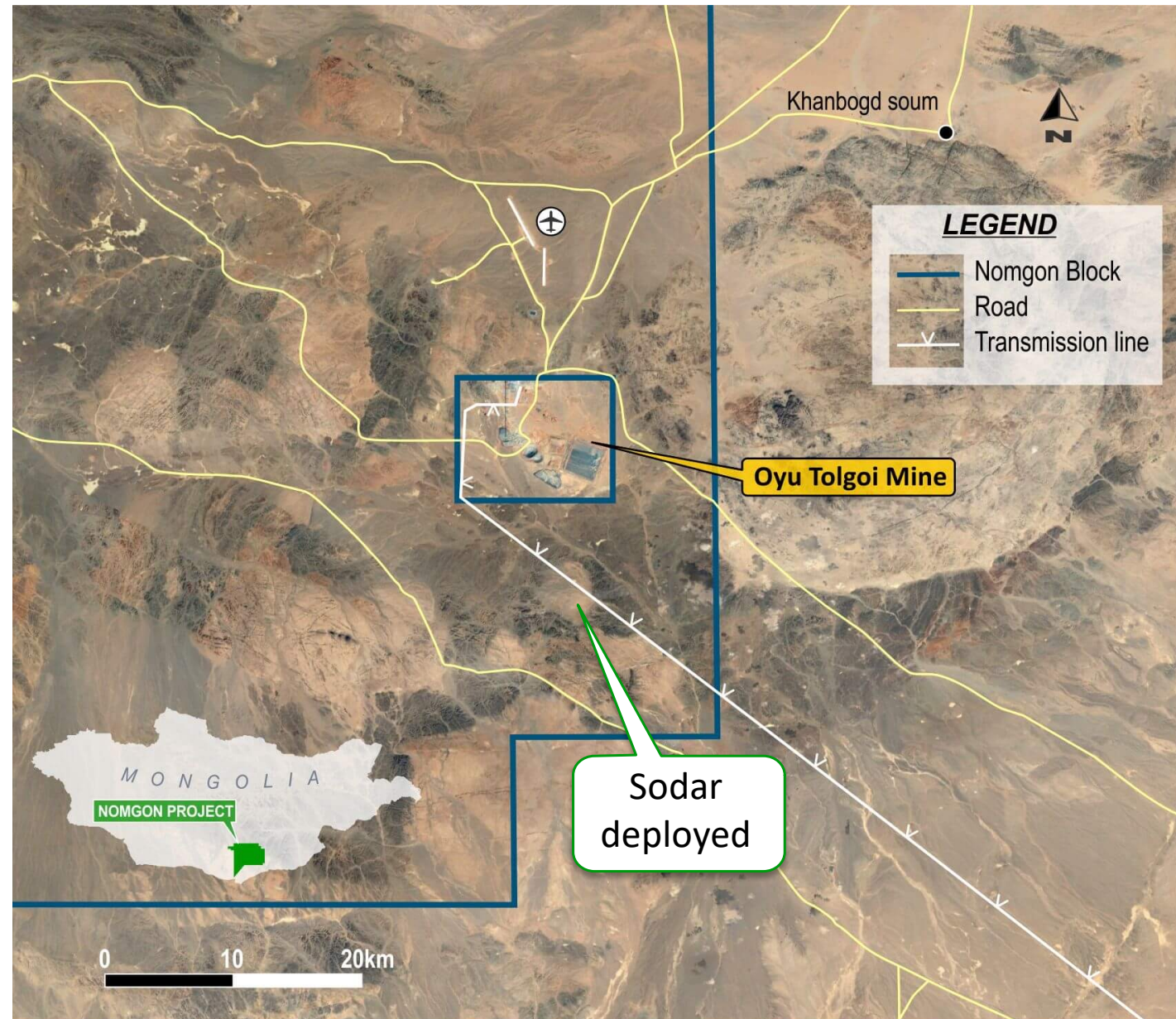


Recent donation of COVID PPE to local administration



Sodar

- Elixir has imported Australian built Sodar equipment into Mongolia to measure wind and solar resources to bankable standards
- The Sodar has been deployed to the same region as where the Company's current CBM operations take place
- This area is advantaged by world class wind and solar renewable resources – and is immediately proximate to China



Hydrogen Project Stakeholders

- The Company has commenced engagement with the key stakeholders required for a successful green H2 project in Mongolia
- This includes various levels of Government
- Elixir has commissioned a study on a H2 supportive legal system – which will be shared with Government
- Progress on this engagement process will be announced as milestones are passed



Summary

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|---|--|--|--|
| <p>1. Most credible international energy experts now see hydrogen as playing a very large role in the future de-carbonized global energy system</p> | <p>2. Hydrogen is not a fuel materially existing on Earth as an element – rather it must be produced from other energy sources</p> | <p>3. It is therefore intrinsically more expensive than the primary energy sources it can be produced from – and its role is therefore as an <u>energy vector/carrier</u> – in time and/or space</p> | <p>4. The physical nature of hydrogen means that it is very expensive to ship long distances – sources of hydrogen production adjacent to large users are therefore massively competitively advantaged</p> |
| <p>5. Elixir’s existing sphere of operations in Southern Mongolia is one such <u>massively advantaged location</u></p> | <p>6. Additionally, the quality of renewable energy resources in this region are also globally top tier</p> | <p>4. In recognition of these factors – and using the experience, personnel and skills the Company has developed over many years – Elixir is now expanding its Mongolian strategy to include hydrogen</p> | <p>5. As a first step, Elixir is already measuring wind and solar resources in the South Gobi to bankable standards – using a SODAR imported from Australia</p> |



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