The Hon. Anna Burke MP
Chair - Joint Select Committee on Australia's Clean Energy Future Legislation
c/- Committee Secretariat
PO Box 6021
Parliament House
CANBERRA ACT 2600
AUSTRALIA
email: jscacefl@aph.gov.au

26 September 2011

Dear Ms Burke

Submission to the Joint Select Committee on Australia's Clean Energy Future Legislation

Thank you for the opportunity to lodge a submission to the Joint Select Committee. The Magnetite Network (MagNet) notes there are no terms of reference for the Committee's inquiry into the provisions of the Clean Energy Future Legislation.

Since 2009, MagNet has been working constructively with the Government and policy-makers to develop a solution that both addresses the emerging magnetite industry's concerns and protects the integrity of any carbon pricing model plus prospective emissions trading scheme provided by the legislation. During that time MagNet's membership has tripled to representation of emerging producers across four states; Tasmania, Western Australia, South Australia and New South Wales.

Our members are focused on adding value in Australia by mining low iron-content ore bodies to produce high iron-content magnetite concentrate, a commodity that is valued for its purity and chemical properties as a steel-making commodity. Magnetite concentrate requires less energy and releases less carbon emissions in the production of premium-quality steel when compared with traditional mining of hematite iron ore.

Selected MagNet member projects in Western Australia alone represent an initial capital investment of some $18 billion, an estimated $9.5 billion in annual export revenue, more than 12 000 direct construction jobs and direct permanent jobs for more than 4 000 Australians.

MagNet has welcomed past opportunities to make submissions to the Senate Select Committee on the Scrutiny of New Taxes, the Department of Climate Change and Energy Efficiency (DCCEE) and Multi-Party Climate Change Committee (MPCCC) regarding the architecture and

implementation arrangements for a carbon pricing mechanism. MagNet would like to acknowledge, in particular, the professionalism of representatives of the DCCEE in their regular dealings with us for several years now.

MagNet's past submissions highlight the emerging industry's key concerns arising from the proposed carbon pricing scheme, as follows:

- the unintended consequence of penalising emerging industries in general due to the rigid setting of activity definitions and allocative baselines;
- the failure to recognise the trade-exposed nature of magnetite in the absence of an international carbon pricing mechanism;
- the failure to recognise the global carbon savings in steel-making from magnetite concentrate when compared to hematite iron ore (Direct Shipping Ore, DSO); and
- the associated difficulty in securing investment for the development of projects at a time of rising global demand for steel and steel-making products.

As the Clean Energy Future Legislation is now before the Joint Select Committee, MagNet's concerns are even more pressing.

In raising these concerns, I wish to draw to the Committee's attention MagNet's efforts in proposing a solution to this policy challenge. That is, MagNet has proposed to the Government, DCCEE and MPCCC the creation of a new activity definition for *Ultrafine Magnetite* which would allow a new baseline level of emissions to be set that is more representative of the wider emerging magnetite industry and would ensure adequate levels of industry assistance until the establishment of a global carbon trading scheme.

I wish to emphasise that this solution has been formulated and proposed in recognition of, and adherence to, the policy framework and objectives of the Clean Energy Future Legislation.

I regret the limited time provided to prepare a submission on the Clean Energy Future Legislation and would welcome the opportunity to substantiate our position at any hearings conducted by the committee. To assist in the committee's deliberations, our members would also be happy to host visits to our members' mine sites under construction in WA.

Thank you for your attention and consideration.

Yours faithfully,

Megan Anwyl
Executive Director
Magnetite Network
8 – 44 Parliament Place West Perth WA 6005
Email: megan@anwyl.com.au

MAGNET
MAGNETITE NETWORK

Summary of Key Submissions

1. The Legislation overlooks Australian magnetite production as a major emerging industry

   It is an unintended consequence that no adequate provision is made for industry assistance for emerging producers and will serve to discourage investment.

   - Provide a mechanism to support and consider Australia's emerging industries

2. The Legislation does not recognise key differences between planned and existing magnetite projects

   Current benchmarking will not reflect the operating requirements and energy-intensity of new magnetite projects.

   - Provide a new *Ultrafine Magnetite* activity definition or mechanism for clear, non-discretionary review of allocative baselines where there is a demonstrated disparity in emissions-intensity
   - Establish an "Emerging Industries Advisory Group" to fast track the development of Productivity Commission review guidelines

3. Magnetite production deserves recognition as an EITE Industry with global carbon savings

   Lack of EITE industry assistance will effectively cause carbon leakage to countries without effective emissions reduction schemes.

   - Provide adequate industry assistance until the establishment of a global mandated carbon emissions reduction regime
   - Make reference to international EITE benchmarking available to interested parties for review

4. The Legislation threatens investment in a value-adding, long-term industry offering massive regional employment and development benefits

   A mechanism to support this emerging industry is critical to the establishment of many new projects that are still seeking major investment partners to develop very capital intensive projects.

   - Move quickly to promote investment by supporting an emerging, onshore value-adding industry that cuts global carbon emissions and delivers long-term jobs and regional development.

Introduction

Since 2009, the Magnetite Network (MagNet) has been working constructively with the Government and policy-makers to develop a solution that both addresses the emerging magnetite industry's concerns and protects the integrity of any carbon pricing model and prospective emissions trading scheme. During that time, MagNet's membership has tripled to include representation of one existing and several emerging producers across four states; Tasmania, Western Australia, South Australia and New South Wales.

Our members are focused on adding value in Australia to low iron-content ore bodies to produce high iron-content magnetite concentrate, a commodity that is valued for its purity and chemical properties as a steel-making commodity. Magnetite concentrate requires less energy and releases less carbon emissions in the production of premium-quality steel (relative to hematite or Direct Shipping Ore- DSO).

Selected MagNet member projects in Western Australia, alone, represent an initial capital investment of some $18 billion, an estimated $9.5 billion in annual export revenue, more than 12 000 direct construction jobs and direct permanent jobs for more than 4 000 Australians.

MagNet's past submissions to various hearings and enquiries highlight the emerging industry's key concerns arising from the proposed carbon pricing scheme, as follows:

- the unintended consequence of penalising emerging industries in general due to the rigid setting of activity definitions and allocative baselines;
- the failure to make adequate allowance for the difference between existing and proposed projects;
- the failure to recognise the trade-exposed nature of magnetite in the absence of an international carbon pricing mechanism;
- the failure to recognise the global carbon savings in steel-making from magnetite concentrate when compared to DSO; and
- the associated difficulty in securing investment for the development of projects at a time of rising global demand for steel and steel-making products.

In raising these concerns, MagNet has made constructive efforts to identify and propose to Government a solution that adheres to the policy framework and objectives of the Clean Energy Future Legislation. Now that the legislation has been introduced and is before the Joint Select Committee, consideration of this proposal is even more pressing.

MagNet's priority is approval of the creation of a new activity definition for *Ultrafine Magnetite* which would allow a new baseline level of emissions to be set that is more representative of the wider emerging magnetite industry and would ensure adequate levels of industry assistance until the establishment of a global carbon trading scheme.

Allocative baseline and industry assistance calculations

Mining and processing magnetite is an energy-intensive trade-exposed activity.

Currently the Department of Climate Change process is underway to establish an allocative baseline for the existing *Magnetite Concentrate* activity definition (set in October 2010) determined under the Carbon Pollution Reduction Scheme legislation. This baseline level will be calculated from data from the two large producers in operation in the baseline measurement years – Grange Resources Savage River project, Tasmania and OneSteel's Whyalla project, South Australia.

The existing activity definition and allocative baseline, once determined, will not represent the processing requirements of the emerging magnetite producers. New magnetite projects in Australia will be substantially more emissions intensive than the existing projects because of the need to grind a harder, lower grade ore to a finer material. It is important to note, however, that the projects will still offer significant global carbon emission savings in steel production compared to DSO.[1]

New WA producers, for example, will be twice as emissions intensive as existing producers in concentrate production. The Sino Iron project, Australia's next magnetite project, is due to commence operation in the first half of 2012 and will produce more than 24 million tonnes per annum, compared to 4 mtpa from the existing producers. When this project is in full production, and even assuming no other projects commence, it will represent more than 85 percent of Australia's magnetite industry, yet under the legislation as drafted it will receive assistance at a rate determined by companies producing less than 15 percent of Australia's magnetite concentrate.

Given the legislation is to provide an interim pricing solution ahead of a full emissions trading scheme in 2015, and the limited ability to predict the likelihood of mandated emissions reduction schemes in other relevant jurisdictions, it is important to consider a way to ensure adequate industry assistance as soon as possible that will support the important emerging magnetite sector.

To this end, MagNet notes the Agreed Principle of the Multi-Party Climate Change Committee (MPCCC) regarding Competitiveness of Australian Industries:

The overall package of carbon price design and associated assistance measures should take appropriate account of impacts on the competitiveness of all Australian industries, having regard to carbon price in other countries, while maintaining incentives to reduce pollution.[2]

We note also the Government's own key messages on the Carbon Pricing Scheme:

[1] See Background for more information about the global net emissions savings from magnetite

[2] http://www.climatechange.gov.au/government/initiatives/~/media/publications/mpccc/mpccc-carbon-price-mechanism.pdf

- the Government is committed to supporting jobs and competitiveness as Australia moves to a clean energy future[3]

- a Jobs and Competitiveness Program will provide $9.2 billion over the period to 2014-15 to assist the most emissions intensive activities in the economy that are exposed to international competition. This will support local jobs, encourage industry to invest in cleaner technologies and avoid 'carbon leakage' offshore.[4]

Despite these assertions, the Clean Energy Future Legislation overlooks both the trade-exposed nature of magnetite and its overall lower carbon emissions in steel-making when compared to DSO. In addition, the time required to confirm the baseline under the existing *Magnetite Concentrate* activity definition has created uncertainty amongst both producers and investors. These factors have prompted a negative reaction to the carbon pricing scheme from investors at a time when producers are making decisions critical to the industry's development.

The new wave of magnetite producers will build projects that are on a much larger scale and have vastly different technical specifications. For example, some processes at new projects, such as desalination plans or long slurry lines, are not used by current producers and therefore preclude consideration under the activity definition. New producers will also have higher energy intensity while still resulting in global carbon savings. This is due to the different nature of the ore in large scale projects, which will require a much harder material be ground finer. Any current benchmarking, therefore, will not reflect the operating requirements and energy-intensity of new magnetite projects.

Adoption of a new activity definition for *Ultrafine Magnetite* would result in an acceptable outcome by recognising the higher energy intensity and technical specifications of emerging magnetite projects.

In reference to the legislation and the provision for review by the Productivity Commission[5], MagNet notes there is a very limited legislative mechanism to re-visit allocative baselines for *new* projects where there is some marked difference to existing projects. Furthermore, the guidelines that deal with the review mechanism are yet to be written, thus compounding the existing uncertainty surrounding the impact of the legislation on the magnetite industry.

As the representative of an emerging value-adding industry undertaking considerable capital investment and poised to deliver thousands of jobs, MagNet seeks involvement in the development of the review guidelines. We propose the appointment of an "Emerging Industries Advisory Group", including expert representatives of the magnetite and/or mining sector, to fast track this process.

MagNet's priority concerns relating to activity definition and allocative baseline determinations are summarised below, along with our broader submissions on the legislation.

---

[3] http://www.cleanenergyfuture.gov.au/wp-content/uploads/2011/07/securing-a-clean-energy-future-summary.pdf
[4] http://www.pm.gov.au/blog/quick-answers-how-jobs-will-be-protected-australia%E2%80%99s-clean-energy-future 18 July 2011
[5] Clean Energy Bill 2011, Part 7, Division 5, 155, pg 201

Key Submissions

1. The Legislation overlooks Australian magnetite production as an emerging industry

Effectively, the failure to adequately assist the emerging magnetite producers can be attributed to the fact these projects are under construction and not yet in production. It is an unintended consequence that no provision is made for industry assistance for emerging producers. Industry assistance should be considered for emerging industries or, at worst, a clear legislative provision made to allow for this once production commences.

Solutions

- Provide a mechanism to protect and consider Australia's emerging industries.

2. The Legislation does not recognise key differences between planned and existing magnetite projects

The activity definition for *Magnetite Concentrate* was formalised only in October 2010. The activity definition and allocative baseline, once determined, comes exclusively from data recently submitted by the two projects that were in production in the baseline years of 2006/7 and 2007/8. The new wave of magnetite producers will build projects that are on a much larger scale and have vastly different technical specifications. For example, some processes at new projects, such as desalination plans or long slurry lines, are not used by current producers and therefore preclude consideration under the activity definition. New producers will also have a higher energy intensity, while still resulting in global carbon savings. This is due to the different nature of the ore in large scale projects, which will require a much harder material be ground finer Any current benchmarking, therefore, will not reflect the operating requirements and energy-intensity of new magnetite projects.

Solutions

- Provide a new Ultrafine Magnetite activity definition or mechanism for clear, non-discretionary review of allocative baselines to recognize the increased energy intensity of future projects.
- Establish an "Emerging Industries Advisory Group" to fast track the development of Productivity Commission review guidelines.

3. Magnetite production deserves recognition as an EITE Industry with global carbon savings

The goal of a price on carbon in Australia is to encourage a reduction in greenhouse gas emissions as part of addressing the challenge of global climate change. Magnetite can be part of this solution by providing a lower carbon pathway to steel production. It would be a perverse outcome to impose a competitive disadvantage and potentially stifle the development of on an emerging industry that offers more Australian jobs, Australian value-adding processing and lower global emissions.

It is therefore in the public interest to ensure that the EITE assistance provided to the magnetite industry under the Clean Energy Future legislation results in an effective carbon price liability per tonne of product broadly equivalent to that of existing DSO producers.

To maintain competitive neutrality this assistance would need to remain in place at least until magnetite's global lifecycle benefits can be rewarded in a global carbon trading scheme.

The production of magnetite concentrate and pellets in Australia is energy and emissions-intensive, as well as trade-exposed. Despite this, under both the current legislation and previous Carbon Pollution Reduction Scheme, magnetite production is not formally recognised as an EITE industry. Emerging magnetite producers are not yet in receipt of any industry assistance as negotiated in 2009 by other industries or provided for in the previous CPRS.

Magnetite and hematite iron ore (DSO) have different chemical compositions, meaning the two ores have different processing requirements and different characteristics in the production of steel. DSO requires only a simple crushing and blending process before export. Magnetite processing is emissions-intensive due to the amount of energy required to extract the magnetite from the ore and produce concentrate suitable for export.

The use of magnetite in steel production overseas, however, results in lower overall carbon emissions when compared to the use of DSO. Modelling commissioned by MagNet (and supplied to the DCCEE) illustrates a net saving of 108kg of Co2 per tonne of magnetite concentrate used in steel production compared to that produced from Pilbara Fines DSO or hematite iron ore. [6]

Magnetite concentrate makes up about half of the feedstock in iron-making furnaces and global steel production. Much of the magnetite produced overseas, in competition with Australian producers, is not subject to any carbon pricing legislation. The Clean Energy Future Legislation is based entirely on emissions in Australia without the capacity to recognise overseas carbon savings.

To discourage magnetite production in Australia, via lack of EITEI assistance, is to cause effective carbon leakage to other countries that are without effective emissions reduction schemes and clean energy sources that will have higher emissions than comparable generators in Australia. The Magnetite Network cannot support any carbon pricing model that does not recognise our member projects' direct contribution to global carbon emission reduction and, therefore, puts this new value-adding industry at a competitive disadvantage with producers in other countries that do not have legislated carbon pollution reduction regimes.

Under an international carbon trading scheme, magnetite producers would be rewarded for the reduced life-cycle emissions resulting from the use of magnetite concentrate in steel production. This would provide a competitive advantage to magnetite producers over DSO producers.

Under the carbon pricing model before the Committee, however, the reverse is true. A simple tax on emissions in Australia will impose significantly higher costs on Australian magnetite operations than comparable DSO operations. This results in a competitive disadvantage for magnetite producers over hematite producers.

[6] See Attachment A – Executive Summary

Solutions

- Provide realistic, adequate industry assistance until the establishment of a global mandated carbon emissions reduction regime.
- Make reference to international EITE benchmarking available to interested parties for review

4. The Legislation threatens investment in a value-adding, long-term industry offering massive regional employment and development benefits

The legislation does not provide adequate levels of assistance for the emerging magnetite industry, and more significantly has the potential to prevent investment in an industry with substantial economic benefits and lower global emissions.

The emerging magnetite sector will create jobs in all States, including those hardest hit by any negative impact from this legislation. Experts Deloitte Access Economics estimate that development of Australia's magnetite industry could add $4.5 billion to Australia's GDP per year and create more than 4,400 new jobs.[7] MagNet members in WA alone estimate they will create 12, 000 jobs in the construction of six key projects and create more than 4,000 direct permanent jobs over the life of the operations.

Emerging magnetite projects present a viable, long-term alternative source of income and development incentives. In the case of WA, many planned magnetite projects are located in drought-stricken traditional pastoral and agricultural regions. The recently completed Prefeasibility Study conducted on the Hawsons Iron Project near Broken Hill in New South Wales concluded that this project alone would require about 6 million labour hours to construct and would offer permanent jobs to approximately 650 people for the twenty year life of the mine. In Tasmania Grange Resources existing Savage River mine has the infrastructure to process other new miner's ore – creating jobs in an area that is facing severe levels of unemployment.

Together, MagNet's members in Western Australia have projects with a capital expenditure well in excess of $17 billion. Two of the projects are well into construction (in the Pilbara and Mid-West regions) with estimated combined capital expenditure in excess of $8 billion. Many more projects are either planned, seeking capital investment or have reached advanced pre-construction stages.

For this reason a mechanism to support this emerging industry is critical to the establishment of many new projects that are still seeking major investment partners to develop very capital intensive projects.

Solution

- Move quickly to promote investment by supporting an emerging, onshore value-adding industry that cuts global carbon emissions and delivers long-term jobs and regional development.

[7] See Attachment B – Executive Summary

Background

The Magnetite Network (MagNet) was formed in 2009 originally to represent the interests of WA's emerging magnetite producers. MagNet is rapidly expanding and now represents eleven of the key existing and emerging magnetite producers in WA, SA, Tasmania and NSW:

Asia Iron Australia Pty Ltd/ Extension Hill Pty Ltd
Atlas Iron Ltd
CITIC Pacific Mining
Gindalbie Metals Ltd
Grange Resources
Iron Ore Holdings Pty Ltd
Bonython Metals Group
Carpentaria Exploration Ltd
Havilah Resources
Minotaur Exploration
Sinosteel PepinNini Curnamona Management

Australia's magnetite industry is in its infancy. There are currently two large magnetite operations in Australia; Grange Resources' Savage River project in Tasmania and the OneSteel Whyalla project in South Australia. They are very important contributors to their local regions: Grange Resources' Savage River has been operating for more than 45 years. Together these projects contribute less than two percent of Australia's total iron ore exports.

Strong rising demand for steel and steel-making products underpins the development of magnetite projects in Australia. In Western Australia there are at least 24 projects based on mining and processing magnetite iron ore are proposed, approved or under construction
The first of these due to come on-line will be CITIC Pacific Mining's Sino Iron project, with an estimated capital cost of US$5.2 billion, which plans to produce magnetite concentrate for export in 2012. Our emerging sector will create jobs in all states, including those hardest hit by any negative impact from this legislation. A selection of member projects in WA alone will create about 12 thousand jobs during construction and more than 4 thousand direct permanent operational jobs.

Unlike traditional DSO, magnetite ore requires significant downstream processing in Australia before it can be exported. As well as creating significant flow-on economic and employment benefits, this value-adding processing will also drive investment in major new regional infrastructure. For example, in Western Australia, the Sino Iron project includes a new port (the first in the Pilbara in 40 years), a 450 MW combined cycle gas-fired power station, and a 51 GL water desalination plant. The MidWest region projects underpin the development of the new Oakajee Port and will transform the region through massive job creation. This is the onshore value-adding industry successive Australian governments have sought to encourage.

Compared to DSO processing, downstream processing of magnetite ore produces more greenhouse gas emissions in Australia. Importantly, however, magnetite concentrate offers a nett environmental benefit over the life cycle compared to DSO by saving carbon emissions in steel production. Magnetite concentrate more than offsets any earlier processing emissions due to its improved efficiency and different chemical composition.

Economic Benefits

The requirement for extensive downstream processing means that magnetite projects will deliver more ongoing jobs throughout their long project lives. Researchers Deloitte Access Economics estimate that development of the magnetite industry could add $4.5 billion to Australia's GDP per year and create more than 4 400 new permanent jobs. Attachment C illustrates the economic benefits represented by selected MagNet members.

Technical Factors

Magnetite and hematite iron ore (DSO) have different chemical compositions, meaning the two ores have different processing requirements and different characteristics in the production of steel. DSO passes through a simple crushing, screening and blending process (beneficiation) before it is shipped overseas for steel production. Direct shipping ores typically have iron (Fe) content when mined of between 56 percent Fe and 64 percent Fe. The predominant minerals in DSO are usually the ferric iron oxides hematite (Fe_2O_3), goethite (FeO(OH) and/or limonite (FeO(OH).nH_2O)

By comparison, magnetite ore typically has a much lower iron content when mined of between 25 and 40 percent Fe and, in this form, is unsuitable for steelmaking. The main iron mineral in magnetite ore is the ferrous iron oxide magnetite (Fe3O4). Magnetite ore requires complex processing to separate magnetite minerals from other minerals in the ore to produce an almost pure magnetite concentrate with an iron content of between 68 percent Fe and 70 percent Fe that is highly sought after by steel makers. In the new projects, the magnetite ore needs to be ground finer to extract smaller grain size magnetite, resulting in a substantially finer concentrate product (Eg, ~28 micron particle size for the Sino Iron project compared to ~45 for Savage River).

The magnetite concentrate production process involves the mixing of water and ore in the grinding process, the separation of magnetite mineral grains in the ore from other mineral grains in the ore using magnets, then the removal of the added water from the magnetite mineral grains to produce saleable magnetite concentrate. This final step is an essential and integral part of the magnetite concentrate production process, whether for export or for use as feedstock for a domestic pellet plant (as is the case for existing producers, Grange Resources and OneSteel).

It is essential, therefore, that desalination of water, transport and filtration are deemed to be part of the magnetite concentrate activity, and/or part of the magnetite pelletisation activity. Given that all of our member companies are exporting at least a portion of product as concentrate it is critical for this portion of the production process to be recognised under the legislation via the activity definition determining the allocative baseline and level of assistance.

The grinding of magnetite ore requires a large amount of energy. For example the Sino Iron project involves the construction of six mill lines to process the magnetite ore. Each of these mill lines will require 44 MW of electricity. The Sino Iron project also has energy requirements associated with desalinating water and pumping concentrate slurry to its port.

With energy as a major input cost, CITIC Pacific Mining has sought to maximise energy efficiency including by constructing a 450MW combined cycle gas fired power plant with 40 percent lower emissions than a conventional open cycle plant.

Despite these efficiency efforts the Sino Iron project will still produce substantial emissions estimated at almost 2 million tonnes of CO_2 equivalent per annum making it approximately ten times as emissions intensive as a comparable DSO project.

Environmental benefits

Importantly early carbon emissions from magnetite concentrate production are more than offset by carbon savings in steel production. Magnetite (Fe3O4) requires substantially less coal and energy to transform into steel than hematite (Fe2O3), resulting in lower CO_2 emissions per tonne of steel output and global emission reductions. These carbon savings are inherent to the chemical differences between the two products and result from the fact that magnetite is exothermic (adds heat to the reaction in the blast furnace), has a higher iron content, lower impurities, and reduces fluxing.
In research commissioned by the Magnetite Network, The Crucible Group estimates a saving of 108kg of CO_2 for every tonne of magnetite concentrate used in steel production, compared to DSO. MagNet has provided this report to the DCCEE and other key Commonwealth departments. It is attached to this submission for the Committee's reference.

In earlier research conducted for CITIC Pacific Mining, The Crucible Group performed a comprehensive life-cycle analysis of the Sino Iron project. The findings, which were included as part of a submission to the 2008 CPRS green paper, show the Sino Iron project would produce savings of more than 800 000 tonnes of CO_2 equivalents across the global steel production value chain when compared with a similar DSO project.

Additional work conducted by The Crucible Group for Extension Hill Pty Ltd show calculated savings of at least 250kg of CO_2 per tonne of iron generated by substituting Pilbara DSO with magnetite concentrate in the steel making process.

Conclusion

The stated objective of the Clean Energy Future Legislation in Australia is to encourage a reduction in global greenhouse gas emissions as part of addressing the challenge of climate change.

Magnetite produces lower global carbon emissions in steel-making: under a global carbon trading scheme it would enjoy a competitive advantage.

Conversely, in the absence of such an international scheme, the Clean Energy Future Legislation promises to penalise Australia's emerging, value-adding magnetite industry *despite* its net global emissions benefits.

We urge the committee to avert this unintended perverse outcome that is clearly contrary to the national interest.

Time is of the essence.

Without adequate recognition and support for emerging magnetite producers as energy-intensive and trade-exposed, Australia risks losing the considerable economic benefits and global carbon savings offered by developing an increasingly sought-after steel-making commodity.

MAGNET
MAGNETITE NETWORK

Implications for the Australian Magnetite Industry of the Introduction of a Price/Tax on Carbon

Independent Report for Policymakers

Dr Joe Herbertson AM and Dr Les Strezov

Principals, The Crucible Group Pty Ltd, Australia

the Crucible

ENGINEERING EXCELLENCE AWARDS
ENGINEERS AUSTRALIA
WINNER SYDNEY 2010

June 2011

EXECUTIVE SUMMARY

Mining and beneficiation of magnetite ore is considerably more energy intensive than conventional direct shipping hematite operations in the Pilbara. As a consequence, magnetite concentrate production is more CO_2 emissions intensive than direct shipping ore (DSO) production, but this can be more than compensated for by emissions savings in overseas ironmaking operations. In the future, when carbon markets operate effectively across international borders, this will be rewarded appropriately. The challenge is the transitional period where carbon is not valued equally across international borders, for example, if Australia introduces a price on carbon before China. It would be dysfunctional if value adding in Australia were penalised or the emerging magnetite industry were disadvantaged in such circumstances. The aim of carbon pricing is to effectively address the global climate change challenge, but avoid perverse outcomes in the transition. A focus on total system emissions will provide better global greenhouse gas emission outcomes and these should not be penalised by how carbon pricing or taxing is implemented in one country. Until a consistent carbon pricing framework exists between Australia and its international trading partners, the inherent value of lower carbon life cycle emissions associated with magnetite concentrate production cannot be realised by its Australian producers

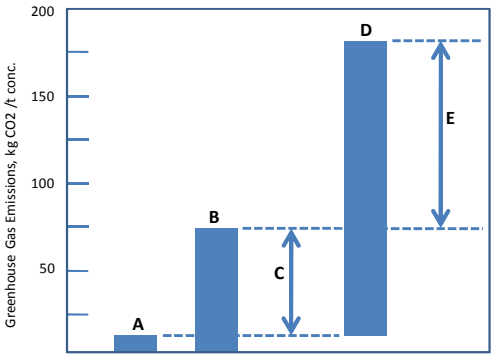
The Crucible Group has been commissioned by the Magnetite Network, to prepare an independent report, drawing on its leading edge modelling capabilities and extensive industry data.

The greenhouse gas benefits of using magnetite concentrates in ironmaking compared to Pilbara hematite fines have been calculated on a Life Cycle basis taken to the blast furnace hot metal stage. Typical reference compositions for magnetite concentrate and hematite fines have been selected for the exercise. For the specific conditions of the reference case, the net Value in Use (VIU) benefits to the ironmaker are 172 kg CO_2e per tonne of magnetite concentrate replacing hematite fines in the blast furnace.

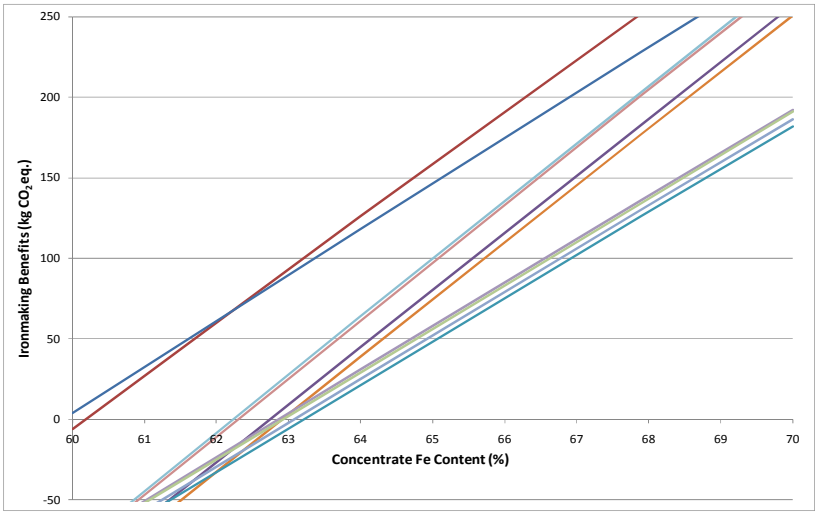
The greenhouse gas emissions associated with production of magnetite concentrate in Australia have also been calculated on a Life Cycle basis taken to the on board ship stage. This is carried out for a particular reference magnetite operation, with a flow sheet typical of the magnetite industry as a whole. For this specific project, the greenhouse gas emissions are 74kg CO_2e per tonne of magnetite concentrate. This is compared to 10 kg CO_2e per tonne attributable to mining operations without beneficiation, based on conventional hematite operations in the Pilbara. This quantifies the 'beneficiation penalty' associated with energy intensive upgrading of magnetite ores.

For the reference case conditions, the total system benefits (from ground to steel) of the magnetite proposition are net savings of greenhouse gas emissions of 108 kg CO_2e per tonne of magnetite concentrate, as summarised below.

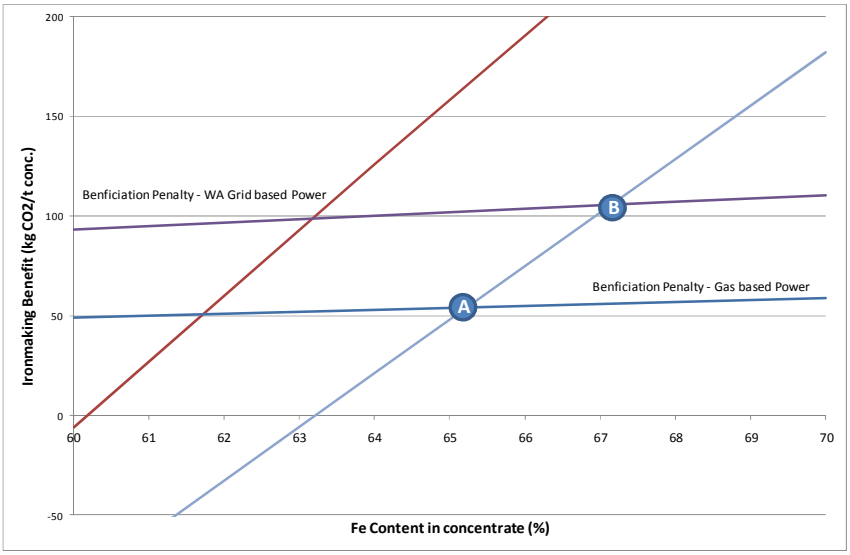
Reference Case Outcomes	CO_2e Emissions
A. Mining operations in the Pilbara without significant beneficiation	10 kg
B. Magnetite concentrate production, with natural gas electricity	74 kg
C. The magnetite "Beneficiation Penalty" (B - A)	64 kg
D. The relative Value in Use benefits of magnetite in ironmaking	172 kg
E. Total system benefits (ground to steel) of the magnetite scenario (D - C)	108 kg



The drivers of the Value in Use benefits of the reference magnetite concentrate compared with the reference hematite (MAC fines) are the thermodynamic advantages of magnetite in reduction to iron, the very low alumina levels (0.1%) and the high Fe content of the magnetite concentrate (67.9%). The beneficiation penalty of concentrate production is driven by the use of electricity in the energy intensive beneficiation steps. In general, the net total system benefits depend on the extent of beneficiation for particular concentrates, the blast furnace operating parameters assumed in the modelling, the hematite fines used in comparisons and how the electricity for magnetite concentrate production is generated. These factors have been modelled in order to make the magnetite proposition more general and more robust. The figure below shows the envelope of outcomes as a function of Fe% in concentrates, with five comparative Pilbara hematite fines and with high and low fluxing regimes assumed for the blast furnace. For this envelope of outcomes, the threshold concentration for which there are net VIU benefits of magnetite extends along a range from around 60% to 63% Fe in concentrate.



The beneficiation penalty for production is significantly increased when electricity is supplied by the grid, as shown below. At the conservative boundary of the envelope of outcomes, the system level threshold concentration, above which the VIU benefits outweigh the beneficiation penalty, increases by some 2% to around 67% Fe when using grid power (marked B), compared to the reference case of natural gas based electricity (marked A).

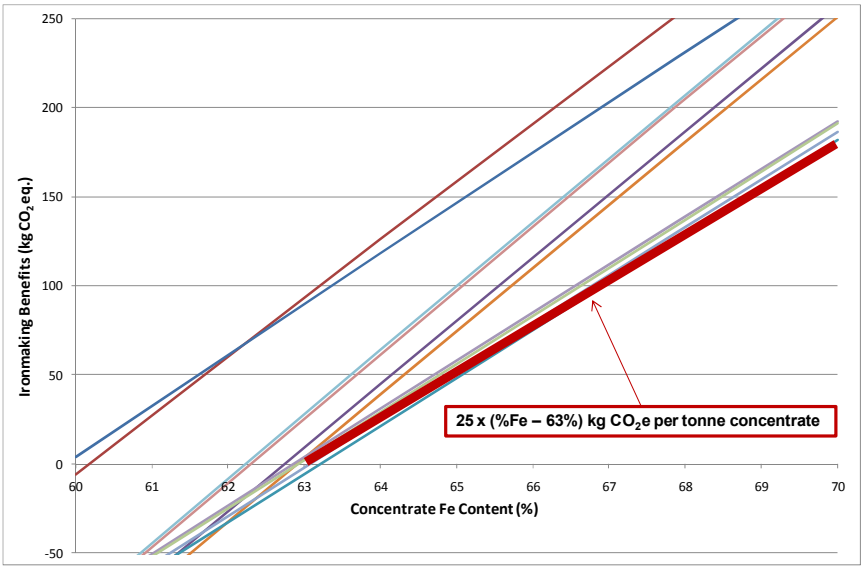


Whilst the magnetite proposition has been developed and quantified in this report using complex modelling, a practical approach for policy making considerations is recommended. This is based on a 'formula' for off shore Value in Use credits, which can be easily applied to different projects across the sector. The simplified formula approach is grounded in the results of the LCA modelling work. It is positioned on the conservative (lower boundary) side of the VIU envelope of outcomes. It should only be applied when, and as long as, the ironmaking customer operates in a jurisdiction without a price on carbon. It should not be applied for magnetite concentrates below the VIU threshold concentration (no offsets generated) and it does not need to be applied for magnetite concentrates above the system level threshold concentration (full offsets achieved).

It is recommended that every tonne of magnetite concentrate production is entitled to a Value in Use offset credit (V_m) equal to 25 kg CO_2e for every 1% Fe above 63%:

$$\mathbf{Vm\ [kg\ CO_2e] = 25 * (\ Fe\% - 63)}$$

The formula is shown graphically below.



For a given magnetite project, the net "taxable emission" could be calculated as follows:

$$T = E_t - G_e - G_c - V_m$$

where:

- T are the taxable carbon dioxide emissions,
- E_t are total carbon dioxide emissions on a Life Cycle basis,
- G_e are general exemptions from the carbon pricing scheme,
- G_c are government concessions to the magnetite industry and
- V_m are the magnetite concentrate Value in Use offset credits.

For typical magnetite industry conditions, T will be negative (therefore no net carbon tax liability), because the VIU offset credits will outweigh the beneficiation penalties, ($V_m > E_t$). This study concludes that magnetite producers will generally be able to justify, in a scientifically legitimate and defensible manner, the offsetting of all their greenhouse gas emissions associated with beneficiation and value adding activities in this country, at least until carbon pricing is introduced in steelmaking markets.

Deloitte Access Economics

Deloitte Access Economics Pty Ltd
ACN149 633 116

Level 1, 9 Sydney Ave
Barton ACT 2600
PO Box 6334
Kingston ACT 2604

Tel: +61 2 6175 2000
Fax: +61 2 6175 2001
www.deloitte.com.au

Modelling the economic benefits of the Sino Iron Project and Australia's magnetite industry

- The Sino Iron project in Western Australia's Pilbara region represents a significant development in terms of Australia's ability to meet the growing needs of Chinese Steel makers.
    - While Australia has traditionally mined hematite, magnetite iron ore effectively increases Australia's iron ore reserves by 34% (from 19.5 to 28 gigatonnes). The magnetite contribution is likely to increase overtime as the sector develops. This includes the potential to extend the life of many hematite mines currently in operation.
- The economics underpinning magnetite development are driven by Chinese steel production which has grown at just under 18% per annum since the year 2000 coupled with their reliance on, and hence demand for, magnetite.
- Deloitte Access Economics (DAE) has estimated that the Sino Iron project will increase Australia's gross domestic product (GDP) by an average of $2.08 billion over the period 2006 to 2034, with an average increase in employment of 2080 full time equivalents (FTE) over that period.
    - In today's dollars this represents a net present value of $32.0 billion in Australia's GDP.
- In Australia, there are a number of magnetite projects in the pipeline totalling some $19.5 billion in investment (including the Sino Iron project). DAE estimated that development of the magnetite industry will add $4.5 billion in Australia's GDP per annum and increase employment by an average of 4,440 FTE over the period 2006 to 2034.
    - This is based on development of the Western Australian mines in the MagNet membership (Sino Iron project, Atlas Iron developments at Ridley and Balla, Extension Hill, Gindalbie's Karara Project and Southdown).
- The proposed development of the magnetite industry confirms that, given the current demand conditions for iron ore, there are a number of commercially viable magnetite projects in Australia. Indeed, the modelling undertaken by DAE confirms the economic credentials of the Sino Iron project in that it is estimated to deliver similar economic benefits to an industry benchmark hematite project.
    - The industry benchmark hematite project for equivalent steel production was estimated to increase Australia's GDP by $31.4 billion in today's dollars which compares with $32 billion for the Sino Iron project.
    - In terms of employment, the industry benchmark hematite project was estimated to generate an average of 1,860 FTE over the period 2006 to 2034 compared with 2080 FTE for the Sino Iron project. The relatively higher employment result for the Sino Iron project is a result of higher labour requirements in the investment phase of the project and higher flow on effects due to the processing requirements of magnetite.

Economic Benefits of Selected MagNet Members' Projects

Company	Mine Life (years)	Capex (A$)	Employment (construction)	Employment (direct ongoing)	Annual Royalties (A$)	Export Revenue (A$)
Asia Iron Australia Ltd Extension Hill Project	+50	2.9b Phase 1	2000	500	50-150m	1.3b
Atlas Iron Ltd Balla Balla Project	+26	1.9b Phase 1 & 2	1650	530	95m	1.1b
Atlas Iron Ltd Ridley Project	+30	2.8b	1100	750	75m	1.25b
CITIC Pacific Mining Sino Iron Project	+25	5.2b (USD)	4000	800	125m	3.0b
Gindalbie Metals Ltd Karara Mining JV	+30	2.6b Phase 1	2000	500	75-100m	1-1.4b
Grange Resources Savage River Operation (Tasmania)	Operating since 1966	NA	NA	600	15m	400m
Grange Resources Southdown Project	+19	2.5b	2000	600	80m	1.6b
TOTAL	-	$17.9 billion	12 750 jobs	4 280 jobs	$515-640 million	$9.65-10.05 billion