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The Magnesia Industry in Transition to Low-Carbon Energy Utilization

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Natural Resources PC

- **Consulting** on Mining, Energy and Climate
- Systems Approach
- **Newsletters** on Climate Policy and China
- Long experience on antidumping – related to CBAM
- **Business brokerage** on Mining and Energy
- **Conferences,** last one June 2-4 www. AllThingsEnergyForum.com, 100 speakers from 22 countries

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Mainstream Climate Science: 'Climate change is happening and is partly due to human activity'
ie burning fossil fuels, cutting down rainforests, farming livestock
GHG causing man-made global warming, %: carbon dioxide 64, methane 17, nitrous oxide 6, fluorinated gases

NR ®

Climate Change Policies - Impact on Businesses

International Climate Agreements [UN-lead]
<2^{0}C above pre-industrial levels

Climate Policies, eg in EU/EFTA but also parts of the USA and Canada
Reduce greenhouse emissions | Increase energy efficiency | Increase renewables

Policy Effects

Effect through Technology | via Finance/Insur | Directly | Soft impact: peer, CSR, self

Affected Businesses

Coal | Other hydrocarb[1] & clean coal | Energy-intensive manufacturing | Transport[2] | Agriculture | Finance | Services[3] | Nuclear | Renewables

[1]Conventional, shale
[2]Land, sea, air
[3]Tech, Consulting, Engineering, Legal, Auditing, NGOs

←*high emissions [threatened by policies]*

low emissions [to benefit from policies] →

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1.2 ETS, the Emissions Trading System 2009-2020

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ETS, the Emissions Trading System 2021 !

Later: EU /EFTA ETS to be extended to buildings,	…road transport, shipping, aviation,…

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1.3 China's Carbon Market to miss start of trading, 28 June

- China's govt had previously set itself a deadline to launch the world's largest carbon market, in terms of GHG covered, by end 2020. Rules guiding the market became official on Feb. 1 and it was supposed to begin trading by end June
- Exchange says it's currently unclear when system will begin.
- The market is seen as another tool President Xi Jinping can use to help meet China's goal of hitting peak emissions by 2030 and carbon neutrality by 2060.
- It will initially cover more than 2,200 companies in China's power sector, which account for about half of the emissions in the world's biggest polluter. The program will eventually grow to encompass more industries, such as steel- and cement-makers.

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1.4 Enter CBAM…

History: From the origin of ETS

Aim: European Green Deal Dec ’19 *‘the EC will propose a carbon border adjustment mechanism, for selected sectors, to reduce the risk of carbon leakage. This measure would be an alternative…’*

Timetable: Public consultation closed 28 Oct ‘20. Legislative proposal planned for Q2 ‘21.

How it could work: Four options

Experience elsewhere: Border measures already in place for electricity imports in the WCI systems. There were proposals to extend these to cement in California.

Difficulties: Compatibility with WTO etc, Administrative complexity, Possibility of bypass,…

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1.4 …Enter CBAM -- US, China, Russia against…

'Where might border adjustments be most effective?' -Study

Table 7: Candidate sectors for border adjustments

Sector	Suitability for border adjustments
Electricity generation	• Highly emissions intensive, though limited imports from outside EU ETS • Imports by UK may become suitable depending on terms of UK departure from the EU
Cement	• Easy to attribute process emissions and set benchmarks for energy emissions • High transport cost implies resource shuffling less of an issue
Iron and Steel	• Emissions Intensive • Benchmarks relatively straightforward to set
Refining	• Emissions Intensive • Benchmarks relatively straightforward to set
Aluminium smelting	• Emissions Intensive if electricity production is high carbon • Attributing sources of electricity may be difficult.

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1.4 …Impact of CBAM on ETS…

Key European producers' Associations have **not** adopted an industry position for nor against a CBAM -- hoping EU ETS will continue to be the key market-based instrument for their sectors, with free allowances providing the key stimulus for industry installations @ indirect costs continuing to be reimbursed.

Considering the above…these Associations 'consider essential a detailed integrated impact assessment of all potential policy instruments in force and the effectiveness of a new one such as the CBAM'…'The carbon leakage protection measures currently in force should be enhanced, not replaced'…'The new CBAM must be WTO compliant.'

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1.4 …Latest information on CBAM, June 9 '21…

- List of sectors: CN codes of cement, electricity, fertilizers, iron and steel, aluminium; will be extended most probably after 2030
- Emissions: In the first phase the legal act will mostly concentrate on direct emissions only
- Export rebates: will not be included in the proposal. No joint agreement yet on how to approach export rebates in a WTO compatible manner
- Overlap between ETS (Free allowances/indirect costs) and CBAM: unclear

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1.4…Latest information on CBAM, June 9 '21

- WTO & 3rd country discussions: Norway and Iceland will be exempted and treated same as EU producers as they are part of the EU ETS Linked systems with the same carbon price will be exempted
- Use of revenues There are 3 possible sources (ETS revenues, digital tax and CBAM) CBAM is just one of them and the lowest money generator. A tax will need unanimity
- Downstream impacts The Commission is doing one study as part of the impact assessment which will assess the impact of CBAM on downstream sectors
- Upstream sectors?

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1.5 Case Study: EU/EFTA* Magnesia production in ETS: Competition from non ETS countries

**Norway, at least up to 2021*

Today

1. Natural MgO – from many non-ETS countries: notably Turkey, Brazil, Russia, Australia, USA [ETS in some states but not in Nevada], N. Korea. Canada [ETS in some states, eg has been discussed for Alberta]
2. Synthetic MgO – from the US [ETS not in Michigan] and Mexico, & Russia; little imports fm Japan, S. Korea
3. China: 'ETS under [slow] development', but not for MgO

In a **future** framework, without CBAM

What happens re ETS in the EU

What happens re ETS in these 'non-ETS' countries

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2. Commercial/Financial Tools

Using green electricity

- **Buying via *real* PPAS: Power Purchase Agreements; a contract directly between a RES supplier and an industrial or commercial consumer.**
- **Buying via *virtual* PPAs: basically a form of price hedge.** ... The project pays the company if the electricity is sold into the market above the agreed contract price, and the company pays the project the difference if the electricity falls below the agreed price.
- **Miners producing electricity themselves -- from on-site Renewables [the 'Energy and Mines' concept];** especially relevant for mines geographically remote from the grid, or in cases of unreliable grids.

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3. Technological Solutions…RHI Magnesita: Increasing Recycling, Improving Energy Efficiency, Switching Fuel and Using Green Electricit

Reduction in Scope 1, 2 and 3 (raw materials) **Recycling** is key and we have committed to achieve 10% secondary raw material (SRM) content by 2025, with recycling facilities in every region.	**CO2 Sequestration** **Conventional measures alone will not take us to net zero**. ~1/2 of our carbon emissions are released from processing minerals. When MgCO3 is processed into MgO, it releases CO2. **We are investing €50 million by 2025 in new technologies to capture & use these CO2 emissions. We are conducting industrial trials of these technologies** — a critical step towards net zero.

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3…Technological Solutions…HeidelbergCement:

- **CO2 Sequestration**
- 15.12.20 to install world's 1st full-scale CCS facility in the Norcem cement plant in Brevik cement plant, to capture of 400,000 mt of CO2/yr & transport for permanent storage. Goal: start CO2 separation from the cement production process by 2024. End result: 50% cut of emissions from the cement produced at the plant.

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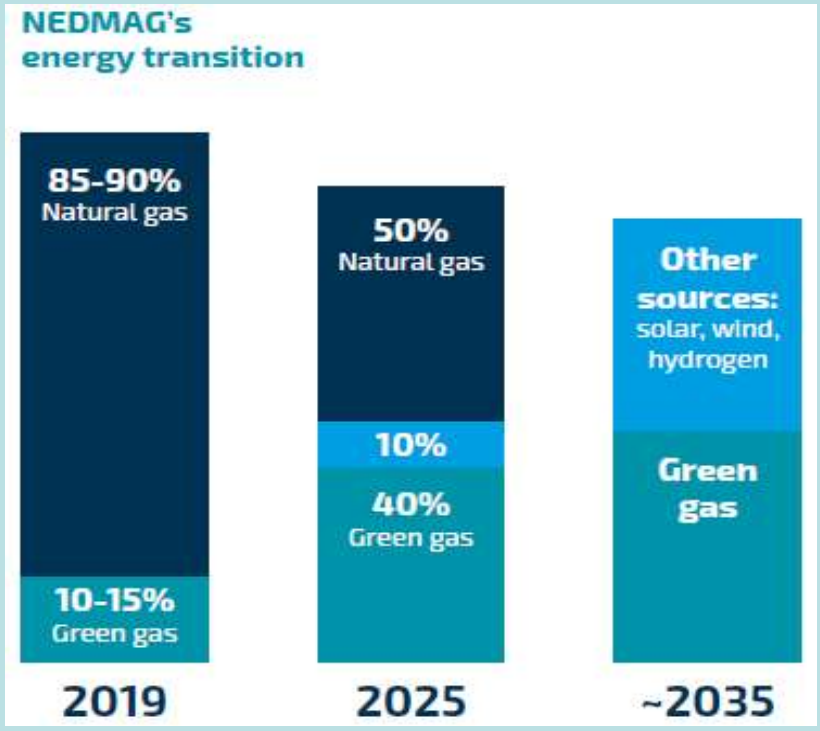
3…Technological Solutions…Nedmag

Goal: Being independent of fossil fuels by 2035.

To achieve that goal, Nedmag intends to use hydrogen as a fuel. Therefore, we collaborate with partners to learn more about hydrogen and how we can use it in our processes.

At the end of 2021 we expect that one of our installations can run **on hydrogen.**



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3…Technological Solutions…The latest on Hydrogen

June 22 '21: SSAB, LKAB and Vattenfall Hydrogen-reduced iron sponge developed by HYBRIT **First time ever iron ore has been directly reduced with H2** -- produced with fossil-free electricity on a pilot scale.	**June 24 '21, IRENA** **Based on the $0.0104 solar power tariff agreed in S. Arabia in April, IRENA modeled a hydrogen plant which would also harness solar and be connected to the grid. Lack of a grid connection would raise the renewable hydrogen cost to $1.74/kg, which still compares favorably to the current $1.45-2.40/kg price of hydrogen production powered by natural gas and equipped with CCS.**

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General Remarks

- **It is mainly *policies* that drive the actions of EU/EFTA companies towards Low-Carbon Energy Utilization**
- **Simultaneously, *Capital [and Insurance]* markets also put pressure on these enterprises, especially listed ones**
- **As well, policies, incl. CO2 prices, drive low-carbon *technology***
- **Lastly, less tangible factors such as CSR and pier pressure also play an actual role**
- **So there is a confluence of FOUR forces pushing for Low-Carbon Energy Utilization**

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Take-Aways for the Magnesia industry

- Main *policy* tool: ETS, especially now at €50/mt CO2 which will probably rising; cannot be ignored by the industry; CBAM: to watch
- Key *commercial* instruments: Renewables will increasingly serve the industry via PPAs, physical or virtual – at the expense of auctions
- *Technology*: The most cost-effective renewables are wind and solar – but should be complemented with batteries. Ideal for remote mines. *Transition fuel*: If 'EU Taxonomy' finally accepts them, Natural Gas and, in some geographical areas, Nuclear [small, decentralized]. *Medium to longer-term, but even earlier in some cases*: [green] hydrogen could replace hydrocarbons.
- Low-Carbon Energy Utilization will lead to *much increased electrification*. Will [the right] grids be ready in time?
- Novel, lower-energy, methods for producing MgO might crop up

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Thank you

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