Form 59
Rule 29.02(1)

Affidavit

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

Affidavit of:	**Paul Alexander Dewar**
Address:	Level 4, 7 Macquarie Place, Sydney NSW 2000
Occupation:	Lawyer
Date:	20 November 2024

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Filed on behalf of	Fortescue Limited and others, the Applicants		
Prepared by	Paul Alexander Dewar, Principal Lawyer		
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Document number	Details	Paragraph	Page
7	Annexure **PAD-29**, being copy of page 10 of the affidavit of Bjorn Winther-Jensen affirmed 8 July 2024	14	33–34
8	Annexure **PAD-30**, being copy of page 28 of the second affidavit of Anand Indravadan Bhatt affirmed 1 August 2024	15	35–36
9	Annexure **PAD-31**, being copies of orders of Justice Markovic made on 1 August 2024 and 13 September 2024	21	37–70
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I, PAUL ALEXANDER DEWAR, of Level 4, 7 Macquarie Place, Sydney, New South Wales, 2000, Lawyer, affirm:

1. I am a principal of the firm Davies Collison Cave Law (**DCCL**) of Level 4, 7 Macquarie Place, Sydney, in the State of New South Wales and have the care, conduct and control of this proceeding on behalf of the Applicants (**Fortescue**).

2. I have over 25 years of experience in the conduct of commercial litigation, including over 15 years of experience in the conduct of intellectual property litigation. I have been a partner of Davies Collison Cave and subsequently a principal of DCCL for more than 10 years.

3. This is my seventh affidavit in this proceeding. I am authorised to make this affidavit on behalf of Fortescue. The statements that I make in this affidavit are based on my own personal knowledge and belief, unless I expressly state otherwise.

4. I am not instructed, and do not intend in this affidavit, to waive privilege on behalf of Fortescue, nor do I have the authority to do so.

5. I make this affidavit in support of Fortescue's interlocutory application dated 20 November 2024 (**Discovery IA**). By the Discovery IA, the Applicants seek an order for non-standard discovery pursuant to rule 20.15 of the *Federal Court Rules 2011* (Cth) (***FCR***).

Background

Orders made on 23 October 2024

6. On 23 October 2024, the parties appeared before Justice Markovic for a case management hearing (**CMH**). Following the CMH, Justice Markovic made the orders which are annexed and marked **Annexure PAD-24**.

7. The orders relevantly state:

> *5. On or before 6 November 2024, the applicants and the respondents are to notify each other of the proposed categories of documents for which they will seek an order for discovery pursuant to r 20.15 of the Federal Court Rules 2011 (Cth).*
>
> *6. On or before 13 November 2024, the applicants and the respondents are to notify each other of which proposed categories of documents are by consent.*
>
> *7. On or before 20 November 2024, the applicants and the respondents are to file and serve any interlocutory application (and any supporting evidence) seeking discovery of documents in disputed categories.*

Inter partes correspondence

8. On 6 November 2024, DCCL sent an email to the Respondents' lawyers which attached Fortescue's proposed discovery categories (**Proposed Categories**), in accordance with order 5 of the 23 October orders. A copy of the email and Proposed Categories is annexed and marked **Annexure PAD-25**.

9. On 13 November 2024, the First, Second and Fourth Respondents' (**EZ Respondents**) solicitors (Gilbert + Tobin) sent a letter via email to DCCL, notifying which of the Proposed Categories are by consent. A copy of the letter is annexed and marked **Annexure PAD-26**. The letter stated that, in respect of the Proposed Categories, the EZ Respondents:

   (a) consent to categories 6 and 12;

   (b) consent to category 14 to the extent that it refers to category 1 (as amended by the EZ Respondents) and category 6 only;

   (c) consent to categories 1, 8 and 13 provided that certain amendments were made; and

   (d) object to the balance of categories.

10. On 13 November 2024, the Third Respondent's solicitors (MinterEllison) sent a letter via email to DCCL, notifying which of the Proposed Categories are by consent. The letter is annexed and marked **Annexure PAD-27**. The letter stated that, in respect of the Proposed Categories, the Third Respondent adopts the same position as the EZ Respondents.

Definition of "Ionic Liquid"; category 1

11. The Respondents do not consent to giving discovery under category 1 because they disagree with the definition of "Ionic Liquid" proposed by Fortescue.

12. I consider that the definition of "Ionic Liquid", which is applicable to multiple categories including category 1, is appropriately drafted, including for the following reasons.

13. The first affidavit of Dr Anand Indravadan Bhatt affirmed on 1 May 2024 (**Bhatt 1**) stated at [42] that the phrases "ionic liquids", "molten salts" and "eutectic" can be synonymous and used interchangeably. Pages 10 to 12 of **Bhatt 1** ([36]–[44]) are annexed and marked **Annexure PAD-28**.

14. Dr Bjorn Winther-Jensen's affidavit affirmed on 8 July 2024 asserted in [47(b)] that: "A second assumption is that the Element Zero process uses an ionic liquid. The common and established definition of an ionic liquid includes melting below 100°C. Element Zero uses a molten hydroxide-based electrolyte with a melting point above 170°C, which falls outside the common definition of ionic liquids... ". Page 10 of Dr Winther-Jensen's affidavit is annexed and marked **Annexure PAD-29**.

15. In the second affidavit of Dr Anand Indravadan Bhatt affirmed on 1 August 2024 (**Bhatt 2**), Dr Bhatt stated at [101]: "As to the alleged difference between 'ionic liquid' and 'molten hydroxide', I refer to what I said in paragraphs 37 to 44 of my First Affidavit." Page 28 of **Bhatt 2** ([101]) is annexed and marked **Annexure PAD-30**.

16. Given the technical definitional debate between Dr Bhatt and Dr Winther-Jensen described above, based on my experience in intellectual property litigation, I consider that there is likely to be a technical definitional debate at trial about what is an "ionic liquid", and whether other terms, such as "eutectics" etc, are synonymous with, can be used interchangeably with, or overlap with, "ionic liquid".

17. Fortescue's claim is that while working at Fortescue, the Second and Third Respondents conducted research into an electrochemical reduction process utilising an ionic liquid electrolyte. This research extends to research on a process utilising a "hydroxide alkali melt or eutectic melt" or a "molten hydroxide eutectic". This is because, as explained by Dr Bhatt, the terms "ionic liquids", "molten salts" and "eutectic" are synonymous and can be used interchangeably.

18. The inclusion of additional definitions (such as "eutectics" etc) in the definition of "Ionic Liquid" in the Discovery IA therefore ensures that the technical definitional debate can be properly ventilated at trial, and ensures that relevant documents are not excluded from discovery prior to that debate being determined.

Category 2

19. The Respondents do not consent to giving discovery of (to the extent not covered by category 1 of the Proposed Categories) all documents recording or evidencing work undertaken by the Second Respondent, the Third Respondent and/or Fortescue at any time during the period from 25 March 2019 to 12 November 2021 in relation to the matters listed at subcategory 2(a)–(x).

20. For ease of reference, Fortescue's evidence referred to in subcategory 2(a)–(x) is reproduced in the bundle which is exhibited to this affidavit and marked **Confidential Exhibit PAD-B** (**PAD-B**). The references to PAD-B, which correspond to subcategory 2(a)–(x), are as follows:

(a) Pages 1–3 of PAD-B contain Annexure AIB-5 to **Bhatt 1**.

(b) Page 2 of PAD-B is a copy of **Bhatt 1** AIB-5 p 52 and page 11 of PAD-B is a copy of AIB–6 p 61.

(c) Pages 20–21 of PAD-B contain **Bhatt 1** AIB-7.

(d) Pages 22–25 of PAD-B contain **Bhatt 1** AIB-8.

(e) Page 31 of PAD-B is a copy of **Bhatt 1** AIB-9 p 81.

(f) Page 35 of PAD-B is a copy of **Bhatt 1** AIB-10 p 85.

(g) Page 36 of PAD-B is a copy of **Bhatt 1** AIB-10 p 86.

(h) Page 40 of PAD-B is a copy of **Bhatt 1** AIB-12 p 93.

(i) Page 41 of PAD-B is a copy of **Bhatt 1** AIB-12 p 94.

(j) Page 41 of PAD-B is a copy of **Bhatt 1** AIB-12 p 94 (same as (i) above).

(k) Pages 43–47 of PAD-B contain **Bhatt 1** AIB-13 pp 96–100.

(l) Page 43 of PAD-B is a copy of **Bhatt 1** AIB-13 p 96.

(m) Page 44 of PAD-B is a copy of **Bhatt 1** AIB-13 p 97.

(n) Page 44 of PAD-B is a copy of **Bhatt 1** AIB-13 p 97 (same as (m) above).

(o) Page 44 of PAD-B is a copy of **Bhatt 1** AIB-13 p 97 (same as (m) and (n) above).

(p) Pages 43–44 of PAD-B contain **Bhatt 1** AIB-13 pp 96–97.

(q) Pages 43–44 of PAD-B contain **Bhatt 1** AIB-13 pp 96–97 (same as (p) above).

(r) Page 51 of PAD-B is a copy of **Bhatt 1** AIB-14 p 104.

(s) Page 53 of PAD-B is a copy of **Bhatt 1** AIB-15 p 106.

(t) Pages 55–57 of PAD-B contain **Bhatt 1** AIB-16.

(u) Pages 58–62 of PAD-B contain **Bhatt 1** AIB-17.

(v) Page 64 of PAD-B is a copy of **Bhatt 1** AIB-19 p 120.

(w) Pages 76–77 of PAD-B contain **Bhatt 1** AIB-20 pp 132–133.

(x) Pages 133–134 of PAD-B contain pages 82–83 of **Hantos**, which are in Annexure SMH-3 to that affidavit.

21. I request that Confidential Exhibit PAD-B be kept confidential as it contains information which is the subject of suppression orders made under *Federal Court of Australia Act 1976* (Cth) s 37AF. Annexed and marked **Annexure PAD-31** are copies of orders of Justice Markovic made on 1 August 2024 and 13 September 2024 which order the suppression of the materials in PAD-B.

Category 2A

22. The categories in the Discovery IA contain a new, additional category, category 2A, which was not part of the Proposed Categories sent to Gilbert + Tobin and MinterEllison on 6 November 2024. Therefore, Fortescue has assumed that this new category is contested and has included it in the categories in the Discovery IA.

23. For convenient reference, the following evidence relevant to category 2A are annexed and marked **Annexure PAD-32**:

    (a) pages 8 and 9 of the Second Respondent's affidavit sworn on 19 June 2024 ([49]–[52]); and

    (b) pages 9 and 10 of Rodney McKemmish's report dated 28 April 2024 (Annexure AH-27), identifying the serial numbers of Toshiba and Kingston USB devices.

Category 11

24. The Respondents do not consent to giving discovery of all versions, including drafts, of the documents outlined at subcategories 11(a)–(f).

25. Below, I explain by reference to the evidence filed by Fortescue what each of the types of documents in subcategory 11(a)–(c) is and why I consider the Respondents should be ordered to give discovery of that type of document (for example, why it is relevant to the issues in dispute). The subparagraph numbering below corresponds to the numbering of subcategory 11(a)–(c).

    (a) (**Basis of design documents**)

        (i) A 'basis of design' (or 'basis of design document') is defined in paragraph 29 of **Bhatt 2** as "a document used for the basis for the detailed engineering of a pilot plant and describes the scope of the pilot plant and the limits for each section of the pilot plant. The document establishes the minimum functional requirements, technical parameters, and criteria to undertake the engineering design of a proposed pilot plant." Another explanation is provided in paragraph 39 of the affidavit of Wayne McFaull affirmed on 1 May 2024 (**McFaull**): the basis of design is "the core starting document for any new plant. It outlines

what the design team is required to deliver. This includes a list of all major process units and the equipment required for each."

(ii) **Bhatt 2** and **McFaull** establish that all versions, including drafts, of the First Respondent's basis of design documents would be relevant to the issues in dispute in this proceeding.

i. A document titled "Basis of Design -- Chameleon Pilot Plant" having file name "FFI0302-10000-00-EG-BOD-0001_A (002) (BK)[1145938].docx" (**Basis of Design**) is particularised at paragraph [19](i)3 of the Further Amended Statement of Claim (**FASOC**) as being one of the Fortescue documents/information obtained by Dr Kolodziejczyk. This Basis of Design is described in paragraph 51(c) of **Bhatt 2** as being a "draft document used as the basis for the detailed engineering of Fortescue's pilot plant for its electrochemical iron ore reduction technology (the Fortescue Process) and describes the scope of the pilot plant and the limits for each section of the plant".

ii. The relevance of the Basis of Design to Element Zero's activities is explained in Part F of **Bhatt 2**, and in particular at paragraph 74 of **Bhatt 2**, as follows: "this document represents the fundamental first step that is required to be undertaken in an engineering project for an electrochemical reduction pilot plant regardless of the electrochemical reduction process to be used in that pilot plant. This specific Basis of Design would be useful for a competitor in designing and engineering its own electrochemical reduction pilot plant, and in particular could be used to identify and list the fundamental assumptions (e.g. feed, site-specific power etc.) with which the design team would need to contend when developing the engineering and scoping documents prior to construction."

iii. Further, Element Zero's basis of design documents or basis of design phase are discussed or referred to in **McFaull** [91]–[92], [94], [104], [114] and [121]. For example, **McFaull** [114] states that basis of design documents "contain a description of most aspects of the Fortescue Pilot Plant and could be built on as a good starting platform for the Element Zero Pilot Plant and used in the context of an engineering company tender".

(b) (**Piping and instrumentation documents**)

(i) 'Piping and instrumentation diagrams' (**P&IDs**) are defined in **Bhatt 2** [30] as "documents containing conceptual engineering drawings that depict the locations of all instruments (e.g., sensors, actuators, switches, etc.) and all equipment (e.g., tanks, stirrers, heaters, etc.). The documents also describe how each component should be connected by pipework and the location of valves and controls in that pipework." In **McFaull** [41], P&IDs are described as diagrams that "show all equipment, valves, instruments and controls in a Pilot Plant, and the interconnection between them."

(ii) **Bhatt 2** and **McFaull** establish that all versions, including drafts, of the First Respondent's P&IDs would be relevant to the issues in dispute in this proceeding.

i. A file named "Bumblebee PID markups 26_10_21.pdf (**Bumblebee P&ID**) is particularised at paragraph [19](i)4 of the FASOC as being one of the Fortescue documents/information obtained by Dr Kolodziejczyk. The Bumblebee P&ID is described in paragraph 51(d) of **Bhatt 2**, as being a "bundle of draft P&IDs and concepts for Fortescue's pilot plant. The document informs the reader of where piping, instruments and other equipment should be located. The Bumblebee P&ID describes a green iron pilot plant".

ii. The relevance of the Bumblebee P&ID to Element Zero's activities is explained in Part F of **Bhatt 2**, and in particular at paragraph 75 of **Bhatt 2** as follows: "this document would be useful to a competitor in identifying the particular piping and circuitry useful for designing and constructing an electrochemical reduction pilot plant regardless of the electrochemical reduction process to be used in that pilot plant (given that aspects of the P&ID relate to other processes that need to be undertaken in a pilot plant). … For example, the iron ore storage slurry tank used in the Fortescue pilot plant could be replaced by an electrolyte feed tank, with the remaining fundamental piping work and instrument configuration otherwise remaining the same or with minimal modification. …"

iii. Further, the relevance of P&IDs in the First Respondent's pilot plant development is discussed in Part B.4 of **McFaull**, and in particular [40]–[41]. For example, **McFaull** [40] states that P&IDs, together with process flow diagrams, "form the operational 'bible' for the Pilot Plant."

(c) (**Laboratory books**) 'Laboratory books' is not used as a term of art — it is used, without limitation, to refer to a book (or another document) in which procedures, results, etc of laboratory experiments are recorded. The relevance of "beneficiation and leaching of ores and electroplating and/or electrowinning and/or electrolyte development" to the issues in dispute is based on concepts described in **Bhatt 1**, **Bhatt 2**, **McFaull**, and the affidavits in answer sworn/affirmed by Drs Kolodziejczyk and Winther-Jensen. These concepts relate to the technologies or processes which are in dispute in this proceeding.

(e) (**Retirement project etc**) For convenient reference, page 9 of Dr Winther-Jensen's affidavit affirmed on 8 July 2024 (at [40]) is annexed and marked **Annexure PAD-33**.

Procedural and evidentiary considerations

26. Many of the documents sought by Fortescue will need to be provided to the one or more independent expert witnesses engaged by Fortescue in the preparation of Fortescue's expert evidence in chief. For example, I anticipate that an independent electrochemist specialising in green iron technology and an independent plant-building engineer will give evidence explaining how the discovered material (particularly, technical material within it) demonstrates that the First Respondent misused Fortescue's confidential information.

27. Fortescue requests that discovery of such documents be given before Fortescue is required to put on evidence in chief in this proceeding. The aim of this is to reduce the number of rounds of evidence, which I consider is consistent with the resolution of the dispute as quickly, inexpensively and efficiently as possible.

Affirmed by Paul Alexander Dewar)
at Sydney)
in New South Wales)
on 20 November 2024)
Before me:)

Signature of deponent

Signature of witness

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-24

This is the annexure marked **PAD-24** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

Federal Court of Australia

District Registry: New South Wales Registry

Division: General No: NSD527/2024

FORTESCUE LIMITED ACN 002 594 872 and others named in the schedule
Applicant

ELEMENT ZERO PTY LIMITED ACN 664 342 081 and others named in the schedule
Respondent

ORDER

JUDGE: Justice Markovic

DATE OF ORDER: 23 October 2024

WHERE MADE: Sydney

THE COURT ORDERS THAT:

Pleadings

1. The applicants have leave to file and serve a further amended statement of claim (**FASOC**) substantially in the form served on the respondents on 18 October 2024.
2. On or before 30 October 2024, each of the respondents file and serve any defence to the FASOC.
3. The applicants pay the respondents' costs thrown away by reason of the amendments.
4. The first, second and fourth respondents' interlocutory application dated 25 June 2024 be dismissed with no order as to costs.

Interlocutory Applications for Discovery

5. On or before 6 November 2024, the applicants and the respondents are to notify each other of the proposed categories of documents for which they will seek an order for discovery pursuant to r 20.15 of the *Federal Court Rules 2011* (Cth).
6. On or before 13 November 2024, the applicants and the respondents are to notify each other of which proposed categories of documents are by consent.
7. On or before 20 November 2024, the applicants and the respondents are to file and serve any interlocutory application (and any supporting evidence) seeking discovery of documents in disputed categories.

8. On or before 27 November 2024, the applicants and the respondents are to file and serve any evidence in answer to any interlocutory application served on them.
9. On or before 4 December 2024, the applicants and the respondents are to file and serve written submissions, not exceeding seven pages in length, in support of any interlocutory application filed by them.
10. On or before 11 December 2024, the applicants and respondents are to file and serve submissions, not exceeding seven pages in length, in answer on any interlocutory application served on them.
11. Any interlocutory application which has been filed be listed for hearing on 6 February 2025 at 10.15 am.
12. The parties have liberty to apply.

Date orders authenticated: 23 October 2024

Registrar

Note: Entry of orders is dealt with in Rule 39.32 of the *Federal Court Rules 2011*.

Schedule

No: NSD527/2024

Federal Court of Australia

District Registry: New South Wales Registry

Division: General

Second Applicant	FORTESCUE FUTURE INDUSTRIES PTY LTD ACN 625 711 373
Third Applicant	FMG PERSONNEL SERVICES PTY LTD ACN 159 057 646
Second Respondent	BARTLOMIEJ PIOTR KOLODZIEJCZYK
Third Respondent	BJORN WINTHER-JENSEN
Fourth Respondent	MICHAEL GEORGE MASTERMAN

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-25

This is the annexure marked **PAD-25** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

Rohit Dighe

From: Rohit Dighe
Sent: Wednesday, 6 November 2024 4:03 PM
To: Michael Williams; Rebecca Dunn; Caitlin Meade; Daisy Cullen; Mike Hales; Daniella Lambert; Lachlan McLean; Edward Fearis
Cc: Paul Dewar; Ashley Cameron; Kevin Huang
Subject: NSD527/2024 Fortescue Limited & Ors v Element Zero Pty Limited & Ors [ITUSEONLY-LAW.FID86345]
Attachments: Fortescue's Proposed Discovery Categories (6 November 2024).docx

Dear Colleagues

We refer to order 5 of the orders of Justice Markovic made on 23 October 2024.

We **attach** the Applicants' proposed categories of documents for which they will seek an order for discovery pursuant to r 20.15 of the *Federal Court Rules 2011* (Cth).

Yours sincerely

Rohit Dighe
Associate

Paul Dewar
Principal Lawyer

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We extend our respect to all Aboriginal and Torres Strait Islander peoples throughout Australia and acknowledge the Traditional Owners and Custodians of the lands on which we work.
We recognise their ongoing connection to land, sea and community.

APPLICANTS' DRAFT DISCOVERY CATEGORIES

Definitions

a. "**directly relevant**" means a document that falls within any of the criteria in rule 20.14(2) of the ***Federal Court Rules*** *2011* (Cth).

b. "**document**" has the meaning given to that term in Schedule 1 of the *Federal Court Rules*.

c. "**First Specified Documents"** means the documents referred to in the particulars of paragraphs 19 and 20 of the FASOC including:

No.	Name	Ref
1	Green Iron Update (02.08.2021).pdf	see FASOC [19(i)(1)]
2	35557986AU- Specification as filed (35557986).pdf	see FASOC [19(i)(2)], see FASOC [20(i)(4)]
3	35557986AU - Drawings as filed (35557986).pdf	see FASOC [19(i)(2)], see FASOC [20(i)(4)]
4	Document titled "Basis of Design – Chameleon Pilot Plant" having document number or file name FFI0302-10000-00-EG-BOD-0001	see FASOC [19(i)(3)]
5	Bumblebee PID markups 26_10_21.pdf	see FASOC [19(i)(4)]
6	The SharePoint documents identified in paragraphs 112 to 118 of the affidavit of Dr Anand Indravadan Bhatt affirmed on 1 May 2024 and Annexure AIB-29	see FASOC [19(ii)], see FASOC [20(iv)]
7	The internal Fortescue procedures and specifications listed in paragraph 103 of the affidavit of Mr Wayne McFaull affirmed on 1 May 2024	see FASOC [19(iii)], see FASOC [20(v)]
8	211029_Iron ore leaching_Report_ASH.R1.docx	see FASOC [20(i)(1)]
9	211014_FFI Green Steel_Ore Leach_ASH_XRF results.csv	see FASOC [20(i)(2)]
10	211014_FFI Green Steel_Ore Leach_ASH_ICP results.csv	see FASOC [20(i)(3)]
11	Technical Evaluation.xlsx	see FASOC [20(i)(5)]

No.	Name	Ref
12	Email from David White sent on 4 November 2024 with Subject "Technical Evaluation of Green Iron process"	see FASOC [20(i)(5)]
13	Green Iron Update (01.11.2021).pdf	see FASOC [20(i)(6)]

d. "**Fortescue**" has the meaning given to that term in paragraph 4 of the Further Amended Statement of Claim filed 24 October 2024 (**FASOC**).

e. "**Ionic Liquid**" means any salt or mixture of salts that is capable of acting as an electrolyte in electrowinning and/or electroplating of metals and/or ores when in its liquid form (irrespective of the temperature range at which the salt or mixture is in its liquid form) including, without limitation, electrolytes that may be described as ionic liquids, molten salts, eutectics, molten hydroxide-based electrolytes, molten carbonate-based electrolytes, "hydroxide alkali melt or eutectic melt" (referred to in paragraph 29(a)(i) of the EZ Parties defence) and/or "molten hydroxide eutectic" (referred to in paragraph 29(c) of Dr Winther-Jensen's defence).

f. "**Search Orders**" means the orders made by Justice Perry on 14 May 2024 providing for the conduct of a search pursuant to Division 7.5 of the *Federal Court Rules*.

g. "**Second Specified Documents**" means any:

   i. modified forms of First Specified Documents, including previous or subsequent drafts;

   ii. documents created directly or indirectly using the First Specified Documents.

Reasonable Search

For the avoidance of doubt, a "reasonable search" for the purposes of r 20.14 of the *Federal Court Rules* includes a reasonable search over the copies of materials seized or imaged pursuant to the Search Orders.

Categories

Ionic Liquid documents

1. All documents recording or evidencing work undertaken by the Second Respondent, the Third Respondent and/or Fortescue at any time during the period from 25 March 2019 to 12 November 2021 in relation to an electrochemical reduction process involving Ionic Liquid.

2. To the extent not covered by category 1, all documents recording or evidencing work undertaken by the Second Respondent, the Third Respondent and/or Fortescue at any time during the period from 25 March 2019 to 12 November 2021 in relation to:

(a) "low temperature oxide (predominantly iron ore) reduction technology" work, being the work referred to in Annexure AIB-5 to the affidavit of Anand Bhatt affirmed 1 May 2024 (**Bhatt**);

(b) "low-temperature metal oxide reduction from mixed electrolytes" work, being the work referred to in Bhatt AIB-5 p 25, or AIB-6 p 61;

(c) the "preliminary work that we have done in ionic liquids and low temperature iron ore reduction", being the work referred to in Bhatt AIB-7;

(d) work relating to "our internal endeavours, where Fortescue develops a new type of electrolyser", being the work referred to in Bhatt AIB-8;

(e) "low-temperature processing from ionic liquids" work, being the work referred to in Bhatt AIB-9 p 81;

(f) work for "getting our manufacturing and R&D facilities set up", being the work referred to in Bhatt AIB-10 p 85;

(g) "low temperature [electrochemical reduction] using ionic liquids as iron ore solvents" work, being the work referred to in Bhatt AIB-10 p 86;

(h) the "low-temperature electrochemical ores reduction in ionic liquid electrolytes" work, being the work referred to in Bhatt AIB-12 p 93;

(i) the "work over Christmas to establish our Perth manufacturing in early 2021", being the work referred to in Bhatt AIB-12 p 94;

(j) "electrolysers and low-temperature electrochemical iron ore processing plants" work, being the further work referred to in Bhatt AIB-12 p 94;

(k) "low temperature electrochemical ores reduction" work, being the work referred to in the Patent Assessment Form and email dated 22 December 2020 in Bhatt AIB-13 pp 96 – 100;

(l) drafts of the "intended patent application" referred to in the email dated 22 December 2020 in Bhatt AIB-13 p 96;

(m) "the use of ionic solvents and electrochemical devices for the low-temperature reduction of ores and oxides" work, being the work referred to in the Patent Assessment Form in Bhatt AIB-13 p 97;

(n) the “ionic liquid or mixture of ionic liquids” work, being the work referred to in the Patent Assessment Form in Bhatt AIB-13 p 97;

(o) the “selection of ionic liquid or mixture of ionic liquids”, “application of ionic liquids in metal oxide reduction”, and “the selection of electrode materials and cell design” work, being further work referred to in the Patent Assessment Form in Bhatt AIB-13 p 97;

(p) the “develop[ment]” and “test[ing]” work as referred to Bhatt AIB-13 pp 96, 97;

(q) the work intended to be “scaled up”, as referred to Bhatt AIB-13 pp 96, 97;

(r) the “low-temperature electrochemical ore reduction in ionic liquids” work, including the “R&D roadmaps”, “write-ups” and proposed “patent applications”, being the work referred to in Bhatt AIB-14 p 104;

(s) the “R&D roadmap” and development “using solvents capable of dissolving iron ore at low temperatures <300 deg C and/or using molten carbonate electrolyte” work, being the work referred to in Bhatt AIB-15 p 106;

(t) the work concerning “alternative processes that would utilise lower temperatures and direct electrochemical reduction of iron ore into iron and further steel. The electrochemical reduction is done in a liquid phase, hence iron ore has to be dissolved in the electrolyte prior to being electrolysed”, being the work referred to in Bhatt AIB-16;

(u) the work concerning “enabling technologies for iron ore processing to produce green commodities”, “apply[ing] this green electricity to electrochemically reduce Fortescue’s iron ore dissolved in a unique electrolyte”, and/or “selection of electrolyte, electrode material and other materials used in the process”, including the proposed “patents covering this development”, being the work referred to in Bhatt AIB-17;

(v) the work concerning “water, ionic liquids, and molten carbonate”, being the work referred to in Bhatt AIB-19 p 120;

(w) the work concerning “[m]olten salts”, “[m]olten carbonates” and “[i]onic liquids”, being the work referred to in Bhatt AIB-20 pp 132-133; and

(x) the work concerning “initial evaluation of various suitable electrolytes”, “laboratory desktop studies”, “R&D roadmap” and “internal electrochemical developments” being work referred to in Annexure SMH-3 to the affidavit of Susanne Monica Hantos affirmed on 1 May 2024, pp 82, 83.

3. All documents recording or evidencing the location and storage of any of the documents referred to in category 1 and 2 above during:

   (a) the period 25 March 2019 to 12 November 2021**;**

   (b) after 12 November 2021.

4. All documents recording or evidencing any conduct or attempt by the Second Respondent and/or the Third Respondent to make any of the documents referred to in category 1 and 2 above unavailable to Fortescue.

5. All documents recording or evidencing any of the Respondents' consideration of the confidentiality of any of the documents referred to in category 1 and 2 above.

Specified Documents

6. All documents constituting or referring to the First Specified Documents.

7. All documents constituting or referring to the Second Specified Documents.

8. All documents recording of evidencing any use or disclosure of any one or more of the First and/or Second Specified Documents by any one or more of the Respondents or their agents.

9. All documents directly relevant to any of the matters pleaded or particularised in paragraph 31, 33 and/or 78 of the FASOC.

Element Zero-related documents

10. All documents recording or evidencing consideration by any one or more of the Second, Third and/or Fourth Respondents at any time during the period 25 March 2019 to 31 July 2022 as to their present or future involvement in an enterprise (other than Fortescue) for electrochemical reduction of iron.

11. All versions, including drafts, of the following documents (howsoever described):

   (a) basis of design documents for the First Respondent's pilot or trial plant/s, including the "**Element Zero Trial Plant**" (referred to in paragraph 30 of the EZ Parties' defence);

   (b) piping and instrumentation documents for the First Respondent's pilot or trial plant/s, including the Element Zero Trial Plant;

   (c) laboratory books (either in hard or soft copy) recording work done with respect to the development of each of beneficiation and leaching of ores and electroplating and/or electrowinning and/or electrolyte development during the period from January 2022 to February 2024;

(d) any documents provided by or on behalf of the Respondents or any of them to Playground Ventures containing any information in relation to chemical processes, plant design, the green iron/green steel industry and/or industry participants;

(e) documents recording or evidencing the "retirement 'project'", the "work[ ] with nickel [and] iron", and the "work that eventually led to the creation of Element Zero", referred to in paragraph 40 of the affidavit of Bjorn Winther-Jensen affirmed on 8 July 2024;

(f) documents recording the research and development of:

i. the "Element Zero Process" referred to in paragraph 29 of the EZ Parties' defence; or

ii. the "Element Zero process" referred to in paragraphs 29(b)-(c) of Dr Winther-Jensen's defence,

during the period from January 2022 to February 2024.

12. One or more documents recording or evidencing the amount of expenditure on designing, engineering and constructing the First Respondent's pilot or trial plant/s, including the Element Zero Trial Plant.

Documents showing use / patent docs

13. Copies of all patents and patent applications (or divisional or related patents and patent applications) filed by any of the Respondents, or in which the Second, Third, and/or Fourth Respondents are named as an inventor concerning any aspect of an electrochemical reduction process involving Ionic Liquid, leaching and/or any aspect of a pilot or trial plant for the electrochemical reduction of ore (including the Element Zero Trial Plant), including drafts thereof, and including but not limited to:

(a) no. 2022903090 entitled "Method of ore processing";

(b) no. 2023902103 entitled "Ore Processing Method for Metal Recovery";

(c) no. 2023903979 entitled "Electrowinning from Molten Salt" (979 Application);

(d) no. PCT/AU2023/051041 entitled "Method of ore processing";

(e) any patent application for an electrochemical reduction process involving Ionic Liquid;

(f) any patent application concerning leaching;

(g) any patent application that relates to the features of a pilot or trial plant (including the Element Zero Trial Plant) in respect of electrochemical reduction of ore;

(h) the patents or patent applications that “cover the overall process and its unique chemistry” as referred to on the Element Zero website as shown at Bhatt AIB-22 p 141;

(i) the patents or patent applications that cover “the complete circuit design for mineral processing incorporating a unique electrolyte” as referred to on the Element Zero website, as shown at Bhatt AIB-22 p 141.

14. All documents evidencing or recording the use of any of the documents in categories 1, 2, 6 and/or 7 above for or in preparing or inventing any of the patents or patent applications referred to in category 13 above.

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-26

This is the annexure marked **PAD-26** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

Partner Michael Williams
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13 November 2024

By email□pdewar□ dcc.com

Mr Paul Dewar
Partner
Davies Collison Cave
Level 4, 7 Macquarie Place
SYDNEY NSW 2000

Dear Colleagues

Fortescue Limited □ Ors v Element Zero Pt□ Ltd □ Ors - Proceedings in the Federal Court of Australia (NSD527□2024)

We refer to order □ of the orders made 23 October 2024 and the Applicants' proposed discovery categories served □ November 2024.

Categories not opposed

The First, Second and Fourth Respondents consent to production of documents under Fortescue's proposed categories □, 12 and 14 (to the extent it refers to category 1 as amended and category □ only).

Categories ob□ected to

Our client objects to the remaining categories proposed by the Applicants in their current form, including on grounds that discovery in those categories□

- Would involve production of material that is not relevant to any issue in the proceedings and extends beyond the scope of the Applicants' pleaded case□
- Would be oppressive, including because the categories as presently drafted require the Respondents to exercise judgement in conducting a subjective evaluation as to the relevance of a particular document□and/or
- Would amount to a "fishing expedition" by the Applicants.

Notwithstanding the above, our clients would be prepared to produce documents under categories 1, 8 and 13 with the amendments set out below.

Category 1

The definition of Ionic Liquid proposed by the Applicants is significantly broader than the Applicants' pleaded case. For example, the definition makes reference to "hydroxide alkali melt or eutectic melt" and "molten hydroxide eutectic", which are terms used in the Respondents' Defences to describe Element Zero's technology, despite the fact that the Applicants do not (and have never) alleged that the Respondents conducted research into these electrolytes during their employment at Fortescue. It

would be oppressive for our clients to conduct searches for documents falling within this broad (and inaccurate) definition of Ionic Liquid.

In the circumstances, our clients would be prepared to produce documents under category 1 with the following amendment which is consistent with the Applicants' pleaded case□

> All documents recording or evidencing work undertaken by the Second Respondent, the Third Respondent and/or Fortescue at any time during the period from 25 March 2019 to 12 November 2021 in relation Ionic Liquid R&D as defined in paragraph 12 of the FASOC. ~~to an electrochemical reduction process involving Ionic Liquid.~~

Category 8

Our clients' objection to this category arises from the ambiguous and imprecise definition of Second Specified Documents. It is not clear how the Respondents could conduct searches for the Second Specified Documents, including an evaluative assessment of whether a document was "indirectly created" from another document. Our clients would be prepared to consent to production of documents under category 8 with the following amendment□

> All documents recording of □sic□evidencing any use or disclosure of any one or more of the First ~~and/or Second~~ Specified Documents by any one or more of the Respondents or their agents.

We note that this category would also capture documents in your proposed category 7, which is therefore redundant (and avoids the aforementioned issues with the definition of "Second Specified Documents").

Category 13

Our clients would be prepared to produce documents under category 13 with the following amendment□

> Copies of all patents and patent applications (or divisional or related patents and patent applications) filed by any of the Respondents, or in which the Second, Third, and/or Fourth Respondents are named as an inventor concerning any aspect of an electrochemical reduction process involving Ionic Liquid, leaching and/or any aspect of a pilot or trial plant for the electrochemical reduction of ore (including the Element Zero Trial Plant), ~~including drafts thereof~~, and including but not limited to:
>
> (a) no. 2022903090 entitled "Method of ore processing";
>
> (b) no. 2023902103 entitled "Ore Processing Method for Metal Recovery";
>
> (c) no. 2023903979 entitled "Electrowinning from Molten Salt" (979 Application);
>
> (d) no. PCT/AU2023/051041 entitled "Method of ore processing";
>
> (e) any patent application for an electrochemical reduction process involving Ionic Liquid;
>
> (f) any patent application concerning leaching;
>
> (g) any patent application that relates to the features of a pilot or trial plant (including the Element Zero Trial Plant) in respect of electrochemical reduction of ore;

(h) the patents or patent applications that "cover the overall process and its unique chemistry" as referred to on the Element Zero website as shown at Bhatt AIB-22 p 141;

(i) the patents or patent applications that cover "the complete circuit design for mineral processing incorporating a unique electrolyte" as referred to on the Element Zero website, as shown at Bhatt AIB-22 p 141.

For the sake of completeness, given the commercially sensitive nature of these documents, our clients will only consent to production of documents under this amended category 13 under a strict confidentiality regime. We contemplate this will cover access by external lawyers and experts in due course.

Reasonable searches

Finally, the First, Second and Fourth Respondents do not consent to the Applicants' definition of 'reasonable searches', which includes a search over the material seized pursuant to the Search Orders. As you would be aware, the purpose of a search order is the preservation of evidence pending determination of the proceeding and Courts have repeatedly cautioned against use of Search Orders "as a mere investigatory tool for applicants": *Microsoft Corp v Goodview Electronics Pty Ltd* (1999) FCA 754. There is no justification for the Applicants to unilaterally impose a requirement to search the seized material on the Respondents.

Yours faithfully
Gilbert + Tobin

Gilbert + Tobin

Michael Williams
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rdunn@gtlaw.com.au

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-27

This is the annexure marked **PAD-27** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

MinterEllison.

13 November 2024

BY EMAIL

pdewar dcc.com

Mr Paul Dewar
Principal
Davies Collison Cave Law
Level 4, 7 Macquarie Place
SYDNEY NSW 2000

Dear Colleagues

Fortescue Limited Ors v Element Zero Pt Ltd Ors (NSD 527 of 2024)

1. We refer to

   (a) order of the Orders made on 23 October 2024

   (b) your clients' proposed categories of discovery served on November 2024 (**Proposed Categories**)and

   (c) Gilbert Tobin's letter dated 13 November 2024, indicating the First, Second and Fourth Respondents' response to the Proposed Categories.

2. We are instructed that our client takes the same position in respect of the Proposed Categories as the First, Second and Fourth Respondents.

3. For the avoidance of doubt, our client

   (a) consents to the production of documents under Proposed Categories and 12

   (b) agrees to the amendments proposed by the Element Zero Respondents to Proposed Categories 1, 8, 13 and 14, as set out in Gilbert Tobin's letterand

   (c) objects to the outstanding categories of discovery proposed by your client.

Yours faithfully
MinterEllison

Contact Daniella Lambert T 1 2 9221 4193
Daniella.Lambert minterellison.com
Partner Mike Hales T 1 8 189 7825
Mike.Hales minterellison.com
O R REF 149 352

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-28

This is the annexure marked **PAD-28** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
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7 Macquarie Place, Sydney 2000

29. Iron ore describes a range of rocks and minerals from which metallic iron can be economically extracted. Iron ore usually contains iron oxides such as Fe_2O_3 (hematite) or Fe_3O_4 (magnetite).

30. The pre-processing of iron ore for Electrochemical Reduction may include a process called "leaching". Leaching is a process by which impurities are removed from iron ore to prepare it for further processing, including by electrolysis.

31. Iron ore contains a variety of other minerals in addition to iron oxides, including silicates and aluminates. Leaching of iron ore may involve, for example, treatment of the iron ore in a highly alkaline environment to dissolve the alumina and silica and thereby remove it from the ore. By way of further example, a high-temperature, high-pressure caustic acid leaching process may also be used to remove the impurities.

32. If iron ore containing high levels of impurities (such as silicates and aluminates) is used in an Electrochemical Reduction process, such impurities may accumulate in the electrolyte, thereby damaging the efficiency of the electrolysis process. Depending on the impurities present, electrolysis processes may simply not work properly. Accordingly, leaching may be essential to preparing iron or for later processing, including via electrolysis.

C.2 Electrowinning / electroplating

33. Two approaches to Electrochemical Reduction currently being developed in the ironmaking industry are:

    (a) Electrowinning / electroplating; and

    (b) Electrochemical reduction of solid iron ore particles.

34. I provide further information about each of these approaches below.

35. Electrowinning (also known as "electroplating") involves the dissolution of iron ore into an electrolyte solution, which is electrolysed by applying a voltage between an immersed anode and cathode. As with other Electrochemical Reduction methods, iron ions are reduced into metallic iron; however, in this case the metallic iron is deposited on the surface of the cathode. The metallic iron can be recovered by scraping or peeling it off the cathode in a batch process, whilst the oxygen gas by-product is vented from the reactor.

36. The type of solution used to dissolve iron ore to form the electrolyte can vary. For example, iron ore particles may be dissolved in concentrated acid, aqueous alkaline solutions, or non-aqueous alkaline solutions such as a molten salt/ionic liquid. The Electrochemical Reduction of iron ore by dissolving the ore in an ionic liquid is referred to hereinafter as the **Ionic Process**.

37. The term "ionic liquid", defined most broadly, refers to a liquid comprised entirely of ions (an "ion" being an atom or molecule with a net electrical charge).

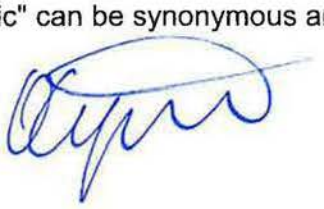
38. The authors in Douglas R. MacFarlane, Mega Kar and Jennifer M. Pringle, *Fundamentals of Ionic Liquids: From Chemistry to Applications* (Wiley-VCH, 2017) at page 2 argue that this is the "most useful practical definition" of an ionic liquid. This definition does not impose particular temperature requirements or require that an ionic liquid be in a liquid phase at room temperature. There is, however, no specific, authoritative definition of "ionic liquid" used in the field of chemistry, and various definitions may be used in different contexts.

39. The term "molten salt" refers to the liquid (i.e. "molten") phase of a crystalline ionic compound ("salt" being another term for an ionic compound). This usually refers to a crystalline ionic compound, or a mixture of ionic compounds, that would be solid at room temperature (20–25 °C) and that has melted to a liquid phase at a temperature above room temperature. Different ionic compounds, and mixtures of ionic compounds, may melt to liquid phase across the entire range of temperatures from just above room temperature through to over 800 °C.

40. In common usage in the field of chemistry, "molten salt" refers to the liquid phase of both an individual ionic compound and mixtures of more than one ionic compound, even though the term "molten salt" is not plural. See again Douglas R. MacFarlane, Mega Kar and Jennifer M. Pringle, Fundamentals of Ionic Liquids: From Chemistry to Applications (Wiley-VCH, 2017) at page 2.

41. The term “eutectic”, ‘eutectics” or “eutectic melt” refers to a mixture of two or more solids that are heated above room temperature to melt the two solids to produce a liquid (see Douglas R. MacFarlane, Mega Kar and Jennifer M. Pringle, *Fundamentals of Ionic Liquids: From Chemistry to Applications* (Wiley-VCH, 2017) at page 132).

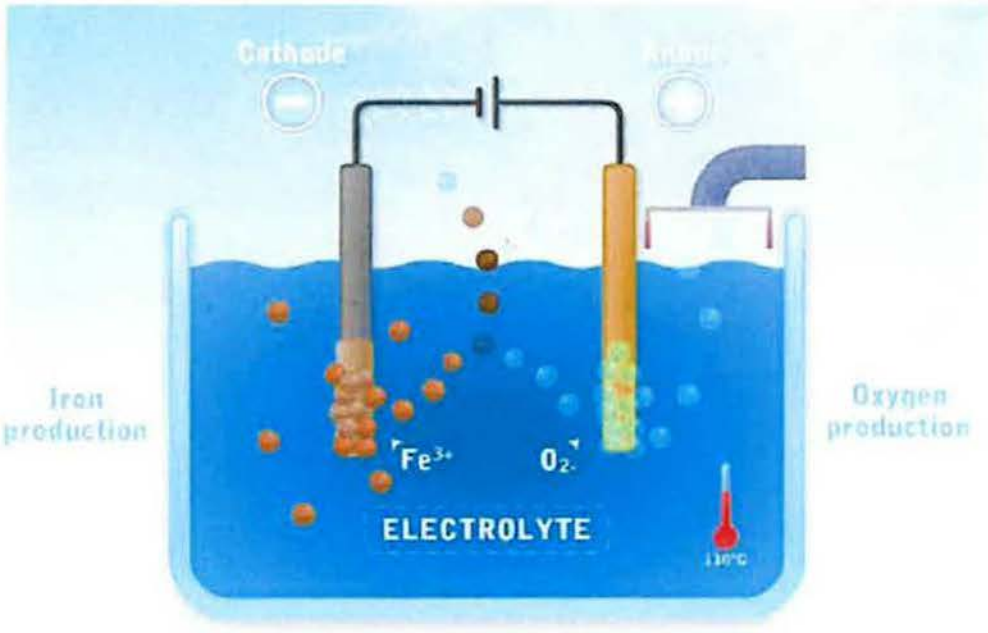
42. Sometimes, ionic liquids and molten salts are differentiated on the basis of a particular temperature at which the ionic compound melts, where ionic compounds with lower temperature melting points are considered "ionic liquids" and ionic compounds with higher temperature melting points are considered "molten salts". For example, sometimes, ionic compounds that are liquid below 100 °C are considered an ionic liquid, whereas ionic compounds that are liquefied above 100 °C are considered molten salts. However, such definitions are not definitive and there is a variety of arbitrary temperatures at which a distinction (if any) between ionic liquids and molten salts can be drawn. Indeed, there can be significant overlap between the terms depending on differing contexts in which they are used and the phrases “ionic liquids”, “molten salts” and "eutectic" can be synonymous and used interchangeably.



43. In summary, at its broadest, an ionic liquid is a liquid comprised of ions in a temperature range that may include room temperature, whereas a molten salt or eutectic is a liquid comprised of ions at a temperature above room temperature. Ionic liquids, molten salts and eutectics can conduct electricity and can serve as an electrolyte for an electroreduction reaction.

44. An example of a "molten salt" is a "molten carbonate". This refers to a liquid (i.e. "molten") phase of a crystalline ionic compound that includes a carbonate ion ("carbonate" refers to the negatively-charged ion with the chemical formula CO_3^{2-}).

45. Below is a diagram extracted from the research article M. Abdul Quader et al., 'A comprehensive review on energy efficient CO_2 breakthrough technologies for sustainable green iron and steel manufacturing' (2015) 50 *Renewable and Sustainable Energy Reviews* 594 at page 606, which, in my opinion, accurately demonstrates the main features of electrowinning of iron ore:



C.3 Electrochemical Reduction of solid iron ore particles

46. A different way of implementing Electrochemical Reduction is to reduce solid iron ore particles suspended in an electrolyte slurry.

47. In the below example of Electrochemical Reduction of solid iron ore particles, we refer to the process used by Fortescue. For clarity, the process used by Fortescue is an example of Electrochemical Reduction of solid iron ore particles, but is not the only way of performing it.

48. According to this process, a voltage is applied across the electrodes in the electrochemical reactor and iron oxide is reduced to metallic iron near the cathode.

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-29

This is the annexure marked **PAD-29** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

his affidavit indicates any change of approach. While I mentioned a parallel "long-term" research strand using ion liquids in February 2021, that work was never pursued.

46. At paragraph 84 of his affidavit, Dr Bhatt indicates that Fortescue staff have been unable to locate any other emails or documents mentioning an 'Ionic Process'. This is because, so far as I am aware, no such research was conducted while I was at Fortescue and therefore, no documents were created on this subject.

47. In Dr Bhatt's affidavit Part F, he presents some assumptions regarding Element Zero's process that are inaccurate. Based on Elements Zero's system at the time I worked on it, this included the following:

(a) A main assumption is that Element Zero's process includes an initial step to purify iron ore (paragraph 89 and 99 of Dr Bhatt's affidavit) and that this step is similar or identical to the water-based chemical leaching process researched by Fortescue. This is incorrect: the Element Zero process relies on dissolving iron ore in a non-aqueous media as the first step and later directly uses this solution for electrowinning of iron.

(b) A second assumption is that the Element Zero process uses an ionic liquid. The common and established definition of an ionic liquid includes melting below 100°C. Element Zero uses a molten hydroxide-based electrolyte with a melting point above 170°C, which falls outside the common definition of ionic liquids and indeed the ionic liquid electrolytes that Dr Kolodziejczyk and I considered in early 2021.

(c) A third assumption is that Element Zero's process is a continuous flow-cell system. It is not. Rather, it is similar in approach to the batch-based electrowinning processes commonly used in the copper, nickel and gold industries.

Surveillance and Execution of Search Orders

48. The Search Orders were executed on 15 May 2024 at my residential premises, Unit 4, 213 Gildercliffe Street, Scarborough, Western Australia, 6019 (**Premises**).

49. At paragraphs 65 to 68 of his affidavit, Dr Kolodziejczyk describes the extensive surveillance that took place leading up to the Search Orders. Like Dr Kolodziejczyk, I

No. NSD527 of 2024

Federal Court of Australia

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Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-30

This is the annexure marked **PAD-30** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

safety and standards (amongst other Fortescue operational documents). They are developed internally at Fortescue for Fortescue's use across all areas of its operations.

98. Further, insofar as Dr Winther-Jensen is suggesting that Fortescue's procedures and specifications documents would not be useful in designing and constructing an electrochemical reduction pilot plant, I disagree. The procedures and specifications documents provide guidance and best practice for how to construct such a pilot plant, identifying the standards and regulations that need to be adhered to; identifying best practice for materials selection and construction; best practice for safety; and so forth. This is regardless of the fact that the electrochemical reduction process used by Element Zero is different to that used by Fortescue.

G.5 Responses to paragraphs 37 and 47 of Dr Winther-Jensen's affidavit (Assumptions)

99. In paragraph 37 and 47 of his affidavit, Dr Winther-Jensen asserts that I made some wrong assumptions about the Element Zero process. I deny making the wrong assumptions he contends, for the following reasons.

100. As to Element Zero's leaching agent, I did not make any assumption that Element Zero's leaching step was "similar or identical to the water-based chemical leaching process researched by Fortescue". I refer to what I said in paragraph 99 of my First Affidavit.

101. As to the alleged difference between "ionic liquid" and "molten hydroxide", I refer to what I said in paragraphs 37 to 44 of my First Affidavit. I took Element Zero's temperature into account: see paragraphs 92(f) and 98(b) of my First Affidavit.

102. As to batch-processing, I did observe that Element Zero's process was a batch-based electrowinning process. I refer to what I said in paragraphs 35 and 98(e) of my First Affidavit.

H Response to paragraph 41 of Dr Kolodziejczyk (Dr Sienna Mohammadzadehmoghadam)

103. In paragraph 41 of his affidavit, Dr Kolodziejczyk asserts that Dr Sienna Mohammadzadehmoghadam knew what work he did during his employment.

104. I am aware that Dr Mohammadzadehmoghadam was one of three scientists working under Dr Winther-Jensen (the other two being Dr Kerr and Dr Shrestha, discussed above) during the period from April 2021 until when Dr Winther-Jensen and Dr Kolodziejcyzyk resigned in November 2021. I am informed by Dr Mohammadzadehmoghadam, and believe, that although Dr Kolodziejczyk was her line manager, Dr

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-31

This is the annexure marked **PAD-31** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

Federal Court of Australia

District Registry: New South Wales Registry

Division: General No: NSD527/2024

FORTESCUE LIMITED ACN 002 594 872 and others named in the schedule
Applicant

ELEMENT ZERO PTY LIMITED ACN 664 342 081 and others named in the schedule
Respondent

ORDER

JUDGE: Justice Markovic

DATE OF ORDER: 1 August 2024

WHERE MADE: Sydney

THE COURT ORDERS THAT:

1. Pursuant to s 37AF of the *Federal Court of Australia Act 1976* (Cth), and on the ground(s) specified in **Annexure A** to these Orders, the publication or disclosure of the information in Annexure A be prohibited until the date of judgment in this proceeding or further order of the Court, except that the information may be disclosed:
   (a) by or with the Applicants' consent; and
   (b) to or among the Court and the parties, including their external legal representatives.
2. As soon as practicable, and in any event by 4 pm on 5 August 2024, the applicants are to file and serve further copies of the affidavits (including annexures and exhibits) referred to in Order 4 of the Orders made on 1 August 2024 and Order 1 above, redacted consistently with:
   (a) Order 4 made on 1 August 2024;
   (b) Order 1 above, and
   (c) the interim suppression order in respect of the documents and information in Annexure B to the Orders made on 9 May 2024 (Order 4 made on 9 May 2024), as extended,

   for the purposes of the Court's public court file and of facilitating inspection pursuant to any non-party access request under r 2.32 of the *Federal Court Rules 2011* (Cth).

3. Liberty to apply.

Date orders authenticated: 7 August 2024

Registrar

Note: Entry of orders is dealt with in Rule 39.32 of the *Federal Court Rules 2011*.

Annexure A

No.	Information	Ground
1. First affidavit of Paul Alexander Dewar affirmed on 1 May 2024		
1	[NOT USED]	
2	[NOT USED]	
2. Second affidavit of Paul Alexander Dewar affirmed on 9 May 2024		
3	[NOT USED]	
3. Third affidavit of Paul Alexander Dewar affirmed on 14 May 2024		
4	[NOT USED]	
4. Fourth affidavit of Paul Alexander Dewar affirmed on 30 May 2024		
5	$ amount between the words *"spent just under"* and *"on its project"* in Annexure PAD-12 (redacted copy of the Applicant's written submissions dated 8 May 2024), page 49 at [53](e).	s 37AG(1)(a)
6	$ amounts in Annexure PAD-12 (redacted copy of the Applicant's written submissions dated 8 May 2024), page 52 at [56](g) chapeau, [56](g)(ii), [56](g)(iv) and [56](h).	s 37AG(1)(a)
7	The second person's name, title and organisation named in Annexure PAD-13 (transcript 9/5/24), page 77 (internal page 14), lines 20, and end of line 21 to line 22.	s 37AG(1)(a)
7(a)	Annexure PAD-13, page 77, reference to the name of the entity beginning with B at line 37.	s 37AG(1)(a)
8	The amounts in Annexure PAD-13 (transcript 9/5/24), page 87 (internal page 224) line 17; page 88 (internal page 25), lines 13, 24; and page 89 (internal page 26), line 31.	s 37AG(1)(a)
5. Affidavit of Nicolas Marrast affirmed on 8 May 2024		
9	[NOT USED]	

No.	Information	Ground
10	Deponent's residential street number and street name on page 1, "Address", page 2, above [1], and top left of Annexure NM-1, page 12.	s 37AG(1)(c)
11	Last three digits of Deponent's and third party mobile telephone numbers in Annexure NM-1 (deponent's CV), pages 12 and 16	s 37AG(1)(c)
12	% values under "Sodium Hydroxide", and the dot-points under "Al, Si NaOH rich" and above "Recovered NaOH" in Annexure NM-3 (Fortescue **Pilot Plant Technical Workshop presentation**), page 30 (internal page 10)	s 37AG(1)(a)
13	[AMENDED AS FOLLOWS]: % values in Pilot Plant Technical Workshop presentation, page 32 (internal page 12), and page 43 (internal page 23)	s 37AG(1)(a)
14	The dot-points under "Equipment Selection – Vendor Package" in Pilot Plant Technical Workshop presentation, page 39 (internal page 19)	s 37AG(1)(a)
15	% value and the two dot-points between "Residence time" and "Atmospheric system" in Pilot Plant Technical Workshop presentation, page 40 (internal page 20)	s 37AG(1)(a)
16	Last three digits of Deponent's mobile telephone number in Annexures NM-4 to NM-6, pages 62, 64, 67 and 68	s 37AG(1)(c)
17	Starting from second row, the middle column in table under subheadings 1), 2) and 3) in Annexure NM-6 (email attachment headed *"Deliverables. Iron ore reduction. Lab effort."*), page 69	s 37AG(1)(a)
18	% value after the words *"Leaching in"* in Annexure NM-6 (email attachment headed "Deliverables. Iron ore reduction. Lab effort."), page 70	s 37AG(1)(a)
6. Affidavit of Wayne McFaull affirmed on 1 May 2024		
19	[NOT USED]	
20	Deponent's residential street number and street name on page 1, "Address" and page 2, above [1].	s 37AG(1)(c)

No.	Information	Ground
21	AUD values in [72], [100], the last line of [101] and [117](b).	s 37AG(1)(a)
22	The line graph headed "Spend Profile", showing "Cumulative Spend AU$ …" between [73] and [74].	s 37AG(1)(a)
23	Last three digits of Deponent's mobile telephone number in Annexure WM-1 (deponent's CV), page 32.	s 37AG(1)(c)
7. Affidavit of Anand Indravadan Bhatt affirmed on 1 May 2024		
24	[NOT USED]	
25	Deponent's residential street number and street address on page 1, "Address", page 4, above [1], and Annexure AIB-1, page 41.	s 37AG(1)(c)
26	The identity of the person whose surname begins with M, their title and organisation in table of contents, pages 1-2 (items 3, 4, 7-9), page 5 [6] (heading D.1), page 15 (heading D.1) [56]-[58], [62], page 16 [63]-[64] and Annexure AIB-5.	s 37AG(1)(a)
27	The identity of the person whose initials are "RG" and their organisation in table of contents, pages 1-2 (items 5, 7), page 15 [59], [62], and Annexure AIB-5, page 52.	s 37AG(1)(a)
28	The identity of the organisation whose name starts with B in table of contents, page 2 (item 11), pages 16-17 [66], Annexures AIB-9, AIB-16.	s 37AG(1)(a)
29	Title of project in [57].	s 37AG(1)(a)
30	References to the organisation whose name begins with M on page 15 [59], [60], [62], page 16 [64], Annexure AIB-5	s 37AG(1)(a)
31	The words between *"to explore opportunities for"* and *"and"* on page 15 [60] and Annexure AIB-5.	s 37AG(1)(a)
32	The words after *"a proposal concerning"* on page 16 [64] to the end of the sentence.	s 37AG(1)(a)
33	Temperature value on page 16 [66].	s 37AG(1)(a)
34	Second to fourth sentences on page 17 [66].	s 37AG(1)(a)

No.	Information	Ground
35	Deponent's day and month of birth, age and last three digits of telephone numbers in Annexure AIB-1.	s 37AG(1)(c)
36	All references to the name and initials of the organisation whose name begins with M in Annexures AIB-2, AIB-3, AIB-4, AIB-5 (21 September 2020 11:50 PM), AIB-6, AIB-7, AIB-8; including in all email addresses, signature blocks, hyperlinks, logos, telephone numbers and names and initials of personnel connected with that entity.	s 37AG(1)(a)
36(a)	Email subject lines and attachment names in AIB-2, AIB-3, AIB-4, AIB-5, AIB-6, AIB-7, AIB-8	s 37AG(1)(a)
36(b)	Title of project in 4th paragraph of email following the words "I came across your project titled", in Annexure AIB-2 and AIB-3.	s 37AG(1)(a)
36(c)	Last three digits of personal mobile number and direct phone number at the bottom of page 56 (internal page ref 2) of Annexure AIB-6	s 37AG(1)(a)
36(d)	The three words following "*we have discussed everything regarding*"; and the two words following "*I am looking forward to receiving*" in the 8.50pm email (page 71) of Annexure AIB-7.	s 37AG(1)(a)
36(e)	The three words following "*Future Industries is looking for in terms of low temperature*"; the four words following "*which could be integrated with your"*, in the 12.52pm email (page 73) of AIB-8	s 37AG(1)(a)
36(f)	The two words following "*share with you a first draft of the proposal on*", and the six words following "*the only prior IP we have in this space is a patent on"* in the 12.39pm email (page 74) of AIB-8.	s 37AG(1)(a)
37	Dr Forrest's email addresses in Annexures AIB-9, AIB-10, AIB-12 and AIB-14	s 37AG(1)(c)
38	[NOT USED]	
39	Email subject lines in Annexure AIB-10.	s 37AG(1)(a)
40	Second paragraph in email sent 15 December 2020 1:46 PM in Annexure AIB-10, page 86.	s 37AG(1)(a)

No.	Information	Ground
41	Annexure AIB-11	s 37AG(1)(a)
42	[NOT USED]	
43	The organisations identified in the email 22 December 2020 8:48 PM in Annexure AIB-14, page 102, after the words *"He is asking"*.	s 37AG(1)(a)
44	Annexure AIB-14, page 103, second paragraph beginning *"We have told Andrew…"*, the places identified before the words *"for trials"* in the third paragraph, and the mt value in the highlighted passage.	s 37AG(1)(a)
45	The name of the person as contained in the subject line of the email from 6 Jan 2021 at 2:15PM, in Annexure AIB-15 page 106.	s 37AG(1)(a)
46	The third and sixth paragraphs of the first email in Annexure AIB-15, page 106.	s 37AG(1)(a)
47	All references to the name or initials of the organisation whose name begins with B in Annexure AIB-16.	s 37AG(1)(a)
47(a)	The words before "*to turn iron oxide into steel*" in the third line of the email at 2.17PM in Annexure AIB-16.	s 37AG(1)(a)
48	Last three digits of the mobile telephone number for Ms Barley in Annexure AIB-16.	s 37AG(1)(c)
49	Second last paragraph in email 22 January 2021 11:41 AM in Annexure AIB-17.	s 37AG(1)(a)
50	Last three digits of the mobile telephone number for Ms Crabbe in Annexure AIB-17.	s 37AG(1)(c)
51	$ values in Annexure AIB-18.	s 37AG(1)(a)
52	In the email of 27 January 2021 at 5:42 PM in Annexure AIB-19: The entity beginning with "B" in the first paragraph; and the whole of the second and fourth paragraphs.	s 37AG(1)(a)
53	Fourth paragraph in email Jan 18, 2021 at 3:17 PM in Annexure AIB-19.	s 37AG(1)(a)

No.	Information	Ground
54	The words in the last paragraph of the email dated Jan 18, 2021 at 3:17 PM in Annexure AIB-19, following after the words "*the idea is to ask for*" to the end of the same sentence.	s 37AG(1)(a)
55	[NOT USED]	
55(a)	The identity of the organisation whose name starts with B on page 126 of Annexure AIB-20.	s 37AG(1)(a)
55(b)	Annexure AIB-20, third paragraph under heading "Priority. Reduction of magnetite concentrate through a solid state process" on page 131.	s 37AG(1)(a)
55(c)	Annexure AIB-20, the % values under the heading "Research topics" on page 131.	s 37AG(1)(a)
55(d)	Annexure AIB-20, the word following "adding significant amounts of" under the heading "Research topics" on page 131.	s 37AG(1)(a)
55(e)	Annexure AIB-20, sub-paragraphs (d) to (f) under the heading "Research topics" on page 131.	s 37AG(1)(a)
55(f)	Annexure AIB-20, the words in parentheses in sub-paragraph (g) under the heading "Research topics" on page 131.	s 37AG(1)(a)
55(g)	Annexure AIB-20, second, third and fourth bullet points on page 132.	s 37AG(1)(a)
55(h)	Annexure AIB-20, sub-paragraphs (a) to (b) under the heading "Research topics" on page 132.	s 37AG(1)(a)
55(i)	Annexure AIB-20, sub-paragraph (b) under the heading "Research topics" on page 133.	s 37AG(1)(a)
56	Emails in Annexure AIB-21: 24 February 2021 9:54 AM (fourth paragraph only); 19 February 2021 6:09 PM; and 16 February 2021 12:40 PM, entity beginning with B.	s 37AG(1)(a)
57	[NOT USED]	s 37AG(1)(a)
58	Last three digits of the mobile telephone number for Dr Shrestha in Annexure AIB-30.	s 37AG(1)(c)

No.	Information	Ground
59	Email 28 May 2021 3:19 PM in Annexure AIB-34.	s 37AG(1)(a)
8. Affidavit of Susanne Monica Hantos affirmed on 1 May 2024		
60	[NOT USED]	
61	All references to the name and initials of the organisation whose name begins with M in page 10 [55] (rows 1, 2-4, 5), page 13 [64] and Annexure SMH-3, pages 28-30, 32-33, 47; including in all email addresses, signature blocks, hyperlinks, logos, telephone numbers and names and initials of personnel connected with that entity.	s 37AG(1)(a)
62	[NOT USED]	
63	[NOT USED]	
64	[NOT USED]	
65	[NOT USED]	
65(a)	Email subject lines and attachment names in Annexure SMH-3, pages 28, 29, 30, 32-33, 47.	s 37AG(1)(a)
65(b)	Title of project in 4th paragraph of email following the words "I came across your project titled", in Annexure SMH-3, page 28.	s 37AG(1)(a)
65(c)	Last three digits of personal mobile number and direct phone number at the bottom of page 33 of Annexure SMH-3.	s 37AG(1)(a)
65(d)	The three words following "*we have discussed everything regarding*"; and the two words following "*I am looking forward to receiving*" in the 8.50pm email at Annexure SMH-3, page 47.	s 37AG(1)(a)
66	The words between *"to explore opportunities for"* and *"and"* on Annexure SMH-3, page 30.	s 37AG(1)(a)
67	The identity of the organisation whose name starts with B in Annexure SMH-3, pages 48-52, 71.	s 37AG(1)(a)
68	Dr Forrest's email addresses in Annexure SMH-3 pages 52-68	s 37AG(1)(c)
69	[NOT USED]	

No.	Information	Ground
70	Email subject lines in Annexure SMH-3, pages 55-56.	s 37AG(1)(a)
71	Second paragraph in email sent 15 December 2020 1:46 PM in Annexure SMH-3, page 56.	s 37AG(1)(a)
72	[NOT USED]	
73	The organisations identified in the email 22 December 2020 8:48 PM in Annexure SMH-3, page 66, after the words *"He is asking"*.	s 37AG(1)(a)
74	Annexure SMH-3, page 67, second paragraph beginning *"We have told Andrew…"*, the places identified before the words *"for trials"* in the third paragraph, and the mt value in the highlighted passage.	s 37AG(1)(a)
75	The name of the person as contained in the subject line of the email from 6 Jan 2021 at 2:15PM, Annexure SMH-3, page 69.	s 37AG(1)(a)
76	The third and sixth paragraphs of the first email in Annexure SMH-3, page 69.	s 37AG(1)(a)
76(a)	References to the name and initials of the entity beginning with B in the emails of Annexure SMH-3, at pages 69-71, and the words before "to turn iron oxide into steel" in the third line of the email at 2.17PM in Annexure SMH-3, at page 71.	s 37AG(1)(a)
77	Last three digits of the mobile telephone number for Ms Barley in Annexure SMH-3, page 71.	s 37AG(1)(c)
78	Second last paragraph in email 22 January 2021 11:41 AM in Annexure SMH-3, page 73.	s 37AG(1)(a)
79	Last three digits of the mobile telephone number for Ms Crabbe in Annexure SMH-3, pages 76 and 79.	s 37AG(1)(c)
80	[NOT USED]	
81	$ amounts in Annexure SMH-3, page 87.	s 37AG(1)(a)
82	In the email of 27 January 2021 at 5:42 PM in Annexure SMH-3, page 89: the entity beginning with "B" in the first paragraph; and the whole of the second and fourth paragraphs.	s 37AG(1)(a)

No.	Information	Ground
83	Fourth paragraph in email Jan 18, 2021 at 3:17 PM in Annexure SMH-3, page 90.	s 37AG(1)(a)
84	The words in the last paragraph of the email dated Jan 18, 2021 at 3:17 PM in Annexure SMH-3, page 90, following after the words "*the idea is to ask for*" to the end of the same sentence.	s 37AG(1)(a)
85	[NOT USED]	
85(a)	Annexure SMH-3 page 94, the identity of the organisation whose name starts with B.	s 37AG(1)(a)
85(b)	Annexure SMH-3 page 99, third paragraph under heading "Priority. Reduction of magnetite concentrate through a solid state process".	s 37AG(1)(a)
85(c)	Annexure SMH-3 page 99, the % values under the heading "Research topics".	s 37AG(1)(a)
85(d)	Annexure SMH-3 page 99, the word following "adding significant amounts of" under the heading "Research topics".	s 37AG(1)(a)
85(e)	Annexure SMH-3 page 99, sub-paragraphs (d) to (f) under the heading "Research topics".	s 37AG(1)(a)
85(f)	Annexure SMH-3 page 99, the words in parentheses in sub-paragraph (g) under the heading "Research topics".	s 37AG(1)(a)
85(g)	Annexure SMH-3 page 100, second, third and fourth bullet points.	s 37AG(1)(a)
85(h)	Annexure SMH-3 page 100, sub-paragraphs (a) to (b) under the heading "Research topics".	s 37AG(1)(a)
85(i)	Annexure SMH-3 page 101, sub-paragraph (b) under the heading "Research topics".	s 37AG(1)(a)
86	Emails in Annexure SMH-3, pages 103-106: 24 February 2021 9:54 AM (fourth paragraph only); 19 February 2021 6:09 PM; and 16 February 2021 12:40 PM, entity beginning with B.	s 37AG(1)(a)
9. Affidavit of John Paul William Testaferrata Olivier affirmed on 2 May 2024		
87	[NOT USED]	

No.	Information	Ground
88	Deponent's residential street number and street name on page 1, "Address" and page 2, above [1].	s 37AG(1)(c)
89	$ value of expenditure on page 4, [16].	s 37AG(1)(a)
90	Last sentence on page 4, [18](a).	s 37AG(1)(a)
91	The identity of the organisation whose name starts with B in Annexure JPO-03, pages 201-205 (email subject) and page 204 (7 December 2020 9:35 AM)	s 37AG(1)(a)
92	Dr Forrest's email addresses in Annexures JPO-03.	s 37AG(1)(c)
93	[NOT USED]	
10. Affidavit of Adrian Huber sworn on 2 May 2024		
94	[NOT USED]	
95	[NOT USED]	
96	Deponent's personal email address before the letters "@gmail.com", last three digits of mobile telephone number and residential street number and address name in Annexure AH-1 page 25	s 37AG(1)(c)
97	Annexure AH-14 (Separation Deed).	s 37AG(1)(a)
98	[NOT USED]	
99	[NOT USED]	
99(a)	[NOT USED]	
99(b)	Annexure AH-22, page 174, the row in *"APPENDIX 2 – Keyword List 1"* between *"g20"* and *"innovators under 35"*	s 37AG(1)(a)
99(c)	Annexure AH-22, page 178, the line item between "*Figure 2_1.png*" and "*35538988 - Specification as filed-20-Feb-2020.PDF*"; and the line item between "*Green Hydrogen.png*" and "*WRL3559.tmp*"	s 37AG(1)(a)
100	[NOT USED]	

No.	Information	Ground
101	Annexure AH-26 (columns entitled "Detail 1" and "Detail 2", "Data", "Argument" and the second column entitled "Source" in the Excel attachment to Cyter forensic IT report)	s 37AG(1)(a)
102	The identity of the organisation whose name starts with B in Annexure AH 11 (email subjects) and page 87 (email 7 December 2020 9:35 AM)	s 37AG(1)(a)
103	Dr Forrest's email addresses in Annexures AH-11.	s 37AG(1)(c)
104	Paragraphs in Annexure AH-24 regarding assignment of patents at 12.59pm email (pages 183-184), 6.32pm email (from the words "Secondly, I acknowledge" on page 184 to "If you have any further questions" on page 185), 1.28pm email (from the words "thank you for your email" to "The deed has been prepared" on page 187), 8.04pm email (from the words "Thank you for your email" to "Lastly I would like to request" on page 188)..	s 37AG(1)(a)
105	[NOT USED]	
105(a)	[NOT USED]	
105(b)	[NOT USED]	
105(c)	Annexure AH-27, page 332, the three words under *"Horizon 2020"* and above *"McKinsey 2021 Executive Leadership Programme"* in the image of the "TempSD" folder structure	s 37AG(1)(a)
105(d)	Columns entitled "Detail 1", "Detail 2" and "Data" in pages 340–658, and columns entitled "Name" and "Path" in pages 659–687, in Excel attachment to Cyter forensic IT report, Annexure AH-27, pages 340 to 687.	s 37AG(1)(a)
11. Second Affidavit of Michael John Williams sworn on 2 May 2024		
106	[NOT USED]	s 37AG(1)(a)
107	Annexure MJW-3, pages 3-33 and 36-38	s 37AG(1)(a)
108	[NOT USED]	

No.	Information	Ground
109	Last three digits of personal phone numbers of Katelin Bettella, Matthew Roper, Phil McKeiver, Andrew Hamilton and Gerald La Rosa appearing on pages and 9, 13, 39, 41, 42, 43, 45, 46, 48, 49, and 50	s 37AG(1)(c)

Schedule of parties

No: NSD527/2024

Federal Court of Australia

District Registry: New South Wales Registry

Division: General

Second Applicant	FORTESCUE FUTURE INDUSTRIES PTY LTD ACN 625 711 373
Third Applicant	FMG PERSONNEL SERVICES PTY LTD ACN 159 057 646
Second Respondent	BARTLOMIEJ PIOTR KOLODZIEJCZYK
Third Respondent	BJORN WINTHER-JENSEN
Fourth Respondent	MICHAEL GEORGE MASTERMAN

Federal Court of Australia

District Registry: New South Wales Registry

Division: General No: NSD527/2024

FORTESCUE LIMITED ACN 002 594 872 and others named in the schedule
Applicant

ELEMENT ZERO PTY LIMITED ACN 664 342 081 and others named in the schedule
Respondent

ORDER

JUDGE: Justice Markovic

DATE OF ORDER: 13 September 2024

WHERE MADE: Sydney

THE COURT ORDERS THAT:

1. Pursuant to s 37AF of the *Federal Court of Australia Act 1976* (Cth) (**FCA Act**), and on the ground(s) specified in Annexures A and B to these Orders, the publication or disclosure of the information in Annexures A and B be prohibited until the conclusion of this proceeding, whether by final judgment or otherwise, or further order of the Court.
2. Pursuant to s 37AF of the FCA Act and on the ground referred to in s 37AG(1)(a), there is to be no disclosure of:
   (a) pages 2 -17, 50 – 51 and 66- 78 of Confidential Exhibit MGM-1 to the Affidavit of Michael George Masterman sworn 20 June 2024 (**Masterman Affidavit**);
   (b) Confidential Exhibit MGM-2 and MGM-3 to the Masterman Affidavit;
   (c) part of Exhibit MGM-4;
   (d) MFI-1, MFI-2, MFI-4 and Exhibit D being transcripts of Confidential Exhibit MGM-2; and
   (e) parts of pages 2 – 3 of Confidential Exhibit BPK-2 to the Affidavit of Dr Bart Piotr Kolodziejczyk sworn on 19 June 2024,

   until 4.00 pm on the date that is five years after the date of this Order, or further order of the Court.
3. Pursuant to s 37AF of the FCA Act and on the ground referred to in s 37AG(1)(a), there is to be no disclosure of:

(a) pages 5-35 and 38-40 of Confidential Exhibit BPK-2; and

(b) last three digits of phone numbers of Katelin Bettella, Matthew Roper, Phil McKeiver, Andrew Hamilton and Gerald La Rosa in Confidential Exhibit MGM-1 and Confidential Exhibit BPK-2,

until the conclusion of this proceeding, by final judgment or otherwise, or further order of the Court.

4. Orders 1 to 3 above do not prevent disclosure to and between the following people:

(a) judicial officers and necessary staff of this Court and any court hearing an appeal from any decision made in the course of this proceeding;

(b) the parties and the legal representatives of the parties instructed in this proceeding; and

(c) an individual by or with the claiming party's/parties' consent subject to that individual first giving confidentiality undertakings in a form agreed between the parties or ordered by the Court.

5. As soon as practicable, and in any event by 4.00 pm on 18 September 2024, the parties are to file and serve further copies of the affidavits (including annexures and exhibits) the subject of these Orders, redacted consistently with:

(a) in the case of the applicants:

(i) Order 1 made on 1 August 2024 in relation to the applicants' suppression application; and

(ii) Order 1 above; and

(b) in the case of the respondents:

(i) Orders 2 and 3 above,

for the purposes of the Court's public court file and of facilitating inspection pursuant to any non-party access request under r 2.32 of the *Federal Court Rules 2011* (Cth).

6. Liberty to apply on three days' notice.

Date orders authenticated: 13 September 2024

Registrar

Note: Entry of orders is dealt with in Rule 39.32 of the *Federal Court Rules 2011*.

3

Annexure A

No.	Information	Ground
1. Sixth affidavit of Paul Alexander Dewar affirmed on 31 July 2024		
1	The second person's name, title and organisation named in Annexure PAD-22 (CB tab 26; transcript 9/5/24), p 14 (CB p 421), lines 20, and end of line 21 to line 22. *[**Transcript which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 7 of Annexure A to that order.]*	s 37AG(1)(a)
2	Annexure PAD-22 (CB tab 26; transcript 9/5/24), p 14 (CB p 421), reference to the name of the entity beginning with B at line 37. *[**Transcript which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 7(a) of Annexure A to that order.]*	s 37AG(1)(a)
3	The amounts in Annexure PAD-22 (CB tab 26; transcript 9/5/24), p 24 (CB p 431), line 17; p 25 (CB p 432), lines 13, 24; and p 26 (CB p 433), line 31. *[**Transcript which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 8 of Annexure A to that order.]*	s 37AG(1)(a)
2. Affidavit of Matthew Fitzgerald Roper affirmed on 31 July 2024 (Roper)		
4	Roper (CB tab 14), paragraph 45 (CB p 196), title of invention in quote marks. *[**Discloses the nature of Fortescue's confidential research and invention. This item is the title of item 11 below, which has not been publicly disclosed. The title contains confidential information of a kind that falls within the fifth affidavit of Paul Alexander Dewar affirmed on 4 July 2024 (**Dewar 5**), paragraph 17.]*	s 37AG(1)(a)
5	Confidential Annexure MFR-5 (CB tab 32), pp 52-55 (CB pp 517-520) *[**Invention disclosure form; similar in nature to Confidential Exhibit MJW-3, pp 3-7, 36-38, which are the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order. Page 3 of the item states that information relating the invention has not been publicly disclosed. This item contains confidential information of a kind that falls within Dewar 5, paragraph 17.]*	s 37AG(1)(a)

No.	Information	Ground
6	Confidential Annexure MFR-6 (CB tab 33), pp 58-62 (CB pp 523-527), but excluding p 57 (CB p 522) *[**Identical with Confidential Exhibit MJW-3, pp 3-7, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
7	Confidential Annexure MFR-7 (CB tab 34), pp 64-68 (CB pp 529-533) *[**Identical with Confidential Exhibit MJW-3, pp 8-13, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
8	Confidential Annexure MFR-8 (CB tab 35), pp 70-89 (CB pp 535-554) *[**Contains the information in Confidential Exhibit MJW-3, pp 14-33, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
9	Confidential Annexure MFR-9 (CB tab 36), pp 91-110 (CB pp 556-575) *[**Identical with Confidential Exhibit MJW-3, pp 14-33, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
10	Confidential Annexure MFR-10 (CB tab 37), pp 113-115 (CB pp 578-580) *[**Identical with Confidential Exhibit MJW-3, pp 36-38, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)

5

No.	Information	Ground
11	Confidential Annexure MFR-13 (CB tab 40), (a) the following information on p 121 (CB p 586): i. the words in the subject line after "IP disclosure form for"; ii. the words in the attachments line after: "210921_IP disclosure_"; iii. the words in the body text of the email after: "We have prepared an IP disclosure for" up to the end of the second sentence in that paragraph; iv. last 3 digits of Aabhash Shrestha's mobile phone number; (b) the attachment on pp 122-131 (CB pp 587-596). *[**Invention disclosure form and the abovementioned parts of covering email; similar in nature to Confidential Exhibit MJW-3, pp 3-7, 36-38, which are the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order. Page 9 of this item states that information relating the invention has not been publicly disclosed. The item contains confidential information of a kind that falls within Dewar 5, paragraph 17. Further, the suppression of the last 3 digits of Aabhash Shrestha's mobile phone number is consistent with her Honour's orders dated 1 August 2024 (for example, see item 11 of Annexure A of those orders).]*	s 37AG(1)(a)
3. Second affidavit of Dr Anand Indravadan Bhatt affirmed on 1 August 2024 (Bhatt 2)		
12	Bhatt 2 (CB tab 15), paragraph 27 (CB p 207), the words after *"identifying R&D gaps, and"* to the end of the sentence. *[**Confidential information about Fortescue's green cement R&D program and commercial strategy. This item contains confidential information of a kind that falls within Dewar 5, paragraph 17 and 18(c).]*	s 37AG(1)(a)
13	Bhatt 2 (CB tab 15), paragraph 54, the words after *"describing an invention"* to the end of the sentence; paragraph 56(b) chapeau, last sentence; paragraph 56(b)(i); paragraph 56(b)(ii) (CB pp 214-215). *[**Describes item 9 above, which is identical with Confidential Exhibit MJW-3, pp 14-33, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order. This item contains confidential information of a kind that falls within Dewar 5, paragraphs 17 and 18(b).]*	s 37AG(1)(a)

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No.	Information	Ground
14	Bhatt 2 (CB tab 15), paragraph 56(c), the fourth sentence to the end of the subparagraph (CB p 215); paragraph 75, the words between *"page 7"* and *"of the P&ID"* and the words between *"capture of iron ore impurities"* and *"I refer to"* (CB p 220). *[**Confidential information about Bumblebee P&ID (item 20 below), being draft piping and instrumentation diagrams for Fortescue's pilot plant. This item contains confidential information of a kind that falls within Dewar 5, paragraphs 17 and 18(b). The reasons in item 20 below are repeated.]*	s 37AG(1)(a)
15	Bhatt 2 (CB tab 15), paragraph 89(d), the words between *"Dr Winther-Jensen's experiments"* and *"and"* (CB p 225). *[**Confidential information about Fortescue's leaching experiments. This item contains confidential information of a kind that falls within Dewar 5, paragraphs 17 and 18(b). This item relates to item 28 below (Dr Winther-Jensen's leaching experiments) and to Annexure B, item 12 below (Leaching Technical Report), and the reasons in those items are repeated.]*	s 37AG(1)(a)
16	Confidential Annexure AIB-38 (CB tab 42), (a) the words in paragraph 2 after "The document describes the"; (b) paragraph 3, second sentence; (c) paragraphs 4, 5 and 10 in full; (d) paragraph 12, final sentence. *[**Confidential description of the Green Iron Update, Basis of Design and Bumblebee P&ID documents: items 18, 19 and 20 below. The reasons in items 18, 19 and 20 below are repeated.]*	s 37AG(1)(a)
17	Confidential Annexure AIB-39 (CB tab 43) *[**Confidential description of items 5, 6, 9 and 10 above. The reasons in items 5, 6, 9 and 10 above are repeated.]*	s 37AG(1)(a)
18	Confidential Annexure AIB-40 (CB tab 44) *[**Confidential Green Iron Update document (SOC 19(a)). This item is marked "STRICTLY PRIVATE AND CONFIDENTIAL". The item contains confidential information of a kind that falls within Dewar 5, paragraphs 17, 18(a), 18(b) and 18(c). Disclosure of this item would provide an advantage to Fortescue's competitors, to Fortescue's detriment, as explained in Bhatt 2 (CB tab 15), paragraph 72.]*	s 37AG(1)(a)

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No.	Information	Ground
19	Confidential Annexure AIB-41 (CB tab 45) *[**Confidential Basis of Design document for Fortescue's pilot plant (SOC 19(c)). This item contains confidential information of a kind that falls within Dewar 5, paragraph 17 and 18(b). Disclosure of this item would provide an advantage to Fortescue's competitors, to Fortescue's detriment, as explained in Bhatt 2 (CB tab 15), paragraph 74.]*	s 37AG(1)(a)
20	Confidential Annexure AIB-42 (CB tab 46) *[**Confidential Bumblebee P&ID document (SOC 19(d)). This item contains confidential information of a kind that falls within Dewar 5, paragraph 17 and 18(b). Disclosure of this item would provide an advantage to Fortescue's competitors, to Fortescue's detriment, as explained in Bhatt 2 (CB tab 15), paragraph 75.]*	s 37AG(1)(a)
21	Confidential Annexure AIB-43 (CB tab 47), pp 100-103 (CB pp 672-675) *[**Invention disclosure form; ruling follows ruling on item 5 above. The reasons in item 5 above are repeated.]*	s 37AG(1)(a)
22	Confidential Annexure AIB-44 (CB tab 48), pp 106-110 (CB pp 678-682) *[**Identical with Confidential Exhibit MJW-3, pp 3-7, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
23	Confidential Annexure AIB-45 (CB tab 49), pp 112-134 (CB pp 684-706) *[**Contains the information in Confidential Exhibit MJW-3, pp 8-33, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
24	Confidential Annexure AIB-46 (CB tab 50), pp 136-160 (CB pp 708-732) *[**Identical with Confidential Exhibit MJW-3, pp 8-33, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)

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No.	Information	Ground
25	Confidential Annexure AIB-47 (CB tab 51), pp 163-165 (CB pp 735-737) *[**Identical with Confidential Exhibit MJW-3, pp 36-38, which is the subject of a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see item 107 of Annexure A to that order.]*	s 37AG(1)(a)
26	Confidential Annexure AIB-49 (CB tab 53) *[**Identical with Annexure JPO-04 (CB tab 168), pp 211-219 (CB pp 2319-2327). The ruling on this item follows the ruling on Annexure B, item 30**Error! Reference source not found.** below. The reasons in Annexure B, item 30**Error! Reference source not found.** below are repeated.]*	s 37AG(1)(a)
27	Confidential Annexure AIB-50 (CB tab 54) *[**Second draft of the Leaching Technical Report (Annexure AIB-30, CB tab 148). The ruling on this item follows the ruling on Annexure B, item 12 below. The reasons in Annexure B, item 12 below are repeated.]*	s 37AG(1)(a)
28	Confidential Annexure AIB-51 (CB tab 55) *[**Confidential email from Dr Winther-Jensen to Dr Shrestha attaching details of Dr Winther-Jensen's leaching experiments; similar in nature to the Leaching Technical Report (Annexure AIB-30, CB tab 148), which is Annexure B, item 12 below. The reasons in Annexure B, item 12 below are repeated.]*	s 37AG(1)(a)
29	Confidential Annexure AIB-52 (CB tab 56) *[**Confidential minutes of FFI Innovation Centre Weekly Meeting, 9 November 2021. The meeting was attended only by Fortescue staff. The minutes describe the status of R&D projects, actions and plans. This item contains confidential information of a kind that falls within Dewar 5, paragraph 17 and 18(b).]*	s 37AG(1)(a)

9

Annexure B

No.	Information	Ground(s)
1. First affidavit of Adrian Huber sworn on 1 May 2024		
1	Annexure AH-11 (CB tab 92), pp 88-89 (CB pp 1541-1542), two emails sent: (a) 3 December 2020 at 8:27 PM; and (b) 3 December 2020 at 5:56:15 AM. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 3.]*	s 37AG(1)(a), (c)
2	Annexure AH-21 (CB tab 102), pp 156-157 (CB pp 1609-1610) (a) p 156 [2.4] heading and text in first paragraph; and (b) the name and position of the individual who expressed "concerns" on p 157 [2.9], first sentence. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 4.]*	s 37AG(1)(a)
2. First affidavit of Dr Anand Indravadan Bhatt affirmed on 1 May 2024 (Bhatt 1)		
3	Bhatt 1 (CB tab 66) pp 15-16 (CB pp 1044-1045): (a) paragraph 61: quote from the confidentiality agreement with M entity; and (b) paragraph 62: quote from the confidentiality agreement with M entity, and the words after *"The"* in the sentence preceding the quote. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 6.]*	s 37AG(1)(a)
4	Bhatt 1 (CB tab 66) pp 31-32 (CB pp 1060-1061), paragraphs 130-131, containing statements from the Leaching Technical Report. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 7.]*	s 37AG(1)(a)

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No.	Information	Ground(s)
5	Bhatt 1 (CB tab 66), pp 34-35 (CB pp 1063-1064): (a) paragraph 145: the words between *"process"* and *"iron ore"* in the first sentence; (b) paragraph 148: the words between *"process"* and *"iron ore"* in subparagraph (a); and (c) paragraph 149: the words between *"process"* and *"iron ore"* in subparagraph (a). *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 8.]*	s 37AG(1)(a)
6	Annexure AIB-5 (CB tab 123), p 52 (CB p 1749), the quote below the words "*The approved purpose for this NDA would be:*" in the email dated 22 September 2020 at 8:28 PM. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 9.]*	s 37AG(1)(a)
7	Annexure AIB-6 (CB tab 124), pp 58-68 (CB pp 1755-1765), being the Confidentiality Agreement between Fortescue Future Industries Pty Ltd and M entity. *[**The reasons for the suppression claim in this item is in Huber 2 AH-29 (CB tab 190), item 10. Information in relation to the M entity is subject to a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see, for example, item 30 of Annexure A to that order.]*	s 37AG(1)(a)
8	Annexure AIB-9 (CB tab 127), pp 82-83 (CB pp 1779-1780), two emails: (a) 3 December 2020 at 8:27 PM. (b) 3 December 2020 at 5:56:15 AM. *[**This item is the same as item 1 above (Annexure AH-11). The ruling in item 1 above applies.]*	s 37AG(1)(a), (c)
9	Annexure AIB-10 (CB tab 128), pp 87-88 (CB pp 1784-1785), emails sent: (a) 15 December 2020 at 1:23 PM; (b) 15 December 2020 at 9:41 AM; and (c) 15 December 2020 at 1:56 AM. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 12.]*	s 37AG(1)(a), (c)

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No.	Information	Ground(s)
10	Annexure AIB-14 (CB tab 132), p 103 (CB p 1800) in the email dated 21 December 2020 at 10:09 AM, the names of organisations with whom Fortescue was "*getting NDAs signed*". *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 13.]*	s 37AG(1)(a)
11	Annexure AIB-15 (CB tab 133) pp 106-107 (CB pp 1803-1804), two emails sent: (a) 6 January 2021 at 12:51 PM; and (b) 4 January 2021 at 7:39 AM. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 14.]*	s 37AG(1)(a)
12	Annexure AIB-30 (CB tab 148) pp 191-211 (CB pp 1888-1908), being the Leaching Technical Report. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 15.]*	s 37AG(1)(a)
13	Annexure AIB-31 (CB tab 149), being extracts from the Leaching Technical Report. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 16.]*	s 37AG(1)(a)
14	Annexure AIB-32 (CB tab 150) pp 215-222 (CB pp 1912-1919), being the Iron Ore Leaching Update: (a) pp 215-217: emails dated 1 November 2021 at 9:37 AM; 1 November 2021 at 8:33 AM; 1 November 2021 at 8:10 AM; 1 November 2021 at 7:26 AM; and 30 October 2021 at 1:27 PM; and (b) pp 218-222: results of Fortescue's iron ore leaching experiments. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 17.]*	s 37AG(1)(a)
15	Annexure AIB-33 (CB tab 151) pp 224-227 (CB pp 1921-1924) (a) pp 224-225: TEA Email, being the email dated 4 November 2021 at 11:52 AM; and (b) pp 226-227: TEA Sheet. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 18.]*	s 37AG(1)(a)

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No.	Information	Ground(s)
3. Affidavit of Wayne McFaull affirmed 1 May 2024 (McFaull) (CB tab 67)		
16	McFaull pp 18-19 (CB pp 1086-1087), paragraph 78, the information in the 4th column of the table in rows 1, 2, 3, 4 and 6 (excluding the words "*Yes.*" and "*No.*"). *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 19.]*	s 37AG(1)(a)
17	McFaull p 19 (CB p 1087), last sentence of paragraph 80. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 20.]*	s 37AG(1)(a)
18	Annexure WM-2 (CB tab 157), being a breakdown of the total expenditure for the Fortescue Project during July 2021 to February 2023. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 21.]*	s 37AG(1)(a)
19	Annexure WM-3 (CB tab 158), being a monthly breakdown of how many human resources were employed or engaged in the Fortescue Project during July 2021 to February 2023. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 22.]*	s 37AG(1)(a)
4. Affidavit of Susanne Monica Hantos affirmed on 1 May 2024 (Hantos) (CB tab 68)		
20	Hantos p 10 (CB p 1109), the table at paragraph 55: (a) the words after the first "*and*" in row 3, column 3 to the end of the sentence; and (b) the second sentence in row 4, column 3. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 23.]*	s 37AG(1)(a)
21	Annexure SMH-3 (CB tab 164) p 30 (CB p 2038), the quote after "*The approved purpose for this NDA would be:*" in the email dated 22 September 2020 at 8:28 PM. *[**This item is the same as item 6 above (Annexure AIB-5). The ruling in item 6 above applies.]*	s 37AG(1)(a)

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No.	Information	Ground(s)
22	Annexure SMH-3 (CB tab 164) pp 35-45 (CB pp 2043-2053), being the Confidentiality Agreement between Fortescue Future Industries Pty Ltd and M entity. *[**This item is the same as item 7 above (Annexure AIB-6). The ruling in item 7 above applies.]*	s 37AG(1)(a)
23	Annexure SMH-3 (CB tab 164) pp 53-54 (CB pp 2061-2062), two emails sent: (a) 3 December 2020 at 8:27 PM; and (b) 3 December 2020 at 5:56:15 AM. *[**This item is the same as item 1 above (Annexure AH-11). The ruling in item 1 above applies.]*	s 37AG(1)(a), (c)
24	Annexure SMH-3 (CB tab 164) pp 57-58 (CB pp 2065-2066), emails sent: (a) 15 December 2020 at 1:23 PM; (b) 15 December 2020 at 9:41 AM; and (c) 15 December 2020 at 1:56 AM. *[**This item is the same as item 9 above (Annexure AIB-10). The ruling in item 9 above applies]*	s 37AG(1)(a), (c)
25	Annexure SMH-3 (CB tab 164) p 67 (CB p 2075) in the email dated 21 December 2020 at 10:09 AM, the names of organisations with whom Fortescue was "*getting NDAs signed*". *[**This item is the same as item 10 above (Annexure AIB-14). The ruling in item 10 above applies.]*	s 37AG(1)(a)
26	Annexure SMH-3 (CB tab 164) pp 69-70 (CB pp 2077-2078), two emails sent: (a) 6 January 2021 at 12:51 PM; and (b) 4 January 2021 at 7:39 AM. *[**This item is the same as item 11 above (Annexure AIB-15). The ruling in item 11 above applies.]*	s 37AG(1)(a)

No.	Information	Ground(s)
27	Annexure SMH-3 (CB tab 164) pp 80-86 (CB pp 2088-2094), being a draft Board paper (including Appendix 1, 2 and 3), except the following at p 82 [3.2]: "*The Fortescue team has done an initial evaluation of various suitable electrolytes. Further laboratory desktop studies will be undertaken at FFI's manufacturing precinct in February/March 2021. The R&D roadmap is currently being developed with the intention to trial this technology in Pilbara in 2021.*" *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 30.]*	s 37AG(1)(a)
5. Affidavit of John Paul William Testaferrata Olivier (Olivier) affirmed on 2 May 2024		
28	Olivier (CB tab 69) p 4 (CB p 1117), the following parts of paragraph 17: (a) AUD figure between "approximately" and "Key activities"; and (b) subparagraphs 17(a) and (b). *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 31.]*	s 37AG(1)(a)
29	Annexure JPO-03 (CB tab 167) pp 206-207 (CB pp 2314-2315), two emails sent: (a) 3 December 2020 at 8:27 PM; and (b) 3 December 2020 at 5:56:15 AM. *[**This item is the same as item 1 above (Annexure AH-11). The ruling in item 1 above applies.]*	s 37AG(1)(a), (c)
30	Annexure JPO-04 (CB tab 168) pp 211-219 (CB pp 2319-2327), being a slide pack for an internal Fortescue meeting involving members of the "Green Iron Forum". *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 34.]*	s 37AG(1)(a)
6. Affidavit of Nicolas Marrast affirmed on 8 May 2024		
31	Annexure NM-2 (CB tab 171), being a block diagram for the Fortescue Project prepared by members of engineering team. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 35.]*	s 37AG(1)(a)

15

No.	Information	Ground(s)
32	Annexure NM-3 (CB tab 172) pp 30-52 (CB pp 2348-2370), in the presentation slides titled "*FFI Innovation Centre: Pilot Plant Technical Work Shop*": (a) p 30, left-hand-side: the word before *"site process water"*, the word before *"site raw water"*, and the dot-point immediately below *"Iron Ore fines"*; (b) p 31, left-hand-side: the first word in the first heading, the first word in each dot-point, and the words between *"Combined product from"* and *"Moisture content"*; (c) p 31, right-hand-side: the first two dot-points; (d) p 32: the percentage ranges under the headings *"Ore Content"* and *"Ore content"*; (e) p 34: the diagram (same as item 31 above); (f) p 38, left-hand-side: the word after *"railable"*, and the words after *"Reclaim from",* (g) p 38, right-hand-side: the word between *"batch feed"* and *"slurry"*, the first and last words of the second dot-point under the heading *"What is required?"* and the word between *"Selection of"* and *"module"*; (h) p 40, left-hand-side: the percentage value after the words *"Ore concentration"*; (i) p 45, left-hand-side: the word before *"Magnetic Separator"* and the dot-point immediately below those words; (j) p 46, left-hand-side: the percentage range after *"Carbon addition"*; (k) p 52: the words in parentheses in the last dot-point. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 36.]*	s 37AG(1)(a)

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No.	Information	Ground(s)
7. Confidential attachments to Annexure AH-21 to Huber 1 (CB tabs 103-109)		
33	Confidential Attachment 1 (CB tab 103) (CB p 1612) (a) fourth paragraph, words after *"2015,"* to the end of the sentence. (b) fifth paragraph, the words between *"technology"* and *"and looking at"*. (c) ninth paragraph, second sentence to the end of the paragraph. (d) tenth paragraph, first and second sentences. (e) eleventh paragraph, first sentence, the words after *"including"* to the end of the sentence. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 37.]*	s 37AG(1)(a)
34	Confidential Attachment 2 (CB tab 104) *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 38.]*	s 37AG(1)(a)
35	Confidential Attachment 4 (CB tab 106), contact information of individuals, namely: (a) last 3 digits of mobile telephone numbers (CB pp 1629-1631). (b) text before "@gmail.com" in sender's email address in respect of email dated 16 January 2020 at 4:23 PM (CB p 1631). *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 40. Mobile telephone numbers and email addresses are subject to a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see, for example, item 96 of Annexure A to that order.]*	s 37AG(1)(c)
36	Confidential Attachment 5 (CB tab 107) (CB p 1632), last 3 digits of the telephone numbers of Nadia Butler and Lloyd Smith in their email signatures. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 41. Telephone numbers are subject to a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see, for example, item 96 of Annexure A to that order.]*	s 37AG(1)(c)

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No.	Information	Ground(s)
37	Confidential Attachment 6 (CB tab 108), contact information of individuals, namely: (a) last 3 digits of telephone numbers; and (b) text before "@andrew.cmu.edu" in email address at top of CB p 1635. *[**The reasons for the suppression claims in this item are in Huber 2 AH-29 (CB tab 190), item 42. Telephone numbers and email addresses are subject to a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see, for example, item 96 of Annexure A to that order.]*	s 37AG(1)(c)
38	Confidential Attachment 7 (CB tab 109) p 12 (CB p 1649), contact information in the table under "Contact details" column, namely: (a) the last 3 digits of each telephone number; and (b) text before the @ symbol in each email address. *[**The reasons for the suppression claim in this item are in Huber 2 AH-29 (CB tab 190), item 43. Telephone numbers and email addresses are subject to a s 37AF order made on 1 August 2024 in relation to the Applicants' suppression application: see, for example, item 96 of Annexure A to that order.]*	s 37AG(1)(c)

Schedule

No: NSD527/2024

Federal Court of Australia

District Registry: New South Wales Registry

Division: General

Second Applicant	FORTESCUE FUTURE INDUSTRIES PTY LTD ACN 625 711 373
Third Applicant	FMG PERSONNEL SERVICES PTY LTD ACN 159 057 646
Second Respondent	BARTLOMIEJ PIOTR KOLODZIEJCZYK
Third Respondent	BJORN WINTHER-JENSEN
Fourth Respondent	MICHAEL GEORGE MASTERMAN

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-32

This is the annexure marked **PAD-32** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

44. During this meeting, I recall that either Ms Ward or Ms Vague told me that I would not be allowed to work at Fortescue for my 3-month notice period, saying words to the effect:

> *"You will need to finalise any outstanding IP work and any other documents in the next week from home. You know too much, you're not to come into the office again or communicate with your colleagues at Fortescue."*

45. On 25 October 2021, I became aware that access to my Fortescue account had been cut off, which meant that I could no longer access Fortescue's system or access Fortescue documents to carry out tasks I had been asked to complete remotely, in particular working on invention disclosures for Fortescue patents.

46. I sent a message to Ms Vague informing her that I could not access my Fortescue account. Ms Vague responded by sending a screenshot of an email that had been sent by Ms Vague to my Fortescue email address. This email confirmed the discussion that I had with Ms Vague and Ms Ward, and stated:

> *"As discussed because of the seniority and level of confidential information that you have access to in your role, we will need to put you on gardening leave.*
>
> *Thank you for the offer to work out your notice period, but we will do a handover this week and finish up at the end of the week (29 October).*
>
> *It is really important for us as part of this handover that you work with us to hand over all intellectual property, which you have said you are happy to do, thank you. I also understand that there are some further patents that need to be lodged and that you are happy to work with us on this."*

47. I responded to Ms Vague confirming that I cannot access my Fortescue email because I had returned my Fortescue issued phone that day. Ms Vague then forwarded a message from Dillon Pope (Fortescue IT) confirming that I can get access to Duo, which is the multi-factor authentication used by Fortescue, on my personal phone.

48. A copy of the Whatsapp communications between Ms Vague and myself referred to above are reproduced at pages 10 to 12 of **Exhibit BPK-1**.

49. Between 25 and 29 October 2021, I worked from home in Perth to finalise my remaining work for Fortescue. At some point during that week, I realised that I still had a number of documents I needed to finalise and would not be able to do so by the end of the week.

50. On or around 29 October 2021, I had a telephone conversation with Mr Roper about my outstanding work. During this telephone call Mr Roper informed me that I could continue to work for another week from home but would need to return my laptop by 29 October 2021. Mr Roper told me to take the documents I needed to finish off my work for Fortescue and then email the finished work to him directly. Mr Roper also asked me to delete any documents saved on the local drives of my Fortescue laptop before I returned it, because he informed me that Fortescue had copies of everything they needed on the SharePoint (being the online file storage platform used by Fortescue).

51. On 29 October 2021, I returned my Fortescue laptop to Fortescue's offices in Bennett St. I cannot recall whether I handed it back to Mr Pope or Ms Vague, although it would have been one of them. Before returning the laptop, I deleted the files on the local drives, as Mr Roper had instructed me to do. Some of the files I deleted were personal files.

52. At subparagraph 77(c) of his affidavit, Mr Huber suggests that the McKemmish Report identifies that a folder called "TempSD" was deleted from my Fortescue laptop on 22 October 2021. To the best of my recollection the "TempSD" folder contained personal files, but I would need to have access to the list of files in the folder to confirm this.

53. In the morning of 29 October 2021, I had text communications with Mr Roper:

(a) At 9:04am, I received a text message from Mr Roper which said "*Hi Bart how are you travelling? Can I expect any IDs today? Matthew*". When Mr Roper referred to "IDs" I understand we was referring to Fortescue invention disclosures;

(b) At 11:04am, I sent Mr Roper a text message requesting confirmation of his Fortescue email address. I sent this message because I no longer had access to Mr Roper's email address, which was stored on my Fortescue laptop and mobile phone; and

(c) At 11:06am, Mr Roper responded providing details of his Fortescue email address.

54. A screenshot showing my text message history with Mr Roper on 29 October 2021 is reproduced at page 13 of **Exhibit BPK-1**.

55. Between 29 October 2021 and 5 November 2021, I continued to work on my outstanding Fortescue work using my personal laptop. For reasons of confidentiality, I set out the details of this work on page 2 of **Confidential Exhibit BPK-2**. Once I

22. A review of the user profile folders in the "Users" folder shows that the Fortescue laptop had the following user profiles installed:

Profile Folder Name	Path	Created (UTC +0800Hrs)	Last Modified (UTC +0800Hrs)
admindipope	C:Users\admindipope	10/08/2021 15:38:13.89	10/08/2021 15:38:14.89
adminjapotts	C:Users\adminjapotts	03/03/2019 18:21:53.31	07/06/2019 08:36:38.59
adminlaetran	C:Users\adminlaetran	21/03/2019 13:37:48.46	07/06/2019 08:36:59.61
All Users	C:Users\All Users	07/12/2019 17:30:39.83	07/12/2019 17:30:39.83
bkolodziejcz	C:Users\bkolodziejcz	27/09/2021 07:26:19.57	21/10/2021 16:58:56.53
Default	C:Users\Default	07/12/2019 17:03:44.22	24/06/2021 19:23:12.59
Default User	C:Users\Default User	07/12/2019 17:30:39.83	07/12/2019 17:30:39.83
Public	C:Users\Public	07/12/2019 17:14:52.89	25/06/2021 11:16:52.81

23. The above user account information informs me that:

a) There was a user account configured and active for the user "bkolodziejcz" (see entries shaded in grey).

b) The user account for ""bkolodziejcz" was a domain level account which means that it was connected to and administered by a domain controller.

c) The user ""bkolodziejcz" had local access to the Windows operating system which means that activity associated with this user was being recorded by Windows.

Finding 4. The Fortescue laptop had a user account for "bkolodziejcz" and was actively being used by this user.

External USB storage device activity

24. The Fortescue laptop contains records of several external USB storage devices (being USB thumb drives, USB hard drives and USB storage media) attached to the computer between June 2021 and October 2021. This activity is recorded in the Windows registry and Windows log files.

25. The following table summarises the devices known to have been connected. It should be noted however that not all instances of a device being connected will be readily identifiable. Over time, and with regular use and system updates, details of previous connections can be overwritten.

Device	Details	Serial / ID Number	Volume Label	Volume Serial Number	User account activity associated with
Toshiba	TOSHIBA USB DRV USB Device	07080A078F1B6304	TSB USB DRV	B1F5919C	bkolodziejcz
Kingston	USB DISK 2.0 USB Device	900042ACAE668708		EA447510	bkolodziejcz

26. A review of device activity for the above devices shows that:

    a) The earliest confirmed connection activity for the Kingston USB drive occurred on 7 October 2021.

    b) There are indications that the Kingston USB drive may have been connected as early as 19 August 2021.

    c) The earliest confirmed connection activity for the Toshiba USB drive occurred on 2 September 2021.

27. The connection history is shown in the accompanying chronology and for ease of reference the relevant entries have been highlighted in Green.

Chronology:	*To see this activity, use the filter option on the "Media" column and select "Removable Drive" and "USB Device"*

28. In addition to the above devices, activity associated with the connection of a SanDisk Cruzer USB thumb drive was observed. This activity was in the system backup logs that were created when the Fortescue laptop was updated on 24 June 2021. As such I am unable to determine any connection history for this device. Given the nature of the information available, I note that this device:

    a) Was connected prior to 24 June 2021.

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

ANNEXURE PAD-33

This is the annexure marked **PAD-33** produced and shown to **PAUL ALEXANDER DEWAR** at the time of affirming his affidavit on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

working on one to be related or transferable to the other. From an equipment perspective, the Element Zero technology has significant similarities to traditional electrowinning equipment used (for example, in the copper and gold industry). It is not comparable to the flow-cell system used by Fortescue. Further, the assumption that Element Zero is using an initial water-based beneficiation/leaching step is incorrect.

My work for Element Zero

38. As stated above, when I resigned I did not intend to work again.

39. After I ceased work for Fortescue, I travelled to Denmark to be with my sister and then to Thailand to reunite with my wife and niece, which was a key factor in my resignation from FMGPS. I returned to Perth in early February 2022.

40. In March 2022 (after returning to Perth in early February) I started setting up electrochemical gear in my garage. This was driven by curiosity and to have a small retirement "project" exploring the footsteps of Humphry Davy's and Michael Faraday's work from 1807 on electrodeposition from molten hydroxides. I worked with nickel initially but then branched into iron in about July 2022. It was this work that eventually led to the creation of Element Zero.

41. I was a director of Element Zero from 7 December 2022 to 11 January 2024. I ended my employment with Element Zero in December 2023.

42. I remain a shareholder of Element Zero.

43. The work I did at FMGPS has no connection to the work that I did on the technology that was developed by Element Zero. The work I did at Element Zero was based on a long and established body of scientific literature that is unrelated to the methods I was working on at FMGPS.

Comparison between Fortescue and Element Zero technology

44. Between January to April 2021, while I was located in Thailand, my work was limited to literature based studies and considerations.

45. At paragraphs 79 to 84 of his affidavit, Dr Bhatt describes that I suggested a 'change in approach' to the work I was involved in. Since the SIDERWIN approach was being considered from the start, I do not agree that the correspondence Dr Bhatt describes in

NOTICE OF FILING

Details of Filing

Document Lodged:	Affidavit - Form 59 - Rule 29.02(1)
Court of Filing	FEDERAL COURT OF AUSTRALIA (FCA)
Date of Lodgment:	10/02/2025 3:53:58 PM AEDT
Date Accepted for Filing:	10/02/2025 3:54:03 PM AEDT
File Number:	NSD527/2024
File Title:	FORTESCUE LIMITED ACN 002 594 872 & ORS v ELEMENT ZERO PTY LIMITED ACN 664 342 081 & ORS
Registry:	NEW SOUTH WALES REGISTRY - FEDERAL COURT OF AUSTRALIA

Registrar

Important Information

This Notice has been inserted as the first page of the document which has been accepted for electronic filing. It is now taken to be part of that document for the purposes of the proceeding in the Court and contains important information for all parties to that proceeding. It must be included in the document served on each of those parties.

The date of the filing of the document is determined pursuant to the Court's Rules.

No. NSD527 of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

Fortescue Limited (ACN 002 594 872) and others

Applicants

Element Zero Pty Limited (ACN 664 342 081) and others

Respondents

CONFIDENTIAL EXHIBIT PAD-B

This is the confidential exhibit marked **PAD-B** to the affidavit of **PAUL ALEXANDER DEWAR** affirmed on 20 November 2024.

Before me: .....

ROHIT MANOJ DIGHE
An Australian Legal Practitioner
within the meaning of the Legal
Profession Uniform Law (New South Wales)
Davies Collison Cave Law Pty Ltd
7 Macquarie Place, Sydney 2000

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-5

This is the annexure marked **AIB-5** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 22 September 2020 8:28 PM
To: Tamahra Dempsey
Cc: Julie Shuttleworth;Emily Ward
Subject: [redacted]
Attachments: [redacted]

Hi Tamahra,

Under Chairman's request, I have approached a team at [redacted] to explore opportunities for [redacted] and low-temperature oxide (predominantly iron ore) reduction technology.

Can you please email Fortescue Non-Compete NDA to [redacted]? Having a non-compete NDA in place is of the highest importance to our Chairman.

The approved purpose for this NDA would be:

[redacted]

Thank you,
Bart

From: [redacted]
Sent: Monday, 21 September 2020 11:50 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: [redacted]
Subject: [redacted]

Hi Bart,

We received a request for an NDA to begin discussions between [redacted] and Fortescue Metals. Please find our standard NDA attached for your review. If you have any questions or edits, please direct them to my attention for review.

We look forward to engaging with you and your colleagues.

Thanks,
[redacted]

[redacted]

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-6

This is the annexure marked **AIB-6** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 13 October 2020 5:34 PM
To: [redacted];Emily Ward
Cc: [redacted]
Subject: [redacted]
Attachments: [redacted]

Hi [redacted],

Please find attached executed NDA. Apologies again for delays.

[redacted], would you have time for another call this or next week to discuss project(s) scope?

Best regards,
Bart

From: [redacted]
Sent: Wednesday, 30 September 2020 2:38 AM
To: Emily Ward <eward@fmgl.com.au>
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi Emily,

[redacted] executed NDA attached.

Thanks,
[redacted]

[redacted]

From: Emily Ward <eward@fmgl.com.au>
Sent: Sunday, September 27, 2020 10:00 AM
To: [redacted]
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi [redacted],

I have attached an updated version of our Agreement.

I have been able to accept most changes as you will see. Where a change has not been accepted, I have simply rejected the mark-up.

I will explain to our team that all correspondence and discussions will need to be prefaced with a statement or note identifying whether the contents are confidential.

Does the University have a legal entity name?

Many thanks,

Emily.

From: [redacted]
Sent: Thursday, 24 September 2020 5:56 PM
To: Emily Ward <eward@fmgl.com.au>
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi Emily,

Please find my requested edits in the attached.

Thanks,
[redacted]

[redacted]

From: Emily Ward <eward@fmgl.com.au>
Sent: Wednesday, September 23, 2020 4:43 AM
To: [redacted]
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Dear [redacted],

Further to your discussions with my colleague Bart Kolodziejczyk, please find attached a Confidentiality Agreement for your review and signature.

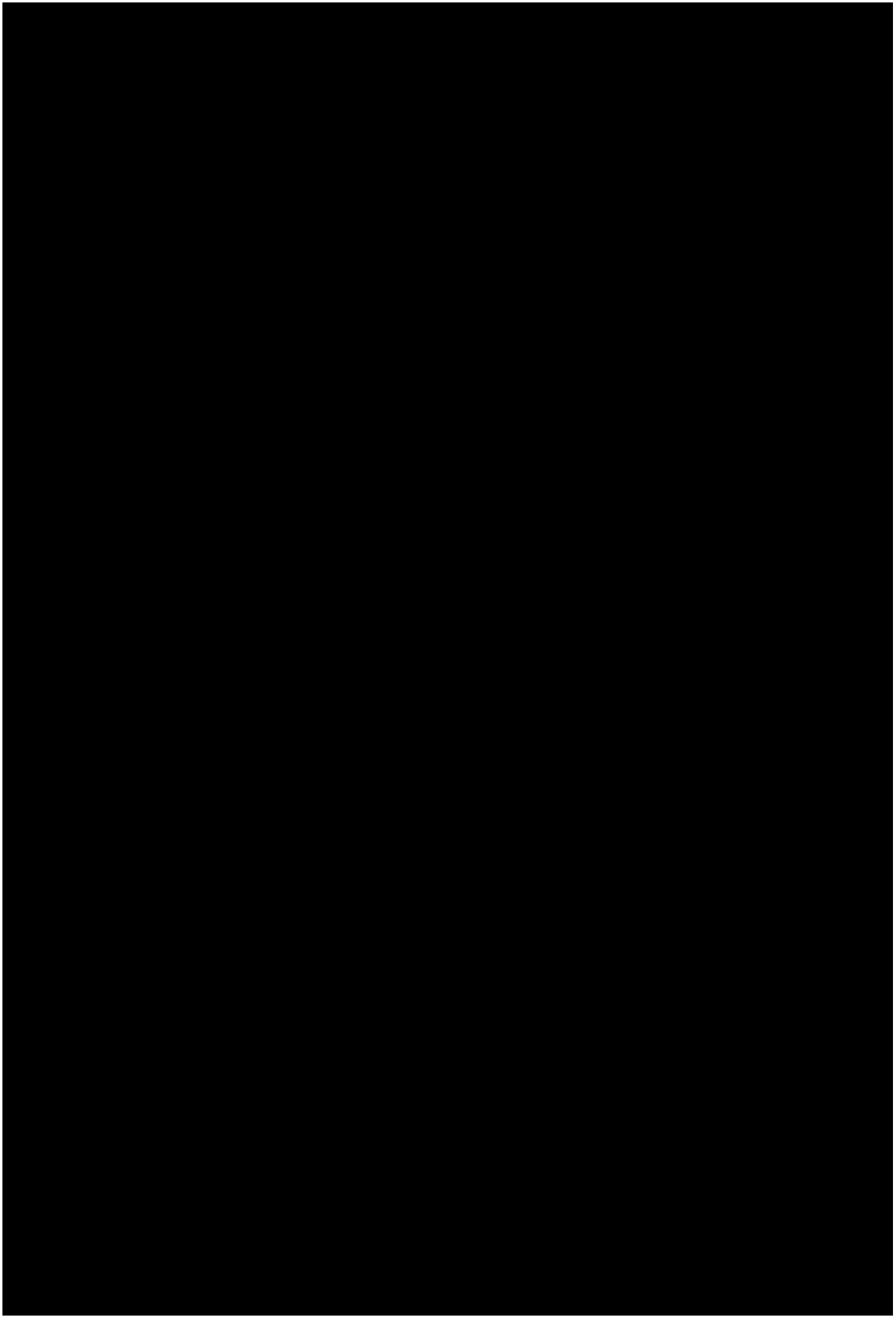
If you have any questions, please do not hesitate to ask.

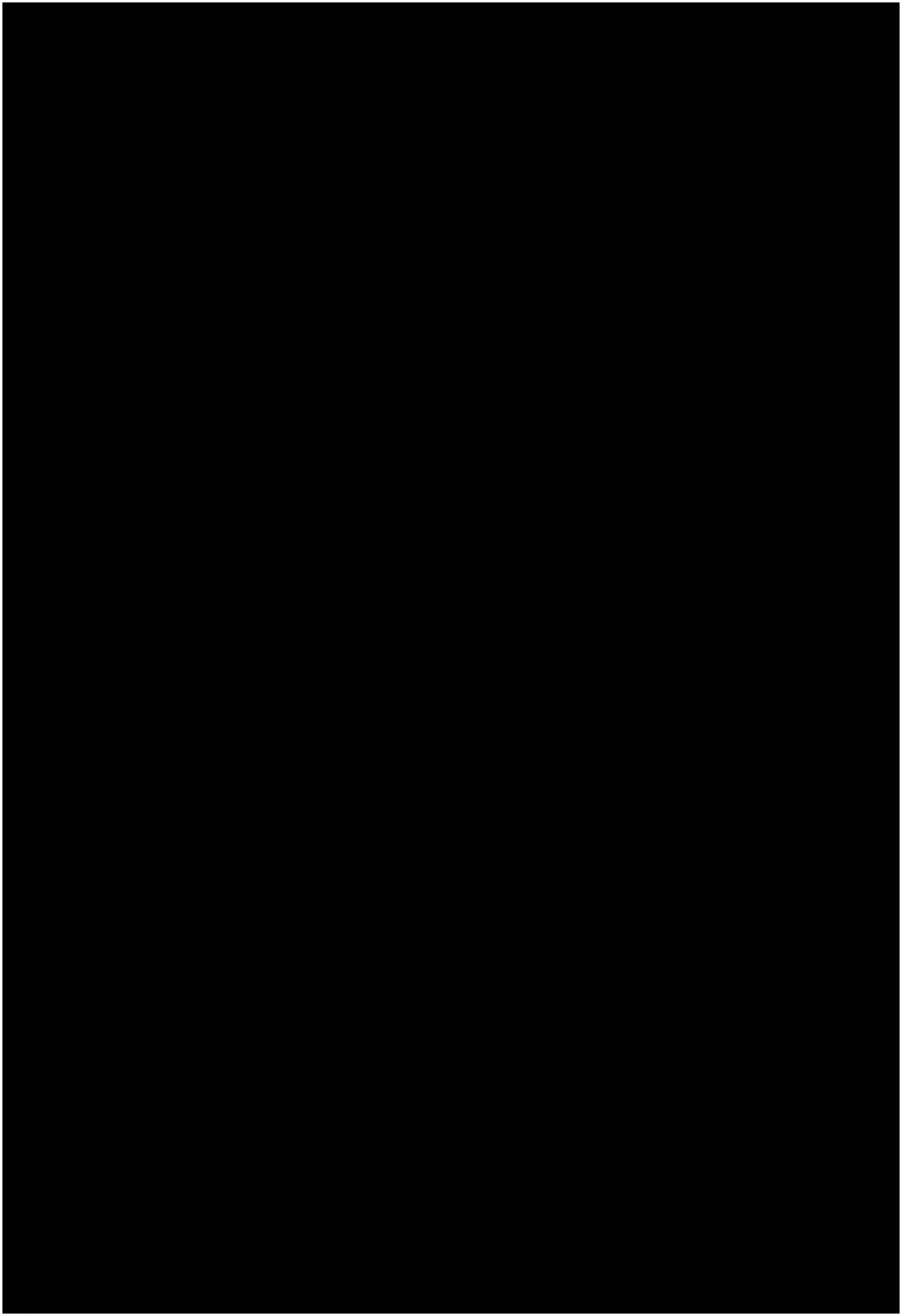
Many thanks,

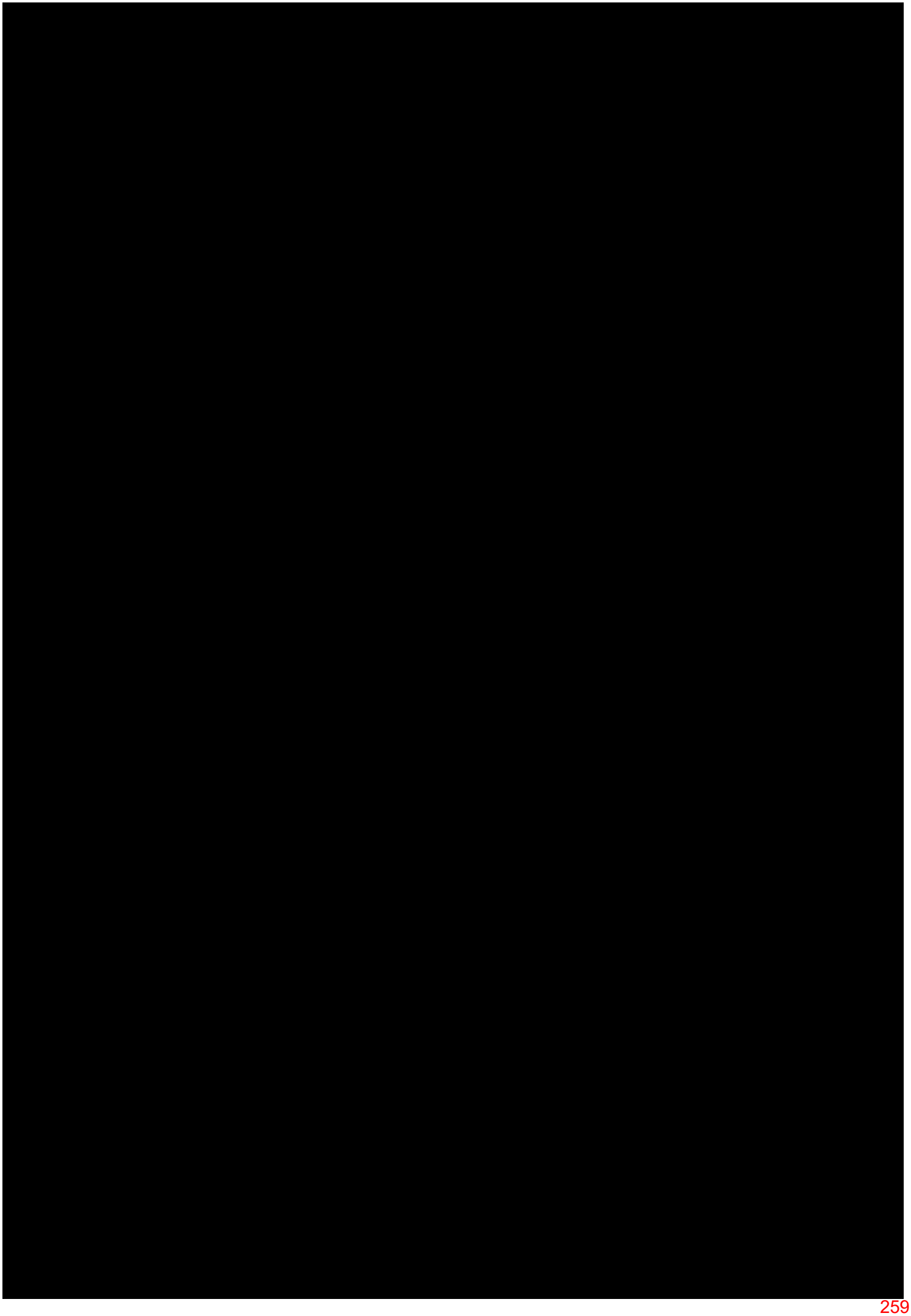
Emily Ward
Legal Manager – International Operations
Fortescue Metals Group Limited
Level 2, 87 Adelaide Terrace
East Perth WA 6004

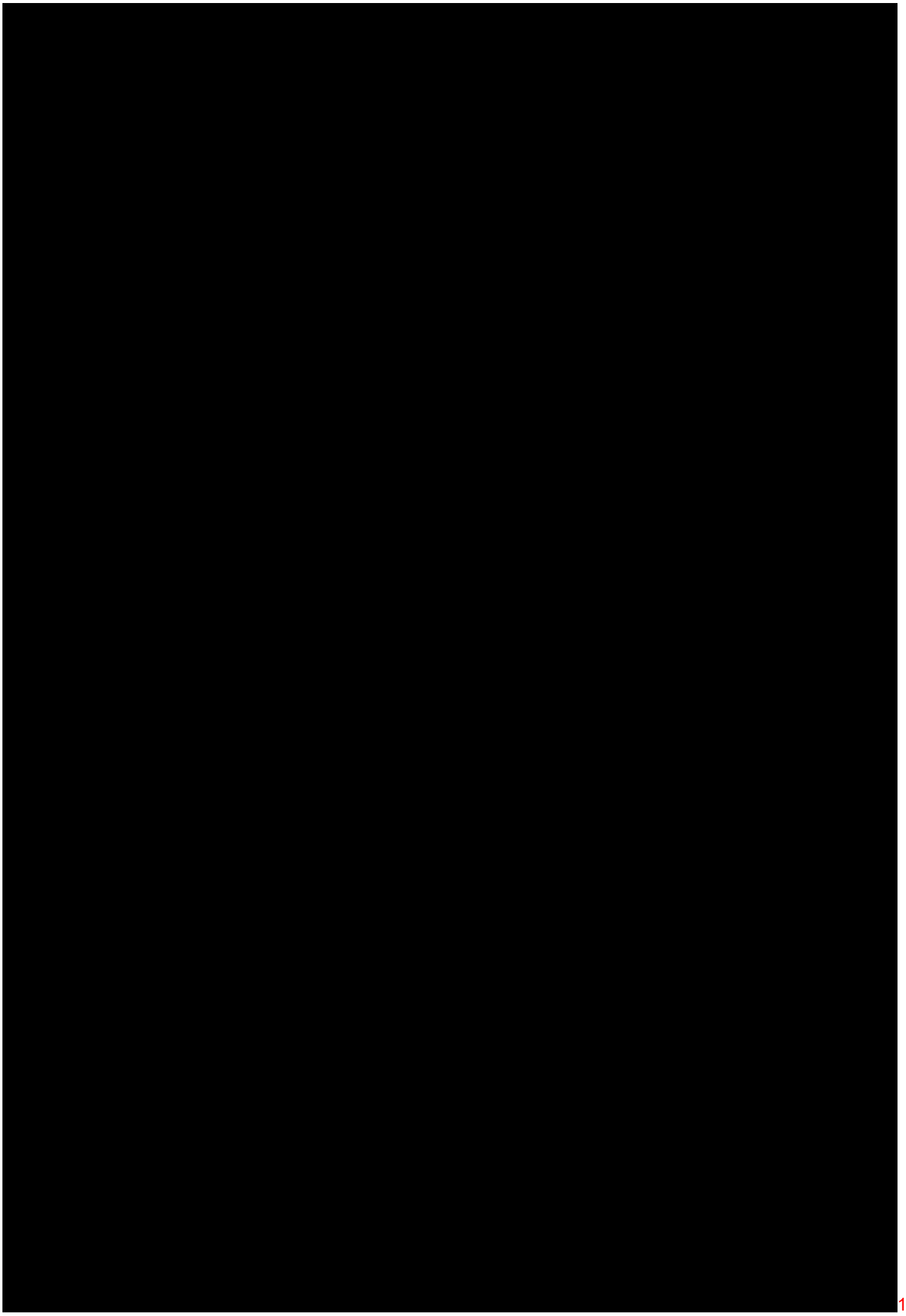
Direct: +61 8 6218 8[redacted]
Mobile: +61 40 277 6[redacted]

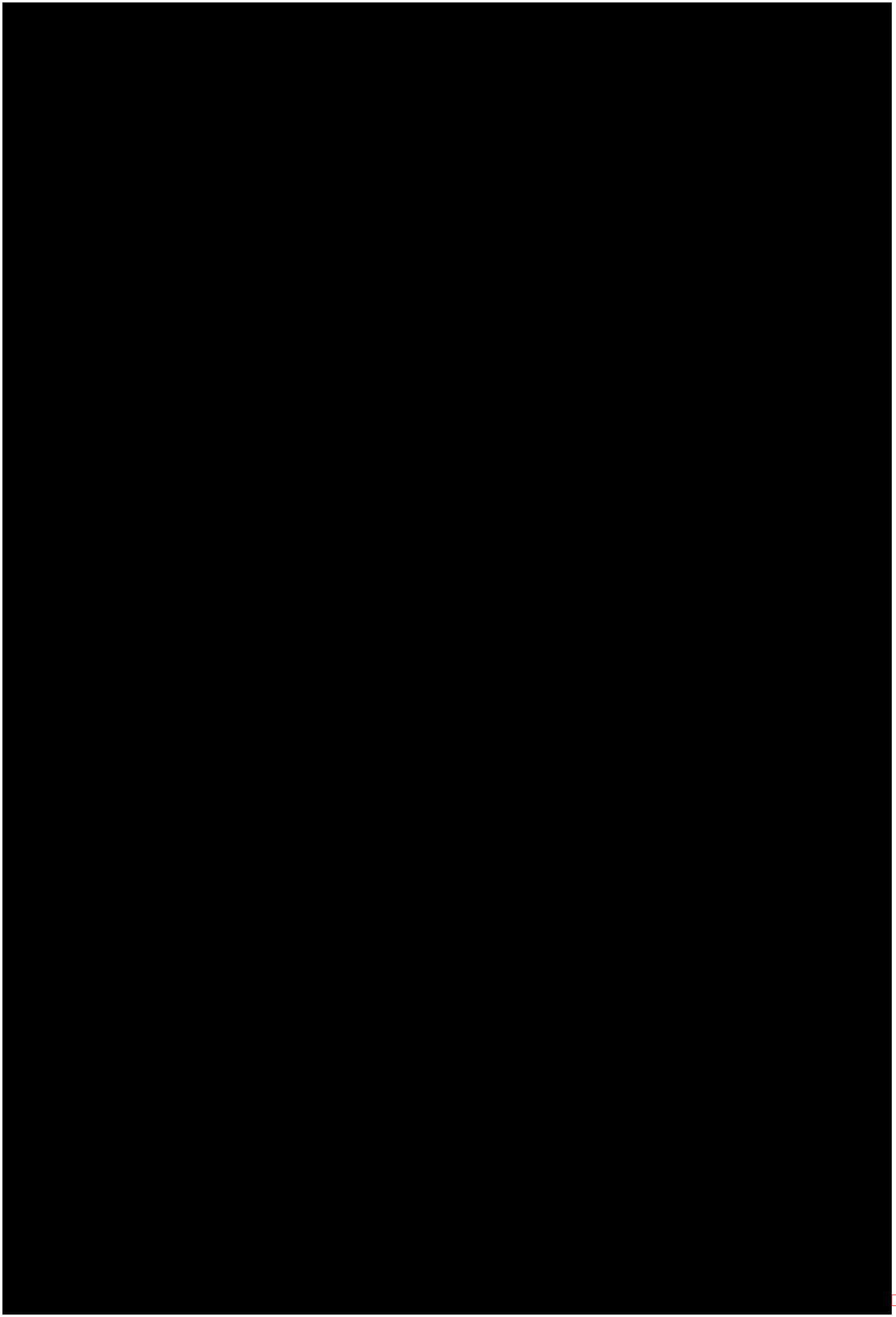
Main: +61 8 6218 8888
Email: eward@fmgl.com.au

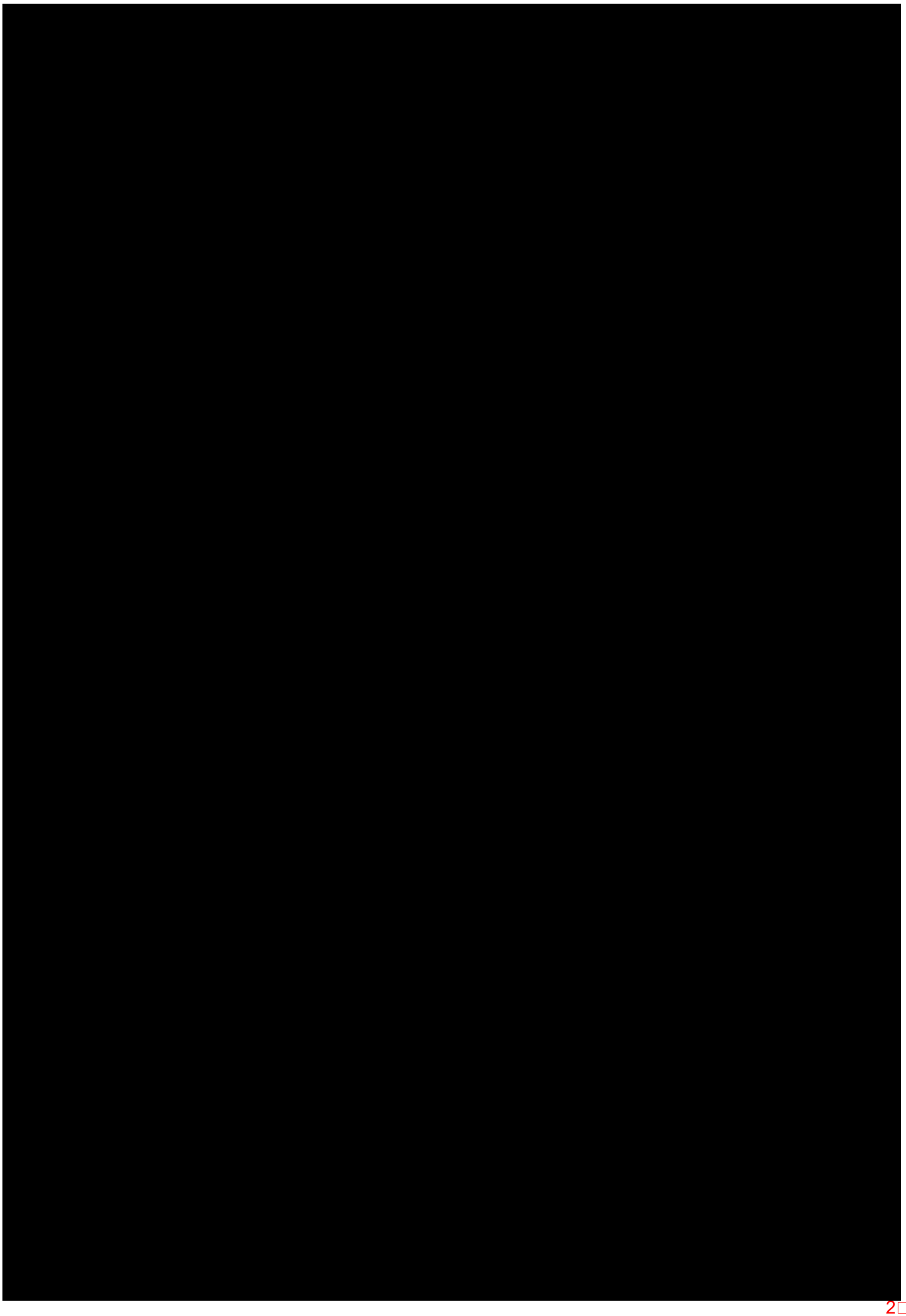


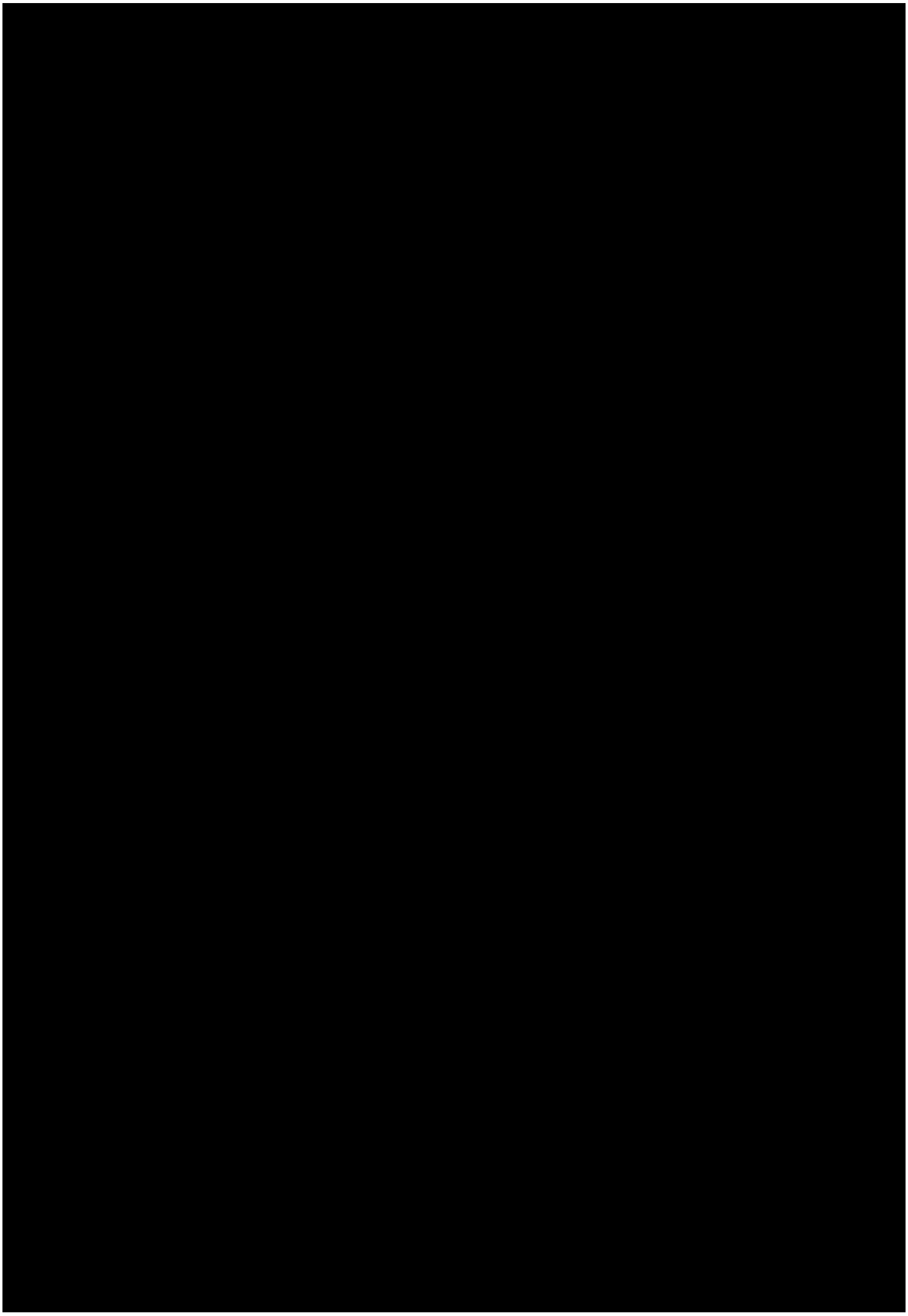












No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-7

This is the annexure marked **AIB-7** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 21 October 2020 8:50 PM
To: [redacted]
Subject: [redacted]

Hi [redacted],

Apologies for my bad connection. Luckily, we have discussed everything regarding [redacted].

I will draft a quick overview of preliminary work that we have done in ionic liquids and low temperature iron ore reduction and share it with you shortly.

I am looking forward to receiving [redacted].

Thank you,
Bart

Get Outlook for Android

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-8

This is the annexure marked **AIB-8** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: [redacted]
Sent: Tuesday, 10 November 2020 7:27 AM
To: Bart Kolodziejczyk
Cc: Ryan Lenegan;[redacted]
Subject: [redacted]

Hi Bart,

I am glad to hear our proposed work lines up well with Fortescue's interests and ongoing efforts. Submitting 2-3 reports a year works well for us. We will have the involvement of myself (PI), a graduate student, and a postdoc. Tasks 1 and 2 will be started in Year 1 (continuing through Years 2 and 3), with efforts initiating on Task 2 in Year 2 (and continuing through Year 3). I am CC'ing [redacted], who helps facilitate corporate partnerships for [redacted] and can help provide guidance on IP and any other topics that we need to clarify.

Best,
[redacted]

On Mon, Nov 9, 2020 at 12:52 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> Hi [redacted],
>
> I have reviewed your proposal. The provided proposal is clear and aligns well with what Fortescue Future Industries is looking for in terms of low-temperature [redacted].
>
> You might be aware that Fortescue is currently exploring for lithium, which adds just another degree of relevance to your proposed pathway.
>
> To move forward, I propose a milestone-based approach, where every year, project progress is evaluated and the decision made to continue or abandon the project.
>
> In terms of governance, I would like to be closely involved in the project. We would also expect two to three project progress reports per year. As mentioned before, your two-step approach fits very well with our internal endeavours, where Fortescue develops a new type of electrolyser which could be integrated with your [redacted].
>
> I've got only two questions related to your proposal:

- Can you please clarify how many researchers will be involved in this project and their research seniority (PI, Postdoctoral researcher, Ph.D. student, etc.)?
- Will all three proposed tasks be undertaken simultaneously or one at a time?

I have CC'ed Ryan who will help to agree on T&Cs for this project including IP ownership.

Best regards,

Bart

From: [redacted]
Sent: Wednesday, 28 October 2020 12:39 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi Bart,

I hope your travels are going well. I wanted to share with you a first draft of the proposal on [redacted]. It would be great to hear your feedback and thoughts, based on which we can make modifications.

The only prior IP we have in this space is a patent on [redacted]. This was supported by the National Science Foundation and our own department's internal funds, so there are no restrictions on licensing by Fortescue.

I look forward to continuing our discussions.

Best,

[redacted]

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-9

This is the annexure marked **AIB-9** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Thursday, 10 December 2020 6:13 AM
To: Michael Masterman;Julie Shuttleworth;Michaela Johnstone
Subject: Re: [redacted] - Call with CEOhop

B

Get Outlook for Android

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Thursday, December 10, 2020 5:15:35 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Bart
Got it – remember you explaining to me (the Bjorn had me thinking Sweden and Abba)
Agree could be a great fit
I will give him a call – what is his mobile

M

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Wednesday, 9 December 2020 10:23 PM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Michael,

Bjorn is currently semi-retired and living in Thailand. Him and his wife had to take care of his wife's niece and adopt her. Until recently, he was working part-time as a professor at Waseda University in Tokyo and travelled back and forth every three months. After a couple of years of living in Thailand, they are ready to move back to Australia. He is an Australian citizen and can move back as quickly as 3+ months.

Bart

From: Julie Shuttleworth
Sent: Wednesday, 9 December 2020 5:47 PM
To: Michael Masterman <mmasterman@squadronenergy.com>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Bart
Please answer MM's query. Is Bjorn in Singapore.?

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Wednesday, 9 December 2020 4:49 PM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Julie
Ok we will action

Where is Bjorn based? We do need to bring the technical team together – initially in Perth

Happy to give him a call

Will bring Aaron on a contract basis.

Michael

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Sent: Wednesday, 9 December 2020 6:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: FW: [redacted] - Call with CEOhop

Hi Bart and Michael

Just answering this email. Happy for you to proceed with Aaron, since you have already done the interview.

I am also happy for you to bring Bjorn on board, once Michael has had a quick interview with him to check FFI values. Michael, Paul Scott and Cameron have offered to join the call if you want either of them to do so. Otherwise, happy for you to have this chat by yourself MM.

We are recruiting for a Manufacturing Manager, however that may take 2 months until onboard. Therefore, I am happy for these two new positions to temporarily report to Michael. Bart and Michael we will involve you in the interviews for that position.

Does that work for everyone? Happy for any other ideas.

Will have a call on manufacturing next week when I am in quarantine, and make sure we really get this cranked up. Having a good discussion on the plane now with Rod, Paul S and Rod.

Cheers
Julie

ulie Shuttleworth

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Monday, 7 December 2020 10:50 AM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Cc: Michael Masterman <mmasterman@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Julie,

We've already got your support. That's super helpful.

Please find attached CVs of Aaron and Bjorn.

Bjorn is my PhD supervisor, who is semi-retired and currently in Thailand. He is probably the best electrochemist I know. His involvement in this would be essential. He is also very hands-on, and I have already discussed it with him without revealing too many details. Before he got his PhD, Bjorn has developed several processes which are deployed commercially. Same time, Bjorn would probably have to report to Michael M, Paul Scott, or someone else.

Best regards,
Bart

From: Julie Shuttleworth
Sent: Monday, 7 December 2020 10:43 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Michael Masterman <mmasterman@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: Re: [redacted] - Call with CEOhop

Hi team

Please proceed with high speed on this

Please get Michaela In the loop so we can get it organised.

Please send me his CV.

What else do you need from me?

Thanks
Julie

Julie Shuttleworth
Fortescue Metals Group
Fortescue Future Industries
+61 439918677

On 6 Dec 2020, at 19:43, Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

Hi Julie,

I agree with Michael. We will need someone to drive this while we do 100s other things and having a quick chat with Aaron. He seems like a great candidate.

Aaron is currently in the process of getting our NDA signed. We will have a more detailed follow-up call with him, but getting him on board asap would definitely help and take some of the work burden from us.

Bart

From: Michael Masterman
Sent: Monday, 7 December 2020 9:35 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Julie
We need someone practical who has a can do attitude and is great at setting up mechanical and material operations.

Bart and I have spoken to Aaron Szumilak (Polish background born in Canada) who worked on the Iron Bridge project and was pivotal in making the HPGR work and overall project innovation. Paul Scott has had a look at the resume. He knows the FMG/FFI values.

He is also very practical and frugal and can work with speed. (not recommending it but he could probably weld up the [redacted] pod we saw [redacted] and get the kiln brick installation going before [redacted] close their term sheet)

Andrew is agitating on all this work. If we bring Aaron on with a contract we can get the arms and legs to start the process.

Michael

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Sunday, 6 December 2020 7:22 PM
To: Andrew Forrest - [redacted]; Michael Masterman <mmasterman@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>
Cc: John Hartman <jhartman@tattarang.com>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Alan Krause <akrause@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Andrew,

I am in Malaysia and this is exactly what I am doing this week while in quarantine.

We will do it better. It will be low-temperature processing from ionic liquids.

Bart

From: Andrew Forrest - [redacted]
Sent: Saturday, 5 December 2020 11:44 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>
Cc: John Hartman <jhartman@tattarang.com>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Alan Krause <akrause@fmgl.com.au>
Subject: Re: [redacted] - Call with CEOhop

Bart

So set up a decent testing facility in Perth and properly prove or disprove the concept so I can set up a steel manufacturing facility.

A

Sent via BlackBerry Hub+ Inbox for Android

Andrew Forrest

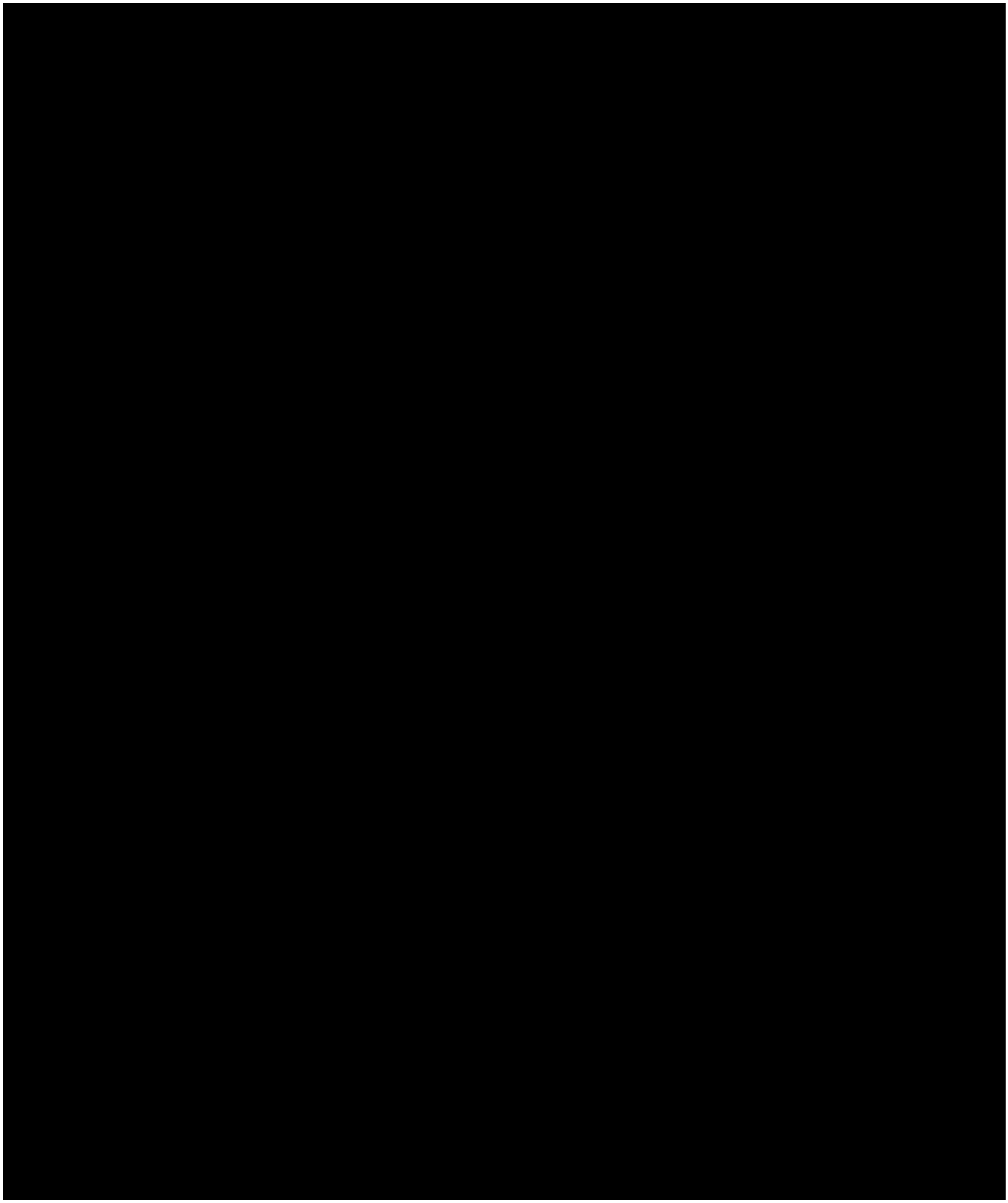
From: bkolodziejcz@fmgl.com.au
Sent: 4 December 2020 15:01
To: mmasterman@fmgl.com.au; jolivier@fmgl.com.au; [redacted]
Cc: jhartman@tattarang.com; jshuttleworth@fmgl.com.au; akrause@fmgl.com.au
Subject: RE: [redacted] - Call with CEO

Hi Michael,

The idea makes sense. Having one step-process which can be easily controlled by tunning applied voltage is definitely preferred over solid-state reduction using green hydrogen or ammonia. It merely makes it easier and potentially cheaper.

In terms of energy intensity, the process uses roughly 4 MWh/tonne of steel. Hence, with 500 MW of hydropower and uninterrupted operation, we would get nearly 1.1 million tonnes of steel per year. While it seems not much, we need to remember that there is a reason why steelmaking is one of the major contributors to global carbon emissions, contributing roughly 7% of global CO2 emissions. The steelmaking process is very energy-intensive. The energy contained in coal used to process iron ore via traditional pathways contains around 5.3 MWh/tonne of steel. On average 0.8 tonnes of coal is used to produce 1 tonne of steel.

Bart



No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-10

This is the annexure marked **AIB-10** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 15 December 2020 10:58 AM
To: Andrew Forrest - ([redacted]);Michael Masterman;John Hartman
Cc: John Paul Olivier
Subject: [redacted]

Andrew, this is exactly what will keep us busy in 2021. We are getting our manufacturing and R&D facilities set up and this work will proceed shortly.

Same time I agree with Michael. We need to look at both hydrogen and ammonia. To convert existing blast furnaces. Green ammonia can be used a carbon-free reductant and it is easier to ship than hydrogen.

Bart

From: Andrew Forrest - [redacted]
Sent: Tuesday, 15 December 2020 10:55 AM
To: Michael Masterman <mmasterman@squadronenergy.com>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Hartman <jhartman@tattarang.com>
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Or build our own mini plant in Freo and shortly after a commercial scale pilot plant in Port Hedland.

Sent from my BlackBerry — the most secure mobile device

Andrew Forrest

From: mmasterman@squadronenergy.com
Sent: 15 December 2020 11:53
To: bkolodziejcz@fmgl.com.au; jhartman@tattarang.com; [redacted]
Cc: jolivier@fmgl.com.au
Subject: [redacted]

We probably also need to understand how a steel mill like Posco would practically use H2 as a reductant to replace coking coal in a sinter furnace or blast furnace

Might be smoking drugs but is there anything we could do at the Bluescope steel works at Port Kembla

M

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Tuesday, 15 December 2020 1:46 PM
To: Michael Masterman <mmasterman@squadronenergy.com>; John Hartman <jhartman@tattarang.com>; Andrew Forrest - [redacted]
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Hi Michael,

Sounds good. We'll do it at low temperature using ionic liquids as iron ore solvents. Low temperature electrochemical reduction will allow us to switch on and off our "iron ore electrolyser" within seconds or minutes and as such we will be able to operate with highly intermittent power supply like wind and solar.

[redacted]

I am available any time this week.

Bart

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Tuesday, 15 December 2020 10:40 AM
To: John Hartman <jhartman@tattarang.com>; Andrew Forrest - ([redacted])
<[redacted]>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Will keep to ourselves

JP, Bart
Lets have a call on expediting Green Steel (as you can imagine its on the top of Andrews priority list)

M

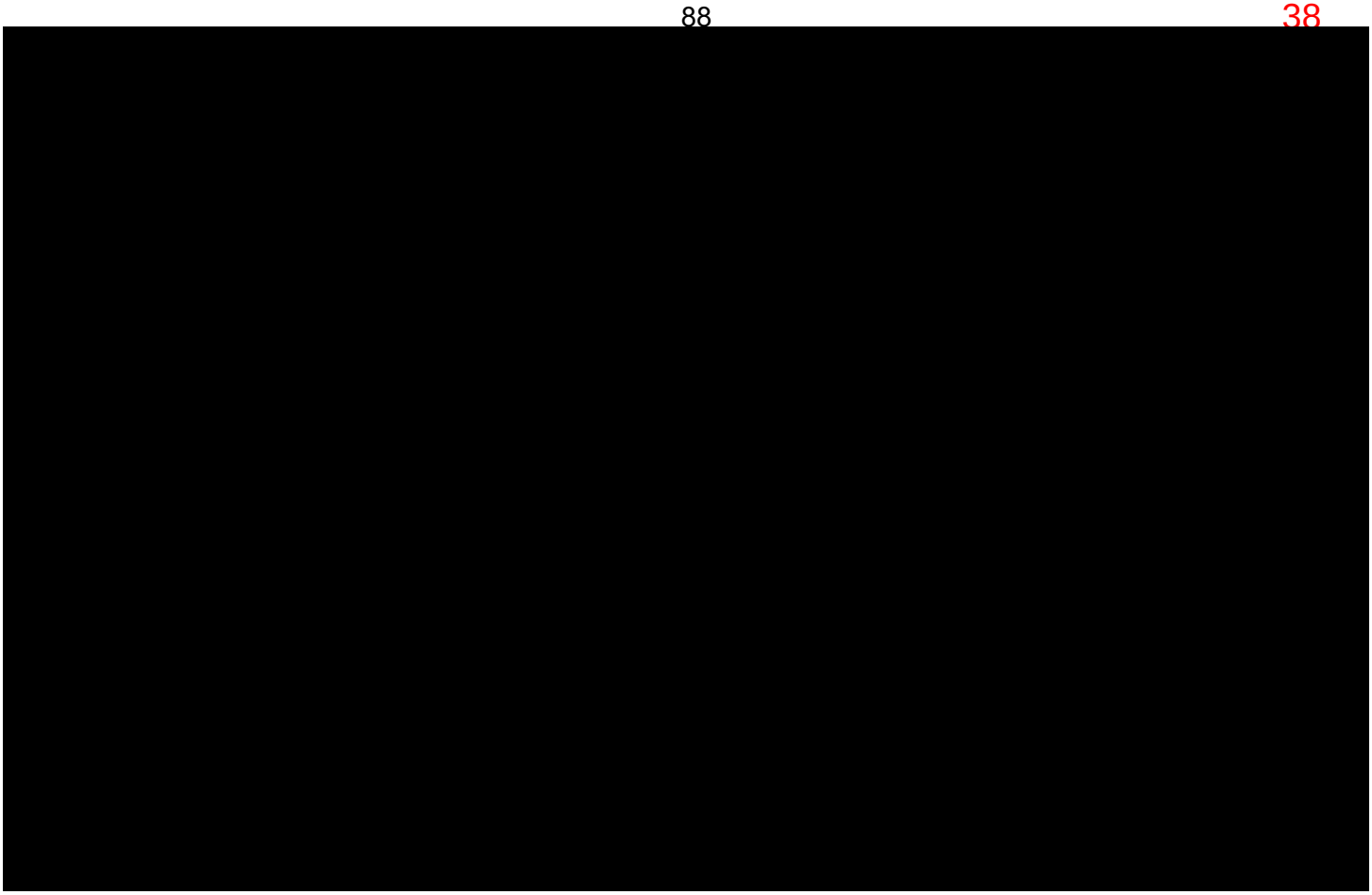
Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang



No. NSD of 2024

Federal Court of Australia
District Registry: New South Wales
Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others
Applicants

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ANNEXURE AIB-12

This is the annexure marked **AIB-12** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 22 December 2020 10:06 AM
To: 'Andrew Forrest';Michael Masterman
Subject: RE: The batteries that could make fossil fuels obsolete - BBC Future

I will do my best, Andrew.

By May, we will definitely have a good idea and a working prototype in our Perth facility. Having a large(er) commercial-scale plant in Pilbara by June 30 might be very challenging. Anyway, challenge accepted.

On the same note, I am currently working on a patent application for our low-temperature electrochemical ores reduction in ionic liquid electrolytes.

This patent application is based on my initial work done a couple of years ago, where I have managed to produce iron from iron oxides, copper from copper complexes, and nickel from nickel oxides. I would like Michael and you to be listed as co-inventors. We wouldn't be doing this work if not for your push. Are you ok with being on that patent?

Bart

From: Andrew Forrest
Sent: Tuesday, 22 December 2020 9:55 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: Re: The batteries that could make fossil fuels obsolete - BBC Future

Well done and thank you.

I need you testing in the Pilbara before June 30 Bart.

A

Sent from my BlackBerry — the most secure mobile device

From: bkolodziejcz@fmgl.com.au
Sent: 22 December 2020 9:06 am
To: [redacted]; mmasterman@squadronenergy.com
Subject: RE: The batteries that could make fossil fuels obsolete - BBC Future

Hi Andrew,

I think batteries have a role to play.

Michael M and I looked at battery ships to send electricity from Pilbara to Japan (and elsewhere) directly in the form of electricity contained in batteries on a vessel. Batteries are so heavy and bulky that using the best batteries today, we would be able to ship only 9% of the energy per shipment compared to energy contained in today's LNG shipping vessels.

Highest performing batteries today are lithium-sulfur batteries. Their energy densities reach 0.55 kWh/L, and specific energy is in the range of 0.5 kWh/kg. For comparison, liquid hydrogen is 2.7 kWh/L and 39.4 kWh/kg. Ammonia gives 3.2 kWh/L and 5.1 kWh/kg.

Batteries will be used for stationary energy storage. Hydrogen and ammonia will be used to ship energy globally.

We are very happy to be out with families.

Very busy 2021 ahead we will be doing work over Christmas to establish our Perth manufacturing in early 2021. We need to have working electrolysers and low-temperature electrochemical iron ore processing plants. Testing in Pilbara to commence in late 2021.

Bart

From: Andrew Forrest
Sent: Monday, 21 December 2020 8:04 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: The batteries that could make fossil fuels obsolete - BBC Future

"The batteries that could make fossil fuels obsolete - BBC Future"
https://www.bbc.com/future/article/20201217-renewable-power-the-worlds-largest-battery

Trust you guys are enjoying some super well deserved freedom. Love to both of you and your families.

A

Sent via BlackBerry Hub+ Inbox for Android

No. NSD of 2024

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District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

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ANNEXURE AIB-13

This is the annexure marked **AIB-13** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From:	Bart Kolodziejczyk
Sent:	Tuesday, 22 December 2020 4:08 PM
To:	Robert Grant
Subject:	Low-temperature electrochemical ores reduction in ionic liquids
Attachments:	22122020 Patent Assessment Form (Electrochemical ore reduction).pdf

Hi Rob,

I hope you're doing well. I have attached a patent assessment form for the intended patent application covering low-temperature electrochemical ores reduction in ionic liquids. Applying Fortescue stretch targets, we are aiming to test it in Pilbara by June 30, 2021.

The technology is proven. I have developed this method and tested it in a small scale laboratory setting before. Now we need to scale it up and couple it with a green power source.

If you don't have any comments, can you please approve the form? I will be working over Christmas to finalise a draft for this application.

Bart

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
Bart □olod□ie□c□□
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA □004

Mobile□□□1 437 947 1□4 **Web**□www.fmgl.com.au
Twitter□□ FortescueNews I **www□fmgl□com□au**

Fortescue
The New Force in Iron Ore

PURPOSE

The purpose of this form is to assist Fortescue's personnel to determine whether or not an invention or innovation should be patented.

The information in this document is strictly private and confidential and must not be publicly disclosed until a patent application has been filed or a decision has been made not to seek patent protection.

The Guidance Notes at the back of this form provides additional information in relation to some of the items.

INVENTION DETAILS

Inventor's Name (Guidance Note 1)	Bartlomiej Piotr KOLODZIEJCZYK
Inventor's Manager's Name	Robert GRANT
Department	Fortescue Future Industries
Title of Invention	Low-temperature Electrochemical Ore Reduction
Summary of Invention	The invention revolves around the use of ionic solvents and electrochemical devices for the low-temperature reduction of ores and oxides, including but not limited to iron ores and nickel ores. Careful selection of ionic liquid or mixture of ionic liquids allows to dissolve ores at low-temperatures. The electrochemical window of ionic liquid or ionic mixtures is selected so that the applied electrochemical potential required to reduce ores does not damage the ionic electrolyte.
Benefit of Invention (Guidance Note 2)	Today's steelmaking accounts for roughly 6 - 7% of global carbon dioxide emissions. Steelmaking processes require the use of coal as an iron ore reductant. Decarbonisation of this process would significantly reduce global carbon dioxide emissions while creating a new commodity – green steel. Proposed carbon-free alternatives are complex and require a multi-step approach, where green hydrogen or green ammonia are used as reductants. In addition, thermochemical processes tend to operate at high temperatures and are challenging to sustain using an intermittent power supply, like wind or solar energy. The low-temperature one-step electrochemical process would overcome those limitations by providing modular and scalable approaches that could operate with a higher degree of flexibility than intermittent renewable energy sources.
Specific Inventive Element (Guidance Note 3)	There are a couple of inventive steps to this process. Firstly, ionic liquids, their mixtures, and composition ratio are innovative. The application of ionic liquids in metal oxide reduction is innovative by itself. In addition, the selection of electrode materials and cell design are novel and unique.
What is the Status of the Invention? Has it been Designed? Constructed? Tested? Used?	The concept has been tested in a laboratory setting and is intended to be scaled up to a commercial system in 2021.
Any Other Comments	NA

Inventor's Email Address	bkolodziejcz@fmgl.com.au, kolodziejczyk.bartlomiej@gmail.com
Inventor's Mobile Phone Number	+61 416 833 585, +61 437 947 164
Date	22/12/2020

PATENT ASSESSMENT

Patents

A patent is a legally enforceable right for a device, substance, method or process. A patent gives Fortescue the right to stop others from using the invention without Fortescue's permission.

When granted, a patent will give Fortescue exclusive commercial rights to the invention for 20 years for a standard patent, or 8 years for an innovation patent.

To be patentable, an invention must be new, useful and inventive or innovative.

Prior to filing the patent application, the invention must be kept confidential. If the invention is disclosed to the public or commercially used before a patent application is filed, there is a risk that the patent will not be granted. If disclosure is required to a third party, the IP Team can assist you to put in place a confidentiality agreement to ensure that information about the invention is kept confidential.

Fortescue has access to an international patent search database and is able to carry out searches to ensure that the invention is not already covered by another patent. Please request the IP Team to carry out searches if you are unsure if the invention is new.

As a general estimate, the initial cost of applying for a patent are in the range of $6,000 to $9,000 with maintenance and ancillary costs bringing the total cost over a five year period up to $30,000 depending on the particular circumstances.

Key Considerations

If in your view the invention or innovation is patentable, the following must be considered:

- what is the objective of protecting the invention? For example:
  - to obtain a commercial advantage over Fortescue's competitors because:
    - the invention improves Fortescue's efficiency/productivity;
    - the invention reduces Fortescue's costs; or
    - the invention may be used in negotiations with a third party to gain another advantage;
  - to commercialise the invention and create a financial return for Fortescue (i.e., through licensing or sale of technology);
  - to ensure Fortescue has the freedom to use and operate that invention without restriction; or
  - to create marketing or business development benefits for Fortescue.
- do the benefits of patent protection outweigh the time, effort and cost (including filing and maintenance costs of the patent) required to file and maintain the patent?

INVENTOR'S DECLARATION

- I have reviewed and considered the information provided in this Patent Assessment Form and in my view the invention should be considered for patent protection by Fortescue's IP Team.
- I acknowledge and agree that the invention and the patent are the sole and exclusive property of Fortescue Metals Group.

What is the objective of patenting the invention?	The objective is to protect the initial invention and enable further scale-up and commercial deployment in Pilbara and elsewhere.

Do the benefits of patenting the invention outweigh the time, effort and costs?	No, the production of green metals, including green iron, green steel, green nickel, and green copper, among other metal commodities, is at the core business of Fortescue Future Industries. Protecting this development will give FFI a competitive advantage in this growing industry space.
Are searches required of the patent database? If yes, please provide search terms and the countries which the searches should cover (i.e., "remote dozing" in Australia) **(Guidance Note 4)**	Patent searches have been performed, and search results will be presented in a longer write up. Technology that is similar to the current proposal is that of Boston Metal, a spin-off from MIT. The difference is that Boston Metal technology uses molten oxide electrolyte and operates at very high temperatures, up to 1,500 ºC.
Has this invention been discussed with others? If yes, with whom? Was the invention developed in co-operation or collaboration with outside parties? If yes, please give details of any such parties.	No
Has the invention or information relating to the invention been made publically available or disclosed to third parties? If so, please provide details of the disclosure. **(Guidance Note 5)**	No, invention has not been publicly disclosed. All information related to this invention is kept internally within Fortescue Future Industries.
Inventor's Name	Bartlomiej Piotr KOLODZIEJCZYK
Inventor's Signature	
Date	22/12/2020
Inventor's Manager's Name	Robert GRANT
Inventor's Manager's Signature	
Date	

NEXT STEPS

If you consider that the invention or innovation should be patented, please complete this Patent Assessment Form and submit it to Fortescue's IP Team at the following email address: ip@fmgl.com.au

If you have any queries, please do not hesitate to contact Simon Yamchikov on 0428 164 830 or ip@fmgl.com.au

GUIDANCE NOTES

1. **Inventor's Name:** There can be more than one inventor. If contractors or consultants have been involved with the invention, please make a note of this as well the role which they have played. If the consultant or contractor was engaged under an agreement, please provide details of that agreement.

2. **Benefit of Invention:** The benefits of the invention are not limited to being financial benefits or cost savings. The benefits of the invention can include safety improvements, the potential to use the intellectual property as bargaining power with another supplier or to gain an advantage over a competitor.
3. **Specific Inventive Element:** What inventive or innovative feature of the device, substance, method or process distinguishes the invention from existing devices, substances, methods or processes? The inventive element might be a structural feature or a function of the invention or it may be a number of different features, improvements or modifications.
4. **Searches:** In order to be patentable, the invention must be new. The IP Team can carry out patent searches to ensure that the invention is new when compared with the prior art base and has not been previously patented.
5. **Public Disclosure:** Disclosure includes contractors inspecting the invention, Fortescue discussing the invention at a presentation or providing information in a publically available document. All communication should be carefully managed and confidentiality agreement should be used wherever possible to ensure that the invention is not disclosed to the public prior to the filing of the patent.

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-14

This is the annexure marked **AIB-14** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 23 December 2020 8:20 AM
To: Julie Shuttleworth
Subject: RE: green steel plant Pilbara

Hi Julie,

Sure. It would be great to have a presentation or a pitch deck.

I will ask Chloe to work on this. Her economics background, together with what she has learned during our trips, should be good enough to do this task. I will work with Chloe to make sure that everything is aligned with Fortescue's vision.

We are proposing the development of two green steel technologies. One will be low-temperature electrochemical ore reduction in ionic liquids. The second one will be the electrolysis of iron ore in molten carbides. I am drafting R&D roadmaps for both of those technologies. Those roadmaps and write-ups will subsequently be used for patent applications.

I will give you a call later today to quickly discuss how we can try something up to scale in Pilbara by June 30, 2021. We need to get equipment for our manufacturing and R&D facility, and we don't have time to wait. My idea is to start getting chemicals, flasks, and other R&D equipment even before our facility is established. I will work with procurement on this. So that by the end of January, we can start hands-on work.

Bart

From: Julie Shuttleworth
Sent: Tuesday, 22 December 2020 8:48 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: green steel plant Pilbara

Hi Bart
Thanks for the info.
Only a few days ago Andrew again mentioned doing green steel in the Pilbara. He is asking [redacted] and others if they want to partner with us to do green steel in the Pilbara.

I still think we need to follow up and get some slides together with numbers etc.
I can ask Rob Grant to find someone to get onto this if you don't have time, I know you have a lot of things on

Let me know, and feel free to call if you wish

Regards
Julie

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Monday, 21 December 2020 10:09 AM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: RE: green steel plant Pilbara

Hi Julie,

Michael and I have had a number of calls with Andrew on this. Hence, I have assumed that this was closed.

[redacted]

We are getting NDAs signed with [redacted] and [redacted] to understand CAPEX and OPEX of hydrogen-powered DRI plants. Also, something to have in mind is that our ores probably have too high silica content to work with DRI. Once, NDAs are signed we will ship our ores to [redacted] and [redacted] for trials.

Bart

From: Julie Shuttleworth
Sent: Saturday, 19 December 2020 2:43 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: green steel plant Pilbara

Bart
Just going through some older emails

The below in yellow. What help do you need with this?
Don't want you to think you havre to do this one all by yourself.

Cheers
Julie

From: Andrew Forrest (Minderoo) <[redacted]>
Sent: Sunday, 15 November 2020 3:59 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: Fw: Shared from BBC:The new fuel to come from Saudi Arabia

Bart your views please.

This is similar to what we are going to do in the Pilbara right?

Bart

IF you can find the time...

I need you to do a quick scoping study on making our own steel in Port Headland please.

I want a rough idea on capex and open per million tonnes produced.

Aiming for a [redacted] plant.

Are you up for it?

A

Sent from my BlackBerry — the most secure mobile device

From: chasbrooke@runbox.com
Sent: 14 November 2020 14:38
To: [redacted]
Subject: Shared from BBC:The new fuel to come from Saudi Arabia

https://www.bbc.com/future/article/20201112-the-green-hydrogen-revolution-in-renewable-energy?ocid=ww.social.link.email

A
I am sure you have probably read this !
all the best and safe travels
Charlie
Kind regards
Charlie
Sent from my iPhone

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

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ANNEXURE AIB-15

This is the annexure marked **AIB-15** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 6 January 2021 2:15 PM
To: Chris Mcmahen;John Paul Olivier;Michael Masterman
Cc: Danny Goeman
Subject: RE: Report from [redacted]

Hi Chris,

Thank you for sharing this draft. It provides some valuable insights into the MOE process.

We are currently developing an R&D roadmap where a number of challenges outlined in this report will be addressed. The major challenge is MOE's high operating temperature, which requires specialised materials, often based on noble and expensive metals. The system's high thermal inertia is also a challenge when running the MOE process with highly intermittent wind and solar power supply.

[redacted]

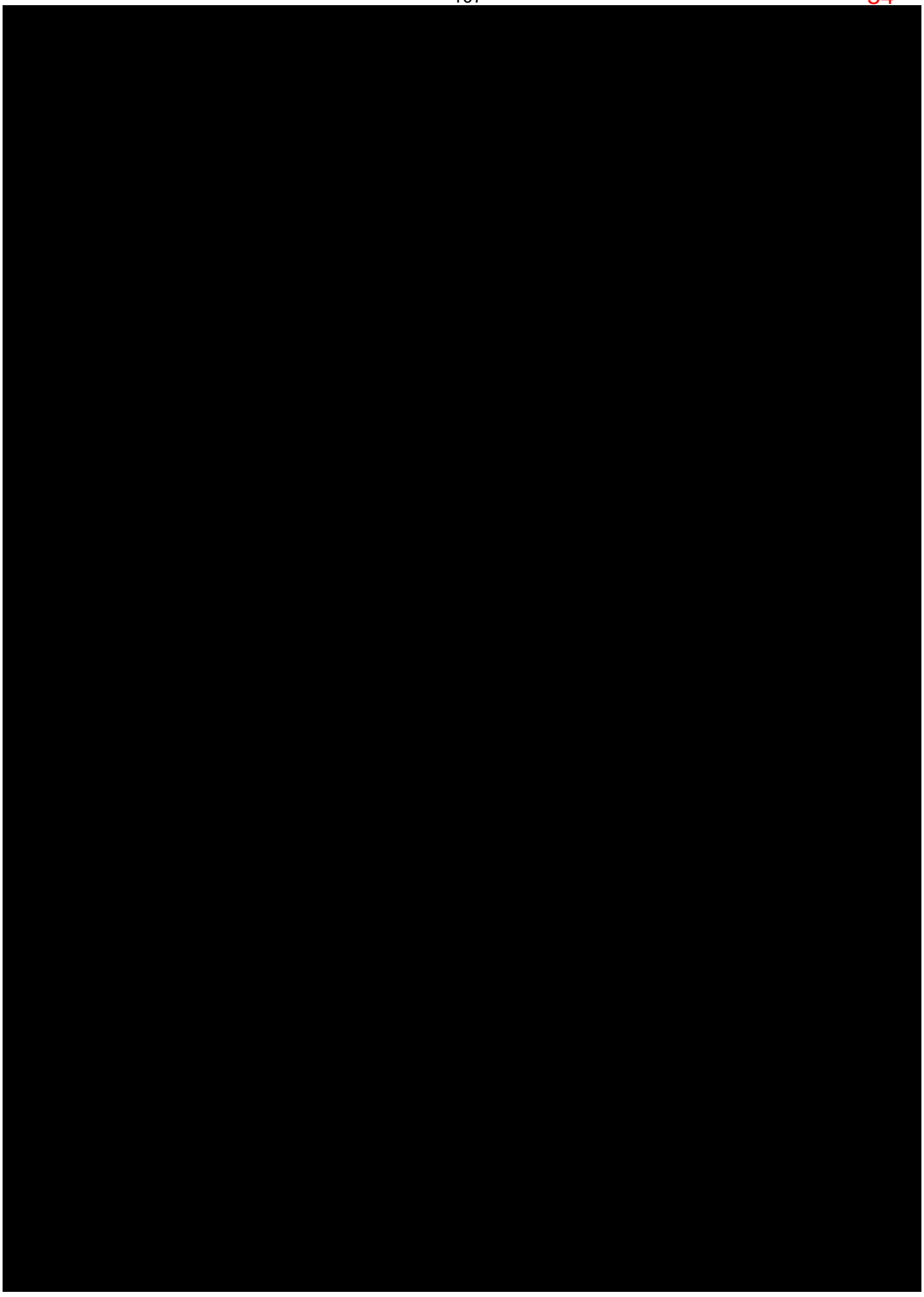
In our development, we are looking at using solvents capable of dissolving iron ore at low temperatures < 300 deg C and/or using molten carbonate electrolyte, which would allow the dissolution of iron ore at temperatures ranging between 700 and 800 deg C. Same time allowing to use less exotic and less expensive materials and making the entire process more compatible with intermittent power supply. Same time we are open to testing MOE too.

Based on your description, Joe seems like a valuable potential employee. However, I know too little about your previous engagement to be able to comment on any future engagement with Joe.

[redacted]

Best regards,
Bart

[redacted]



No. NSD of 2024

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ANNEXURE AIB-16

This is the annexure marked **AIB-16** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 6 January 2021 2:39 PM
To: Shanta Barley
Subject: RE: [redacted]

Hi Shanta,

We are working internally at Fortescue on alternative processes that would utilise lower temperatures and direct electrochemical reduction of iron ore into iron and further steel.

The electrochemical reduction is done in a liquid phase. Hence iron ore has to be dissolved in the electrolyte prior to being electrolysed. High temperature helps iron ore dissolution but poses certain technical challenges, especially when running the intermittent power supply process. With the intermittency of wind and solar energy supply, it becomes challenging to maintain the high temperature of the process.

We are working to overcome this issue.

Other than the above, I am not aware of alternatives.

As we have discussed before, we could use green hydrogen as an iron ore reductant instead of using coal as a reductant (traditional steel making process uses coal). But this is different from using direct current.

Bart

From: Shanta Barley <sbarley@minderoo.org>
Sent: Wednesday, 6 January 2021 2:17 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Dear Bart,

I was wondering if you know of a good alternative to [redacted] for the sentence below:

[redacted] to turn iron oxide into steel. This is a radical step change that does away, not only with coal, but with blast furnaces.

Thanks!
Shanta

Shanta Barle
Minderoo Foundation Research

M 1 439 485 [redacted]
P 1 8 4 0 4949
E sbarley minderoo.org
L Perth (GMT 8)

PO Box 3155, Broadway Nedlands
WA 009 Australia
minderoo org research

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-17

This is the annexure marked **AIB-17** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Friday, 22 January 2021 11:41 AM
To: Ashlee Crabbe;Chris Mcmahen;Geoff Beros
Cc: Danny Goeman;Alison Terry;Stephanie Vanicek;Julie Shuttleworth
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee,

The way I interpret Chairman's Boyer Lecture is that Fortescue is interested in exploring green steel opportunities. Production of green steel would be a natural extension to our vertically integrated value chain and fits well with Fortescue's decarbonisation strategy.

In terms of a pilot plant in Pilbara, the lecture does not talk about that plant's size. It could be 10 tonnes/day, but it could be 100 kg/day. We are exploring various existing technologies, but we are also developing internally enabling technologies for iron ore processing to produce green commodities.

It is going to be a small scale pilot plant.

As discussed over the phone, please find links to four existing technologies that use hydrogen as a green reductant for iron ore processing.

https://www.thyssenkrupp-steel.com/en/company/sustainability/climate-strategy/

https://www.hybritdevelopment.com/

https://www.midrex.com/technology/midrex-process/midrex-h2/

https://www.energiron.com/hydrogen/

Internally, we are developing a process that will allow us to take green electricity produced from wind, solar, hydropower, etc., and apply this green electricity to electrochemically reduce Fortescue's iron ore dissolved in a unique electrolyte. In other words, green electricity will be used to separate oxygen from iron. The selection of electrolyte, electrode material, and other materials used in the process is proprietary, and at this point, Fortescue's trade secret. In the future, we are aiming to file a series of patents covering this development.

[redacted]

Please let me know if this explanation is suitable? I am happy to provide feedback on your reply draft.

Bart

From: Ashlee Crabbe
Sent: Friday, 22 January 2021 10:28 AM
To: Chris Mcmahen <cmcmahen@fmgl.com.au>; Geoff Beros <gberos@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Danny Goeman <dgoeman@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi all,

Are you please able to give an estimate of when I can get any info on this, or if it is available?

We have had a follow up from the journalist and I need to run any information past Elizabeth for approval asap.

Kind regards
Ashlee

From: Ashlee Crabbe
Sent: Friday, 22 January 2021 8:58 AM
To: Chris Mcmahen <cmcmahen@fmgl.com.au>; Geoff Beros <gberos@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Danny Goeman <dgoeman@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Thank you all

From: Danny Goeman <dgoeman@fmgl.com.au>
Sent: Friday, 22 January 2021 8:57 AM
To: Ashlee Crabbe <acrabbe@fmgl.com.au>
Cc: Geoff Beros <gberos@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee

Yes, this information is even available on the internet. Perhaps best to coordinate with Geoff/Chris/Bart - they are the technical experts.

Danny

From: Ashlee Crabbe <acrabbe@fmgl.com.au>
Sent: Friday, 22 January 2021 8:53 AM
To: Danny Goeman <dgoeman@fmgl.com.au>
Cc: Chris Mcmahen <cmcmahen@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>; Ben Kuchel <bkuchel@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Thanks Danny,

I think what Brad is hoping to receive, is some basic information about how the processes work for people (like me) who aren't across the technical process.

Are there any summaries available on these two processes?

Ash

From: Danny Goeman <dgoeman@fmgl.com.au>
Sent: Friday, 22 January 2021 8:52 AM
To: Ashlee Crabbe <acrabbe@fmgl.com.au>
Cc: Chris Mcmahen <cmcmahen@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>; Ben Kuchel <bkuchel@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee,

What Andrew is referring to here is (i) reducing/removing coal in the steel making process in the BF and replacing it with hydrogen, and (ii) direct reduction of iron ore by using electricity to create steel. We don't have an agreed commercial design/solution on how to achieve either at this stage. That said, we are engaging/collaborating with a number of parties in the steel making industry and elsewhere to pursue solutions.

Chris/Geoff/Bart (copied) are across the details of discussions/progress to date, but I am not sure we necessarily want to reveal who we are engaging - for obvious reasons. Between Bart/Chris/Geoff we can dig up some high-level generic information to explain the concepts.

Regards,

Danny

From: Ashlee Crabbe <acrabbe@fmgl.com.au>
Sent: Friday, 22 January 2021 8:42 AM
To: Geoff Beros <gberos@fmgl.com.au>; Danny Goeman <dgoeman@fmgl.com.au>
Cc: Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>
Subject: For review: Media enquiry AFR green steel pilot

Hi Geoff and Danny,

Following our Chairman's Boyer Lecture last night, Brad Thompson from the Australian Financial Review has asked us for background information on the two green steel processes Andrew referenced in the speech.

Do we have any background information to hand, which I could edit and provide to the AFR?

From the Chairman's speech, there are two ways:

- In one, you replace coal in the furnace with green hydrogen. You get steel – but instead of emitting vast clouds of CO2, you produce nothing more than water vapour.

  To strengthen the steel, you simply add the carbon separately. It bonds into the metal rather than dispersing into the atmosphere.
- The other way to make green steel is to scrap the blast furnace altogether and just zap the ore with renewable electricity.

Brad is working to an East Coast deadline for the AFR, so would be great to get this as soon as possible. Please feel free to call me for further clarification 0439 941 [redacted].

Thank you
Ashlee

Ashlee Crabbe

Senior Media and Corporate Affairs Specialist
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

Phone +61 8 2930 1855 **M** 0439 941 [redacted]
E acrabbe@fmgl.com.au
Twitter FortescueNews I **www.fmgl.com.au**

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-19

This is the annexure marked **AIB-19** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 27 January 2021 5:42 PM
To: bjorn winther-jensen
Subject: RE: contract signed...

Hi Bjorn,

We have visited [redacted] roughly two months ago.

[redacted]

I have looked at water, ionic liquids, and molten carbonate.

[redacted]

Suggest any supplier globally, I am having a meeting with our procurement team to prepare them form what is coming and make it clear to them that their traditional procurement approaches won't work.

Bart

From: bjorn winther-jensen <bjornwj@gmail.com>
Sent: Wednesday, 20 January 2021 5:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: Re: contract signed...

Hi Bartek

Thanks for the info and the report.

I can see the industrial appeal in the MOE process, but man, it is not at all "elegant" or even efficient (I even think that the energy efficiency calculation in the report is overestimating the efficiency...).
Unfortunately it looks like they are ahead of any other technology for CO2 free steel.
Is it correctly understood that the molten iron (or other metal) is separated from the electrolyte by "simple" phase separation (helped by gravity) ?
At the current state, do they do batch processing or can they do continuous operation ?

I have been looking at many (MANY) papers and technical reports on dissolving iron ore. (Notably, magnetite seems to be quite easy to dissolve - especially compared to Hematite). All these reports have one thing in common: They intend to dissolve the ore in water.
Have you seen any reports on attempting dissolution in (polar) organic solvents ?
The point is that many iron(II)and iron(III) salts have higher solubility in e.g.alcohols than in water. So it is quite curious that there seems to be no attempts in that direction... (ILs not counting !)

On the lab equipment and chemicals shopping: Does Fortescue have "prefered suppliers" ? Or can I suggest products from any supplier in Australia/Perth ?

Cheers
Bjorn

On Mon, Jan 18, 2021 at 3:17 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> Wow, sounds good. Yes, we will start ordering chemicals as soon as we have the facility.
>
> It is also great that you're making a list of things that we will need. I am working with Emily and our procurement team to simplify and expedite procurement processes to get the necessary equipment asap.
>
> I have attached a report draft from tests on Fortescue ores using Molten Oxide Electrolysis.
>
> [redacted]
>
> We are having a board meeting in February, the idea is to ask for [redacted]. With further funds in "the next grant round" for scale up.

Bart □olod□ie□c□□□

Fortescue Metals Group Ltd

Level 2, 87 Adelaide Terrace East Perth WA □004

Mobile□□□1 437 947 1□4 **Web**□www.fmgl.com.au

Twitter□□ FortescueNews I **www□fmgl□com□au**

From: bjorn winther-jensen <bjornwj@gmail.com>
Sent: Monday, 18 January 2021 3:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: Re: contract signed...

I also got the signed NDA back, today.

I have been trying to make "shopping lists" for both lab-equipment and chemicals. So if you need input, please let me know (also before 15th of Feb..,).

Also been looking for possible passes for the ore to iron process. Have got some possible good ideas that will be easy to try out. Am considering doing initial trials while here in Thailand to test viability. I should be able to do it with the gear we have here...

Cheers

Bjorn

On Mon, Jan 18, 2021 at 2:34 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> That's great! I am happy that you didn't have to start as contractor. Enjoy your "holidays" 😊
>
> From: bjorn winther-jensen <bjornwj@gmail.com>
> Sent: Monday, 18 January 2021 3:12 PM
> To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
> Subject: Re: contract signed...
>
> Starting date is 15th of Feb. - there are "things" here that need time to be resolved before I can focus 38 hours a week on FFI work... 😬
>
> I will be employed directly by Fortescue from the 15th of Feb. Having an Australian taxfile number and an Australian bank account apparently solves the issue.
>
> We hope to be able to make the move to Perth in mid-April. FIngers crossed.
>
> Cheers
>
> Bjorn

On Mon, Jan 18, 2021 at 1:58 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> No worries. Congrats!
>
> When is your start day? Are you going to be initially engaged as a contractor working form Thailand?
>
> From: bjorn winther-jensen <bjornwj@gmail.com>
> Sent: Monday, 18 January 2021 2:55 PM
> To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
> Subject: contract signed...
>
> Hi Bartek,
>
> I got, signed and returned the contract today ! 😎
>
> Thanks for initiating this whole process.
>
> Cheeers
>
> Bjorn

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE AIB-20

This is the annexure marked **AIB-20** produced and shown to **ANAND INDRAVADAN BHATT** at the time of affirming his affidavit on 1 May 2024.

Before me: .....

Susanne Hantos

From: Bjorn Winther-jensen
Sent: Tuesday, 23 February 2021 10:51 AM
To: Bart Kolodziejczyk
Subject: Research plan for Green Steel
Attachments: Electrochemical Green Steel.docx

Hi Bartek,

Before I go much further with the time-line for the research activities, personnel etc. , I would kindly ask you to have a look at the attached *draft* research plan (sorry for the repetitive structure of the document…) to see if there are any significant areas that I have overlooked or over/under prioritized.
Also where possible, provide input to perspective collaborative research groups you know of and/or have already been in contact with.

Cheers
Bjorn

Electrochemical Green Steel - Starting from iron ore

General background and considerations

Roadmap and research plan for Electrochemical Green Steel (EC Green Steel)

Generally, the process of converting iron ore to steel contains two tasks:

- To reduce iron oxides to steel
- To remove a sufficient level of impurities/oxides

In traditional industrial practice carbon is employed for the reduction, itself being oxidized to CO_2 in a high-temperature blast furnace process. The removal of impurities – in this case mainly excess carbon as well as silicium- and metal oxides from the ore are removed in a subsequent high-temperature process through the formation of slag.

The obvious drive for developing an alternative reduction process is to stop the CO_2 release. However, a new route must also be able to manage the removal of impurities to an appropriate level, such that the resulting Green Steel products are optimized to suit the subsequent steel-making process overseas.

As such three major theoretical routes can be outlined:

Molten Iron Route.

- From dissolved ore at high-temperature, purification through phase separation of molten iron form the electrolyte ([redacted] type)

Dissolved Iron Route.

- Dissolution of ore in chelating or coordinating electrolytes, purification through non-solution of impurities. Followed by electrochemical (EC) reduction

Solid-state Route.

- Through solid-state electrochemistry, purification of ore prior to or after electrochemical operation

For all scenarios, the counter electrode (anode) process is oxygen evolution

Main details, requirements and limitations for these possibilities are listed below.

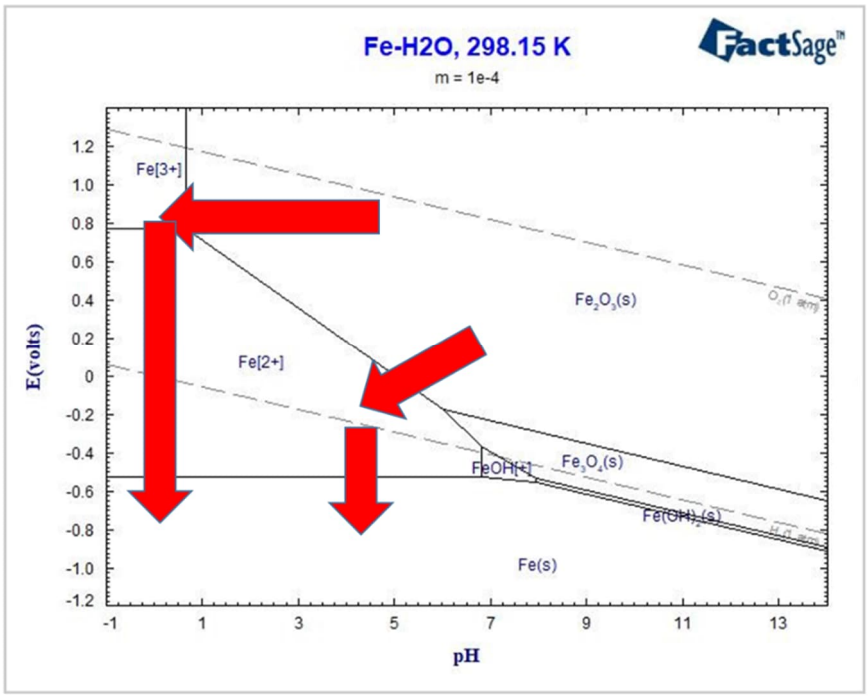
Molten Iron Route.
From dissolved/melted ore at high temperature above the melting temperature of (carbon-free) iron, i.e. in the 1500°C range.

- Electrolyte. molten oxides ([redacted] model), other possibilities may include carbonates or molten salts
- Current ore qualities can be used directly. However, water and other volatiles have to be removed in a pre-melting step (presumably to avoid steam explosions in the electrolyte !)

- Not very compatible with intermittent power supply from solar and wind.
- Expected Power Efficiencies in the 20 – 30% range
- Apparent long development time-line
- The iron is separated from the electrolyte in the molten state by gravity assisted phase separation. Impurities (SiO_2 and metal oxides) thus remain in the electrolyte => electrolyte "cleaning" needed

Dissolved Iron Route(s)
Dissolution of ore in chelating or coordinating electrolytes, purification through non-solution of impurities

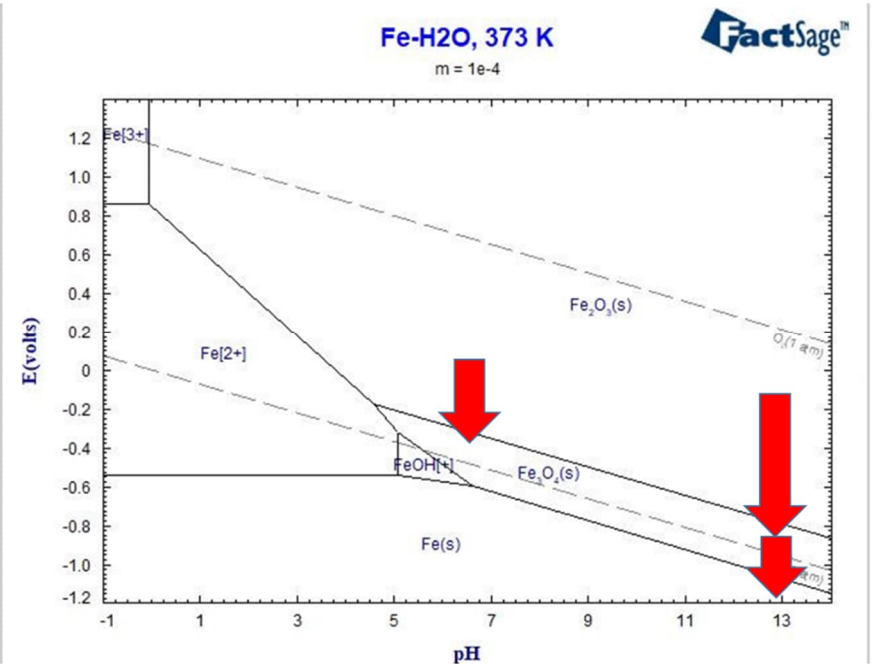
- Dissolution of hematite is generally very slow
- The chelating/coordination is increasing the potential required for iron deposition
- The chelating/coordination is allowing a wider range of pH and solvents.
- Expected Power Efficiencies in the 30 – 60 % range
- Deposition is limited by the concentration of iron in solution – which may be low in these systems
- Impurities remain in the electrolyte => electrolyte "cleaning" needed
- Significant research has been conducted but without any clear "winner" technology.
- New possibilities may emerge from "medium" temerature options using ionic liquids, molten salts or molten carbonates (300 – 800°C)
- Apparent long development time-line
- Dissolution of magnetite is significantly easier that hematite. However, it seems a detour when solid-state reduction of magenetite concentrate could give a Green Steel product directly



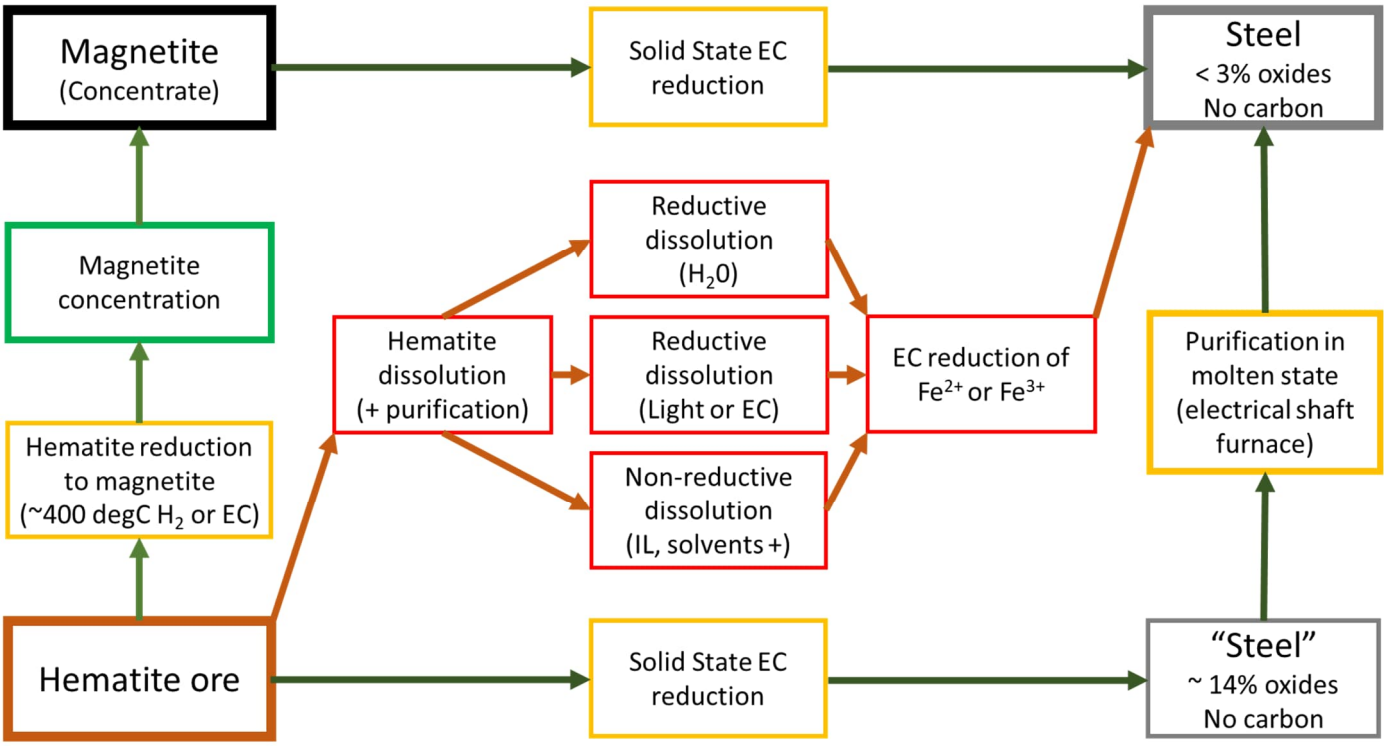
Solid-state Route(s)

The electrochemistry is resempling the “Edison cell” in charging mode where magnetite is reduced to metalic iron through a $Fe(OH)_2$ intermidiate. At temperature above ~85°C, the $Fe(OH)_2$ intemediate becomes thermodynamically unstabel and the conversion from magnetite to iron can proceed directly and significanltly faster.

- Impurities are not removed trough the process => requires pure enough ore concentrates to produce a meaningful product or a post-reduction process e.g. in molten state for slag formation
- Cheap electrolyte (high pH NaOH or KOH solutions)
- Impurities are not deposited in the electrolyte => longer electrolyte lifetime
- Expected Power Efficiencies in the > 60 % range
- High deposition rates at temperature above 85 °C
- Apparent short development time-line
- Magnetite Concentrate could be a starting material, producing a pig iron quality product (without carbon)
- Large scale conversion of hematite to magnetite has been reported with hydrogen as reductant in fluidbed setups
- Direct solid-state reduction of hematite is possible. However, resulting in a “steel” product with ~ 14% oxides (based on existing ore qualities from FMG)



Flow diagram for dissolved iron (red) and solid-state (green) routes of iron ore reduction



Green frame indicates well-known, unscaled process. Yellow frame indicates well-documented research at (at least) pilot-scale level. Red frame indicates solely research level.

Alignment

In order to make a meaningful R&D planning, communication with other parts of FMG should be established to ensure that the products R&D are aiming for are aligned with "the market" and that there are agreements in place to "allow" the use of different ore types. i.e. can we suggest to firstly aim for magnetite concentrate conversion and later move to hematite ?

Below some of the questions regarding the requirements to Green Steel products out of Port Headland – to qualify to be a "product". => Anticipating the product is a type of "raw" or intermediate material in the steel production process

- Maximum level of impurities (oxides; SiO_2, Al_2O_3 etc.)
  - Is steel with 14% oxides a product ?
  - How will price be related to the level of impurities –> what impurity level is it worth aiming for ?
- Porosity / Bulk density
- Preferred physical form (bars, "pigs", rolls, plates etc.)
- Estimate for max. production cost to be profitable

Preferred scenario from a R&D viewpoint

- *Priority*. Reduction of magnetite concentrate

  To get prototype and pilot facility established based on solid-state reduction of magnetite concentrate to steel, where no further purification is needed to meet specs within “product range”.

  - Justification.
    - The fundamentals of this process are known and tested
    - I see this as the most viable and economic (i.e. high volume) route to obtain a commercial Green Steel product on a short timescale.
    - Magnetite (concentrate) as starting material is preferred due to purity and electrical conductivity
    - It will give valuable knowhow also for possible solid-state reduction of hematite
    - It will broaden the possibilities for reduction of hematite. i.e. the hematite reduction may be carried out in two steps. Firstly, to magnetite, where concentration can proceed with known technology, secondly from magnetite to steel through the solid-state process.

- *Parallel research* with longer lead-time, maybe to be pursued in collaboration with universities and/or research institutions.

  1. Dissolution of hematite. The reaction rate is a main and general issue for both the dissolution and the deposition step.
     a. Reductive dissolution (chelating with use of solvents)
     b. Chelating (non-reductive) dissolution of hematite
     c. Light induced/assisted dissolution of hematite
        - These three routes have all been reported previously without any serious scale-up. However, all with either low rates, low end-concentration and/or with unknown possibilities for recycling the media.
        - A method for electrodeposition of iron will depend on the “liquid” used for the dissolution. i.e. starting electrodeposition studies without having a dissolution route is therefore meaningless. The dissolution process must produce significant iron concentrations to allow appreciable deposition rates of metallic iron.
        - Shifting to “medium-high” temperatures (300-850°C) with molten salt or molten carbonate electrolytes could help the rate issues, but it is quite early days.

  2. Reduction of hematite to magnetite.
     a. By hydrogen reduction of hematite (e.g. in a fluid bed setup at ~300 - 450 degC). This is well-documented and at least pilot-scale has been demonstrated

b. Reduction of hematite, using metallic iron as reducing agent.

3. On-shore post-purification of “raw” Green Steel to export quality Green Steel.

Priority. Reduction of magnetite concentrate through a solid state process

A 67% Fe magnetite concentrate should produce a ~ 92.5% Fe Green Steel (without including the calculation of the removal of water/moisture, which would indeed be removed in the process – am awaiting a more detailed composition of the magnetite concentrate(s) existing and expected). This is approximately the iron content in pig iron.

The solid-state reduction of magnetite is less researched than that of hematite (except for the Edison cell !). The high(er) conductivity of magnetite should help limiting the ohmic loss in the process.

[redacted]

Research topics

a) *Testing the reduction on relevant, available magnetite ore concentrates.* Most reports have been using synthetic magnetite (or synthetic hematite) so adjusting to large-scale reality is needed.
b) *Optimization of electrolyte.* Traditional [redacted] NaOH electrolytes have been used with success. The NaOH electrolytes have high conductivity and low water activity, which is needed to suppress hydrogen evolution. However, there is merit in revisiting the electrolyte composition. During the reduction process, the released oxygen ions are reacting with water (not OH^-) and thus a lower pH could be an advantage. The very high pH is in principal not helping the reaction to “escape” the hydrogen evolution potential (see Pourbaix diagram at 100°C above) and low water activity could alternatively be obtained by adding significant amounts of [redacted] (It is acknowledged that high pH is an advantage to the oxygen evolution reaction on the anode).
c) *Securing 100% conversion of ore.* Particle size and distribution, reactor layout and dimensions, operational parameters (voltage and current density), The possibility of multiple reduction steps (by changing the operational parameters) as well as the dimensions of the magnetite layer, all have to be optimized.

[redacted]

g) *Reactor design for upscaling, eventually continuous operation*.
   - Operating at 90°C or higher ([redacted]). Possible “co-heating” through pre-heating (drying of raw magnetite concentrate is needed to control the

electrolyte composition in a more continuous operation) of the magnetite concentrate by microwave or inductive heating.

- Efficient removal of produced oxygen from the anode and reactor closed to atmospheric oxygen to avoid oxygen reduction as cross reaction.

Parallel research with longer lead-time.

1. Dissolution of hematite.
   We don't have a clear direction here. There is surely no apparent method that can provide appreciable dissolution rates. Pure aqueous systems are, in my opinion, not worth revisiting.

Research topics

c) Molten salts, Molten carbonates. Iron dissolution and deposition has been reported from these medium-high temperature electrolytes. E.g. from $CaCl_2$-KF @ 825°C. My suggestion would be to seek "proof of concept" projects (with clear scale-up passes) with relevant groups experienced in these systems, before setting up facilities in Perth. One such collaborator could be Professor Geir Martin Haarberg, Department of Materials Science and Engineering, Faculty of Natural Sciences, NTNU in Norway, geir.martin.haarberg@ntnu.no, +47 73594036. His group has been working on both molten salt and molten carbonate systems for various metals.

d) Ionic Liquids. Here I suggest to search for systems/research groups that have shown reasonable dissolution rates of iron ore (hematite). I have not found any convincing reports

yet (!). If there is indeed merit for dissolution in the temperature range below 300°C, then we should pursue collaborative research projects until scaling has been verified.

2. Reduction of hematite to magnetite.

Research topics

a) Reduction of hematite to magnetite is a well-documented field using either hydrogen, carbon (CO) or siderite (CO) as reducing agents. Pursuing one of these routes should not require further research on the R&D level but be on pilot plant level in collaboration with a fluid-bed-equipment manufacture.

3. On-shore post-purification of “raw” Green Steel to export quality Green Steel.
Many in FMG and elsewhere will know much more about the possibilities and ultimately this topic may be well outside the R&D facility’s business.

Research topics

a) Using traditional high-temperature, molten iron processes for the removal of SiO_2 and metal oxides. E.g. Open-hearth process, Bessemer converter or Electric shaft furnace.
Several patents have been filed in the area, e.g. US2693411A - Method of purifying molten pig iron, and EP2530171A1 - Method for removing impurities in molten cast iron.

No. NSD of 2024

Federal Court of Australia

District Registry: New South Wales

Division: General

FORTESCUE LIMITED (ACN 002 594 872) and others

Applicants

ELEMENT ZERO PTY LIMITED (ACN 664 342 081) and others

Respondents

ANNEXURE SMH-3

This is the annexure marked **SMH-3** produced and shown to **SUSANNE MONICA HANTOS** at the time of affirming her affidavit on 1 May 2024.

Before me: .....

Olivia Campana

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 5 August 2020 3:58 PM
To: [redacted]
Subject: [redacted]

Dear [redacted],

By way of introduction, Fortescue Metals Group Ltd (Fortescue) is a global leader in the iron ore industry, recognised for our culture, innovation, and industry-leading development of world-class infrastructure and mining assets in the Pilbara, Western Australia.

Fortescue is one of the largest global iron ore producers and is focussed on a vision of being the safest, lowest cost, most profitable mining company. Consistently shipping around 170 million tonnes of iron ore per annum, Fortescue is the lowest cost provider of seaborne iron ore to China with revenues last year reaching US$10.0 billion and a net profit of US$3.2 billion.

In addition to growing our iron ore business, Fortescue is diversifying domestically and internationally into other mineral resources. As part of our commitment to decarbonise our operations, we are exploring various low-emission technologies.

I came across your project titled [redacted]
Would you have time for an introductory call to briefly discuss this project and its current TRL? I am available next week if this suits you.

Best regards,

Bart Kolodziejczyk
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

Mobile +61 437 947 164 **Web** www.fmgl.com.au
Twitter @FortescueNews I **www.fmgl.com.au**

Susanne Hantos

From: [redacted]
Sent: Monday, 21 September 2020 11:50 PM
To: Bart Kolodziejczyk
Cc: [redacted]
Subject: [redacted]
Attachments: [redacted]

Hi Bart,

We received a request for an NDA to begin discussions between [redacted] and Fortescue Metals. Please find our standard NDA attached for your review. If you have any questions or edits, please direct them to my attention for review.

We look forward to engaging with you and your colleagues.

Thanks,
[redacted]

[redacted]

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 22 September 2020 8:28 PM
To: Tamahra Dempsey
Cc: Julie Shuttleworth;Emily Ward
Subject: [redacted]
Attachments: [redacted]

Hi Tamahra,

Under Chairman's request, I have approached a team at [redacted] to explore opportunities for [redacted] and low-temperature oxide (predominantly iron ore) reduction technology.

Can you please email Fortescue Non-Compete NDA to [redacted]? Having a non-compete NDA in place is of the highest importance to our Chairman.

The approved purpose for this NDA would be:

[redacted]

Thank you,
Bart

From: [redacted]
Sent: Monday, 21 September 2020 11:50 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: [redacted]
Subject: [redacted]

Hi Bart,

We received a request for an NDA to begin discussions between [redacted] and Fortescue Metals. Please find our standard NDA attached for your review. If you have any questions or edits, please direct them to my attention for review.

We look forward to engaging with you and your colleagues.

Thanks,
[redacted]

[redacted]

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 13 October 2020 5:34 PM
To: [redacted];Emily Ward
Cc: [redacted]
Subject: [redacted]
Attachments: [redacted]

Hi [redacted],

Please find attached executed NDA. Apologies again for delays.

[redacted], would you have time for another call this or next week to discuss project(s) scope?

Best regards,
Bart

From: [redacted]
Sent: Wednesday, 30 September 2020 2:38 AM
To: Emily Ward <eward@fmgl.com.au>
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi Emily,

[redacted] executed NDA attached.

Thanks,
[redacted]

[redacted]

From: Emily Ward <eward@fmgl.com.au>
Sent: Sunday, September 27, 2020 10:00 AM
To: [redacted]
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi [redacted],

I have attached an updated version of our Agreement.

I have been able to accept most changes as you will see. Where a change has not been accepted, I have simply rejected the mark-up.

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I will explain to our team that all correspondence and discussions will need to be prefaced with a statement or note identifying whether the contents are confidential.

Does the University have a legal entity name?

Many thanks,

Emily.

From: [redacted]
Sent: Thursday, 24 September 2020 5:56 PM
To: Emily Ward <eward@fmgl.com.au>
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Hi Emily,

Please find my requested edits in the attached.

Thanks,
[redacted]

[redacted]

From: Emily Ward <eward@fmgl.com.au>
Sent: Wednesday, September 23, 2020 4:43 AM
To: [redacted]
Cc: [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Dear [redacted],

Further to your discussions with my colleague Bart Kolodziejczyk, please find attached a Confidentiality Agreement for your review and signature.

If you have any questions, please do not hesitate to ask.

Many thanks,

Emily Ward
Legal Manager – International Operations
Fortescue Metals Group Limited
Level 2, 87 Adelaide Terrace
East Perth WA 6004

Direct: +61 8 6218 8[redacted]
Mobile: +61 40 277 6[redacted]

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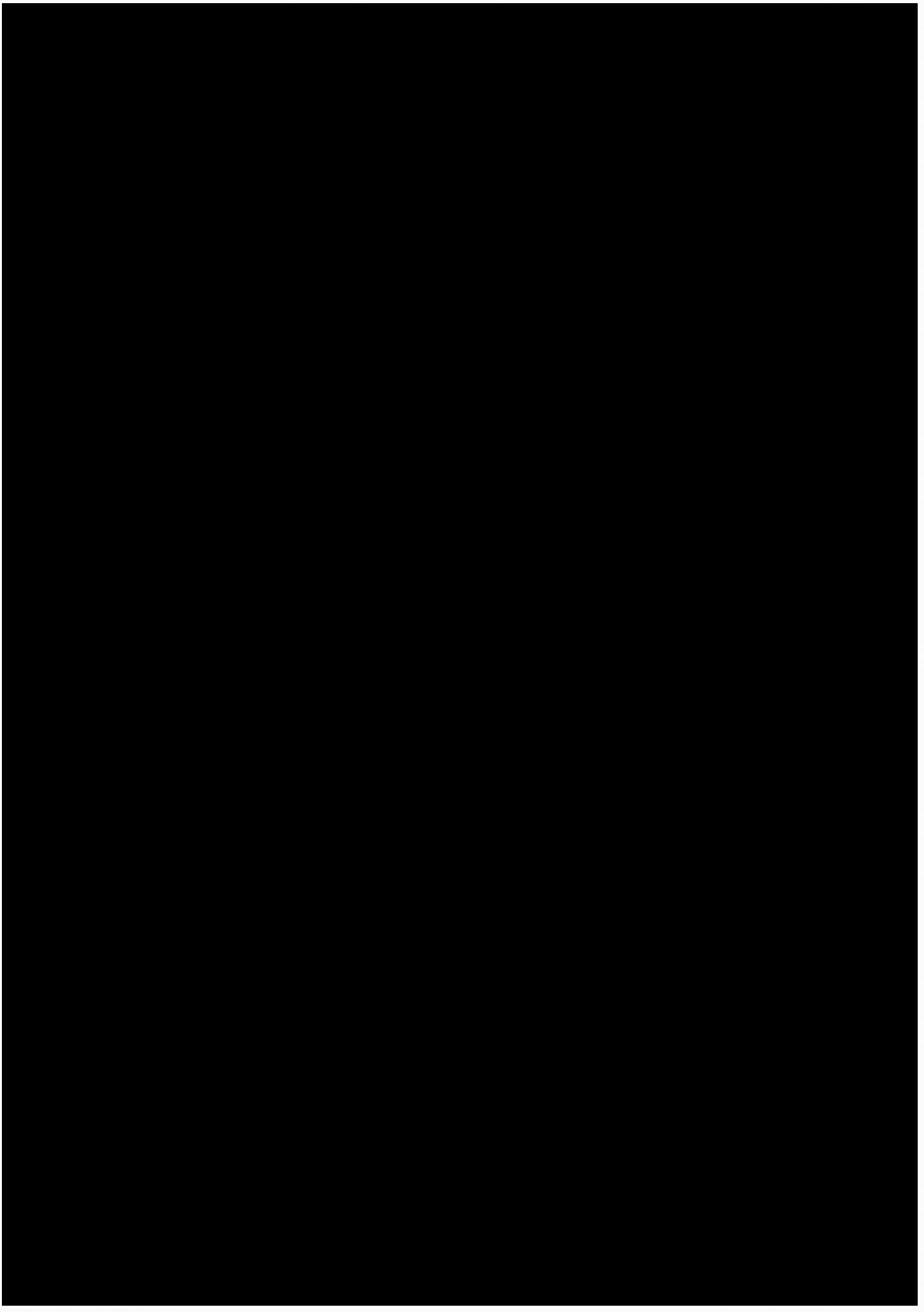
Main: +61 8 6218 8888
Email: eward@fmgl.com.au



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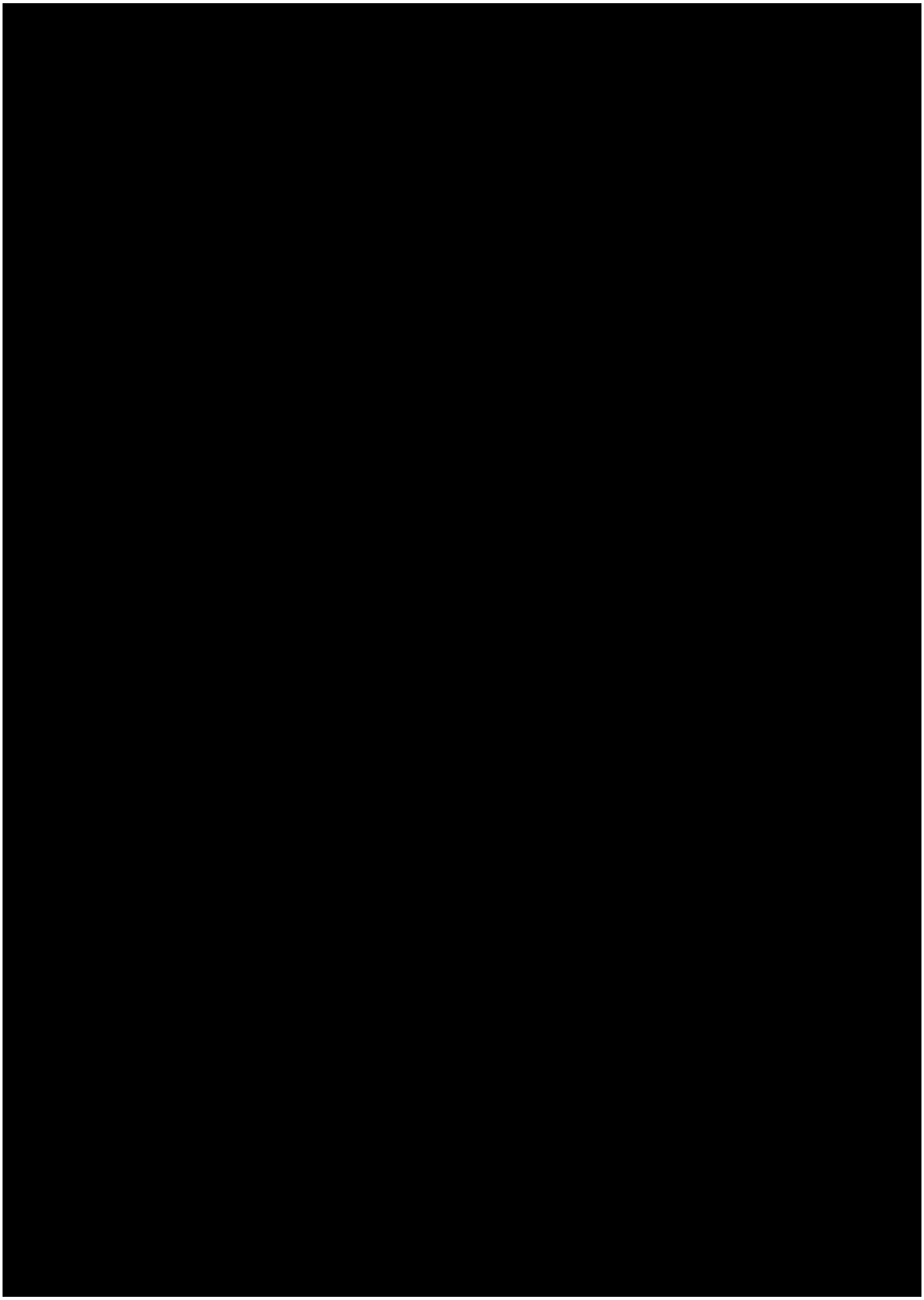

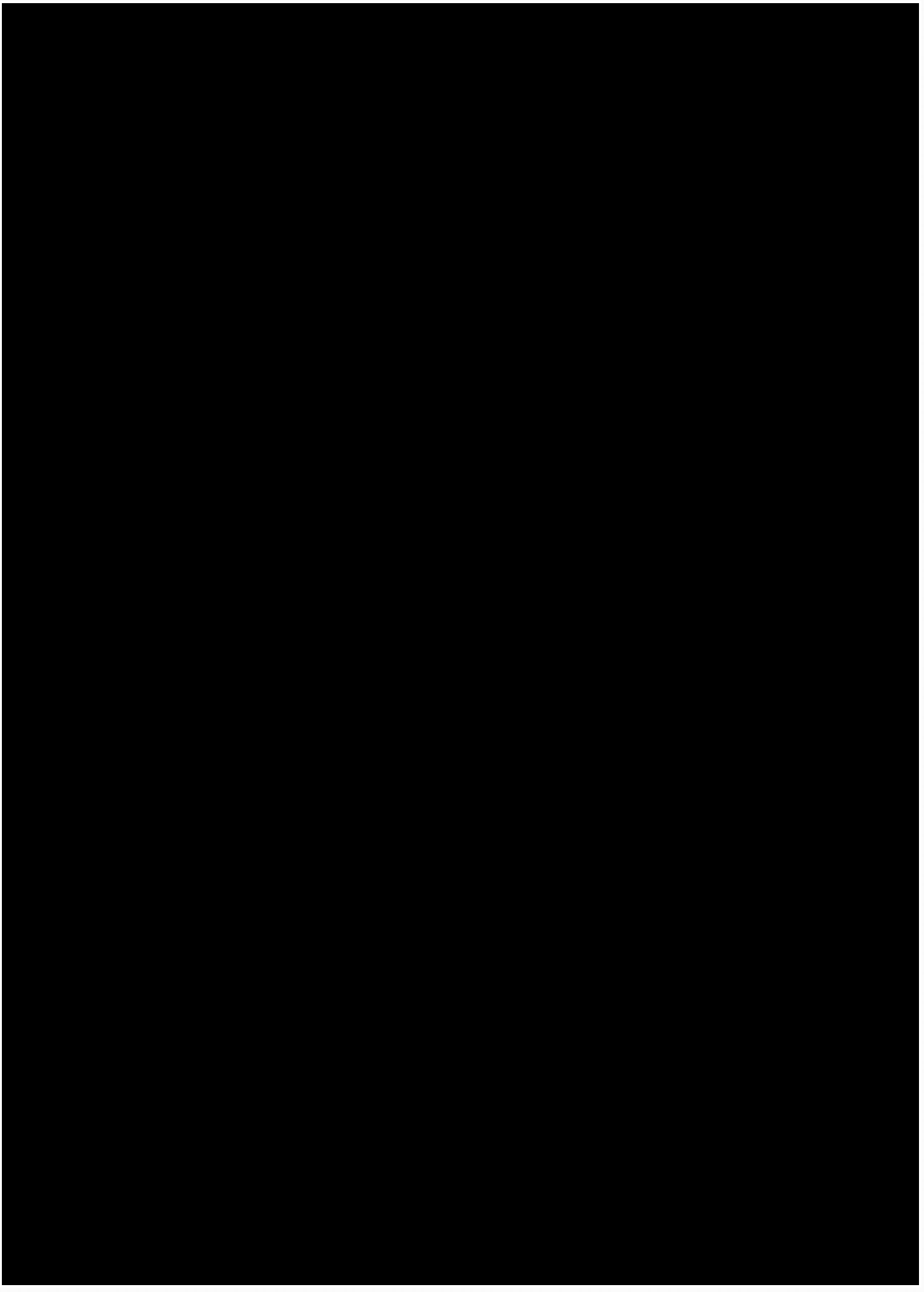

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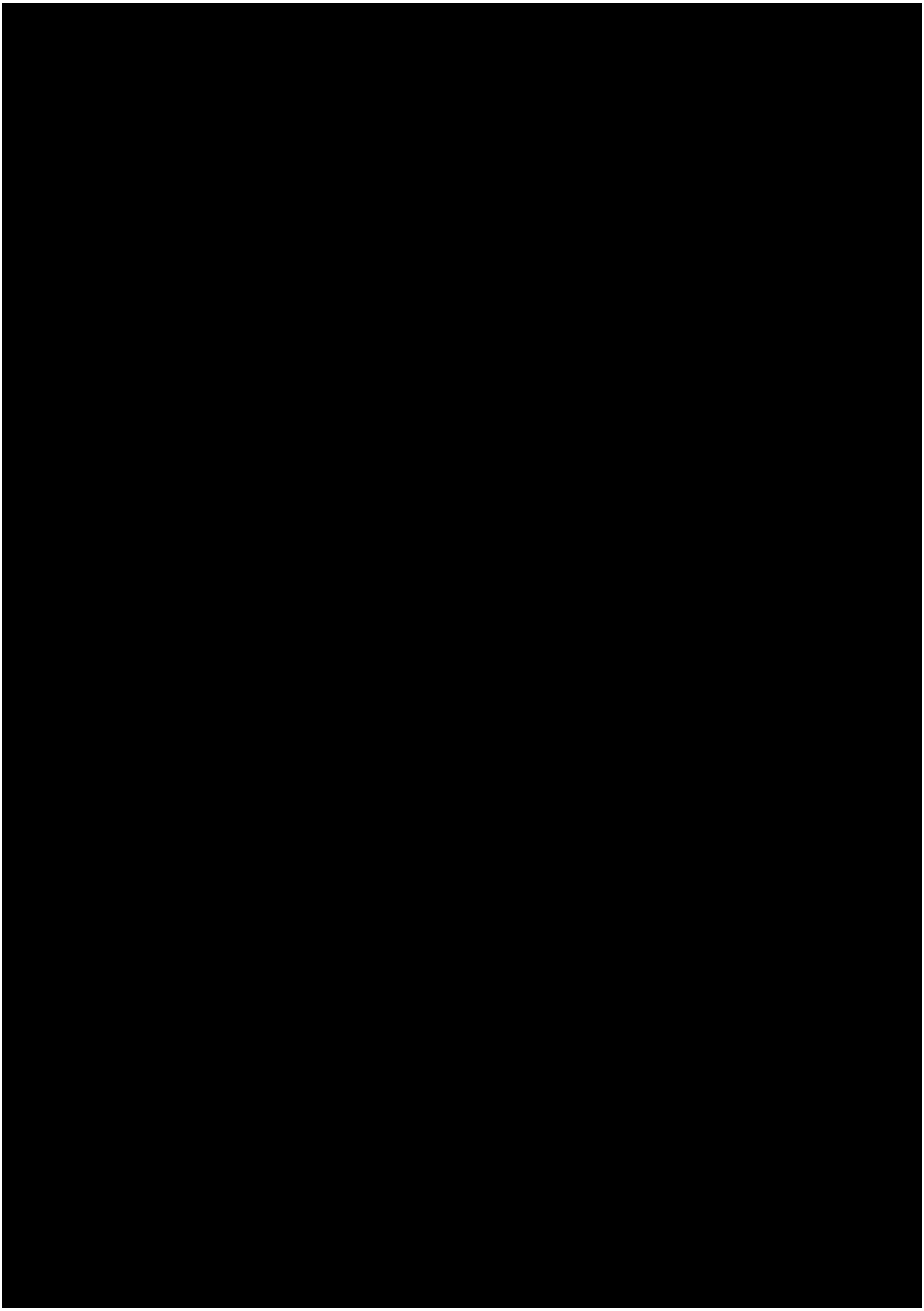

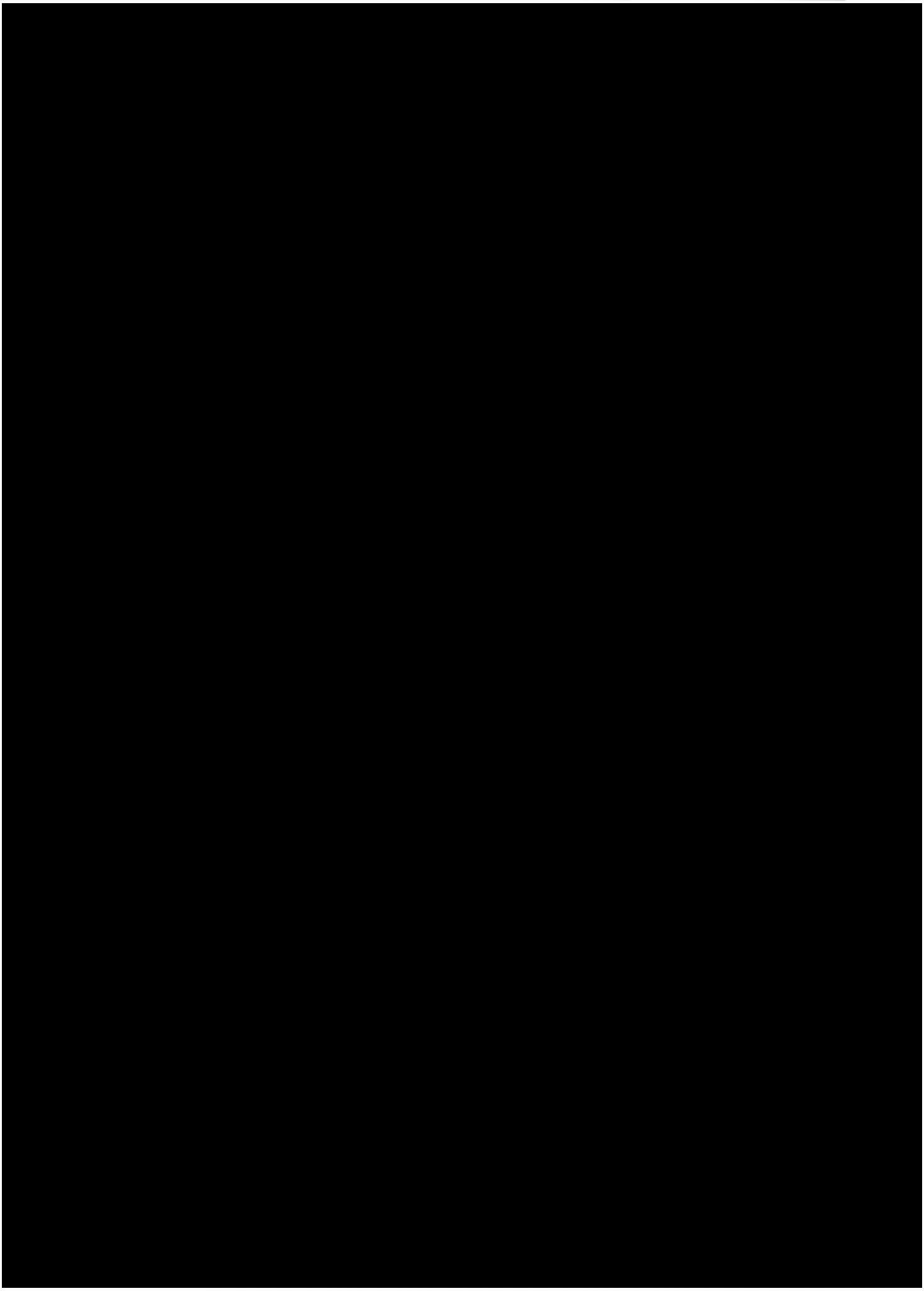

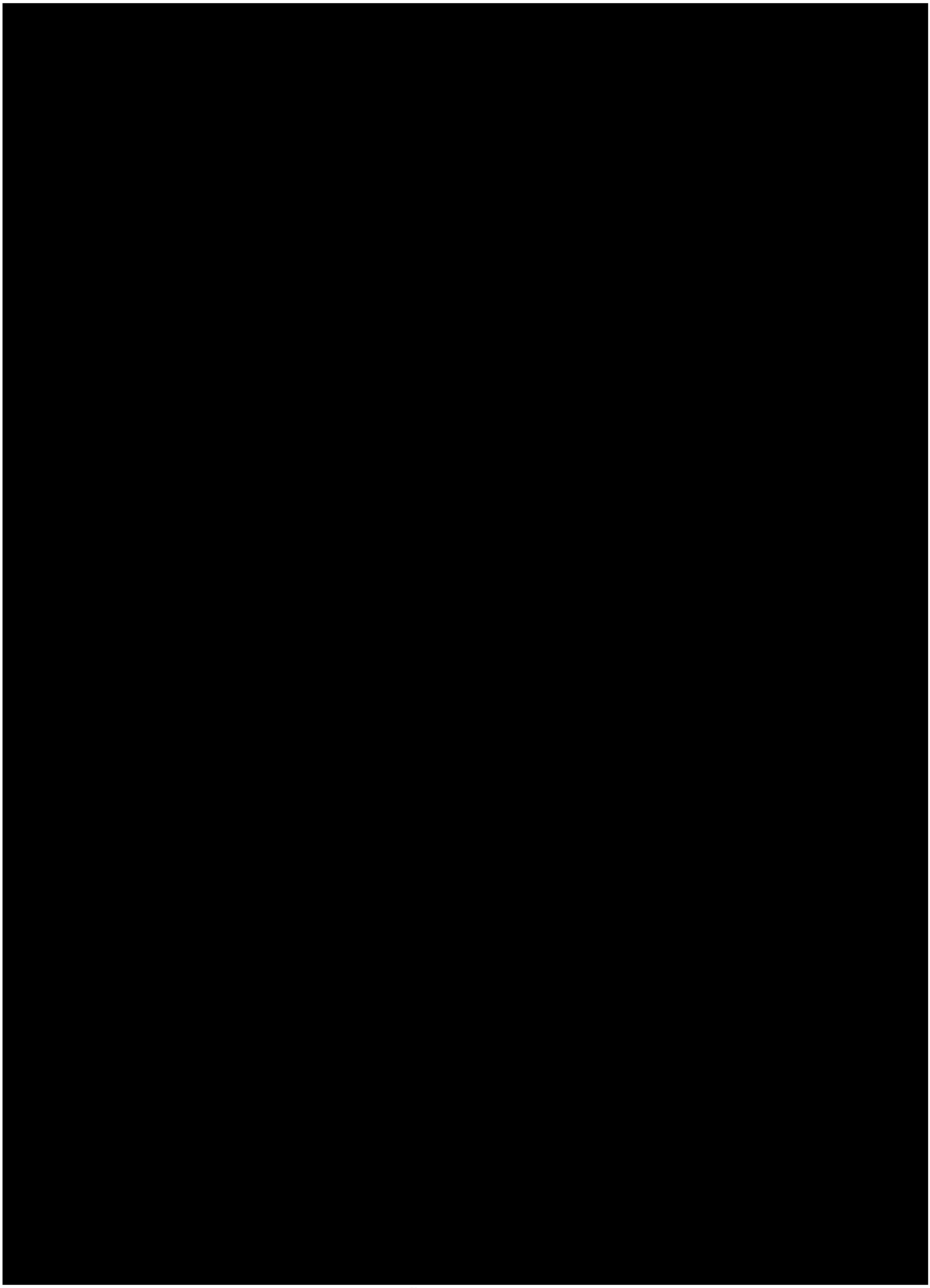

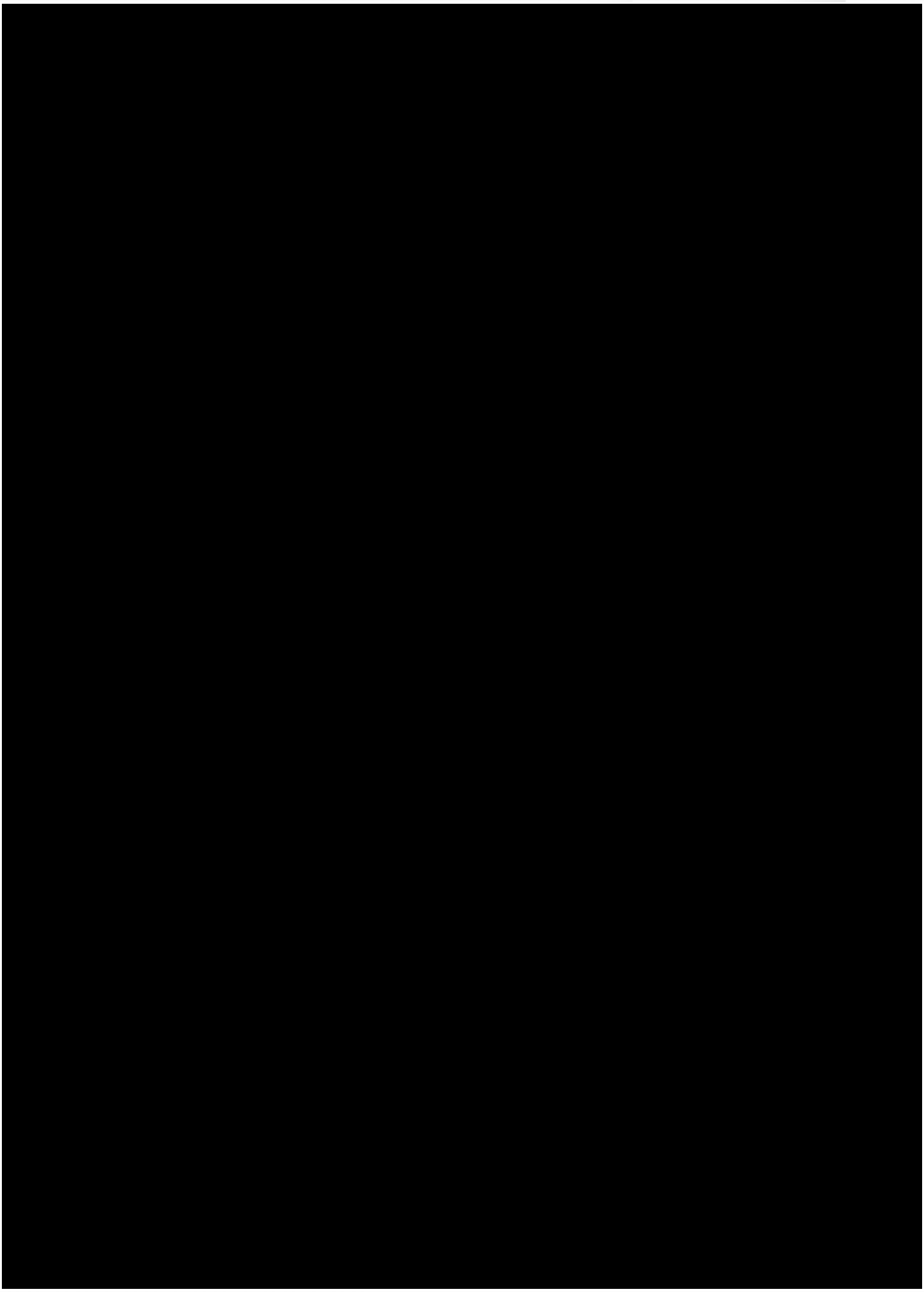

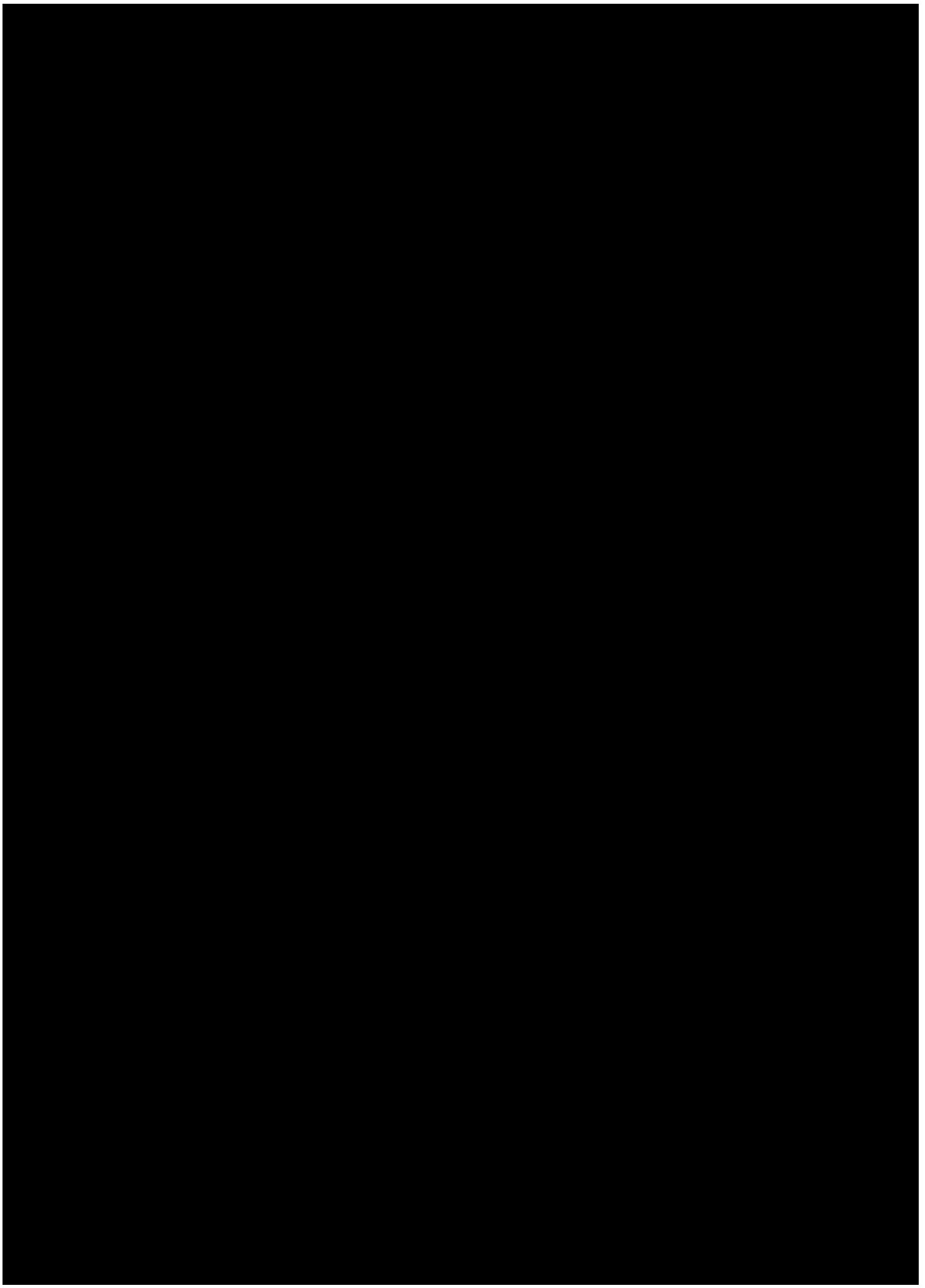

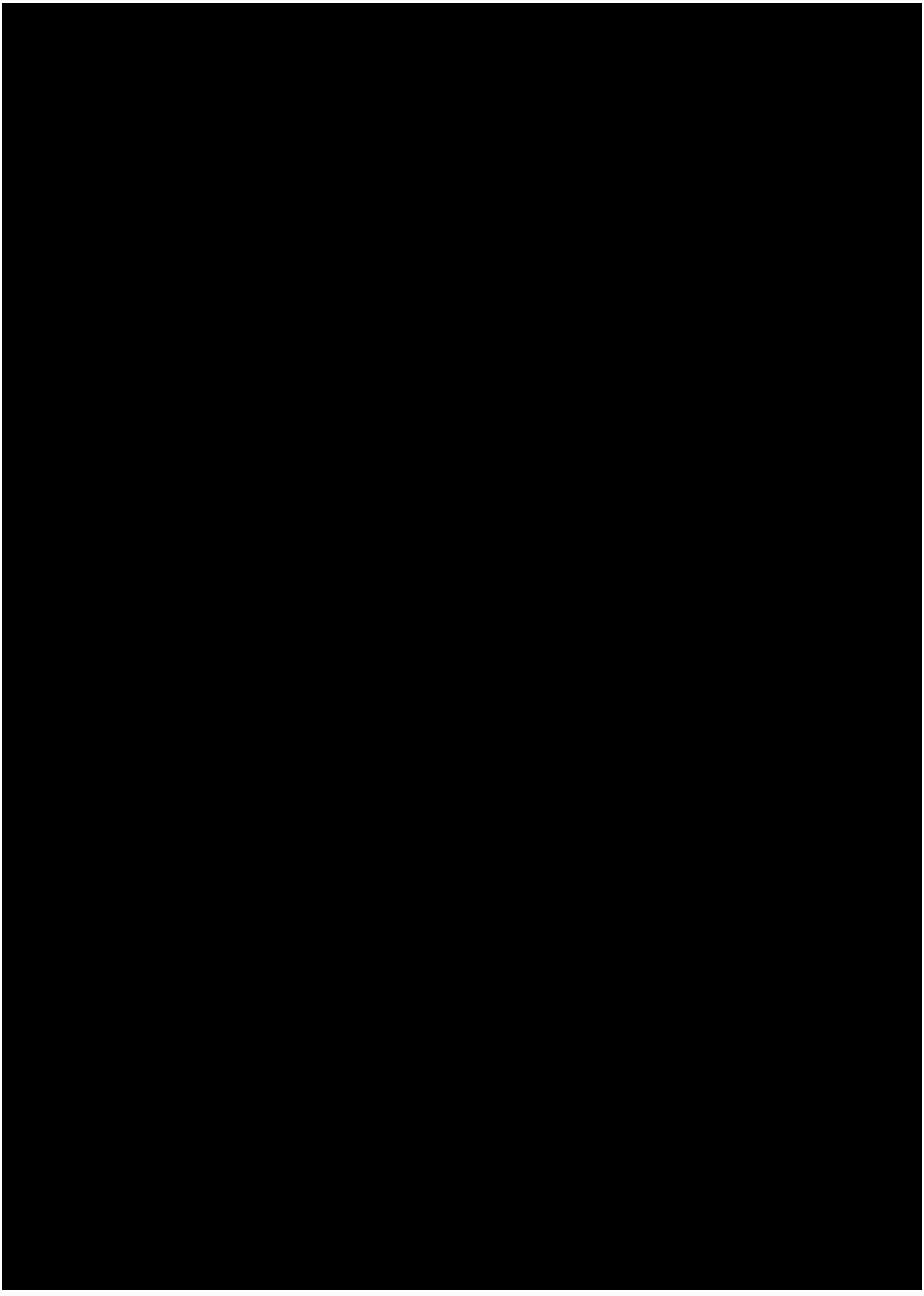

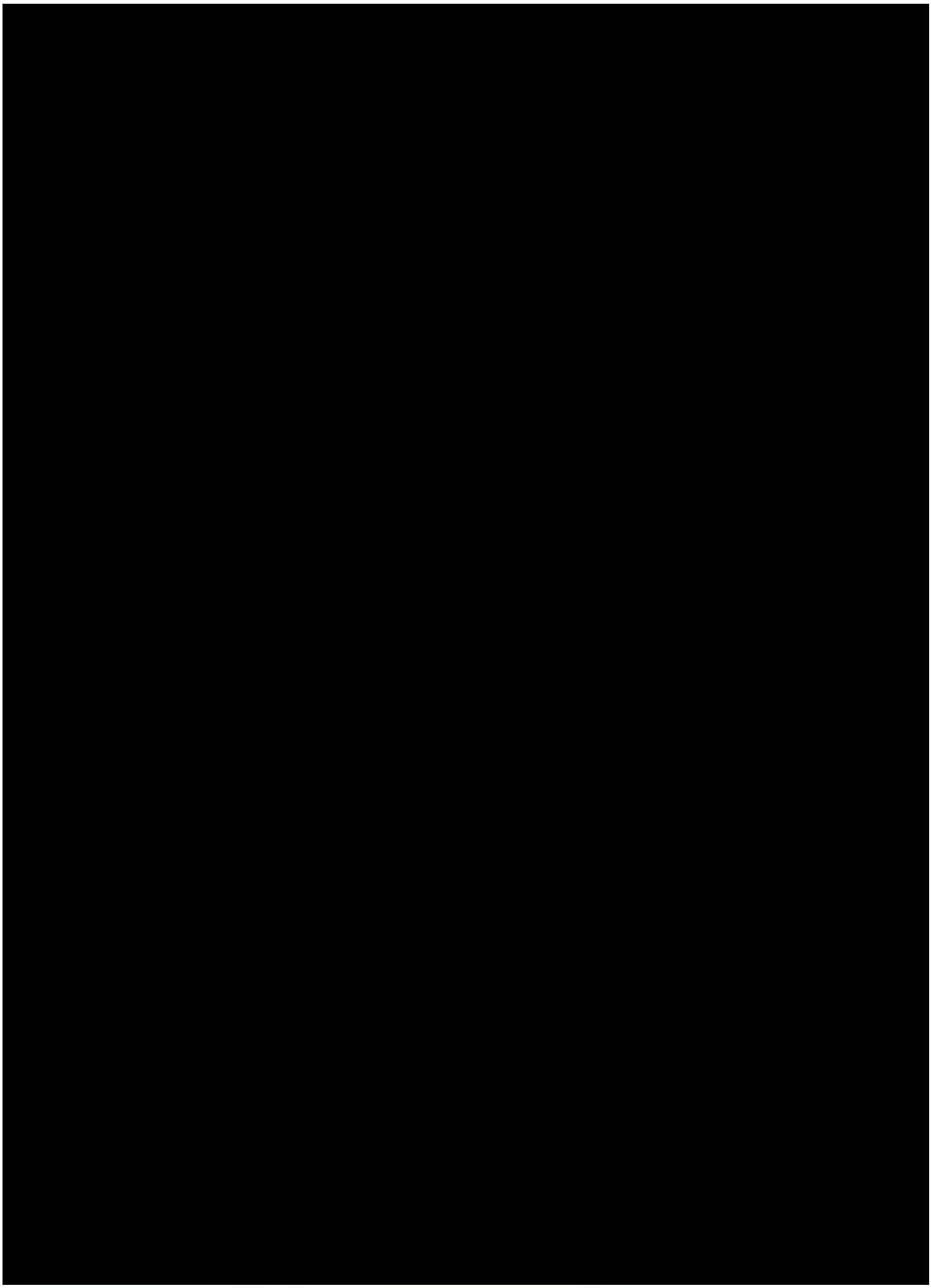

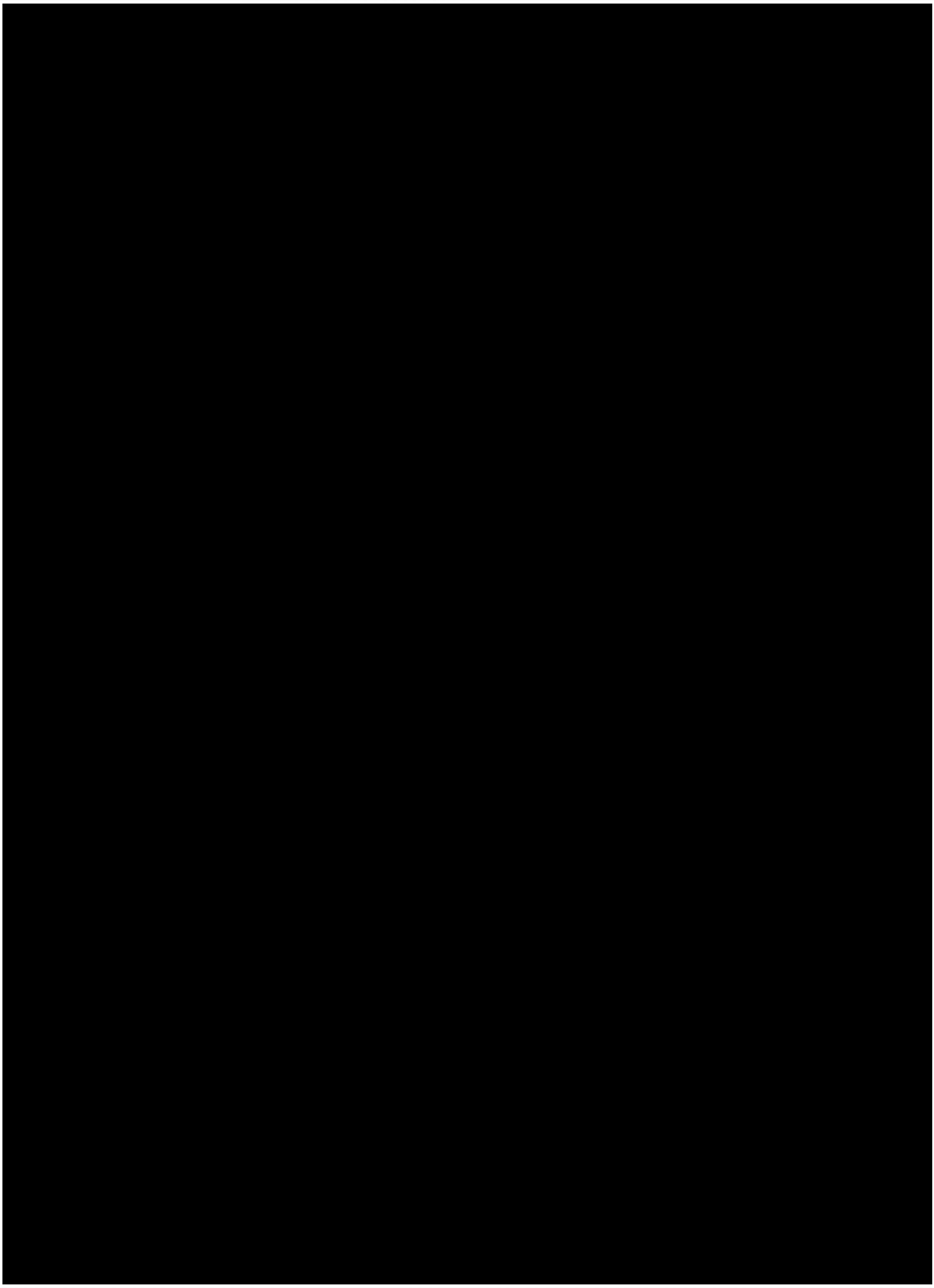

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 21 October 2020 8:50 PM
To: [redacted]
Subject: [redacted]

Hi [redacted],

Apologies for my bad connection. Luckily, we have discussed everything regarding [redacted].

I will draft a quick overview of preliminary work that we have done in ionic liquids and low temperature iron ore reduction and share it with you shortly.

I am looking forward to receiving [redacted].

Thank you,
Bart

Get Outlook for Android

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Thursday, 10 December 2020 6:13 AM
To: Michael Masterman;Julie Shuttleworth;Michaela Johnstone
Subject: Re: [redacted] - Call with CEOhop

B

Get Outlook for Android

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Thursday, December 10, 2020 5:15:35 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Bart
Got it – remember you explaining to me (the Bjorn had me thinking Sweden and Abba)
Agree could be a great fit
I will give him a call – what is his mobile

M

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

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WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Wednesday, 9 December 2020 10:23 PM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Michael,

Bjorn is currently semi-retired and living in Thailand. Him and his wife had to take care of his wife's niece and adopt her. Until recently, he was working part-time as a professor at Waseda University in Tokyo and travelled back and forth every three months. After a couple of years of living in Thailand, they are ready to move back to Australia. He is an Australian citizen and can move back as quickly as 3+ months.

Bart

From: Julie Shuttleworth
Sent: Wednesday, 9 December 2020 5:47 PM
To: Michael Masterman <mmasterman@squadronenergy.com>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Bart
Please answer MM's query. Is Bjorn in Singapore.?

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Wednesday, 9 December 2020 4:49 PM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Julie
Ok we will action

Where is Bjorn based? We do need to bring the technical team together – initially in Perth

Happy to give him a call

Will bring Aaron on a contract basis.

Michael

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Sent: Wednesday, 9 December 2020 6:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: FW: [redacted] - Call with CEOhop

Hi Bart and Michael

Just answering this email. Happy for you to proceed with Aaron, since you have already done the interview.

I am also happy for you to bring Bjorn on board, once Michael has had a quick interview with him to check FFI values. Michael, Paul Scott and Cameron have offered to join the call if you want either of them to do so. Otherwise, happy for you to have this chat by yourself MM.

We are recruiting for a Manufacturing Manager, however that may take 2 months until onboard. Therefore, I am happy for these two new positions to temporarily report to Michael. Bart and Michael we will involve you in the interviews for that position.

Does that work for everyone? Happy for any other ideas.

Will have a call on manufacturing next week when I am in quarantine, and make sure we really get this cranked up. Having a good discussion on the plane now with Rod, Paul S and Rod.

Cheers
Julie

ulie Shuttleworth

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Monday, 7 December 2020 10:50 AM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Cc: Michael Masterman <mmasterman@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Julie,

We've already got your support. That's super helpful.

Please find attached CVs of Aaron and Bjorn.

Bjorn is my PhD supervisor, who is semi-retired and currently in Thailand. He is probably the best electrochemist I know. His involvement in this would be essential. He is also very hands-on, and I have already discussed it with him without revealing too many details. Before he got his PhD, Bjorn has developed several processes which are deployed commercially. Same time, Bjorn would probably have to report to Michael M, Paul Scott, or someone else.

Best regards,
Bart

From: Julie Shuttleworth
Sent: Monday, 7 December 2020 10:43 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Michael Masterman <mmasterman@fmgl.com.au>; Michaela Johnstone <mjohnstone@fmgl.com.au>
Subject: Re: [redacted] - Call with CEOhop

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Hi team

Please proceed with high speed on this

Please get Michaela In the loop so we can get it organised.

Please send me his CV.

What else do you need from me?

Thanks
Julie

Julie Shuttleworth
Fortescue Metals Group
Fortescue Future Industries
+61 439918677

On 6 Dec 2020, at 19:43, Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

Hi Julie,

I agree with Michael. We will need someone to drive this while we do 100s other things and having a quick chat with Aaron. He seems like a great candidate.

Aaron is currently in the process of getting our NDA signed. We will have a more detailed follow-up call with him, but getting him on board asap would definitely help and take some of the work burden from us.

Bart

From: Michael Masterman
Sent: Monday, 7 December 2020 9:35 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Julie
We need someone practical who has a can do attitude and is great at setting up mechanical and material operations.

Bart and I have spoken to Aaron Szumilak (Polish background born in Canada) who worked on the Iron Bridge project and was pivotal in making the HPGR work and overall project innovation. Paul Scott has had a look at the resume. He knows the FMG/FFI values.

He is also very practical and frugal and can work with speed. (not recommending it but he could probably weld up the [redacted] pod we saw [redacted] and get the kiln brick installation going before [redacted] close their term sheet)

Andrew is agitating on all this work. If we bring Aaron on with a contract we can get the arms and legs to start the process.

Michael

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Sunday, 6 December 2020 7:22 PM
To: Andrew Forrest - [redacted]; Michael Masterman <mmasterman@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>
Cc: John Hartman <jhartman@tattarang.com>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Alan Krause <akrause@fmgl.com.au>
Subject: RE: [redacted] - Call with CEOhop

Hi Andrew,

I am in Malaysia and this is exactly what I am doing this week while in quarantine.

We will do it better. It will be low-temperature processing from ionic liquids.

Bart

From: Andrew Forrest - [redacted]
Sent: Saturday, 5 December 2020 11:44 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>
Cc: John Hartman <jhartman@tattarang.com>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Alan Krause <akrause@fmgl.com.au>
Subject: Re: [redacted] - Call with CEOhop

Bart

So set up a decent testing facility in Perth and properly prove or disprove the concept so I can set up a steel manufacturing facility.

A

Sent via BlackBerry Hub+ Inbox for Android

Andrew Forrest

From: bkolodziejcz@fmgl.com.au
Sent: 4 December 2020 15:01
To: mmasterman@fmgl.com.au; jolivier@fmgl.com.au; [redacted]
Cc: jhartman@tattarang.com; jshuttleworth@fmgl.com.au; akrause@fmgl.com.au
Subject: RE: [redacted] - Call with CEO

Hi Michael,

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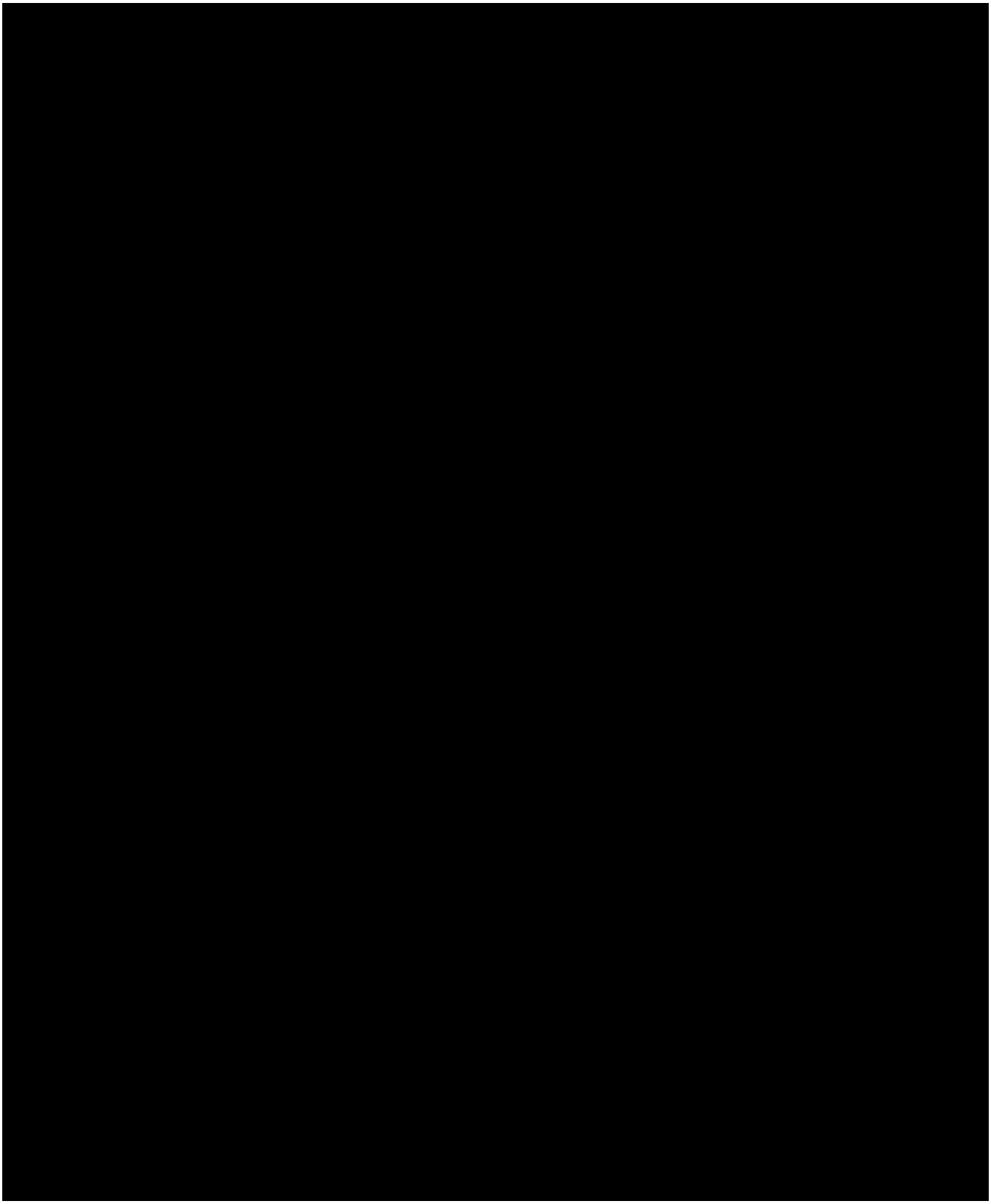
The idea makes sense. Having one step-process which can be easily controlled by tunning applied voltage is definitely preferred over solid-state reduction using green hydrogen or ammonia. It merely makes it easier and potentially cheaper.

In terms of energy intensity, the process uses roughly 4 MWh/tonne of steel. Hence, with 500 MW of hydropower and uninterrupted operation, we would get nearly 1.1 million tonnes of steel per year. While it seems not much, we need to remember that there is a reason why steelmaking is one of the major contributors to global carbon emissions, contributing roughly 7% of global CO2 emissions. The steelmaking process is very energy-intensive. The energy contained in coal used to process iron ore via traditional pathways contains around 5.3 MWh/tonne of steel. On average 0.8 tonnes of coal is used to produce 1 tonne of steel.

Bart



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Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 15 December 2020 10:58 AM
To: Andrew Forrest - [redacted];Michael Masterman;John Hartman
Cc: John Paul Olivier
Subject: [redacted]

Andrew, this is exactly what will keep us busy in 2021. We are getting our manufacturing and R&D facilities set up and this work will proceed shortly.

Same time I agree with Michael. We need to look at both hydrogen and ammonia. To convert existing blast furnaces. Green ammonia can be used a carbon-free reductant and it is easier to ship than hydrogen.

Bart

From: Andrew Forrest - [redacted]
Sent: Tuesday, 15 December 2020 10:55 AM
To: Michael Masterman <mmasterman@squadronenergy.com>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Hartman <jhartman@tattarang.com>
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Or build our own mini plant in Freo and shortly after a commercial scale pilot plant in Port Hedland.

Sent from my BlackBerry — the most secure mobile device

Andrew Forrest

From: mmasterman@squadronenergy.com
Sent: 15 December 2020 11:53
To: bkolodziejcz@fmgl.com.au; jhartman@tattarang.com; [redacted]
Cc: jolivier@fmgl.com.au
Subject: [redacted]

We probably also need to understand how a steel mill like Posco would practically use H2 as a reductant to replace coking coal in a sinter furnace or blast furnace

Might be smoking drugs but is there anything we could do at the Bluescope steel works at Port Kembla

M

Michael Masterman

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E mmasterman□ squadronenergy.com

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A company of Tattarang

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Tuesday, 15 December 2020 1:46 PM
To: Michael Masterman <mmasterman@squadronenergy.com>; John Hartman <jhartman@tattarang.com>; Andrew Forrest - [redacted]
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Hi Michael,

Sounds good. We'll do it at low temperature using ionic liquids as iron ore solvents. Low temperature electrochemical reduction will allow us to switch on and off our "iron ore electrolyser" within seconds or minutes and as such we will be able to operate with highly intermittent power supply like wind and solar.

[redacted]

I am available any time this week.

Bart

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Tuesday, 15 December 2020 10:40 AM
To: John Hartman <jhartman@tattarang.com>; Andrew Forrest - [redacted]; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: John Paul Olivier <jolivier@fmgl.com.au>
Subject: [redacted]

Will keep to ourselves

JP, Bart
Lets have a call on expediting Green Steel (as you can imagine its on the top of Andrews priority list)

M

Michael Masterman

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M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

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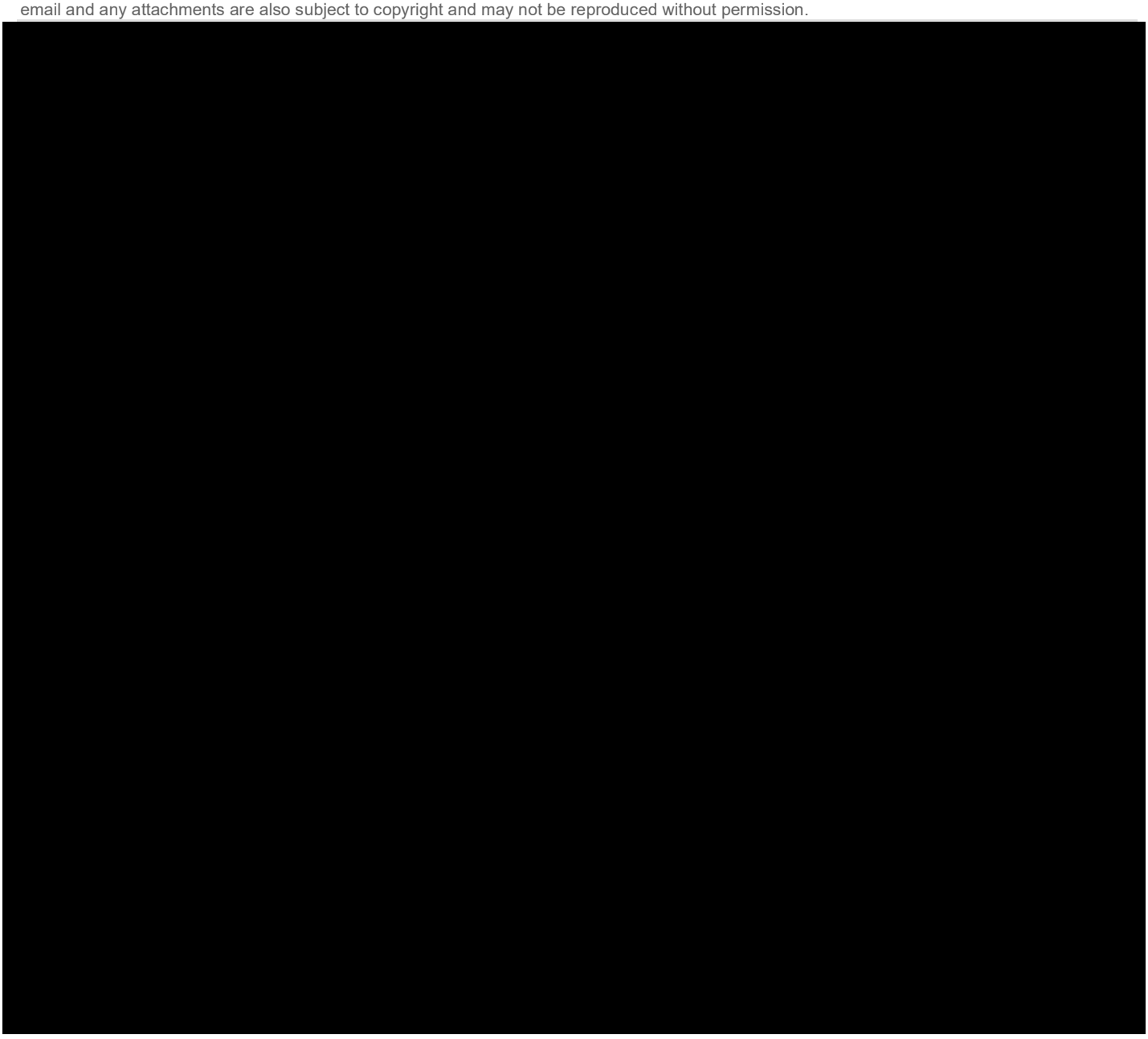

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Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 22 December 2020 10:06 AM
To: 'Andrew Forrest';Michael Masterman
Subject: RE: The batteries that could make fossil fuels obsolete - BBC Future

I will do my best, Andrew.

By May, we will definitely have a good idea and a working prototype in our Perth facility. Having a large(er) commercial-scale plant in Pilbara by June 30 might be very challenging. Anyway, challenge accepted.

On the same note, I am currently working on a patent application for our low-temperature electrochemical ores reduction in ionic liquid electrolytes.

This patent application is based on my initial work done a couple of years ago, where I have managed to produce iron from iron oxides, copper from copper complexes, and nickel from nickel oxides. I would like Michael and you to be listed as co-inventors. We wouldn't be doing this work if not for your push. Are you ok with being on that patent?

Bart

From: Andrew Forrest
Sent: Tuesday, 22 December 2020 9:55 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: Re: The batteries that could make fossil fuels obsolete - BBC Future

Well done and thank you.

I need you testing in the Pilbara before June 30 Bart.

A

Sent from my BlackBerry — the most secure mobile device

From: bkolodziejcz@fmgl.com.au
Sent: 22 December 2020 9:06 am
To: [redacted]; mmasterman@squadronenergy.com
Subject: RE: The batteries that could make fossil fuels obsolete - BBC Future

Hi Andrew,

I think batteries have a role to play.

Michael M and I looked at battery ships to send electricity from Pilbara to Japan (and elsewhere) directly in the form of electricity contained in batteries on a vessel. Batteries are so heavy and bulky that using the best batteries today, we would be able to ship only 9% of the energy per shipment compared to energy contained in today's LNG shipping vessels.

111

Highest performing batteries today are lithium-sulfur batteries. Their energy densities reach 0.55 kWh/L, and specific energy is in the range of 0.5 kWh/kg. For comparison, liquid hydrogen is 2.7 kWh/L and 39.4 kWh/kg. Ammonia gives 3.2 kWh/L and 5.1 kWh/kg.

Batteries will be used for stationary energy storage. Hydrogen and ammonia will be used to ship energy globally.

We are very happy to be out with families.

Very busy 2021 ahead we will be doing work over Christmas to establish our Perth manufacturing in early 2021. We need to have working electrolysers and low-temperature electrochemical iron ore processing plants. Testing in Pilbara to commence in late 2021.

Bart

From: Andrew Forrest
Sent: Monday, 21 December 2020 8:04 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: The batteries that could make fossil fuels obsolete - BBC Future

"The batteries that could make fossil fuels obsolete - BBC Future"
https://www.bbc.com/future/article/20201217-renewable-power-the-worlds-largest-battery

Trust you guys are enjoying some super well deserved freedom. Love to both of you and your families.

A

Sent via BlackBerry Hub+ Inbox for Android

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Tuesday, 22 December 2020 4:08 PM
To: Robert Grant
Subject: Low-temperature electrochemical ores reduction in ionic liquids
Attachments: 22122020 Patent Assessment Form (Electrochemical ore reduction).pdf

Hi Rob,

I hope you're doing well. I have attached a patent assessment form for the intended patent application covering low-temperature electrochemical ores reduction in ionic liquids. Applying Fortescue stretch targets, we are aiming to test it in Pilbara by June 30, 2021.

The technology is proven. I have developed this method and tested it in a small scale laboratory setting before. Now we need to scale it up and couple it with a green power source.

If you don't have any comments, can you please approve the form? I will be working over Christmas to finalise a draft for this application.

Bart

Bart Kolodziejczyk
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

Mobile +61 437 947 174 **Web** www.fmgl.com.au
Twitter @FortescueNews I **www.fmgl.com.au**

PURPOSE

The purpose of this form is to assist Fortescue's personnel to determine whether or not an invention or innovation should be patented.

The information in this document is strictly private and confidential and must not be publicly disclosed until a patent application has been filed or a decision has been made not to seek patent protection.

The Guidance Notes at the back of this form provides additional information in relation to some of the items.

INVENTION DETAILS

Inventor's Name (Guidance Note 1)	Bartlomiej Piotr KOLODZIEJCZYK
Inventor's Manager's Name	Robert GRANT
Department	Fortescue Future Industries
Title of Invention	Low-temperature Electrochemical Ore Reduction
Summary of Invention	The invention revolves around the use of ionic solvents and electrochemical devices for the low-temperature reduction of ores and oxides, including but not limited to iron ores and nickel ores. Careful selection of ionic liquid or mixture of ionic liquids allows to dissolve ores at low-temperatures. The electrochemical window of ionic liquid or ionic mixtures is selected so that the applied electrochemical potential required to reduce ores does not damage the ionic electrolyte.
Benefit of Invention (Guidance Note 2)	Today's steelmaking accounts for roughly 6 - 7% of global carbon dioxide emissions. Steelmaking processes require the use of coal as an iron ore reductant. Decarbonisation of this process would significantly reduce global carbon dioxide emissions while creating a new commodity – green steel. Proposed carbon-free alternatives are complex and require a multi-step approach, where green hydrogen or green ammonia are used as reductants. In addition, thermochemical processes tend to operate at high temperatures and are challenging to sustain using an intermittent power supply, like wind or solar energy. The low-temperature one-step electrochemical process would overcome those limitations by providing modular and scalable approaches that could operate with a higher degree of flexibility than intermittent renewable energy sources.
Specific Inventive Element (Guidance Note 3)	There are a couple of inventive steps to this process. Firstly, ionic liquids, their mixtures, and composition ratio are innovative. The application of ionic liquids in metal oxide reduction is innovative by itself. In addition, the selection of electrode materials and cell design are novel and unique.
What is the Status of the Invention? Has it been Designed? Constructed? Tested? Used?	The concept has been tested in a laboratory setting and is intended to be scaled up to a commercial system in 2021.
Any Other Comments	NA

Inventor's Email Address	bkolodziejcz@fmgl.com.au, kolodziejczyk.bartlomiej@gmail.com
Inventor's Mobile Phone Number	+61 416 833 585, +61 437 947 164
Date	22/12/2020

PATENT ASSESSMENT

Patents

A patent is a legally enforceable right for a device, substance, method or process. A patent gives Fortescue the right to stop others from using the invention without Fortescue's permission.

When granted, a patent will give Fortescue exclusive commercial rights to the invention for 20 years for a standard patent, or 8 years for an innovation patent.

To be patentable, an invention must be new, useful and inventive or innovative.

Prior to filing the patent application, the invention must be kept confidential. If the invention is disclosed to the public or commercially used before a patent application is filed, there is a risk that the patent will not be granted. If disclosure is required to a third party, the IP Team can assist you to put in place a confidentiality agreement to ensure that information about the invention is kept confidential.

Fortescue has access to an international patent search database and is able to carry out searches to ensure that the invention is not already covered by another patent. Please request the IP Team to carry out searches if you are unsure if the invention is new.

As a general estimate, the initial cost of applying for a patent are in the range of $6,000 to $9,000 with maintenance and ancillary costs bringing the total cost over a five year period up to $30,000 depending on the particular circumstances.

Key Considerations

If in your view the invention or innovation is patentable, the following must be considered:

- what is the objective of protecting the invention? For example:
  - to obtain a commercial advantage over Fortescue's competitors because:
    - the invention improves Fortescue's efficiency/productivity;
    - the invention reduces Fortescue's costs; or
    - the invention may be used in negotiations with a third party to gain another advantage;
  - to commercialise the invention and create a financial return for Fortescue (i.e., through licensing or sale of technology);
  - to ensure Fortescue has the freedom to use and operate that invention without restriction; or
  - to create marketing or business development benefits for Fortescue.
- do the benefits of patent protection outweigh the time, effort and cost (including filing and maintenance costs of the patent) required to file and maintain the patent?

INVENTOR'S DECLARATION

- I have reviewed and considered the information provided in this Patent Assessment Form and in my view the invention should be considered for patent protection by Fortescue's IP Team.
- I acknowledge and agree that the invention and the patent are the sole and exclusive property of Fortescue Metals Group.

What is the objective of patenting the invention?	The objective is to protect the initial invention and enable further scale-up and commercial deployment in Pilbara and elsewhere.

Do the benefits of patenting the invention outweigh the time, effort and costs?	No, the production of green metals, including green iron, green steel, green nickel, and green copper, among other metal commodities, is at the core business of Fortescue Future Industries. Protecting this development will give FFI a competitive advantage in this growing industry space.
Are searches required of the patent database? If yes, please provide search terms and the countries which the searches should cover (i.e., "remote dozing" in Australia) **(Guidance Note 4)**	Patent searches have been performed, and search results will be presented in a longer write up. Technology that is similar to the current proposal is that of Boston Metal, a spin-off from MIT. The difference is that Boston Metal technology uses molten oxide electrolyte and operates at very high temperatures, up to 1,500 ºC.
Has this invention been discussed with others? If yes, with whom? Was the invention developed in co-operation or collaboration with outside parties? If yes, please give details of any such parties.	No
Has the invention or information relating to the invention been made publically available or disclosed to third parties? If so, please provide details of the disclosure. **(Guidance Note 5)**	No, invention has not been publicly disclosed. All information related to this invention is kept internally within Fortescue Future Industries.
Inventor's Name	Bartlomiej Piotr KOLODZIEJCZYK
Inventor's Signature	
Date	22/12/2020
Inventor's Manager's Name	Robert GRANT
Inventor's Manager's Signature	
Date	

NEXT STEPS

If you consider that the invention or innovation should be patented, please complete this Patent Assessment Form and submit it to Fortescue's IP Team at the following email address: ip@fmgl.com.au

If you have any queries, please do not hesitate to contact Simon Yamchikov on 0428 164 830 or ip@fmgl.com.au

GUIDANCE NOTES

1. **Inventor's Name:** There can be more than one inventor. If contractors or consultants have been involved with the invention, please make a note of this as well the role which they have played. If the consultant or contractor was engaged under an agreement, please provide details of that agreement.

2. **Benefit of Invention:** The benefits of the invention are not limited to being financial benefits or cost savings. The benefits of the invention can include safety improvements, the potential to use the intellectual property as bargaining power with another supplier or to gain an advantage over a competitor.
3. **Specific Inventive Element:** What inventive or innovative feature of the device, substance, method or process distinguishes the invention from existing devices, substances, methods or processes? The inventive element might be a structural feature or a function of the invention or it may be a number of different features, improvements or modifications.
4. **Searches:** In order to be patentable, the invention must be new. The IP Team can carry out patent searches to ensure that the invention is new when compared with the prior art base and has not been previously patented.
5. **Public Disclosure:** Disclosure includes contractors inspecting the invention, Fortescue discussing the invention at a presentation or providing information in a publically available document. All communication should be carefully managed and confidentiality agreement should be used wherever possible to ensure that the invention is not disclosed to the public prior to the filing of the patent.

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 23 December 2020 8:20 AM
To: Julie Shuttleworth
Subject: RE: green steel plant Pilbara

Hi Julie,

Sure. It would be great to have a presentation or a pitch deck.

I will ask Chloe to work on this. Her economics background, together with what she has learned during our trips, should be good enough to do this task. I will work with Chloe to make sure that everything is aligned with Fortescue's vision.

We are proposing the development of two green steel technologies. One will be low-temperature electrochemical ore reduction in ionic liquids. The second one will be the electrolysis of iron ore in molten carbides. I am drafting R&D roadmaps for both of those technologies. Those roadmaps and write-ups will subsequently be used for patent applications.

I will give you a call later today to quickly discuss how we can try something up to scale in Pilbara by June 30, 2021. We need to get equipment for our manufacturing and R&D facility, and we don't have time to wait. My idea is to start getting chemicals, flasks, and other R&D equipment even before our facility is established. I will work with procurement on this. So that by the end of January, we can start hands-on work.

Bart

From: Julie Shuttleworth
Sent: Tuesday, 22 December 2020 8:48 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: green steel plant Pilbara

Hi Bart
Thanks for the info.
Only a few days ago Andrew again mentioned doing green steel in the Pilbara. He is asking [redacted] and others if they want to partner with us to do green steel in the Pilbara.

I still think we need to follow up and get some slides together with numbers etc.
I can ask Rob Grant to find someone to get onto this if you don't have time, I know you have a lot of things on

Let me know, and feel free to call if you wish

Regards
Julie

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Monday, 21 December 2020 10:09 AM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: RE: green steel plant Pilbara

Hi Julie,

Michael and I have had a number of calls with Andrew on this. Hence, I have assumed that this was closed.

[redacted]

We are getting NDAs signed with [redacted] and [redacted] to understand CAPEX and OPEX of hydrogen-powered DRI plants. Also, something to have in mind is that our ores probably have too high silica content to work with DRI. Once, NDAs are signed we will ship our ores to [redacted] and [redacted] for trials.

Bart

From: Julie Shuttleworth
Sent: Saturday, 19 December 2020 2:43 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: green steel plant Pilbara

Bart
Just going through some older emails

The below in yellow. What help do you need with this?
Don't want you to think you havre to do this one all by yourself.

Cheers
Julie

From: Andrew Forrest (Minderoo) <[redacted]>
Sent: Sunday, 15 November 2020 3:59 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: Fw: Shared from BBC:The new fuel to come from Saudi Arabia

Bart your views please.

This is similar to what we are going to do in the Pilbara right?

Bart

IF you can find the time...

I need you to do a quick scoping study on making our own steel in Port Headland please.

I want a rough idea on capex and open per million tonnes produced.

Aiming for a [redacted] plant.

Are you up for it?

A

Sent from my BlackBerry — the most secure mobile device

From: chasbrooke@runbox.com
Sent: 14 November 2020 14:38
To: [redacted]
Subject: Shared from BBC:The new fuel to come from Saudi Arabia

https://www.bbc.com/future/article/20201112-the-green-hydrogen-revolution-in-renewable-energy?ocid=ww.social.link.email

A
I am sure you have probably read this !
all the best and safe travels
Charlie
Kind regards
Charlie
Sent from my iPhone

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 6 January 2021 2:15 PM
To: Chris Mcmahen;John Paul Olivier;Michael Masterman
Cc: Danny Goeman
Subject: RE: Report from [redacted]

Hi Chris,

Thank you for sharing this draft. It provides some valuable insights into the MOE process.

We are currently developing an R&D roadmap where a number of challenges outlined in this report will be addressed. The major challenge is MOE's high operating temperature, which requires specialised materials, often based on noble and expensive metals. The system's high thermal inertia is also a challenge when running the MOE process with highly intermittent wind and solar power supply.

[redacted]

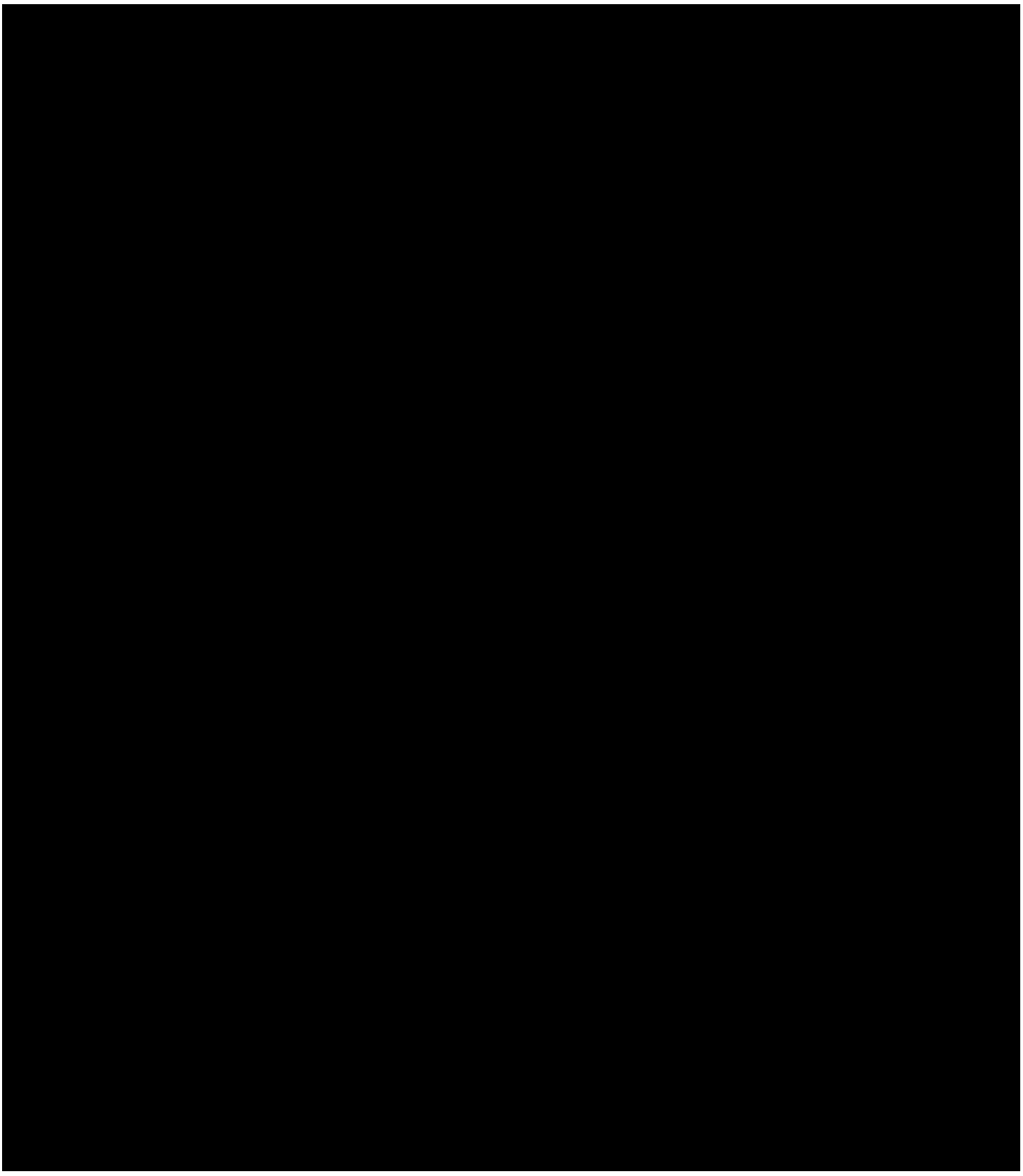
In our development, we are looking at using solvents capable of dissolving iron ore at low temperatures < 300 deg C and/or using molten carbonate electrolyte, which would allow the dissolution of iron ore at temperatures ranging between 700 and 800 deg C. Same time allowing to use less exotic and less expensive materials and making the entire process more compatible with intermittent power supply. Same time we are open to testing MOE too.

Based on your description, Joe seems like a valuable potential employee. However, I know too little about your previous engagement to be able to comment on any future engagement with Joe.

[redacted]

Best regards,
Bart

[redacted]



Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 6 January 2021 2:39 PM
To: Shanta Barley
Subject: RE: [redacted]

Hi Shanta,

We are working internally at Fortescue on alternative processes that would utilise lower temperatures and direct electrochemical reduction of iron ore into iron and further steel.

The electrochemical reduction is done in a liquid phase. Hence iron ore has to be dissolved in the electrolyte prior to being electrolysed. High temperature helps iron ore dissolution but poses certain technical challenges, especially when running the intermittent power supply process. With the intermittency of wind and solar energy supply, it becomes challenging to maintain the high temperature of the process.

We are working to overcome this issue.

Other than the above, I am not aware of alternatives.

As we have discussed before, we could use green hydrogen as an iron ore reductant instead of using coal as a reductant (traditional steel making process uses coal). But this is different from using direct current.

Bart

From: Shanta Barley <sbarley@minderoo.org>
Sent: Wednesday, 6 January 2021 2:17 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: [redacted]

Dear Bart,

I was wondering if you know of a good alternative to [redacted] for the sentence below:

[redacted] to turn iron oxide into steel. This is a radical step change that does away, not only with coal, but with blast furnaces.

Thanks!
Shanta

Shanta Barle
Minderoo Foundation Research

M 1 439 485 [redacted]
P 1 8 4 0 4949
E sbarley minderoo.org
L Perth (GMT 8)

PO Box 3155, Broadway Nedlands
WA 009 Australia
minderoo org research

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Susanne Hantos

From: Bart Kolodziejczyk
Sent: Friday, 22 January 2021 11:41 AM
To: Ashlee Crabbe;Chris Mcmahen;Geoff Beros
Cc: Danny Goeman;Alison Terry;Stephanie Vanicek;Julie Shuttleworth
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee,

The way I interpret Chairman's Boyer Lecture is that Fortescue is interested in exploring green steel opportunities. Production of green steel would be a natural extension to our vertically integrated value chain and fits well with Fortescue's decarbonisation strategy.

In terms of a pilot plant in Pilbara, the lecture does not talk about that plant's size. It could be 10 tonnes/day, but it could be 100 kg/day. We are exploring various existing technologies, but we are also developing internally enabling technologies for iron ore processing to produce green commodities.

It is going to be a small scale pilot plant.

As discussed over the phone, please find links to four existing technologies that use hydrogen as a green reductant for iron ore processing.

https://www.thyssenkrupp-steel.com/en/company/sustainability/climate-strategy/

https://www.hybritdevelopment.com/

https://www.midrex.com/technology/midrex-process/midrex-h2/

https://www.energiron.com/hydrogen/

Internally, we are developing a process that will allow us to take green electricity produced from wind, solar, hydropower, etc., and apply this green electricity to electrochemically reduce Fortescue's iron ore dissolved in a unique electrolyte. In other words, green electricity will be used to separate oxygen from iron. The selection of electrolyte, electrode material, and other materials used in the process is proprietary, and at this point, Fortescue's trade secret. In the future, we are aiming to file a series of patents covering this development.

[redacted]

Please let me know if this explanation is suitable? I am happy to provide feedback on your reply draft.

Bart

From: Ashlee Crabbe
Sent: Friday, 22 January 2021 10:28 AM
To: Chris Mcmahen <cmcmahen@fmgl.com.au>; Geoff Beros <gberos@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Danny Goeman <dgoeman@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi all,

Are you please able to give an estimate of when I can get any info on this, or if it is available?

We have had a follow up from the journalist and I need to run any information past Elizabeth for approval asap.

Kind regards
Ashlee

From: Ashlee Crabbe
Sent: Friday, 22 January 2021 8:58 AM
To: Chris Mcmahen <cmcmahen@fmgl.com.au>; Geoff Beros <gberos@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Danny Goeman <dgoeman@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Thank you all

From: Danny Goeman <dgoeman@fmgl.com.au>
Sent: Friday, 22 January 2021 8:57 AM
To: Ashlee Crabbe <acrabbe@fmgl.com.au>
Cc: Geoff Beros <gberos@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee

Yes, this information is even available on the internet. Perhaps best to coordinate with Geoff/Chris/Bart - they are the technical experts.

Danny

From: Ashlee Crabbe <acrabbe@fmgl.com.au>
Sent: Friday, 22 January 2021 8:53 AM
To: Danny Goeman <dgoeman@fmgl.com.au>
Cc: Chris Mcmahen <cmcmahen@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>; Ben Kuchel <bkuchel@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Thanks Danny,

I think what Brad is hoping to receive, is some basic information about how the processes work for people (like me) who aren't across the technical process.

Are there any summaries available on these two processes?

Ash

From: Danny Goeman <dgoeman@fmgl.com.au>
Sent: Friday, 22 January 2021 8:52 AM
To: Ashlee Crabbe <acrabbe@fmgl.com.au>
Cc: Chris Mcmahen <cmcmahen@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; John Paul Olivier <jolivier@fmgl.com.au>; Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>; Ben Kuchel <bkuchel@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Ashlee,

What Andrew is referring to here is (i) reducing/removing coal in the steel making process in the BF and replacing it with hydrogen, and (ii) direct reduction of iron ore by using electricity to create steel. We don't have an agreed commercial design/solution on how to achieve either at this stage. That said, we are engaging/collaborating with a number of parties in the steel making industry and elsewhere to pursue solutions.

Chris/Geoff/Bart (copied) are across the details of discussions/progress to date, but I am not sure we necessarily want to reveal who we are engaging - for obvious reasons. Between Bart/Chris/Geoff we can dig up some high-level generic information to explain the concepts.

Regards,

Danny

From: Ashlee Crabbe <acrabbe@fmgl.com.au>
Sent: Friday, 22 January 2021 8:42 AM
To: Geoff Beros <gberos@fmgl.com.au>; Danny Goeman <dgoeman@fmgl.com.au>
Cc: Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>
Subject: For review: Media enquiry AFR green steel pilot

Hi Geoff and Danny,

Following our Chairman's Boyer Lecture last night, Brad Thompson from the Australian Financial Review has asked us for background information on the two green steel processes Andrew referenced in the speech.

Do we have any background information to hand, which I could edit and provide to the AFR?

From the Chairman's speech, there are two ways:

- In one, you replace coal in the furnace with green hydrogen. You get steel – but instead of emitting vast clouds of CO2, you produce nothing more than water vapour.

  To strengthen the steel, you simply add the carbon separately. It bonds into the metal rather than dispersing into the atmosphere.
- The other way to make green steel is to scrap the blast furnace altogether and just zap the ore with renewable electricity.

Brad is working to an East Coast deadline for the AFR, so would be great to get this as soon as possible. Please feel free to call me for further clarification 0439 941 [redacted].

Thank you
Ashlee

Ashlee Crabbe

Senior Media and Corporate Affairs Specialist
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

Phone +61 8 2930 1855 **M** 0439 941 [redacted]

E acrabbe@fmgl.com.au

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Susanne Hantos

From: Bart Kolodziejczyk
Sent: Friday, 22 January 2021 4:13 PM
To: Michael Masterman;Julie Shuttleworth;Rod Aguilar
Subject: RE: For review: Media enquiry AFR green steel pilot
Attachments: 7.3 Green Steel_v1 (BK).docx

Hi Michael and Rod,

Can you have a look at this first draft before sending to Julie for further feedback?

Michael and Rod, can you help me with financial section as per my comment in the Word doc?

Rod, given Chairman's clear direction, do we need any further elaboration on HyET in the main FFI board paper.

Have a good weekend,
Bart

From: Michael Masterman <mmasterman@squadronenergy.com>
Sent: Friday, 22 January 2021 12:22 PM
To: Julie Shuttleworth <jshuttleworth@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Rod Aguilar <roaguilar@fmgl.com.au>
Subject: RE: For review: Media enquiry AFR green steel pilot

Will look at Barts draft over the weekend

(assume we are talking green steel)

M

Michael Masterman

SQUADRON ENERGY

M □□1 429 957 831
P □□1 8 □4□0 4949
E mmasterman□ squadronenergy.com

PO Box 3155, Broadway Nedlands
WA □009 Australia
s□uadronenerg□□com

A company of Tattarang

From: Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Sent: Friday, 22 January 2021 11:56 AM

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To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Rod Aguilar <roaguilar@fmgl.com.au>; Michael Masterman <mmasterman@squadronenergy.com>
Subject: RE: For review: Media enquiry AFR green steel pilot

Hi Bart & MM

Just speaking with the CLT, and lots of questions now coming in on this topic.

I am speaking with Greg Lilleyman about a plan with operational/technical/construction resources to help with this pilot plant, as approvals etc will be needed and we have some ideas to speed those up.

The Board paper is now critical as the CLT have the quarterly presentations next week and need to prepare their commentary.

Please can you let me know when I will get the first draft Board paper.

Regards & thanks
Julie

ulie Shuttleworth
Deput Chief Executive Officer

Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 004

P 1 8 218 88 8 I **M** 1 439 918 77

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From: Ashlee Crabbe <acrabbe@fmgl.com.au>
Sent: Friday, 22 January 2021 8:18 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Rod Aguilar <roaguilar@fmgl.com.au>; Catherine Bozanich <bbozanich@fmgl.com.au>
Cc: Alison Terry <aterry@fmgl.com.au>; Stephanie Vanicek <svanicek@fmgl.com.au>; Julie Shuttleworth <jshuttleworth@fmgl.com.au>
Subject: For review: Media enquiry AFR green steel pilot

Good morning Bart and Rod,

Brad Thompson from the Australian Financial Review has asked Elizabeth for comment following the Boyer Lecture.

Specifically, he has asked the question around current capital/budgets, however he has also asked for background information on the two green steel processes Andrew referenced in the speech.

Do we have any background information to hand, which I could edit and provide to the AFR?

From the Chairman's speech, there are two ways:

- In one, you replace coal in the furnace with green hydrogen. You get steel – but instead of emitting vast clouds of CO2, you produce nothing more than water vapour.

  To strengthen the steel, you simply add the carbon separately. It bonds into the metal rather than dispersing into the atmosphere.
- The other way to make green steel is to scrap the blast furnace altogether and just zap the ore with renewable electricity.

Brad is working to an East Coast deadline for the AFR, so would be great to get this as soon as possible. Please feel free to call me for further clarification 0439 941 [redacted].

Thank you
Ashlee

Ashlee Crabbe

Senior Media and Corporate Affairs Specialist
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

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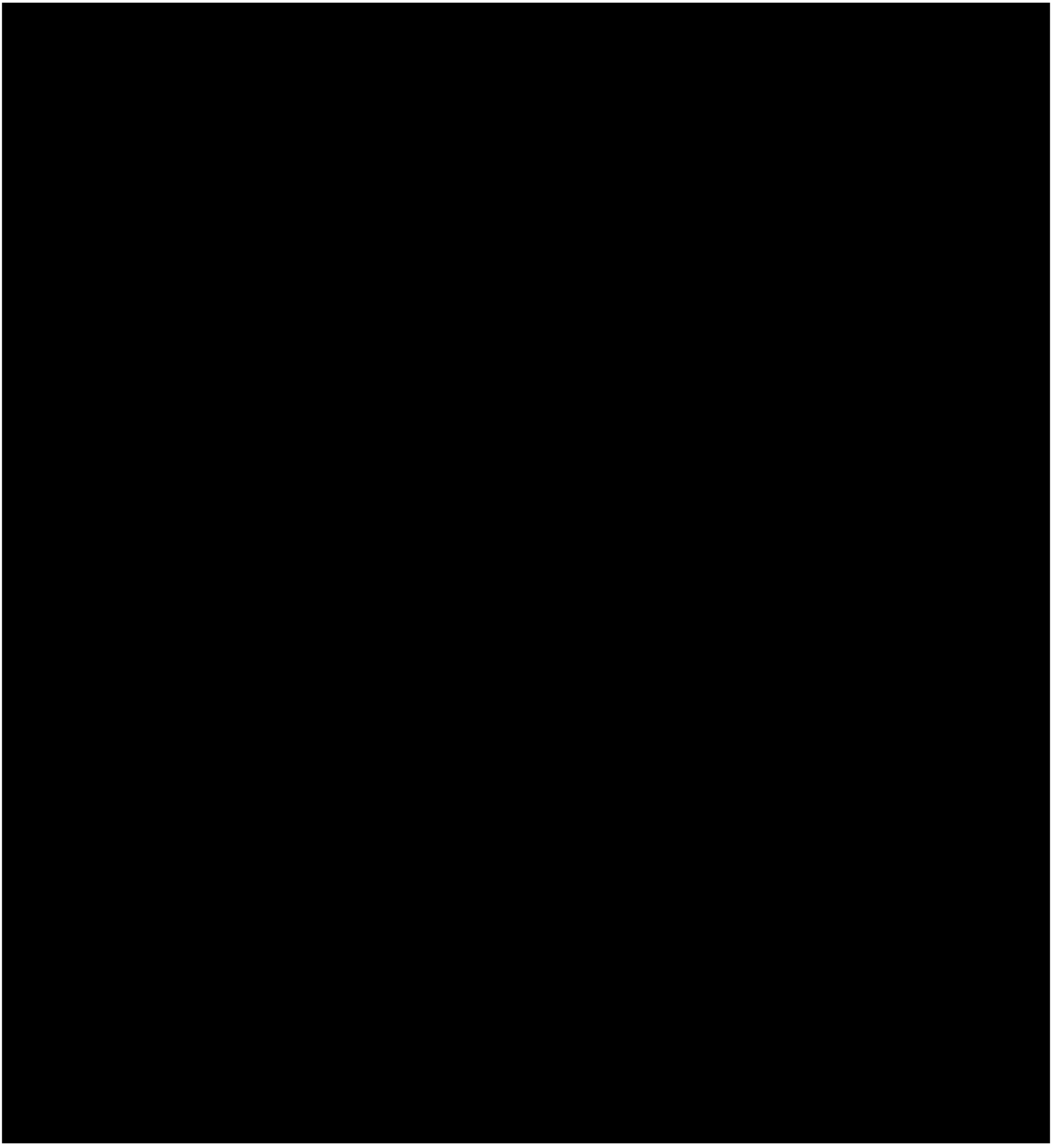
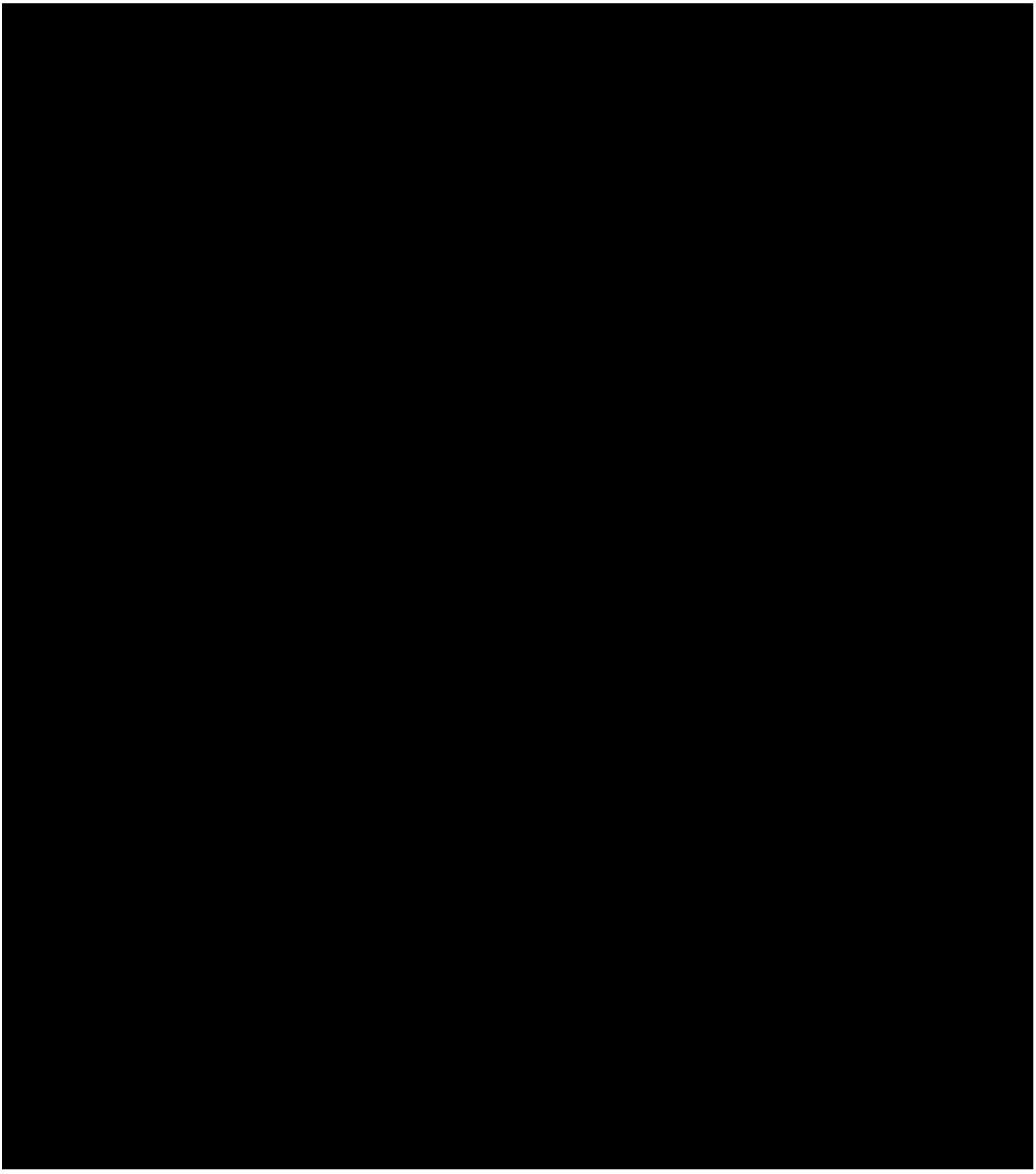
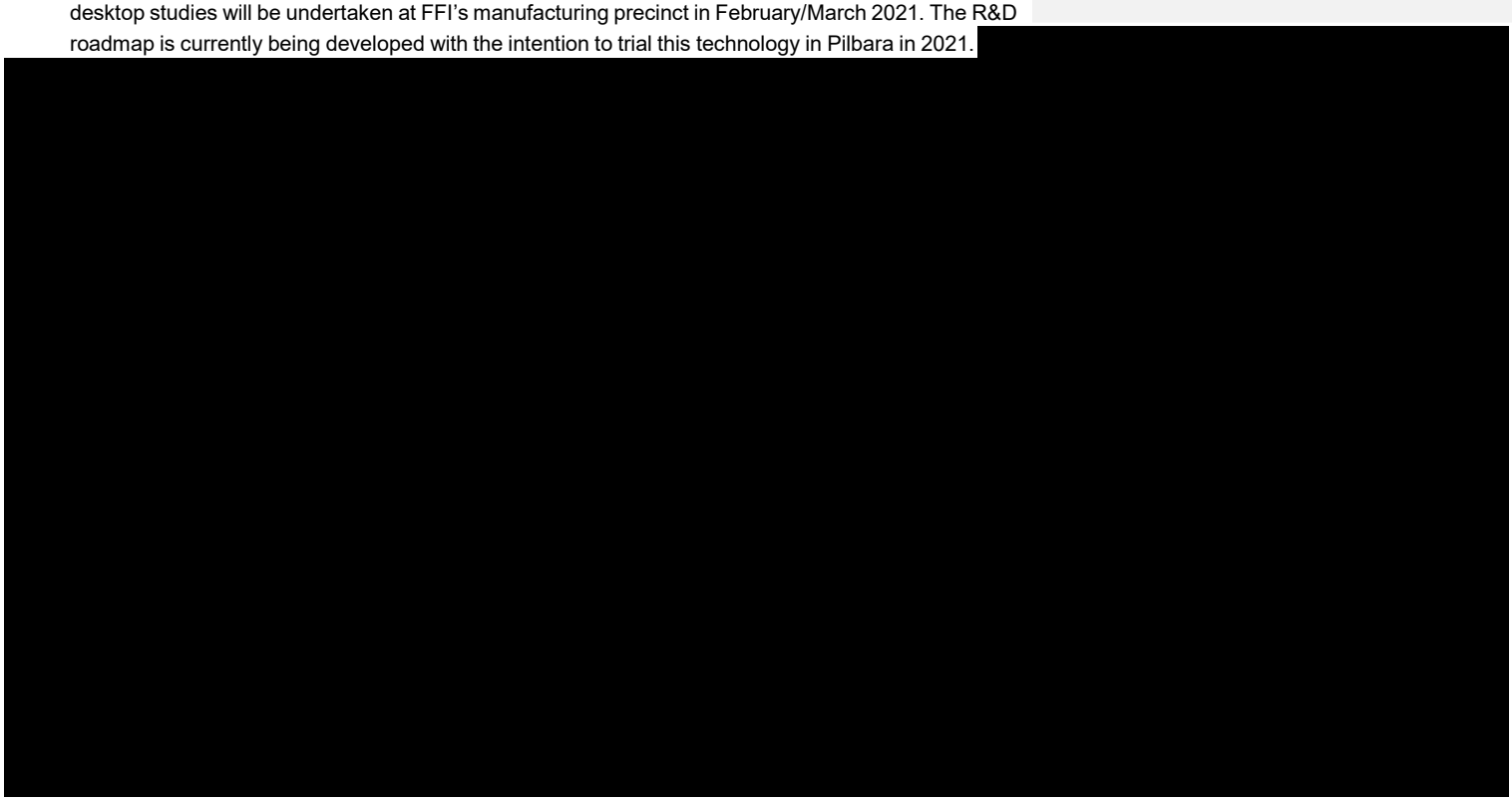
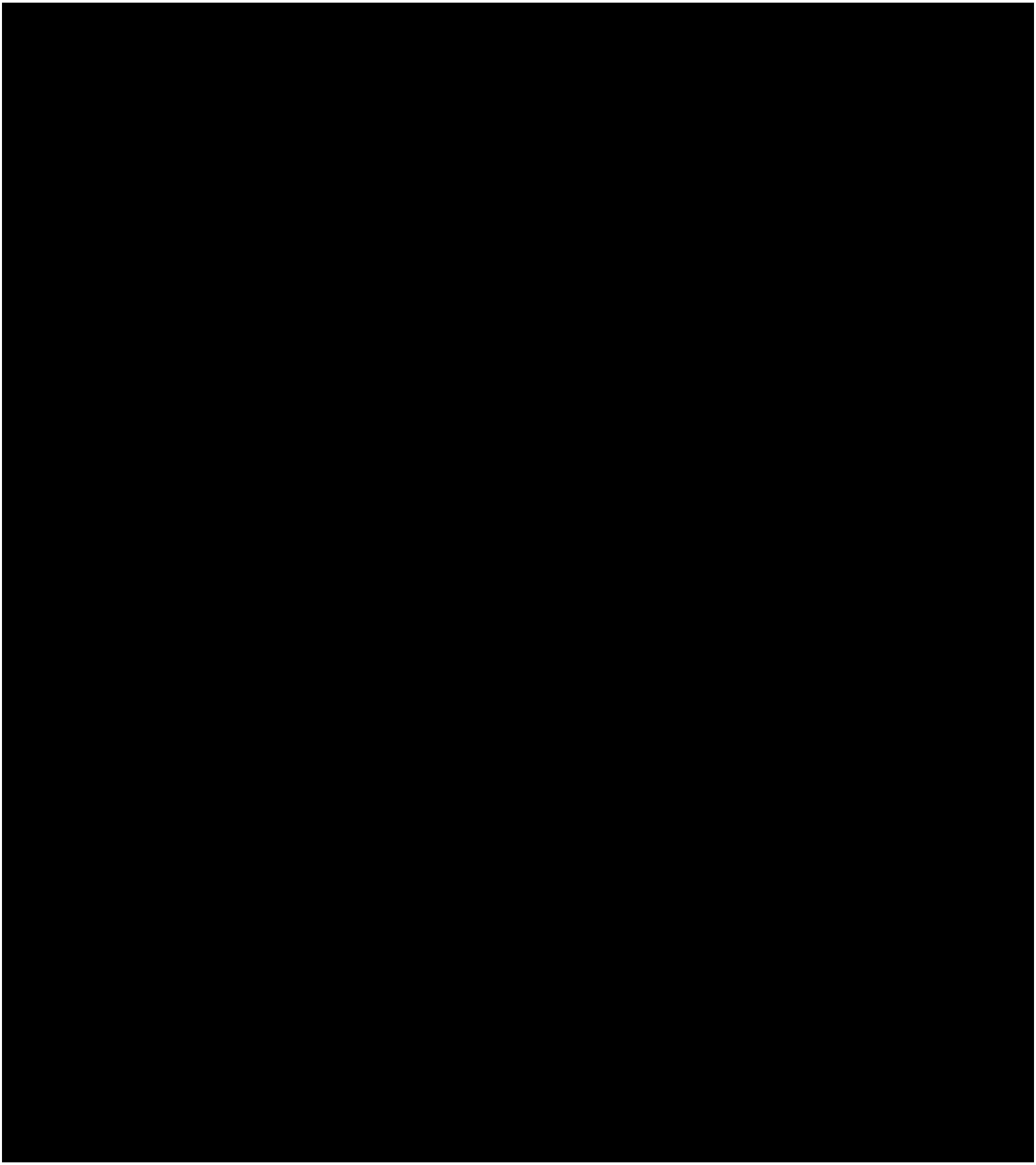




The Fortescue team has done an initial evaluation of various suitable electrolytes. Further laboratory desktop studies will be undertaken at FFI's manufacturing precinct in February/March 2021. The R&D roadmap is currently being developed with the intention to trial this technology in Pilbara in 2021.





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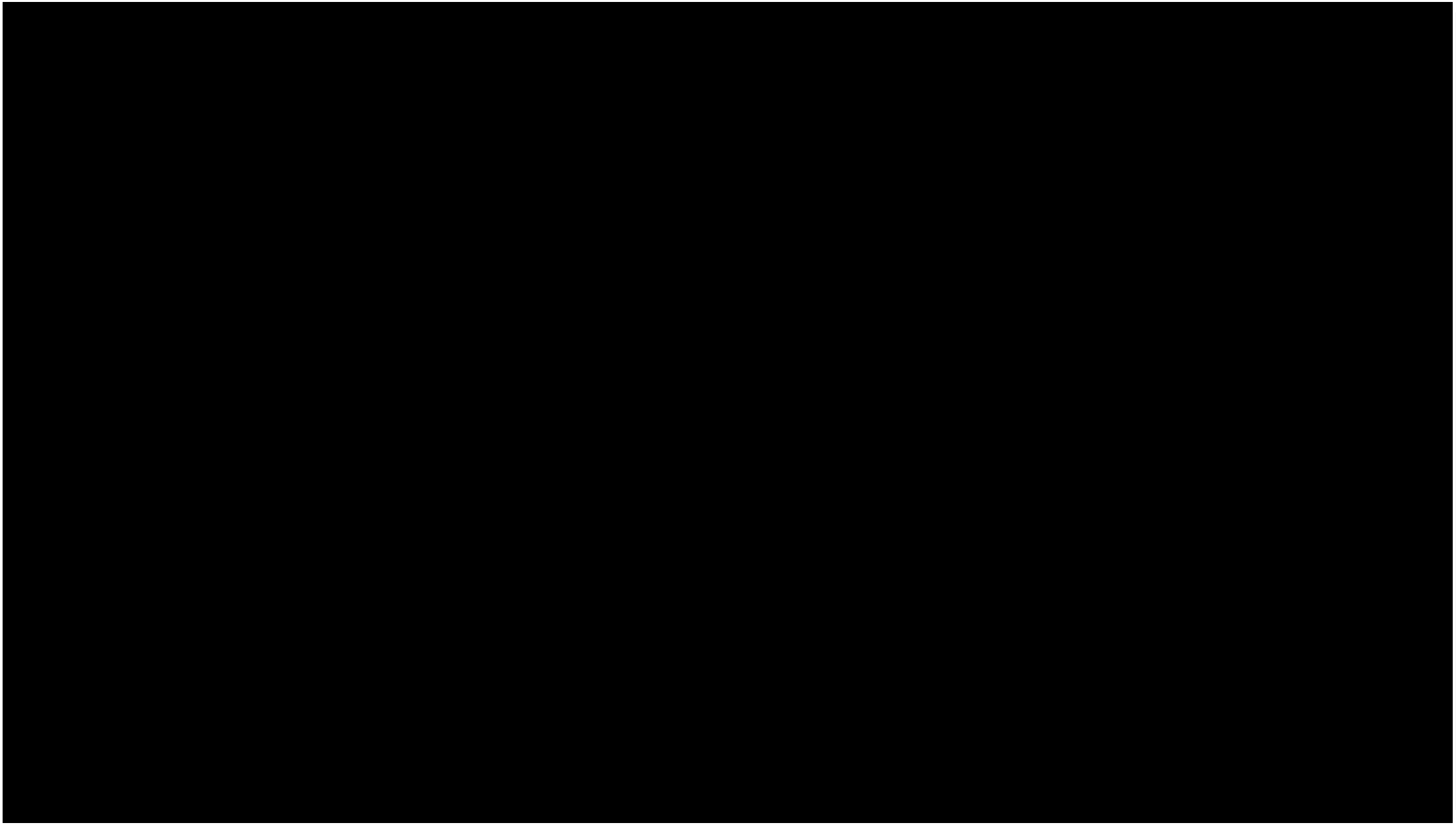

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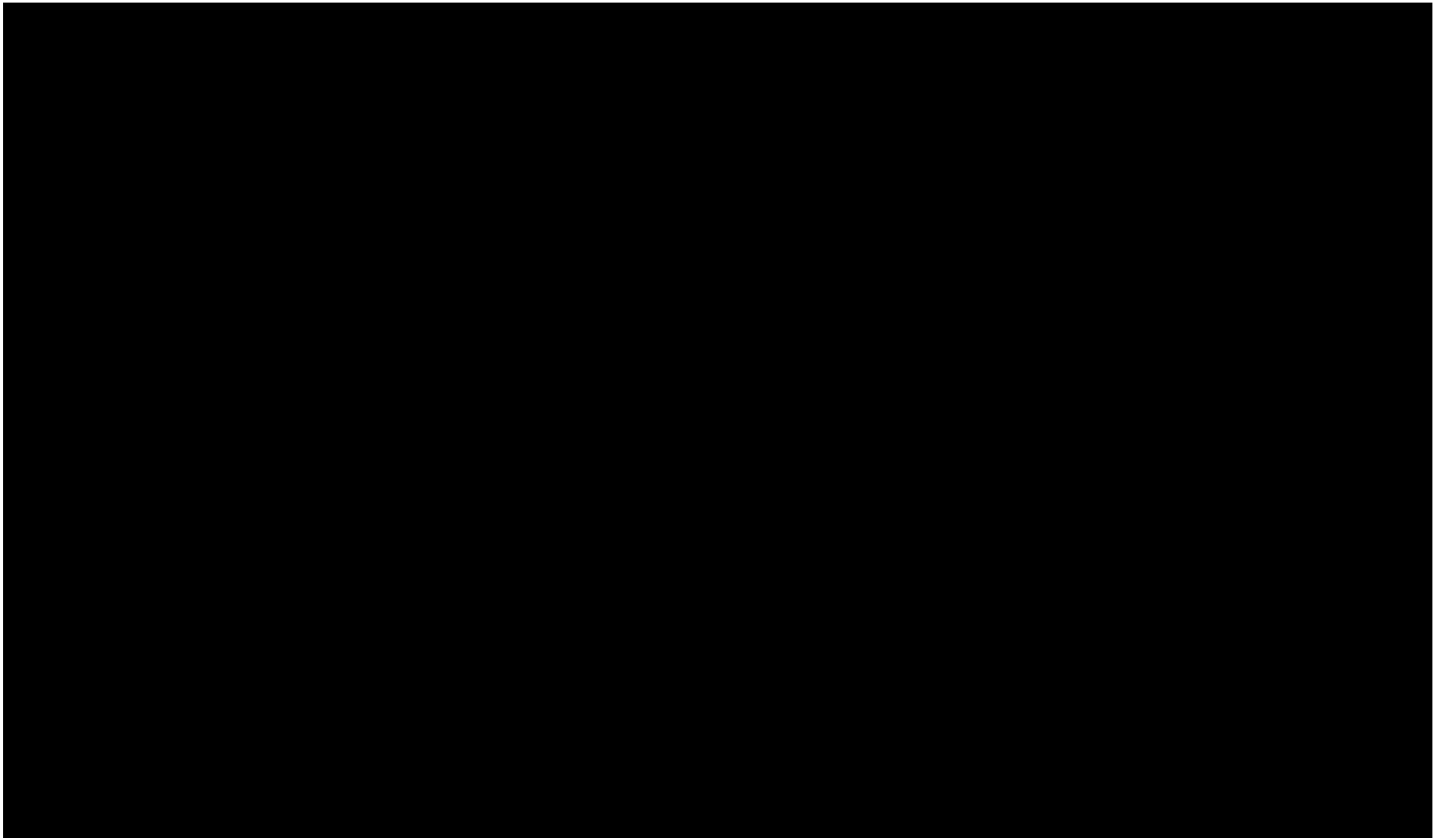

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Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 27 January 2021 5:29 PM
To: bjorn winther-jensen
Subject: RE: Out of quarantine yet ?

Hi Bjorn,

Yes, we've got money for R&D. Additional, [redacted] will go towards scale up and pilot plant.

Yes, I have read many of those NaOH papers. Another option, potentially in the future would be using molten carbonate or ionic liquids.

Do you want to have a call to discuss this, this or next week? It is much easier than emails.

Also apologies for late reply, I am swamped with "urgent" emails.

Talk soon,

Bart Kolodziejcz
Fortescue Metals Group Ltd
Level 2, 87 Adelaide Terrace East Perth WA 6004

Mobile +61 437 947 164 **Web** www.fmgl.com.au
Twitter @FortescueNews I **www.fmgl.com.au**

From: bjorn winther-jensen <bjornwj@gmail.com>
Sent: Sunday, 24 January 2021 5:33 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: Out of quarantine yet ?

Hi Bartek,

Are you guys out of the quarantine ?
(Maybe the real question is if you are back to "normal" work tomorrow ?)

You wrote: "the idea is to ask for [redacted] for green steel R&D and a pilot project in Pilbara". Are there any decisions made for a plan regarding this ?
I understand the need for doing/achieving something fast (pilot project) and on the other hand I see the need for "buying" a fair bit of time for R&D.
So, here is a suggestion (although that I should not involve myself in politics...):
The most obvious possibility, I think, to do something (meaningful) fast is to suggest that the pilot project should be on solid state electrochemical reduction of magnetite from the Iron Bridge site. The product coming out of Iron Bridge is expected to be (in press releases etc.) 67% Fe. When water/moisture is subtracted that means almost pure Fe3O4. In other words, the electrochemical process does not need to include removal of other oxides - and can

therefore be a solid state process. The conductivity of magnetite is relatively high (compared to other iron oxides), which will also be an advantage to a solid state process.
There are numerous reports on performing such solid state electrochemical reduction in concentrated NaOH (which suppress the hydrogen evolution and also means that the same anode material intended for electrolysis can be used here). Potentials below 2V at reasonably high current densities have been achieved at around 100 degC (which suppress/eliminate the crossover reaction from dissolved oxygen).
Getting that going could (maybe) allow some time to find some smarter approaches to tackle hematite - which understandably is the higher aim.
This suggestion clearly needs decisions on the highest level - where understandably, there are other issues to take into account (e.g. that Iron Bridge has minority owners...).

Think about it and maybe we should arrange a call soonish.

Cheers
Bjorn

Susanne Hantos

From: Bart Kolodziejczyk
Sent: Wednesday, 27 January 2021 5:42 PM
To: bjorn winther-jensen
Subject: RE: contract signed...

Hi Bjorn,

We have visited [redacted] roughly two months ago.

[redacted]

I have looked at water, ionic liquids, and molten carbonate.

[redacted]

Suggest any supplier globally, I am having a meeting with our procurement team to prepare them form what is coming and make it clear to them that their traditional procurement approaches won't work.

Bart

From: bjorn winther-jensen <bjornwj@gmail.com>
Sent: Wednesday, 20 January 2021 5:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: Re: contract signed...

Hi Bartek

Thanks for the info and the report.

I can see the industrial appeal in the MOE process, but man, it is not at all "elegant" or even efficient (I even think that the energy efficiency calculation in the report is overestimating the efficiency...).
Unfortunately it looks like they are ahead of any other technology for CO2 free steel.
Is it correctly understood that the molten iron (or other metal) is separated from the electrolyte by "simple" phase separation (helped by gravity) ?
At the current state, do they do batch processing or can they do continuous operation ?

I have been looking at many (MANY) papers and technical reports on dissolving iron ore. (Notably, magnetite seems to be quite easy to dissolve - especially compared to Hematite). All these reports have one thing in common: They intend to dissolve the ore in water.
Have you seen any reports on attempting dissolution in (polar) organic solvents ?
The point is that many iron(II)and iron(III) salts have higher solubility in e.g.alcohols than in water. So it is quite curious that there seems to be no attempts in that direction... (ILs not counting !)

On the lab equipment and chemicals shopping: Does Fortescue have "prefered suppliers" ? Or can I suggest products from any supplier in Australia/Perth ?

Cheers
Bjorn

On Mon, Jan 18, 2021 at 3:17 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> Wow, sounds good. Yes, we will start ordering chemicals as soon as we have the facility.
>
> It is also great that you're making a list of things that we will need. I am working with Emily and our procurement team to simplify and expedite procurement processes to get the necessary equipment asap.
>
> I have attached a report draft from tests on Fortescue ores using Molten Oxide Electrolysis.
>
> [redacted]
>
> We are having a board meeting in February, the idea is to ask for [redacted]. With further funds in "the next grant round" for scale up.

Bart □olod□ie□c□□□

Fortescue Metals Group Ltd

Level 2, 87 Adelaide Terrace East Perth WA □004

Mobile□□□1 437 947 1□4 **Web**□www.fmgl.com.au

Twitter□□ FortescueNews I **www□fmgl□com□au**

From: bjorn winther-jensen <bjornwj@gmail.com>
Sent: Monday, 18 January 2021 3:47 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: Re: contract signed...

I also got the signed NDA back, today.

I have been trying to make "shopping lists" for both lab-equipment and chemicals. So if you need input, please let me know (also before 15th of Feb..,).

Also been looking for possible passes for the ore to iron process. Have got some possible good ideas that will be easy to try out. Am considering doing initial trials while here in Thailand to test viability. I should be able to do it with the gear we have here...

Cheers

Bjorn

On Mon, Jan 18, 2021 at 2:34 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> That's great! I am happy that you didn't have to start as contractor. Enjoy your "holidays" 😊
>
> From: bjorn winther-jensen <bjornwj@gmail.com>
> Sent: Monday, 18 January 2021 3:12 PM
> To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
> Subject: Re: contract signed...
>
> Starting date is 15th of Feb. - there are "things" here that need time to be resolved before I can focus 38 hours a week on FFI work... 😬
>
> I will be employed directly by Fortescue from the 15th of Feb. Having an Australian taxfile number and an Australian bank account apparently solves the issue.
>
> We hope to be able to make the move to Perth in mid-April. FIngers crossed.
>
> Cheers
>
> Bjorn

On Mon, Jan 18, 2021 at 1:58 PM Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au> wrote:

> No worries. Congrats!
>
> When is your start day? Are you going to be initially engaged as a contractor working form Thailand?
>
> From: bjorn winther-jensen <bjornwj@gmail.com>
> Sent: Monday, 18 January 2021 2:55 PM
> To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
> Subject: contract signed...
>
> Hi Bartek,
>
> I got, signed and returned the contract today ! 😎
>
> Thanks for initiating this whole process.
>
> Cheeers
>
> Bjorn

Susanne Hantos

From: Bjorn Winther-jensen
Sent: Tuesday, 23 February 2021 10:51 AM
To: Bart Kolodziejczyk
Subject: Research plan for Green Steel
Attachments: Electrochemical Green Steel.docx

Hi Bartek,

Before I go much further with the time-line for the research activities, personnel etc. , I would kindly ask you to have a look at the attached *draft* research plan (sorry for the repetitive structure of the document…) to see if there are any significant areas that I have overlooked or over/under prioritized.
Also where possible, provide input to perspective collaborative research groups you know of and/or have already been in contact with.

Cheers
Bjorn

Electrochemical Green Steel - Starting from iron ore

General background and considerations

Roadmap and research plan for Electrochemical Green Steel (EC Green Steel)

Generally, the process of converting iron ore to steel contains two tasks:

- To reduce iron oxides to steel
- To remove a sufficient level of impurities/oxides

In traditional industrial practice carbon is employed for the reduction, itself being oxidized to CO_2 in a high-temperature blast furnace process. The removal of impurities – in this case mainly excess carbon as well as silicium- and metal oxides from the ore are removed in a subsequent high-temperature process through the formation of slag.

The obvious drive for developing an alternative reduction process is to stop the CO_2 release. However, a new route must also be able to manage the removal of impurities to an appropriate level, such that the resulting Green Steel products are optimized to suit the subsequent steel-making process overseas.

As such three major theoretical routes can be outlined:

Molten Iron Route.

- From dissolved ore at high-temperature, purification through phase separation of molten iron form the electrolyte ([redacted] type)

Dissolved Iron Route.

- Dissolution of ore in chelating or coordinating electrolytes, purification through non-solution of impurities. Followed by electrochemical (EC) reduction

Solid-state Route.

- Through solid-state electrochemistry, purification of ore prior to or after electrochemical operation

For all scenarios, the counter electrode (anode) process is oxygen evolution

Main details, requirements and limitations for these possibilities are listed below.

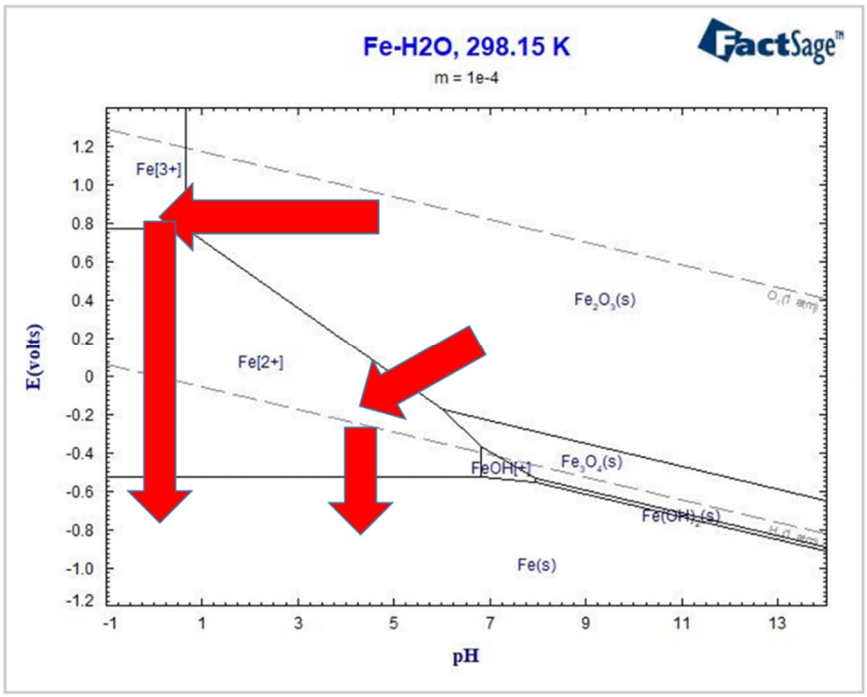
Molten Iron Route.
From dissolved/melted ore at high temperature above the melting temperature of (carbon-free) iron, i.e. in the 1500°C range.

- Electrolyte. molten oxides ([redacted] model), other possibilities may include carbonates or molten salts
- Current ore qualities can be used directly. However, water and other volatiles have to be removed in a pre-melting step (presumably to avoid steam explosions in the electrolyte !)

- Not very compatible with intermittent power supply from solar and wind.
- Expected Power Efficiencies in the 20 – 30% range
- Apparent long development time-line
- The iron is separated from the electrolyte in the molten state by gravity assisted phase separation. Impurities (SiO_2 and metal oxides) thus remain in the electrolyte => electrolyte "cleaning" needed

Dissolved Iron Route(s)
Dissolution of ore in chelating or coordinating electrolytes, purification through non-solution of impurities

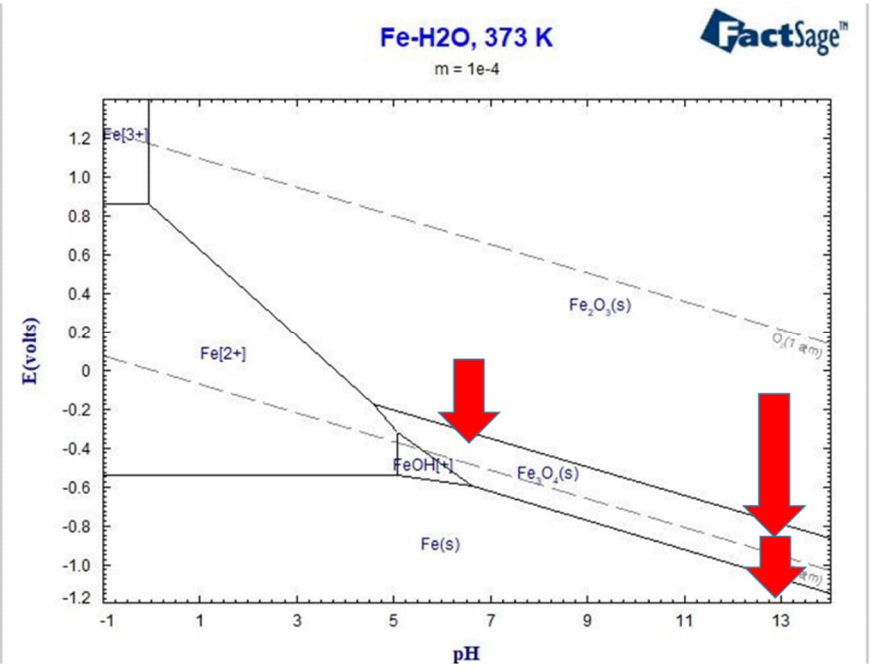
- Dissolution of hematite is generally very slow
- The chelating/coordination is increasing the potential required for iron deposition
- The chelating/coordination is allowing a wider range of pH and solvents.
- Expected Power Efficiencies in the 30 – 60 % range
- Deposition is limited by the concentration of iron in solution – which may be low in these systems
- Impurities remain in the electrolyte => electrolyte "cleaning" needed
- Significant research has been conducted but without any clear "winner" technology.
- New possibilities may emerge from "medium" temerature options using ionic liquids, molten salts or molten carbonates (300 – 800°C)
- Apparent long development time-line
- Dissolution of magnetite is significantly easier that hematite. However, it seems a detour when solid-state reduction of magenetite concentrate could give a Green Steel product directly



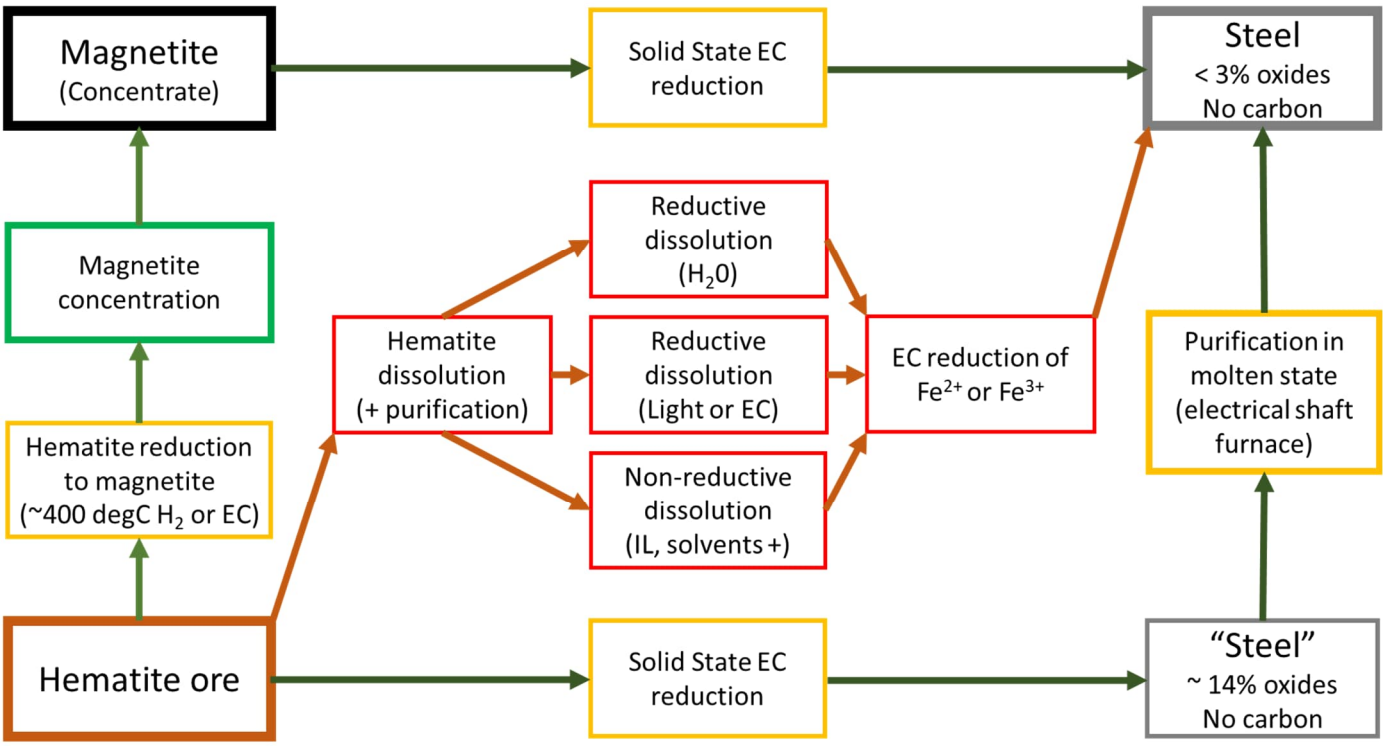
Solid-state Route(s)

The electrochemistry is resempling the “Edison cell” in charging mode where magnetite is reduced to metalic iron through a $Fe(OH)_2$ intermidiate. At temperature above ~85°C, the $Fe(OH)_2$ intemediate becomes thermodynamically unstabel and the conversion from magnetite to iron can proceed directly and significanltly faster.

- Impurities are not removed trough the process => requires pure enough ore concentrates to produce a meaningful product or a post-reduction process e.g. in molten state for slag formation
- Cheap electrolyte (high pH NaOH or KOH solutions)
- Impurities are not deposited in the electrolyte => longer electrolyte lifetime
- Expected Power Efficiencies in the > 60 % range
- High deposition rates at temperature above 85 °C
- Apparent short development time-line
- Magnetite Concentrate could be a starting material, producing a pig iron quality product (without carbon)
- Large scale conversion of hematite to magnetite has been reported with hydrogen as reductant in fluidbed setups
- Direct solid-state reduction of hematite is possible. However, resulting in a “steel” product with ~ 14% oxides (based on existing ore qualities from FMG)



Flow diagram for dissolved iron (red) and solid-state (green) routes of iron ore reduction



Green frame indicates well-known, unscaled process. Yellow frame indicates well-documented research at (at least) pilot-scale level. Red frame indicates solely research level.

Alignment

In order to make a meaningful R&D planning, communication with other parts of FMG should be established to ensure that the products R&D are aiming for are aligned with "the market" and that there are agreements in place to "allow" the use of different ore types. i.e. can we suggest to firstly aim for magnetite concentrate conversion and later move to hematite ?

Below some of the questions regarding the requirements to Green Steel products out of Port Headland – to qualify to be a "product". => Anticipating the product is a type of "raw" or intermediate material in the steel production process

- Maximum level of impurities (oxides; SiO_2, Al_2O_3 etc.)
  - Is steel with 14% oxides a product ?
  - How will price be related to the level of impurities –> what impurity level is it worth aiming for ?
- Porosity / Bulk density
- Preferred physical form (bars, "pigs", rolls, plates etc.)
- Estimate for max. production cost to be profitable

Preferred scenario from a R&D viewpoint

- *Priority*. Reduction of magnetite concentrate

  To get prototype and pilot facility established based on solid-state reduction of magnetite concentrate to steel, where no further purification is needed to meet specs within “product range”.

  - Justification.
    - The fundamentals of this process are known and tested
    - I see this as the most viable and economic (i.e. high volume) route to obtain a commercial Green Steel product on a short timescale.
    - Magnetite (concentrate) as starting material is preferred due to purity and electrical conductivity
    - It will give valuable knowhow also for possible solid-state reduction of hematite
    - It will broaden the possibilities for reduction of hematite. i.e. the hematite reduction may be carried out in two steps. Firstly, to magnetite, where concentration can proceed with known technology, secondly from magnetite to steel through the solid-state process.

- *Parallel research* with longer lead-time, maybe to be pursued in collaboration with universities and/or research institutions.

1. Dissolution of hematite. The reaction rate is a main and general issue for both the dissolution and the deposition step.
   a. Reductive dissolution (chelating with use of solvents)
   b. Chelating (non-reductive) dissolution of hematite
   c. Light induced/assisted dissolution of hematite
      - These three routes have all been reported previously without any serious scale-up. However, all with either low rates, low end-concentration and/or with unknown possibilities for recycling the media.
      - A method for electrodeposition of iron will depend on the “liquid” used for the dissolution. i.e. starting electrodeposition studies without having a dissolution route is therefore meaningless. The dissolution process must produce significant iron concentrations to allow appreciable deposition rates of metallic iron.
      - Shifting to “medium-high” temperatures (300-850°C) with molten salt or molten carbonate electrolytes could help the rate issues, but it is quite early days.

2. Reduction of hematite to magnetite.
   a. By hydrogen reduction of hematite (e.g. in a fluid bed setup at ~300 - 450 degC). This is well-documented and at least pilot-scale has been demonstrated

b. Reduction of hematite, using metallic iron as reducing agent.

3. On-shore post-purification of “raw” Green Steel to export quality Green Steel.

Priority. Reduction of magnetite concentrate through a solid state process

A 67% Fe magnetite concentrate should produce a ~ 92.5% Fe Green Steel (without including the calculation of the removal of water/moisture, which would indeed be removed in the process – am awaiting a more detailed composition of the magnetite concentrate(s) existing and expected). This is approximately the iron content in pig iron.

The solid-state reduction of magnetite is less researched than that of hematite (except for the Edison cell !). The high(er) conductivity of magnetite should help limiting the ohmic loss in the process.

[redacted]

Research topics

a) *Testing the reduction on relevant, available magnetite ore concentrates.* Most reports have been using synthetic magnetite (or synthetic hematite) so adjusting to large-scale reality is needed.
b) *Optimization of electrolyte.* Traditional [redacted] NaOH electrolytes have been used with success. The NaOH electrolytes have high conductivity and low water activity, which is needed to suppress hydrogen evolution. However, there is merit in revisiting the electrolyte composition. During the reduction process, the released oxygen ions are reacting with water (not OH^-) and thus a lower pH could be an advantage. The very high pH is in principal not helping the reaction to “escape” the hydrogen evolution potential (see Pourbaix diagram at 100°C above) and low water activity could alternatively be obtained by adding significant amounts of [redacted] (It is acknowledged that high pH is an advantage to the oxygen evolution reaction on the anode).
c) *Securing 100% conversion of ore.* Particle size and distribution, reactor layout and dimensions, operational parameters (voltage and current density), The possibility of multiple reduction steps (by changing the operational parameters) as well as the dimensions of the magnetite layer, all have to be optimized.

[redacted]

g) *Reactor design for upscaling, eventually continuous operation*.
   - Operating at 90°C or higher ([redacted]). Possible “co-heating” through pre-heating (drying of raw magnetite concentrate is needed to control the

electrolyte composition in a more continuous operation) of the magnetite concentrate by microwave or inductive heating.

- Efficient removal of produced oxygen from the anode and reactor closed to atmospheric oxygen to avoid oxygen reduction as cross reaction.

Parallel research with longer lead-time.

1. Dissolution of hematite.
   We don't have a clear direction here. There is surely no apparent method that can provide appreciable dissolution rates. Pure aqueous systems are, in my opinion, not worth revisiting.

Research topics

c) Molten salts, Molten carbonates. Iron dissolution and deposition has been reported from these medium-high temperature electrolytes. E.g. from $CaCl_2$-KF @ 825°C. My suggestion would be to seek "proof of concept" projects (with clear scale-up passes) with relevant groups experienced in these systems, before setting up facilities in Perth. One such collaborator could be Professor Geir Martin Haarberg, Department of Materials Science and Engineering, Faculty of Natural Sciences, NTNU in Norway, geir.martin.haarberg@ntnu.no, +47 73594036. His group has been working on both molten salt and molten carbonate systems for various metals.

d) Ionic Liquids. Here I suggest to search for systems/research groups that have shown reasonable dissolution rates of iron ore (hematite). I have not found any convincing reports

yet (!). If there is indeed merit for dissolution in the temperature range below 300°C, then we should pursue collaborative research projects until scaling has been verified.

2. Reduction of hematite to magnetite.

Research topics

a) Reduction of hematite to magnetite is a well-documented field using either hydrogen, carbon (CO) or siderite (CO) as reducing agents. Pursuing one of these routes should not require further research on the R&D level but be on pilot plant level in collaboration with a fluid-bed-equipment manufacture.

3. On-shore post-purification of "raw" Green Steel to export quality Green Steel.
Many in FMG and elsewhere will know much more about the possibilities and ultimately this topic may be well outside the R&D facility's business.

Research topics

a) Using traditional high-temperature, molten iron processes for the removal of SiO_2 and metal oxides. E.g. Open-hearth process, Bessemer converter or Electric shaft furnace.
Several patents have been filed in the area, e.g. US2693411A - Method of purifying molten pig iron, and EP2530171A1 - Method for removing impurities in molten cast iron.

Susanne Hantos

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 3:02 PM
To: Bart Kolodziejczyk
Subject: Iron Ore samples

Hi Bartek,

The outcome of my last two hours considerations, given the current situation/state of facilities etc., etc.:
I cannot commit to produce any meaningful “something” (understood as solid iron samples made by electrochemical reduction of FMG iron ore) by the end of June 2021.
I don’t mind challenges but this is out of proportion.

I guess the fastest way to “something” is by reduction of hematite with hydrogen at high temperature (700 – 900 degC) followed by removal of oxides in the molten state (1500 degC). These processes are well outside my expertize and a more appropriate person should be appointed for pursuing such path.

Cheers
Bjorn

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 1:08 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bartek,

Better be today after 5pm (which is only 4pm here, I presume)

B

From: Bart Kolodziejczyk
Sent: Wednesday, 24 February 2021 1:03 PM
To: Bjorn Winther-jensen <bjorn.wintherjensen@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bjorn, can do only after 5 pm, or tomorrow.

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 1:57 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bartek,

When would you have time to talk ?

Cheers
Bjorn

From: Bart Kolodziejczyk
Sent: Wednesday, 24 February 2021 12:41 PM
To: Bjorn Winther-jensen <bjorn.wintherjensen@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bjorn,

Yes, I talked to Deputy Vice-Chancellor of UWA. We'll get overarching R&D agreement this or early next week. You will be able to use any equipment at UWA.

Bart

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 11:25 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bartek,

I see…

In that case I guess that we cannot wait for our own lab to be up running.
Somehow we have to get started in somebody's else lab. Hmmm

Bjorn

From: Bart Kolodziejczyk
Sent: Wednesday, 24 February 2021 10:07 AM
To: Bjorn Winther-jensen <bjorn.wintherjensen@fmgl.com.au>
Subject: RE: Iron Ore samples

Sounds good. We had this Think Tank last two days, I was just told that we need to have something to show by June 30, 2021. The pressure is not only on us, but also others to decarbonise FMG operations.

On a positive note, Malcolm Turnbull was appointed FFI Australia Chairman.

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 11:02 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bartek,

Am aware of the issues at Iron Bridge and that material may not be available on the short term. However, there must be data available e.g. from the pilot project at iron bridge and I would like to be able to at least consider the possibilities of using magnetite.

Cheers
Bjorn

From: Bart Kolodziejczyk
Sent: Wednesday, 24 February 2021 9:54 AM
To: Bjorn Winther-jensen <bjorn.wintherjensen@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bjorn,

I am not sure if you get any magnetite at this point.

Iron Bridge has been suspended last week due to cost blow out. Magnetite projects have been highly unsuccessful globally.

[redacted]

Bart

From: Bjorn Winther-jensen
Sent: Wednesday, 24 February 2021 10:51 AM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Uu Vuu <tvuu@fmgl.com.au>; Simon Campbell-Hardwick <scampbellhardwick@fmgl.com.au>; Christopher Counsell <ccounsell@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>
Subject: RE: Iron Ore samples

Dear all,

- Thanks Bart for getting me in the loop.

I am currently investigating the overall possibilities for Green Steel processes. As help to evaluate these possibilities I need input regarding the composition and particle size of the available and “possible” ore qualities.
For the hematite ores, I already have sufficient data.
For the magnetite concentrate(s), data for “typical” composition and particle size distribution would be very helpful.
I presume that these data already exist and can be made available to me.

Kind regards
Bjorn WJ

From: Bart Kolodziejczyk
Sent: Wednesday, 24 February 2021 8:42 AM
To: Uu Vuu <tvuu@fmgl.com.au>; Simon Campbell-Hardwick <scampbellhardwick@fmgl.com.au>; Christopher Counsell <ccounsell@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>; Bjorn Winther-jensen <bjorn.wintherjensen@fmgl.com.au>
Subject: RE: Iron Ore samples

Thank you, Tuu.

I have CC’ed Bjorn who also had questions regarding particle size and distribution would be helpful.

Bjorn is leading R&D on our green steel effort.

Thank you,
Bart

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Friday, 19 February 2021 11:33 AM
To: Simon Campbell-Hardwick <scampbellhardwick@fmgl.com.au>; Christopher Counsell <ccounsell@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Simon and Ben,

Thank you for your package. We have received it just now.

Can you please tell us more about the composition of this sample, if that information is available?

Thank you and have a great weekend,
Bart

From: Simon Campbell-Hardwick
Sent: Tuesday, 16 February 2021 4:56 PM
To: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>; Christopher Counsell <ccounsell@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Bart,

Nice to e-meet you too. Ben will be sending it to you via Express Post. It should arrive by the end of this week.

Cheers,
Simon

From: Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Sent: Tuesday, 16 February 2021 3:11 PM
To: Simon Campbell-Hardwick <scampbellhardwick@fmgl.com.au>; Christopher Counsell <ccounsell@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>
Subject: RE: Iron Ore samples

Hi Simon,

Nice e-meeting you.

That's a great news. Can we get it all sent to Level 2, 6-8 Bennett Street, East Perth?

Thank you,
Bart

From: Simon Campbell-Hardwick
Sent: Tuesday, 16 February 2021 1:56 PM
To: Christopher Counsell <ccounsell@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>; Benjamin Brun <bbrun@fmgl.com.au>; !RS-QA <RS-QA@fmgl.com.au>
Subject: RE: Iron Ore samples

G'day Chris,

It looks like there is a 5kg duplicate of the WP (NJ1677).

Where would you like it sent?

Cheers,
Simmo

From: Christopher Counsell <ccounsell@fmgl.com.au>
Sent: Tuesday, 16 February 2021 12:40 PM
To: Simon Campbell-Hardwick <scampbellhardwick@fmgl.com.au>; Bart Kolodziejczyk <bkolodziejcz@fmgl.com.au>
Cc: Aaron Szumilak <aszumilak@fmgl.com.au>
Subject: Iron Ore samples

Gday Simmo

Bart is after 1kg sample of Iron ore for Electrolysis test work. Have we still got splits from the [redacted] test work? If so can we get a 1kg split of the WPF sample please?

Cheer

Chris