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و المعرض الدولي للحديد و الصلب

17th Arab Steel Summit
and International Iron and Steel Exhibition

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Iron Ore Supply for Direct Reduction: Outlook and Challenges

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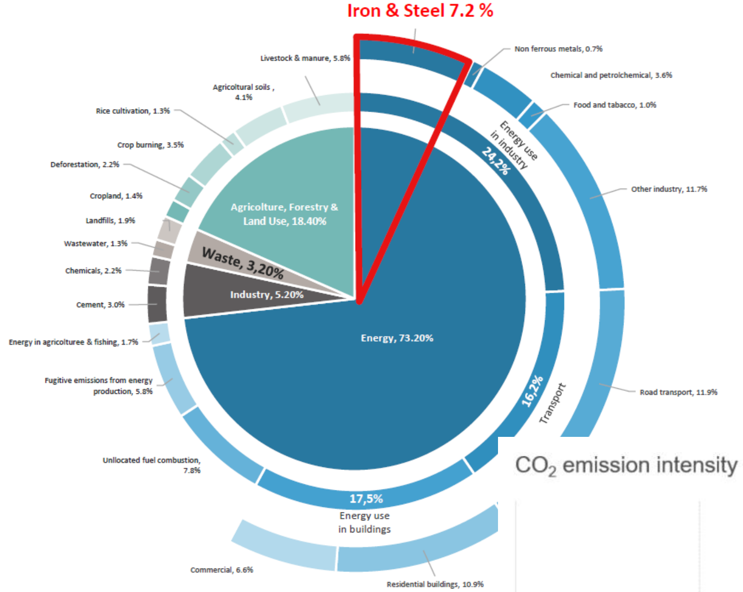
Presentation Overview

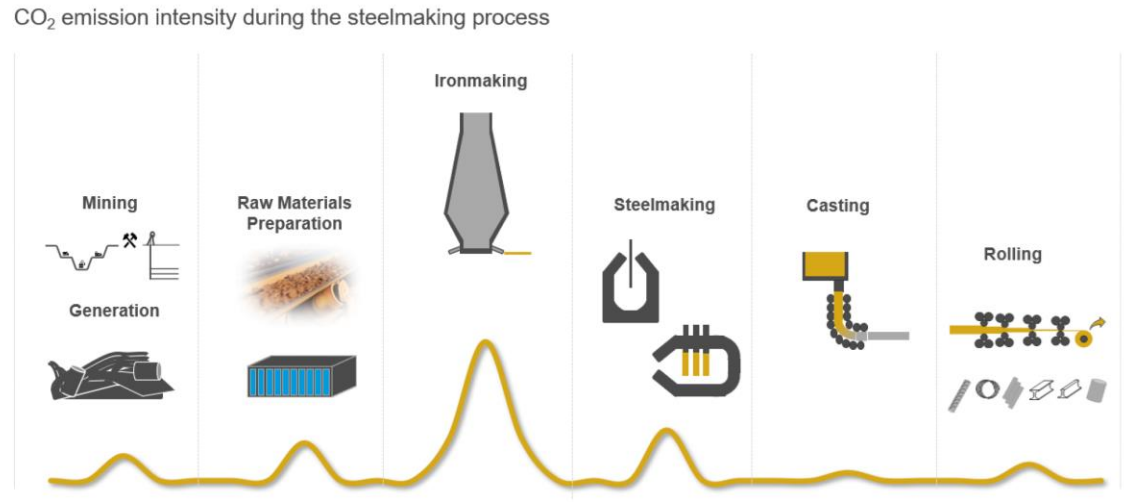
- Introduction and the opportunity for DRI
- The iron ore challenge
- DR grade pellets –supply demand balance
- Responses to the iron ore challenge

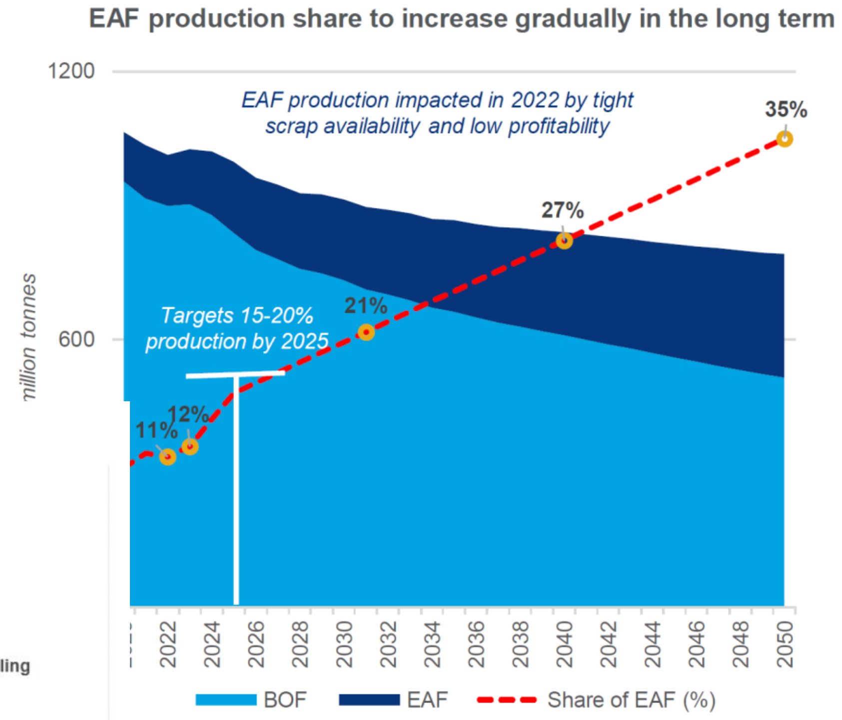
DRI Based Carbon Neutral Steelmaking



Source: Danieli presentation, Estad 2023

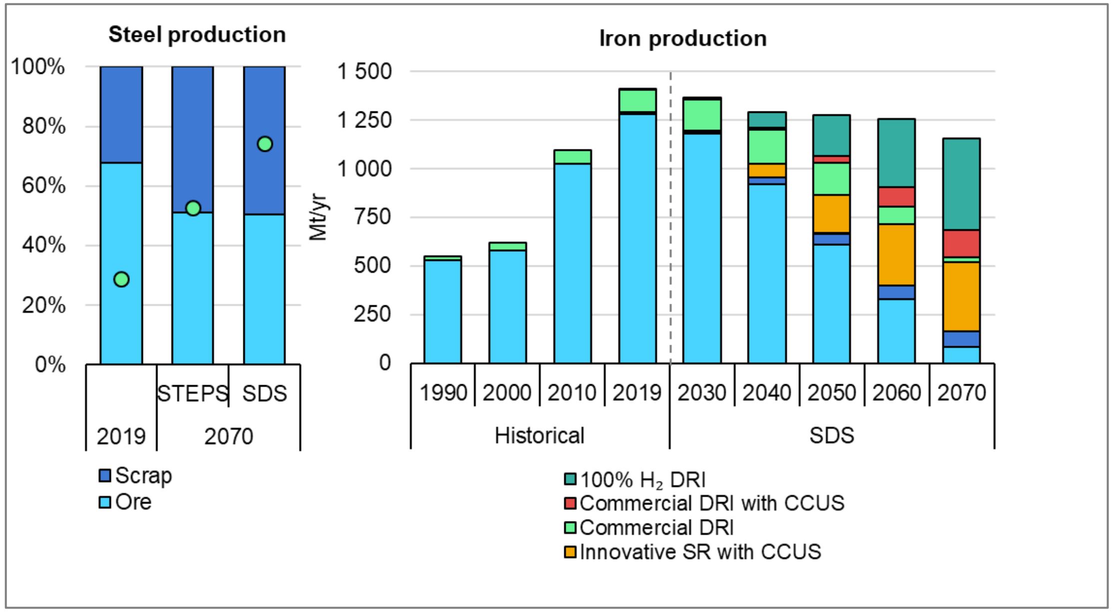
Pivotal point



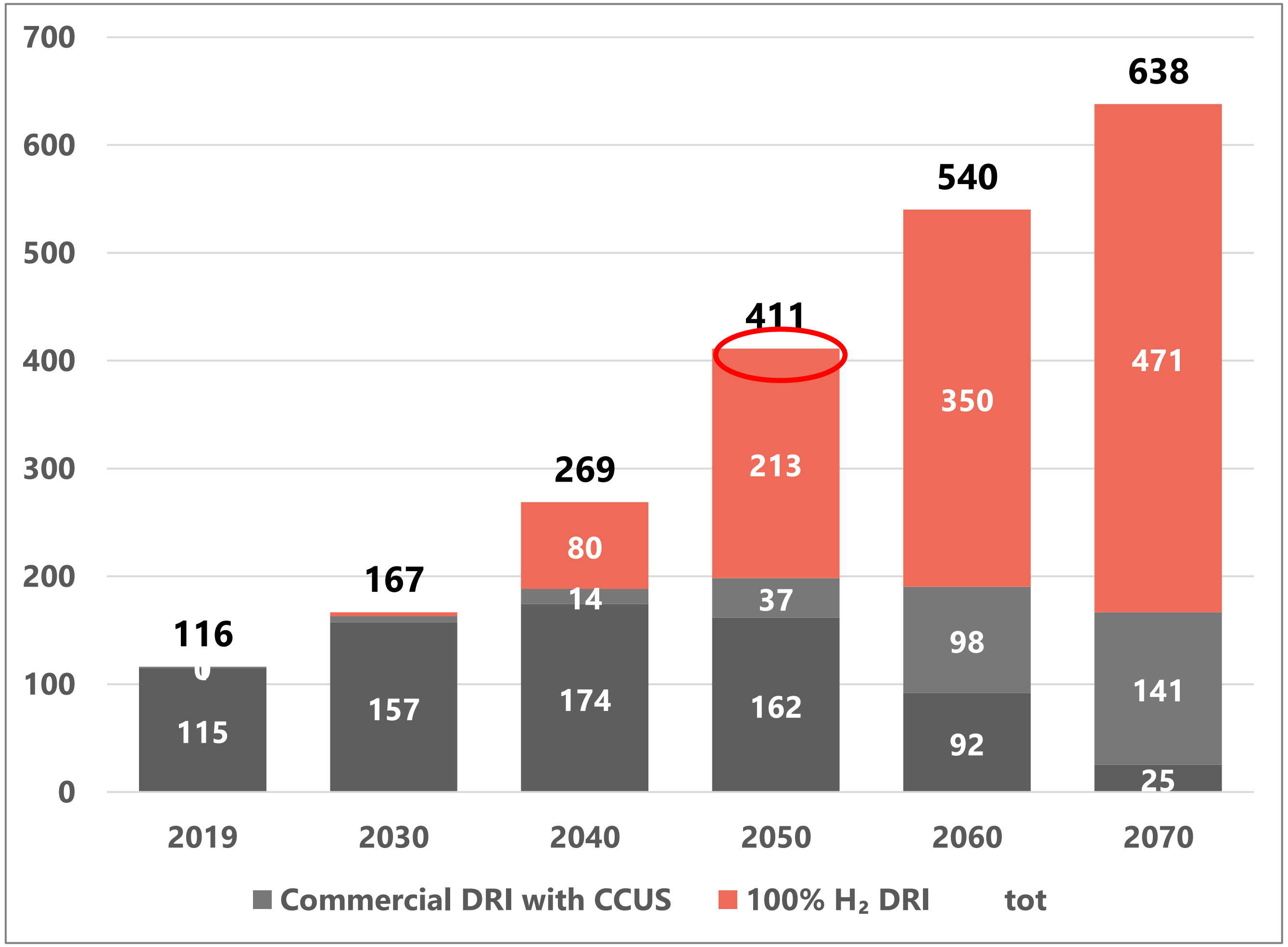


Source: CRU

Background and context

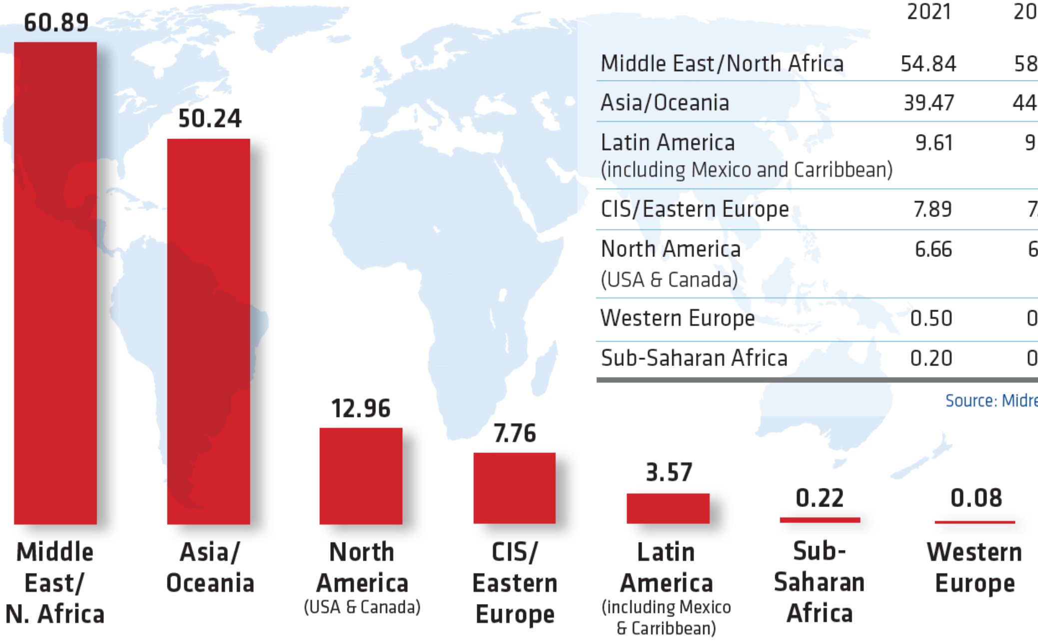


Source: International Energy Agency: Energy Technology Perspectives 2020
SDS = Sustainable Development Scenario
STEPS = Stated Policies Scenario



Production Trends

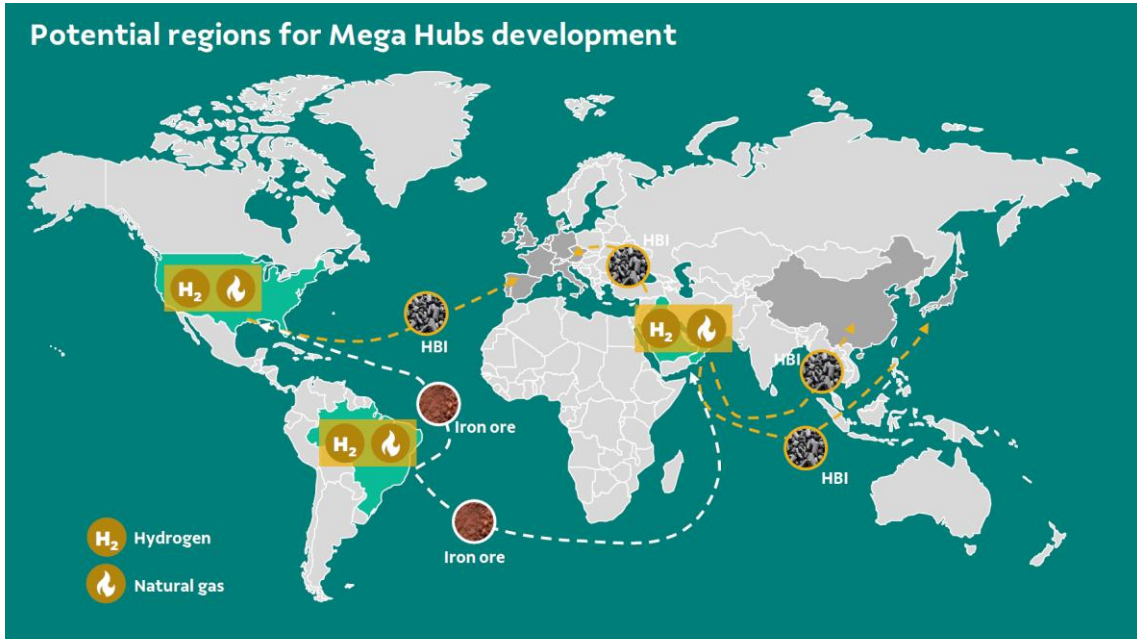
2023 World DRI Production by Region (Mt)



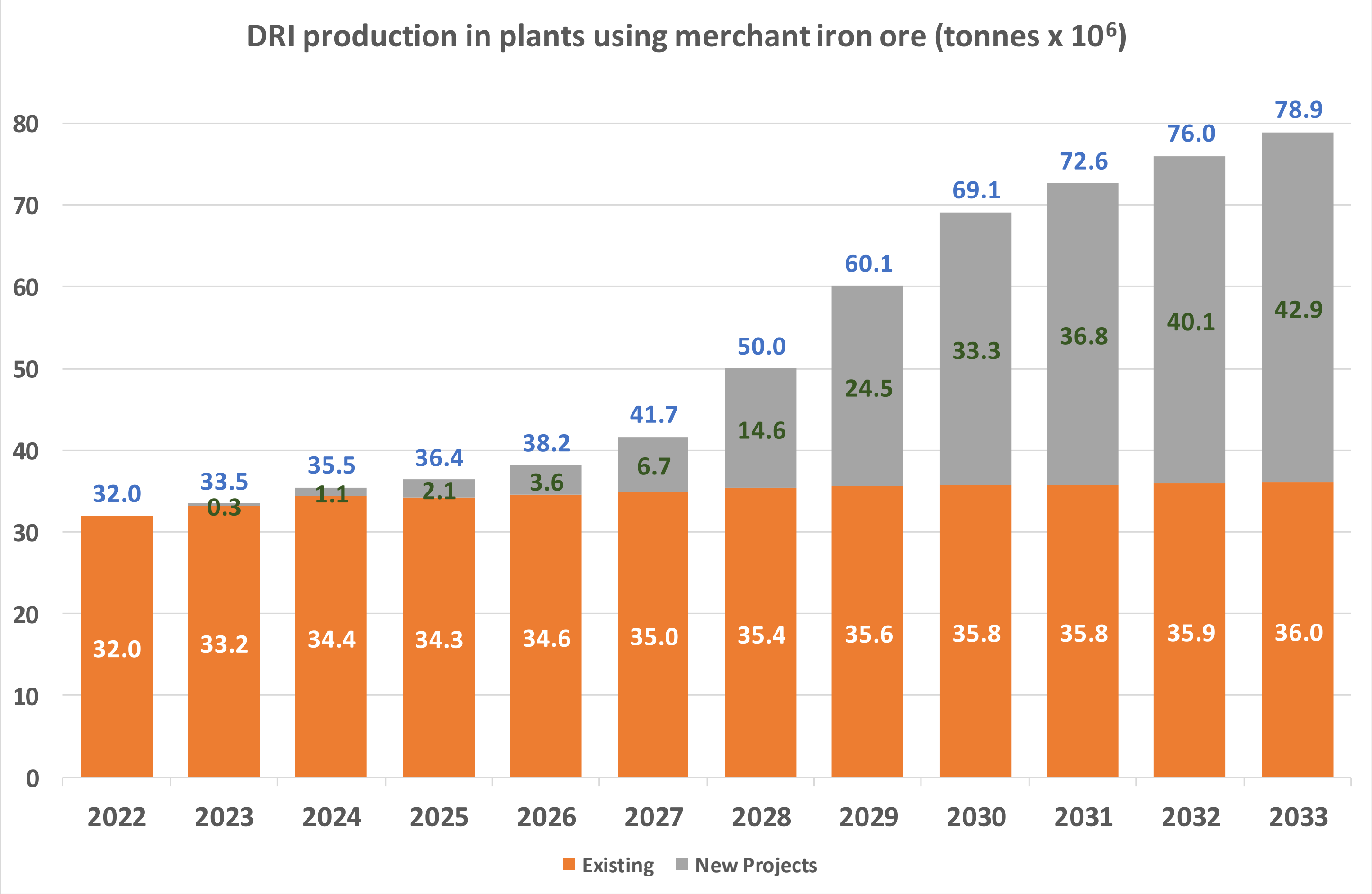
	2021	2022	2023
Middle East/North Africa	54.84	58.48	60.89
Asia/Oceania	39.47	44.33	50.24
Latin America (including Mexico and Carribbean)	9.61	9.79	3.57
CIS/Eastern Europe	7.89	7.66	7.76
North America (USA & Canada)	6.66	6.76	12.96
Western Europe	0.50	0.15	0.08
Sub-Saharan Africa	0.20	0.19	0.22

Source: Midrex Technologies, Inc.

Source: Midrex



10 year DRI production scenario (merchant iron ore-based)



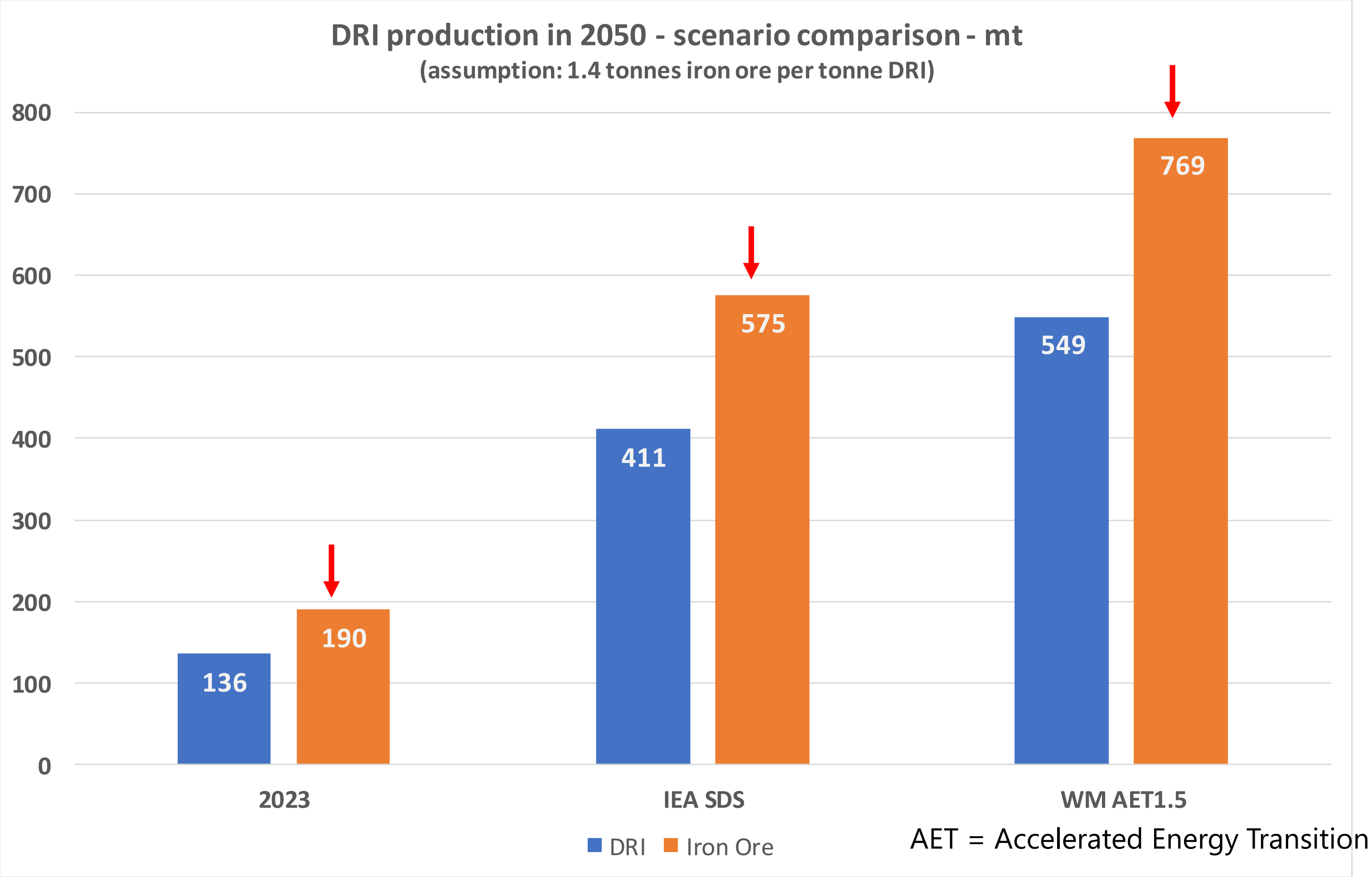
Countries with existing DR plants using merchant pellets:
Argentina, Trinidad, USA, Germany, Algeria, Libya, Egypt, Saudi Arabia, Qatar, UAE, Oman, Malaysia + Bahrain which uses pellets based on purchased pellet feed

New DR projects based on merchant iron ore

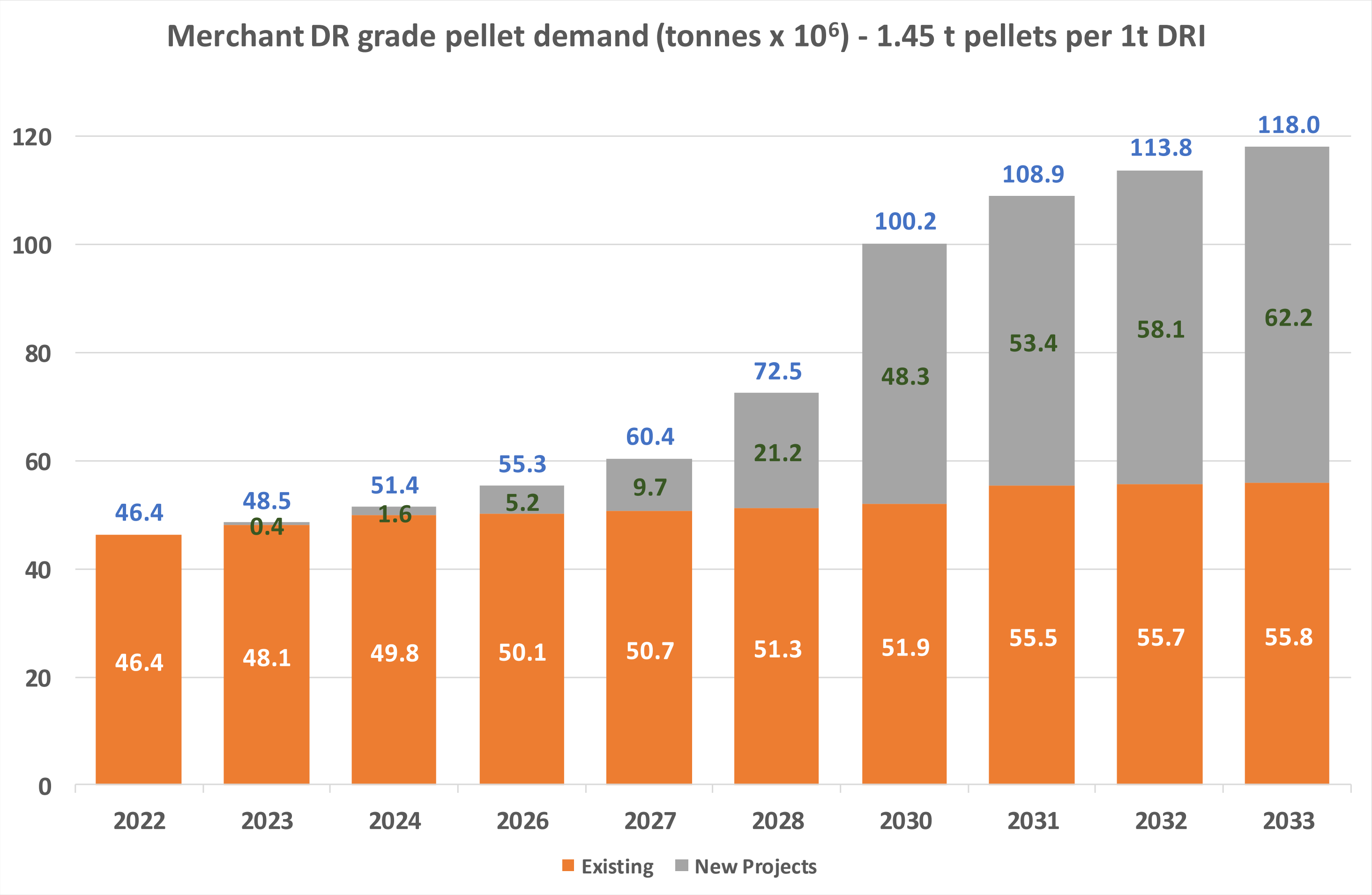
New DR plants		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
HBIS		0.3	0.6	0.6	0.6	0.6	0.9	1.2	1.2	1.2	1.2	1.2
Baosteel Zhangjiang			0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Stegra Sweden				0.5	1.5	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Salzgitter phases 1 & 2						0.5	1.5	2.1	2.1	2.1	2.6	3.2
TKS phases 1 & 2							0.5	1.5	2.5	2.5	2.5	3.0
AM Gijon								0.5	1.5	2.0	2.3	2.3
AM Bremen									0.5	1.5	2.0	2.0
AM Gent									0.5	1.5	2.0	2.5
AM Dunkirk							0.5	1.5	2.5	2.5	2.5	2.5
GravitHy, Fos-sur-Mer							0.5	1.5	2.0	2.0	2.0	2.0
Blastr, Inkoo, Finland							0.5	1.0	2.0	2.0	2.0	2.0
Rogesa/Saarstahl						0.5	1.5	2.0	2.5	2.5	2.5	2.5
Ternium, Pesqueria, Mexico					0.5	1.5	2.1	2.1	2.1	2.1	2.1	2.1
Baosteel/Aramco						0.5	1.5	2.5	2.5	2.5	2.5	2.5
LISCO / Danieli Misurata							0.5	1.5	2.0	2.0	2.0	2.0
Tosyali/SULB, Benghazi, Libya							0.5	1.0	1.5	2.0	2.5	2.7
JFE-Itochu-Emirates Steel							0.5	1.5	2.3	2.3	2.3	2.3
Mitsui - Kobe Steel Oman							0.5	1.5	2.5	3.0	4.0	5.0
Total		0.3	1.1	2.1	3.6	6.7	14.6	24.5	33.3	36.8	40.1	42.9

There are many other projects at various stages of planning & development – the author's list equates to almost 100 mt ore demand.

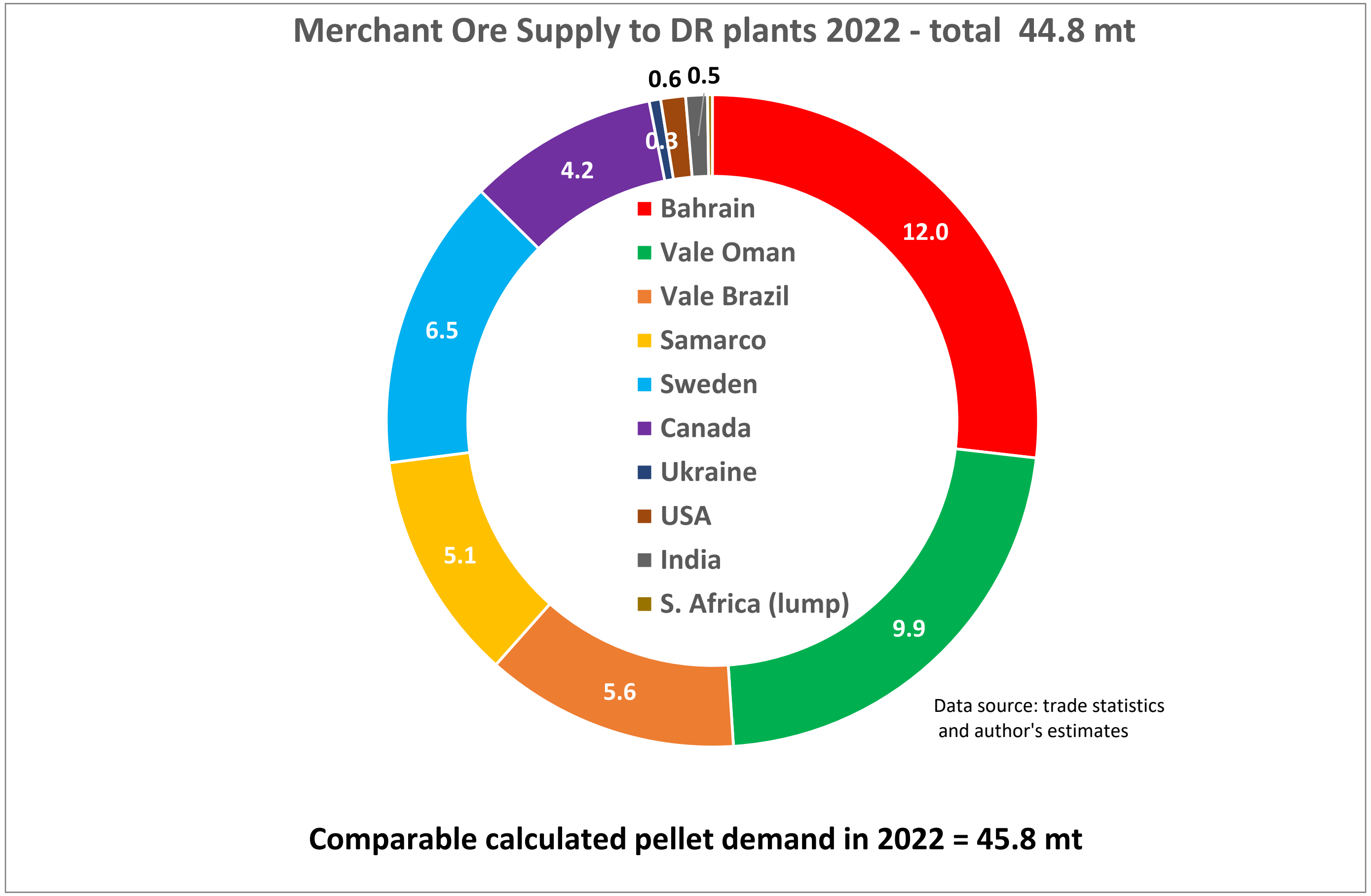
What does it mean for iron ore?



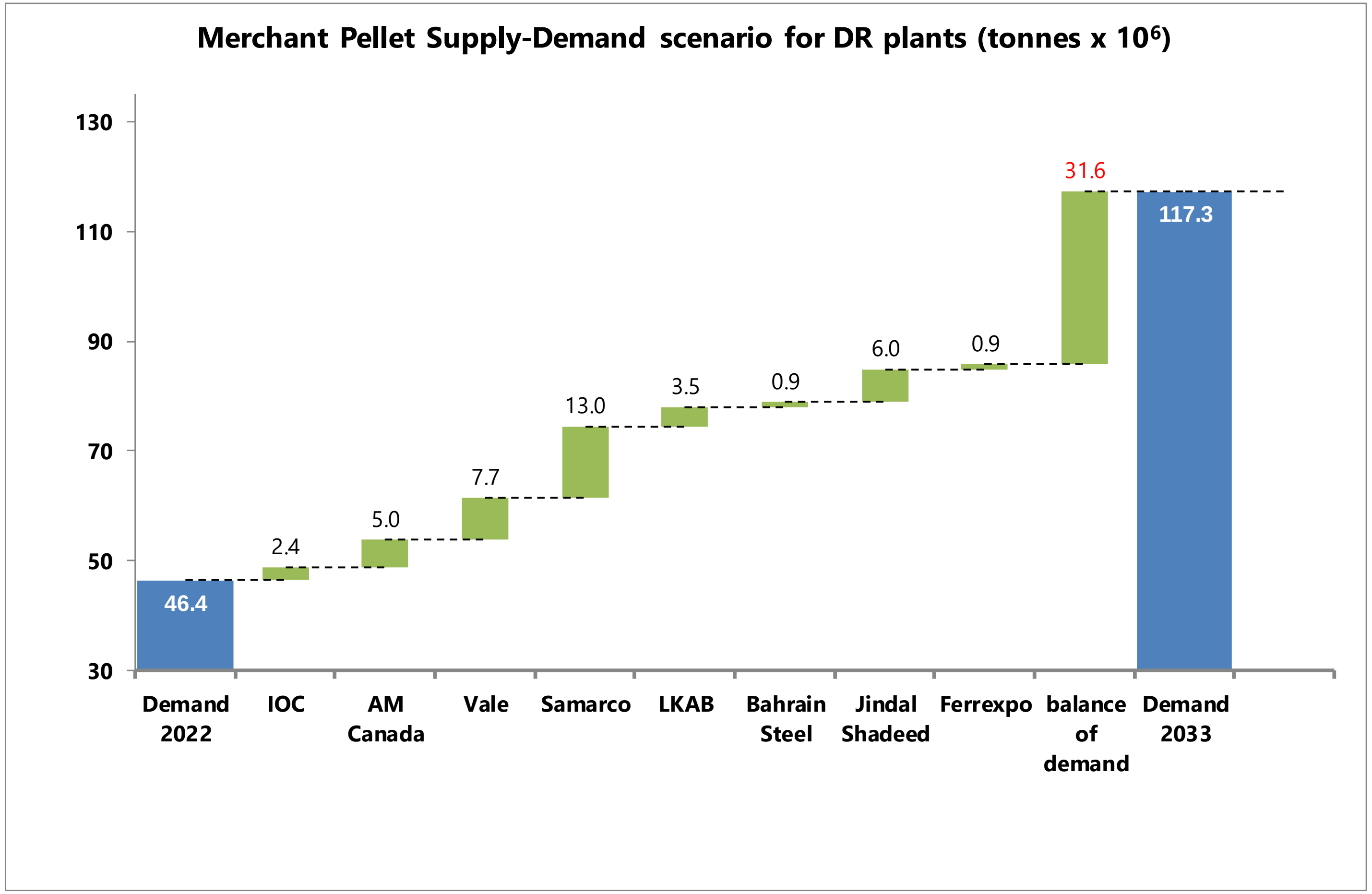
Merchant pellet demand scenario



Merchant ore supply to DR plants 2022



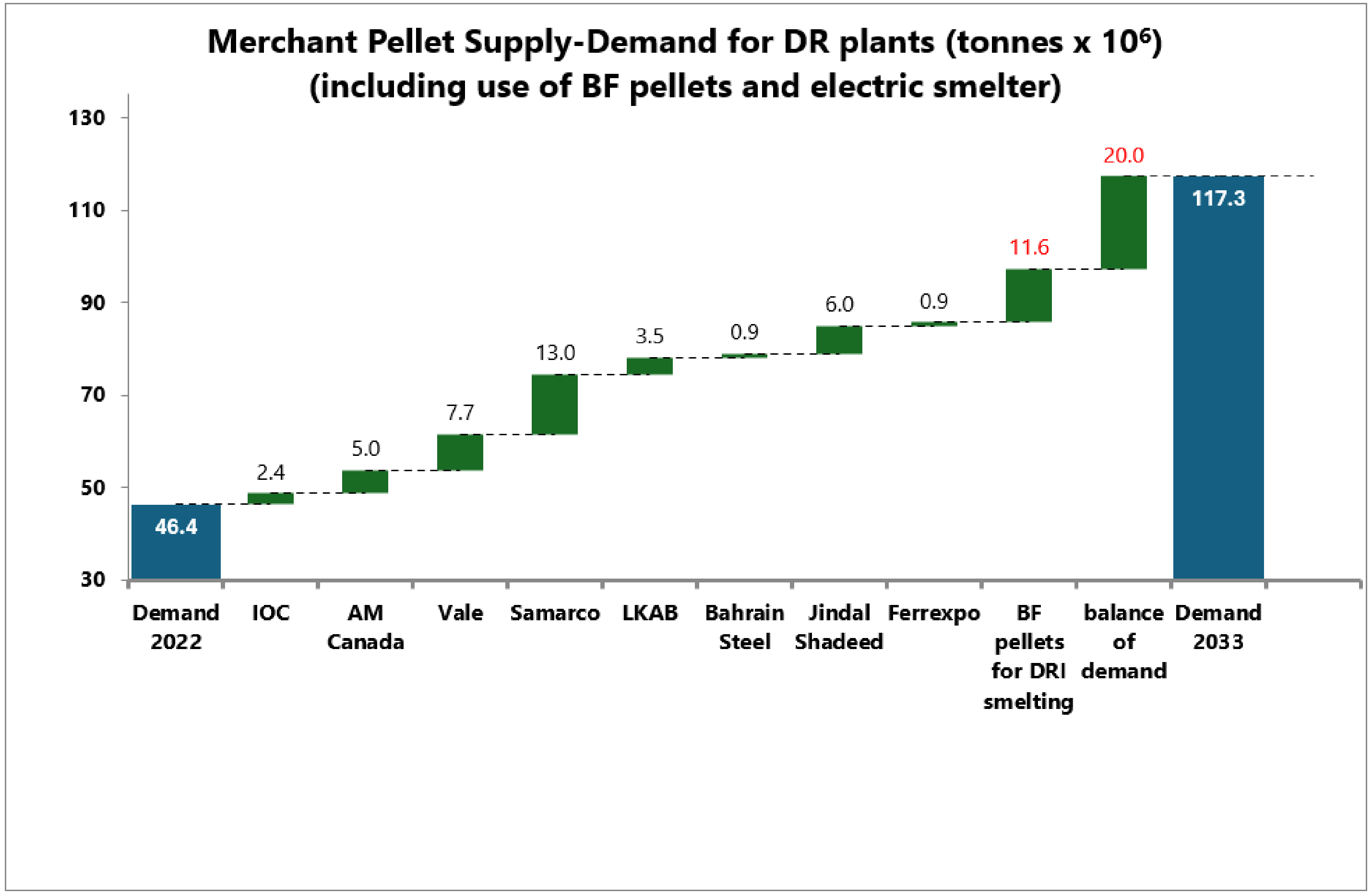
Merchant pellet supply-demand scenario for DR plants



Potential solutions

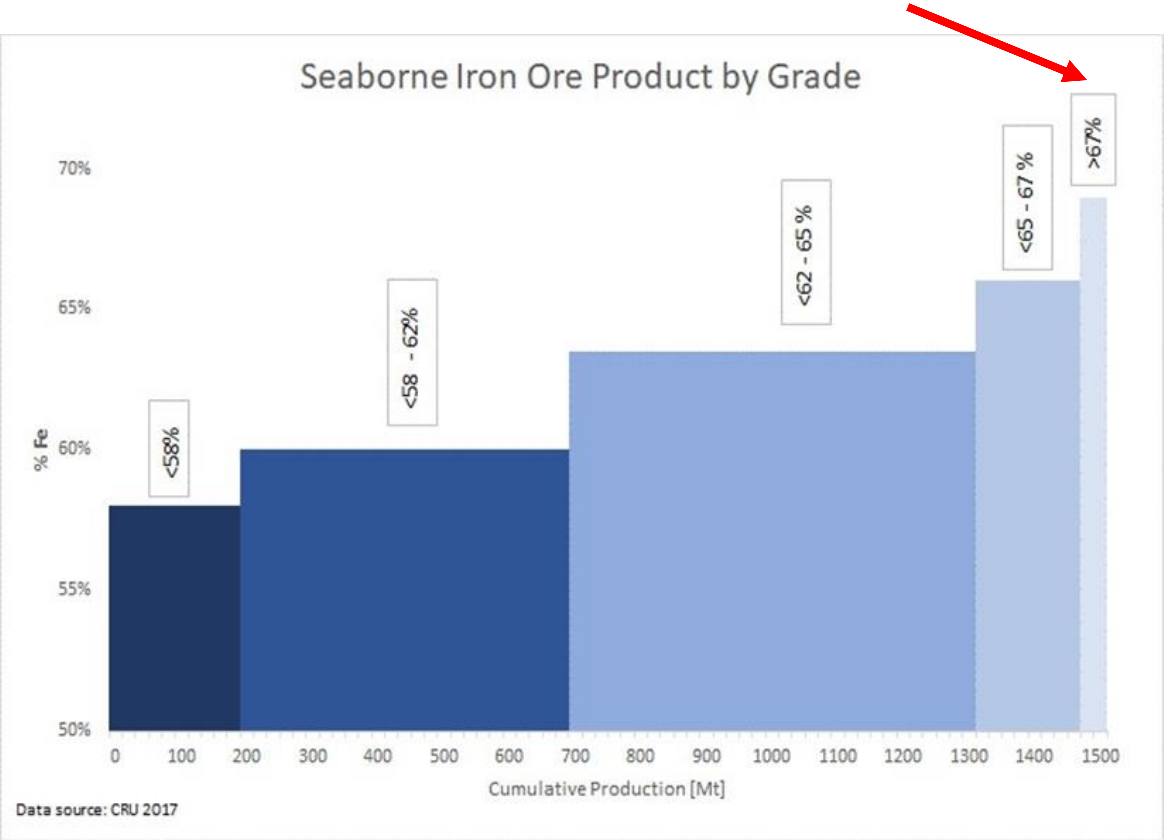
- DR pellet projects and lump ore
- use of BF pellets as DR feedstock
- intermediate smelting step between DR and steel plant
- integration of pellet plant with DRI production
- use of fines-based DR technologies
- use of other iron ore agglomerates

Merchant pellet supply-demand scenario for DR plants (v2)



Longer term considerations

- More high-grade iron ore deposits will need to be developed
- More pelletising capacity will be required
- LKAB’s strategic transition from pellet supplier to supplier of sponge iron (i.e. HBI) will impact the market



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