



GSEU

GEOLOGICAL SERVICE | FOR EUROPE

GSEU WP2 TRAIN-THE-TRAINER COURSE

Module Case studies

Level 2

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Geological Survey of Norway

www.geologicalservice.eu



**Funded by
the European Union**





UNFC Case studies-Norway

- Cu project
- Trælen graphite mine
- Bukken graphite deposit



Case Studies - Norway

- Data sources
- Data gaps
- Uncertainties and challenges
- UNFC classification of Cu and graphite deposits in Norway with active participation of trainees
- Discussion



Data sources

- Company websites
- Government agencies:
 - Government of Norway (regjeringen.no)
 - The Norwegian Directorate of Mining with the Commissioner of Mines at Svalbard (dirmin.no)
 - The Norwegian Water Resources and Energy Directorate (www.nve.no)
 - The Norwegian Environment Agency (miljodirektoratet.no/)
 - The Geological Survey of Norway (ngu.no), the mineral resource database and rapports
- elnnsyn – A service to search for information related to the public sector (developed by the Norwegian Digitalisation Agency (Digdir) and the City of Oslo.
- Online news media: Norsk rikskringkasting AS, nrk.no, e24.no



Cu project

Commodities: Cu (main product), Au and Ag (by-products)

Project status: Active Project, Permits in place

Geology

The copper mineralisations occur within thin (< 5 m) dolostone members within grey-purple silty slates that conformably overlay conglomerates. The ore minerals, mainly bornite, chalcocite and chalcopyrite (\pm neodigenite) occur finely disseminated and commonly comprise interstitial grains and aggregates forming the matrix in the dolarenite. They are also found enriched in irregular quartz- and carbonate-rich veinlets and lenses and exhibit textural features indicative of both diagenetic and epigenetic mineral precipitation and localised structural reworking.



Project history

Operations:

1978-1979, Geophysics

1978-1979, Geology

1983-1984, Sampling

1984-1996, Core drilling

1986-1987 Test beneficiation

2007, Helicopter-borne geophysical measurements

2006-2009, Core drilling

2011, Core drilling

2011, Ground geophysics (2D resistivity and Induced Polarization (IP))

2013, Ground geophysics (2D resistivity and Induced Polarization (IP))

2013-18, Core drilling



Resource and Reserves

Company reported Inferred and Indicated Resources according to JORC, it was previously published on the company's website but is not available today.

Reserves have been calculated in accordance with the JORC Code as a part of the feasibility study in 2022.

Reserves

Deposit 1	Ore	Cu Grade	Contained Cu		Deposit 2	Ore	Cu Grade	Contained Cu	
	Mt	%	kt	Mlb		Mt	%	kt	Mlb
Proven	✓	✓	✓	✓	Probable	✓	✓	✓	✓
Probable	✓	✓	✓	✓	Total	✓	✓	✓	✓
Total	✓	✓	✓	✓					

Historic Production: Deposit 1 has not been in production. Deposit 2 was in production for six years during the 1970s.

Deposit 1 and Deposit 2 are not in production.



Recognized Challenges and/or Block Factors

In 2019, the Ministry of Trade, Industry, and Fisheries granted an operational license for the extraction of the copper deposit to company.

Since then, environmental organizations, the Sami reindeer herding community, and the fishing community have expressed their concerns and protested against the Cu project. The ministry has received five complaints about the decision from: The Norwegian Society for the Conservation of Nature, 3 reindeer herding district, The Sámi Parliament of Norway. The complaints were not upheld.

In 2021, the company and its partner ended their agreement concerning the supply of a copper concentrate. This decision was taken due to findings from routine assessments related to corporate social responsibility, revealing certain project aspects inconsistent with the company's sustainability standards.

The zoning plan and building permit granted by the municipality are currently under appeal. The appeal is still in process with the State Administration.

UNFC Classification

How would you classify it with class/ category based on the presented facts ?

E	F	G
<ul style="list-style-type: none">• All major permits from the Norwegian government are in place.• Operating license//Extraction been approved.• Mining waste permits been approved.• The agreement between the copper company and the company which was supposed to buy copper concentrate has been canceled due to unfavorable social conditions.• There is an appeal on the zoning plan and granted building permit approved by municipality. The appeal is still being processed by the State Administration.	<ul style="list-style-type: none">• Positive feasibility study• In 2021, was ended the agreement concerning the supply of a copper concentrate.• The company is seeking new buyers for the copper.	<ul style="list-style-type: none">• Company reported Inferred and Indicated Resources according to JORC, it was previously published on the company's website but is not available today.• Only calculated proven and probable reserves, according to the JORC Code, are disclosed in 2022, while resources remain unpublished.

E, F, G

E1 Development and operation are confirmed to be environmentally-sociallyeconomically viable

E2 Development and operation are expected to become environmentally-sociallyeconomically viable in the foreseeable future.

E3 Development and operation are not expected to become environmentally-sociallyeconomically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socioeconomic viability.

F1 Technical feasibility of a development project has been confirmed.

F2 Technical feasibility of a development project is subject to further evaluation.

F3 Technical feasibility of a development project cannot be evaluated due to limited data.

F4 No development project has been identified.

G1 Product quantity associated with a project that can be estimated with a high level of confidence.

G2 Product quantity associated with a project that can be estimated with a moderate level of confidence.

G3 Product quantity associated with a project that can be estimated with a low level of confidence.

G4 Product quantity associated with a Prospective Project, estimated primarily on indirect evidence.

UNFC Classification

E1 Development and operation are confirmed to be environmentally-socially-economically viable.

E2 Development and operation are expected to become environmentally-socially-economically viable in the foreseeable future.

E3 Development and operation are not expected to become environmentally-socially-economically viable in the foreseeable future or evaluation is at too early a stage to determine environmental-socioeconomic viability.

F1 Technical feasibility of a development project has been confirmed.

F2 Technical feasibility of a development project is subject to further evaluation.

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F4 No development project has been identified.

G1 Product quantity associated with a project that can be estimated with a high level of confidence.

G2 Product quantity associated with a project that can be estimated with a moderate level of confidence.

G3 Product quantity associated with a project that can be estimated with a low level of confidence.

G4 Product quantity associated with a Prospective Project, estimated primarily on indirect evidence.



UNFC Classification



How would you classify it with E & F sub-categories, based on the presented facts ?

E1.1 *Development is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions.*

E.1.2 *Development is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations.*

F1.1 *Production is currently taking place.*

F1.2 *Capital funds have been committed and implementation of the development is underway.*

F1.3 *Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming.*

UNFC Classification

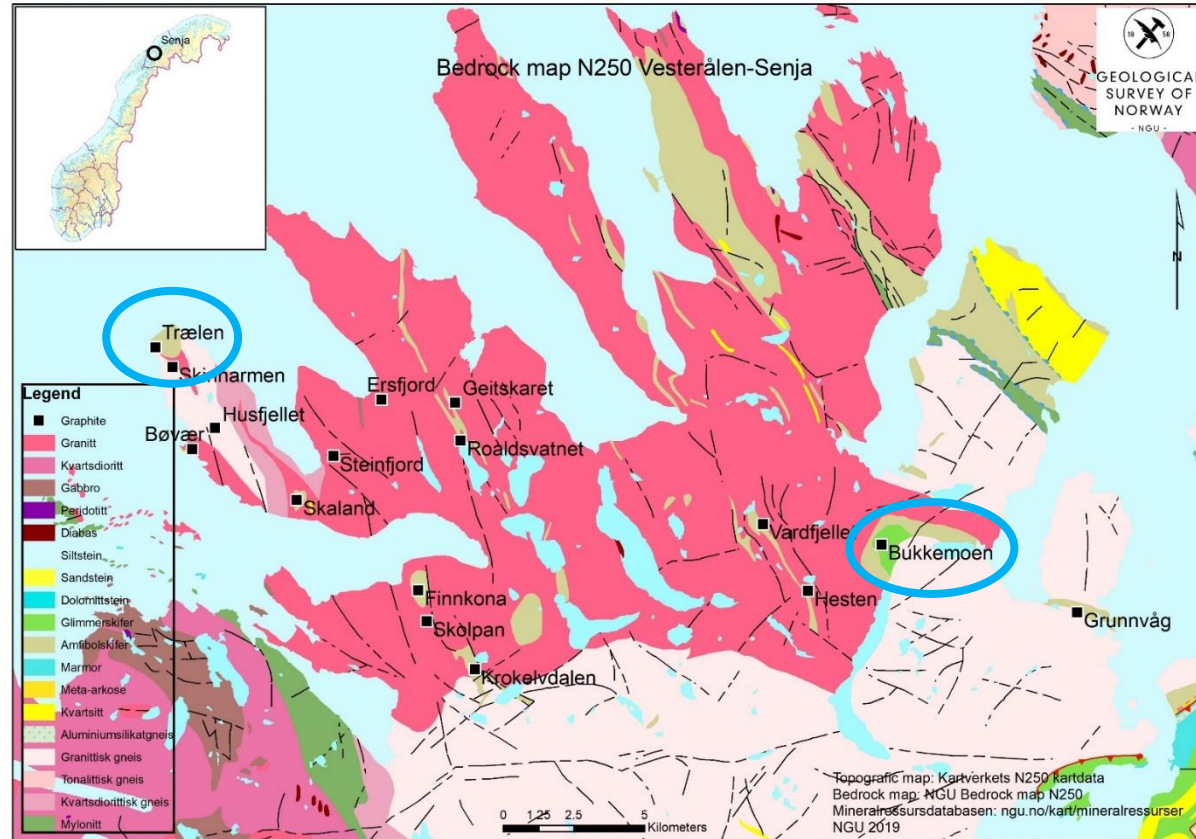
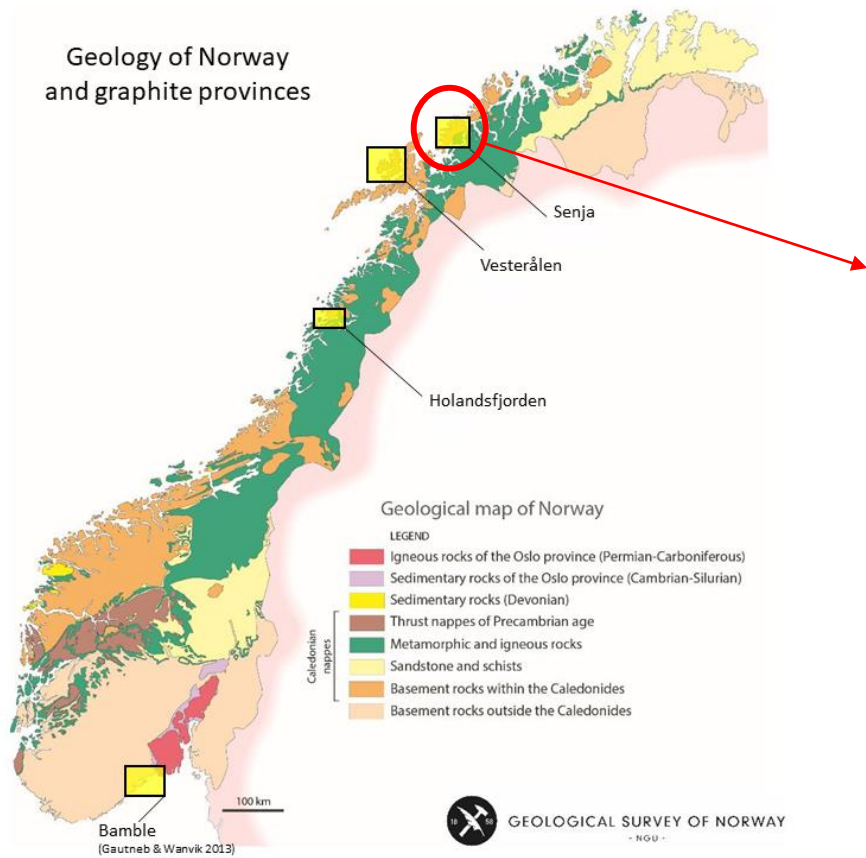


Viable Project - Justified for development

E1.2	F1.3	G1, G2, G3
<ul style="list-style-type: none"> • All major permits from the Norwegian government are in place. • Operating license//Extraction been approved. • Mining waste permits been approved. • The agreement between the copper company and the company which was supposed to buy copper concentrate has been canceled due to unfavorable social conditions. • There is an appeal on the zoning plan and granted building permit approved by municipality. The appeal is still being processed by the State Administration. 	<ul style="list-style-type: none"> • Positive feasibility study • In 2021, was ended the agreement concerning the supply of a copper concentrate. • The company is seeking new buyers for the copper. 	<ul style="list-style-type: none"> • Company reported Inferred and Indicated Resources according to JORC, it was previously published on the company's website but is not available today. • Only calculated proven and probable reserves, according to the JORC Code, are disclosed in 2022, while resources remain unpublished..

UNFC Case Studies on Graphite

Trælen graphite underground mine in operation & Bukken graphite deposit

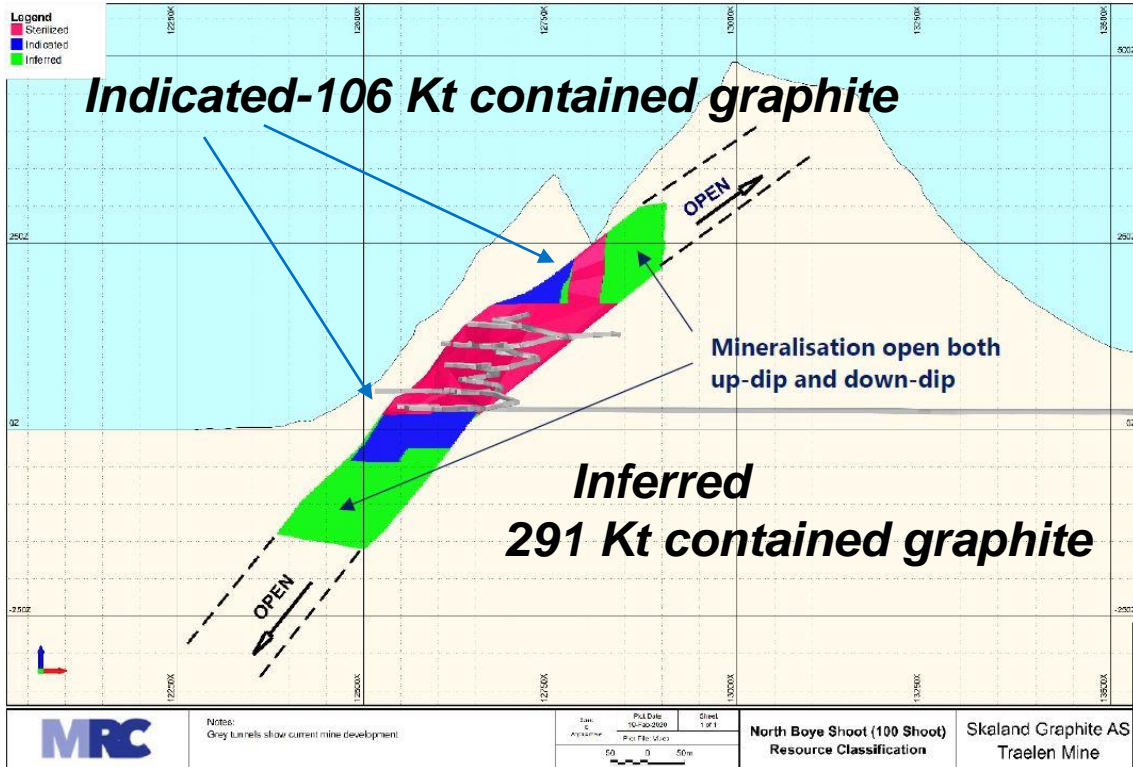


Senja is part of The West Troms Basement Complex (WTBC). Graphite occurrences are found in supracrustal granulite facies rocks of Archaean to Proterozoic age, comprising quartzites, migmatitic gneisses, iron formations, calcsilicates and graphite schist. Graphite occurs within graphite biotite gneiss which are abundant in feldspar, amphibole, sulfides, and mica minerals. Appears in lenses, veins and is also disseminated.

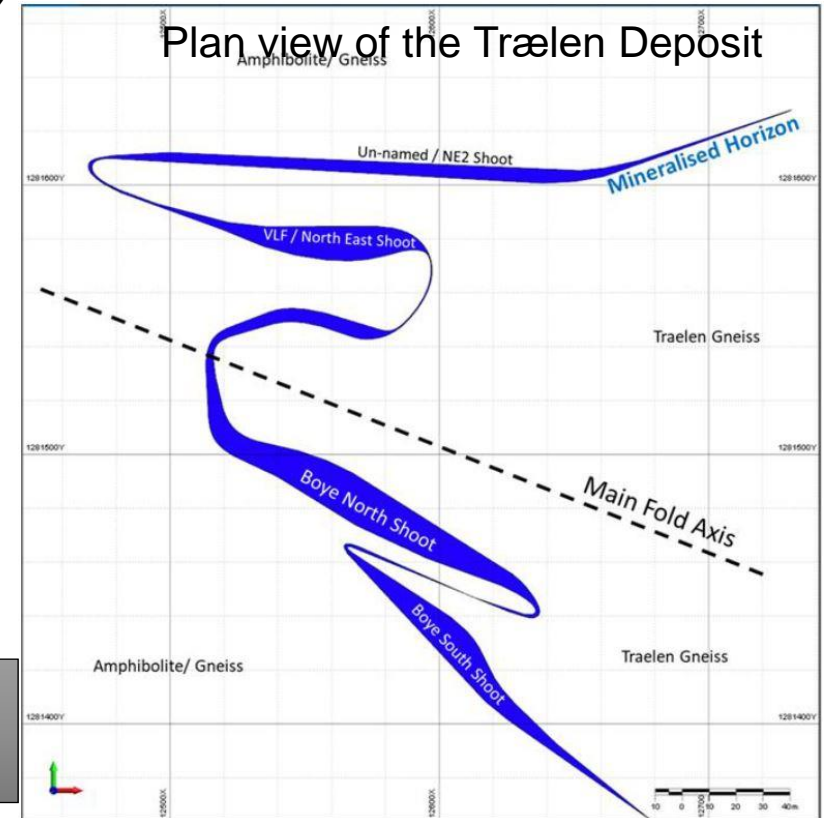
Trælen (Skaland graphite)

In operation since 1932

MAIDEN JORC RESOURCE ESTIMATION, (Mineral Commodities Ltd, 2020)



G?

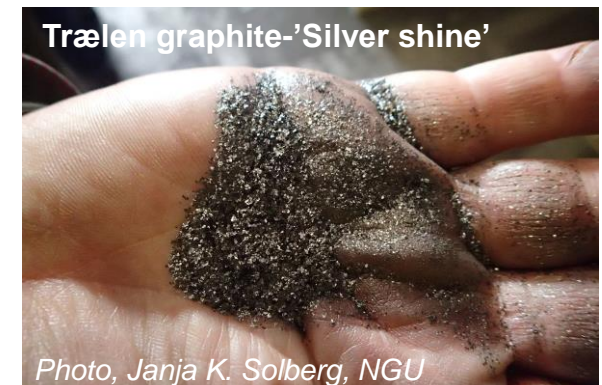


Source: www.mineralcommodities.com/. Public ASX release



Photo: Janja K. Solberg, NGU

The current resource database consists of 133 holes, representing 15 531 m of drilling and 1 245 analysed drill samples.



Photo, Janja K. Solberg, NGU



Trælen (Skaland graphite) - E,F,G

2020

In Operation.

The mine with the highest-grade flake graphite in the world.

Fully Permitted

Reporting of Exploration Results (the JORC Code (2012), *Mineral Commodities Ltd, 2020* :

Environmental factors or assumptions - *All necessary environmental permits required to operate the mine and process plant are in place.*

Mineral tenement and land tenure status - *All licenses and permits are in good standing with no known impediments..*

Due to grade uncertainty, the company couldn't classify Measured mineral resources, even near established mines with high geological confidence.

Total Mineral Resources for the Trælen Graphite Deposit (10% cut-off), *Mineral Commodities Ltd*

Classification	Tonnes Kt	Total Graphitic Carbon (TGC)	Tonnes Contained Graphite Kt
Indicated	409	26%	106
Inferred	1,376	21%	291
Total¹	1,785	22%	397

Production volume	Carbon content	Product types
12 000 At/year	85 % to 99%	flake & powder grades

E? F? G?

slido

Based on the presented summarized facts, how would you classify the Trælen?

In Operation.

The mine with the highest-grade flake graphite in the world.

- Fully Permitted
- All necessary environmental permits required to operate the mine and process plant are in place.
- All licenses and permits are in good standing with no known impediments.
- JORC Resources: Indicated and Inferred
- Due to grade uncertainty, the company couldn't classify Measured mineral resources, even near established mines with high geological confidence.



① Start presenting to display the poll results on this slide.



Trælen (Skaland graphite) - E,F,G

2020

In Operation.

The mine with the highest-grade flake graphite in the world.

Fully Permitted

Reporting of Exploration Results (the JORC Code (2012), *Mineral Commodities Ltd, 2020* :

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Production volume	Carbon content	Product types
12 000 At/year	85 % to 99%	flake & powder grades

Source: mineralcommodities.com

E1,2 F1,2 G2,3

Trælen (Skaland graphite)



Resources and reserves (JORC Code (2012), *Mineral Commodities Ltd*

2021

Total Mineral Resources for the Trælen Graphite

Category	Tonnes (kt)	Total Graphitic carbon (TGC)%	Contained Graphite (kt)
Measured	67	30.2	20
Indicated	719	25.2	181
Inferred	1,058	22	233
Total	1,844	23.6	434

10% TGC cut-off grade used for Trælen Mineral Resource estimate

E? F? G?

Total maiden Ore Reserves of Trælen Graphite

Category	Tonnes (kt)	Total Graphitic Carbon (TGC)%	Contained Graphite (kt)
Proven	55	27.8	15
Probable	585	24.6	144
Total	640	24.8	159

Ore Reserve was estimated using a 10% TGC cut-off grade.

Tables, source: mineralcommodities.com/operations-projects/graphite/norway/

Trælen (Skaland graphite)



Resources and reserves (JORC Code (2012)), *Mineral Commodities Ltd*

2021

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Ore Reserve was estimated using a 10% TGC cut-off grade.

UNFC update 2022

E	F	G
1,2	1,2	1,2,3

Tables, source: mineralcommodities.com/operations-projects/graphite/norway/

Supplementary Tables (UNFC Update 2019, UNFC Guidance Europe)

Table 10. UNFC Classes defined by Categories and Sub-categories with Mapping of INSPIRE Codes

FIGURE 3
UNFC Classes and Sub-classes defined by Sub-categories^a

UNFC Classes Defined by Categories and Sub-categories						
Total Products	Produced	Sold or used production				
		Production which is unused or consumed in operations				
	Class	Sub-class	Categories			
			E	F	G	
Known Sources	Viable Projects	On Production	1	1.1	1, 2, 3	
		Approved for Development	1	1.2	1, 2, 3	
		Justified for Development	1	1.3	1, 2, 3	
	Potentially Viable Projects	Development Pending	2 ^b	2.1	1, 2, 3	
		Development On Hold	2	2.2	1, 2, 3	
	Non-Viable Projects	Development Unclarified	3.2	2.2	1, 2, 3	
		Development Not Viable	3.3	2.3	1, 2, 3	
	Remaining products not developed from identified projects		3.3	4	1, 2, 3	
	Potential Sources	Prospective Projects	[No sub-classes defined]	3.2	3	4
		Remaining products not developed from prospective projects		3.3	4	4

Source: UNFC Update 2019

Table 1. Simplified Mapping of CRIRSCO Template to UNFC-2009⁸ Classes and Categories

CRIRSCO Template		UNFC-2009 "minimum" Categories			UNFC-2009 Class
Mineral Reserve	Proved	E1	F1	G1	Commercial Projects
	Probable			G2	
Mineral Resource	Measured	E2	F2	G1	Potentially Commercial Projects
	Indicated			G2	
	Inferred			G3	
Exploration Results		E3	F3	G4	Exploration Projects

UNFC Classes Defined by Categories and Sub-categories						INSPIRE Code List		
Produced	Sold or used production							
	Production which is unused or consumed in operations <i>Future production that is either unused or consumed in the Project operations is categorized as E3.1. These can exist for all Classes of recoverable quantities^c</i>							
	Class	Sub-class	Categories					
			E	F	G ^a			
Total Products	Known Sources	Viable Projects <i>Estimates associated with Viable Projects are defined in many classification systems as Reserves, but there are some material differences between the specific definitions that are applied within different industries and hence the term is not used here.^c</i>	On Production	1	1.1	1, 2, (3)	operating continuously operating intermittently	
		Potentially Viable Projects <i>Not all Potentially Viable Projects will be developed</i>	Approved for Development	1	1.2	1, 2, 3	under development	
			Justified for Development	1	1.3	1, 2, 3	pending approval	
			Development Pending	2 ^b	2.1	1, 2, 3	feasibility evaluation of the ore deposit	
		Non-Viable Projects <i>Non-Viable Projects include those that are at an early stage of evaluation in addition to those that are considered unlikely to become Viable developments within the Foreseeable Future.^c</i>	Development On Hold	2	2.2	1, 2, 3	care and maintenance retention	
			Development Unclarified	3.2	2.2	1, 2, 3	resource assessment (geological interpretation, approximate calculation of the resource)	
		Remaining Products not developed from identified Projects <i>Remaining Products not developed from identified Projects or Prospective Projects may become developable in the future as technological or environmental-socio-economic conditions change. Some or all these estimates may never be developed due to physical and/or environmental-socio-economic constraints.^c</i>	Development Not Viable	3.3	2.3	1, 2, 3	closed abandoned historic	
					3.3	4	1, 2, 3	
		Potential Sources	Prospective Projects		3.2	3.1	4	subsurface exploration
					3.2	3.2	4	detailed surface exploration
			3.2	3.3	4	regional reconnaissance		
Remaining Products not developed from Prospective Projects			3.3	4.1	4			
			3.3	4.2	4			
		3.3	4.3	4				

Source: UNFC Guidance Europe)



Supplementary Table (Bridging Document, 2024)



Table 1
UNFC Classes, Sub-Classes, Categories and Sub-Categories (from UNECE, 2021)

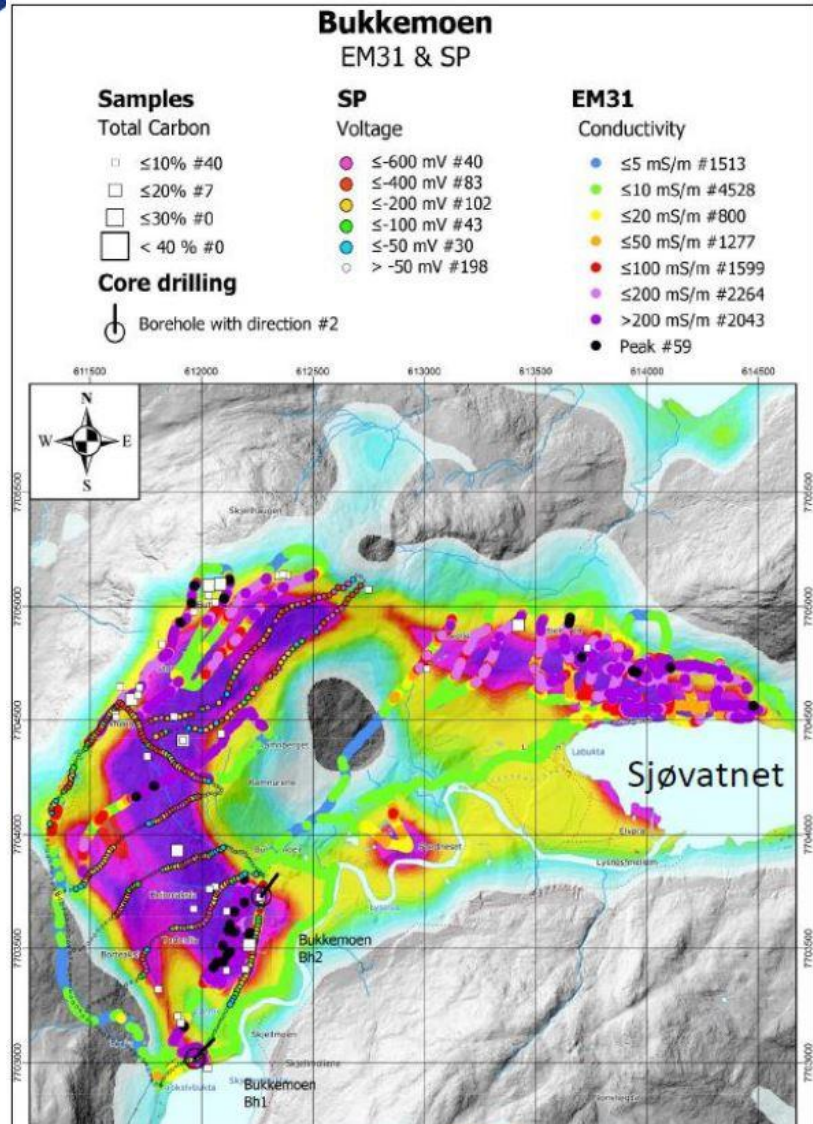
UNFC Classes Defined by Categories and Sub-categories					
Total Products	Class	Sub-class	Categories		
			E	F	G
			Produced	Sold or used production	
		Production which is unused or consumed in operations			
Known Sources	Viable Projects	On Production	1	1.1	1, 2, (3) ^b
		Approved for Development	1	1.2	1, 2, (3) ^b
		Justified for Development	1	1.3	1, 2, (3) ^b
	Potentially Viable Projects	Development Pending	2 ^a	2.1	1, 2, 3
		Development on Hold	2	2.2	1, 2, 3
		Non-Viable Projects			
	Non-Viable Projects	Development Unclassified	3.2	2.2	1, 2, 3
		Development not Viable	3.3	2.3	1, 2, 3
		Remaining products not developed from identified projects	3.3	4	1, 2, 3
	Potential Sources	Prospective Projects	[No Sub-classes defined]	3.2	3
Remaining products not developed from prospective projects			3.3	4	4

^a Development Pending Projects may satisfy the requirements for E1.

^b In minerals projects, the parallel categorisation of G3 together with E1 and F1 Categories usually is not realised due to the

Table 2
Standard mapping of CRIRSCO Template aligned estimates to UNFC Categories

CRIRSCO Template			Corresponding UNFC Category ^c			UNFC Class	
Public Report and Study Types ^a	Standard Definitions						
Feasibility Study or Life of Mine Plan ^b (for an operating mine)	Mineral Reserves	Proved	E1	F1	G1	Viable Projects	
		Probable			G2		
Pre-feasibility Study ^d	Mineral Reserves	Proved	E2	F2	G1	Potentially Viable Projects	
		Probable			G2		
Feasibility Study, Life of Mine Plan ^b (for an operating mine) or Pre-feasibility Study ^e	Mineral Resources (exclusive of Mineral Reserves)	Measured	E2	F2	G1		
		Indicated			G2		
		Inferred			G3		
Scoping Study report or other Public Report on a Mineral Resource estimate ^f	Mineral Resources	Measured	E2	F2	G1		
		Indicated			G2		
		Inferred			G3		
Public Report on exploration stage projects	Exploration Target		E3	F3	G4		Prospective Projects
	Exploration Results		Estimates not published				
Not applicable ^g	Estimates obtained from historical reports ^h					Non-viable Projects	



23 Figure 1: NGU report 2019.023

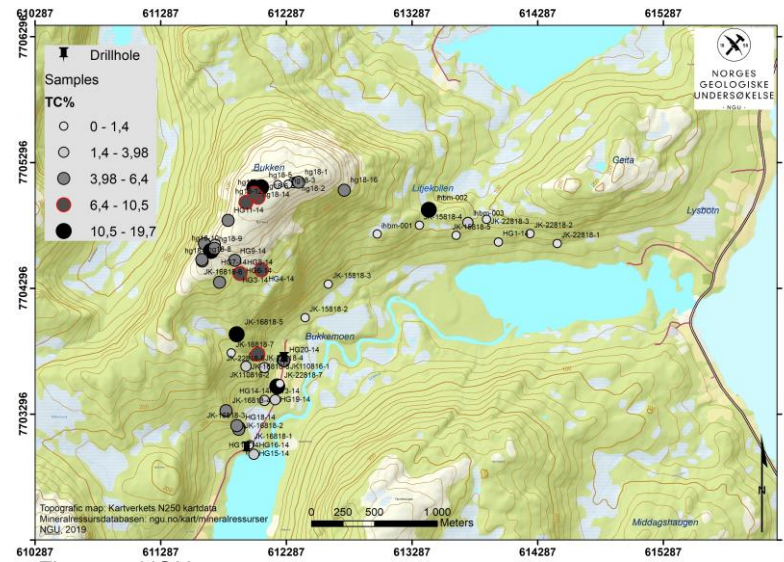


Figure 2: NGU report 2019.023

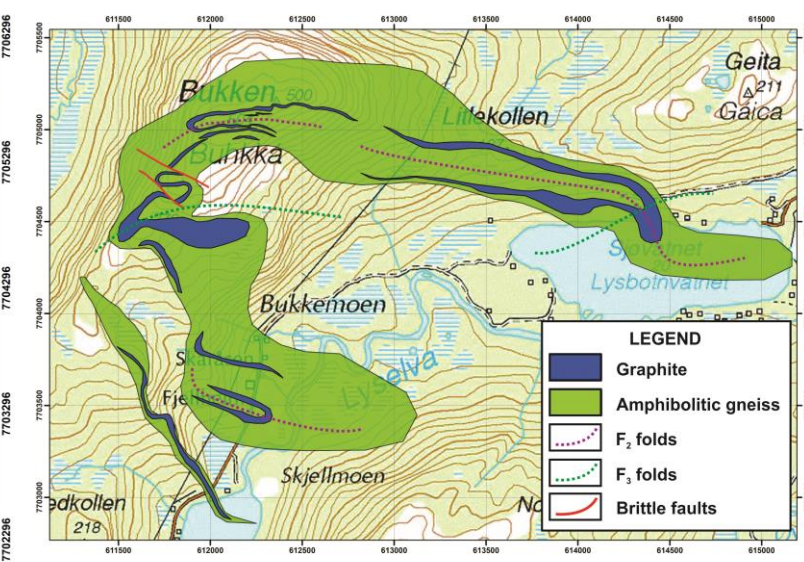
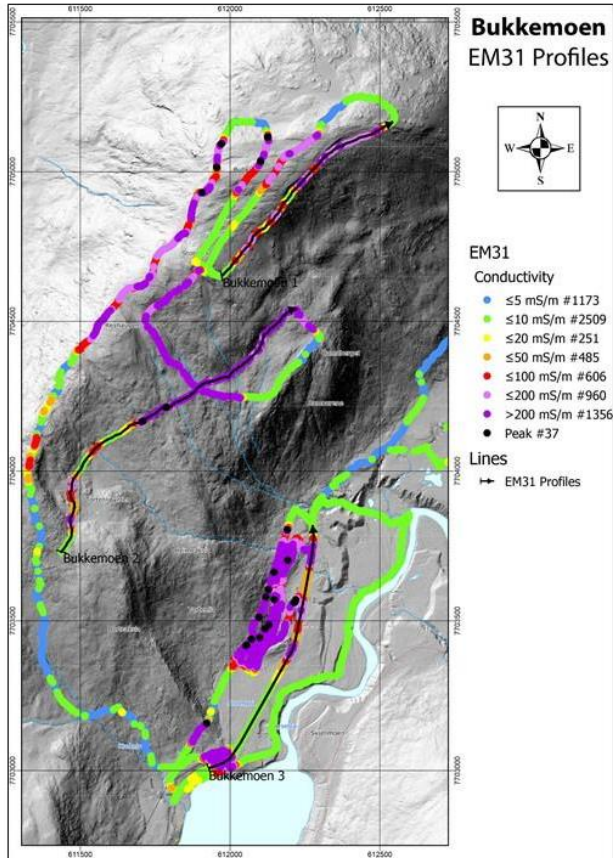


Figure 3: Minerals-10-00626

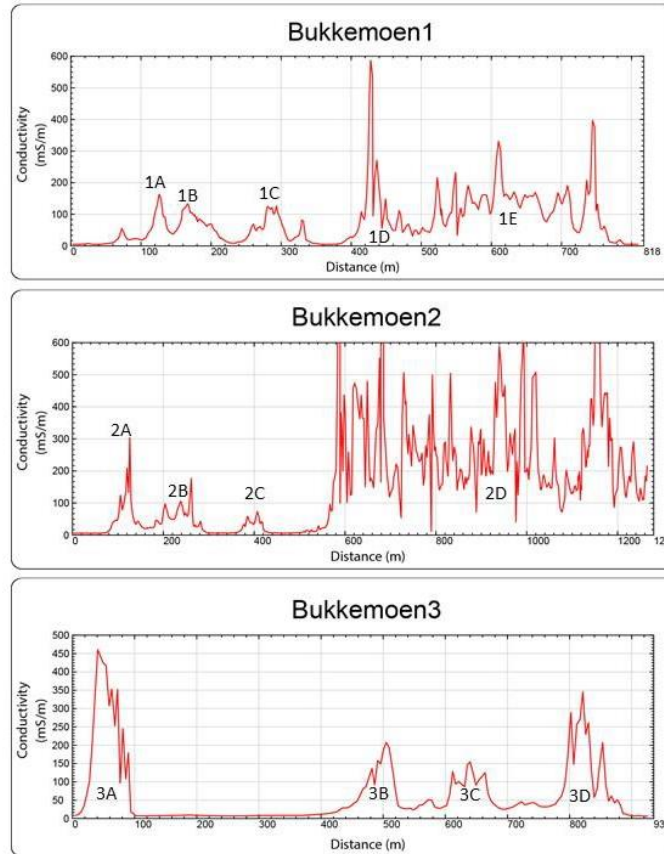
Geophysical methods: Helicopter-borne electromagnetic (HEM), Charged Potential (CP), Self Potential (SP), 2D Resistivity (also called ERT), Induced Polarisation (IP), Ground conductivity meter Geonics EM31 (Geonics 1984)

Geological methods: Geological mapping, Structural analysis, Sampling, Chemical analyses TC, TS, Geological drilling

Bukken – resources



Rønning et al. 2019



EM traversing

Peaks represents graphite bands under thin cover. The thickness of the individual bands can be measured, and total width and length estimated.

$$\text{Tonnage} = (W (\sin \alpha) L 100) 2.437$$

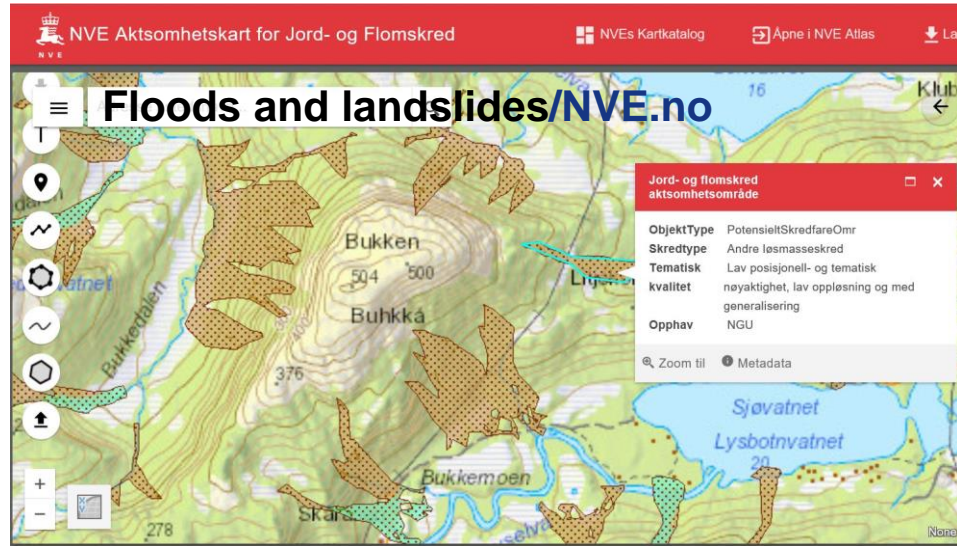
Name	% TC	Tonnage (Mt)	Contained Graphite (Mt)
Bukken	6,5	51,03	3,34

Little or no drilling information is available.

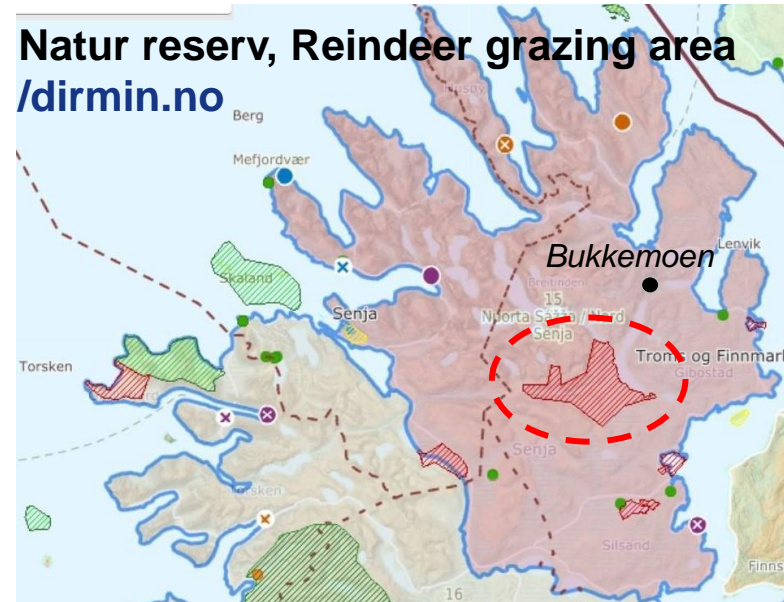
With the use of ground geophysics, the aggregate width (W) and length (L) of graphite zone are estimated. Using 100 m as depth and 2.437 t/m³ as density and α as the average dip of graphite zones.



Bukken, E- axis



Source: The Norwegian Water Resources and Energy Directorate (NVE.no)



Source: The Norwegian Directorate of Mining (DMF.no)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	<ul style="list-style-type: none"> Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings. The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area. 	<ul style="list-style-type: none"> The area has a granted binding landowner agreement with Skaland Graphite AS a subsidiary of MRC for 10 years from 02.01.2020 The area is owned by Senja municipality on property No. Gnr.90/Bnr.2 (Fjellheim)

Source: mineralcommodities.com/wp-content/uploads/2020/07/Bukken-Graphite-Prospect





Bukken, F axis

Mineral Commodities Ltd, 2020

“Highly Prospective Graphite Exploration Project Secured 20km From Skaland

Mineral Commodities Ltd is pleased to announce that through its 90% owned subsidiary, Skaland Graphite AS, it has entered into a landowner agreement to explore the south of Bukken Graphite Prospect, on the island of Senja, Norway. The tenement is located approximately 20km east of MRC’s existing Skaland Graphite Operation. The agreement will provide MRC with exclusive exploration rights for 10 years.” (source: <https://www.mineralcommodities.com/2020/>)

Mineral Commodities Ltd, 2022

“Surface mapping/sampling results and strong geophysical anomalies indicate high prospectivity of Bukken, Hesten and Vardfjellet.

First pass drilling is planned to commence in 2023” (source: [mineralcommodities.com/investors-media/asx-announcements/2022-2/](https://www.mineralcommodities.com/investors-media/asx-announcements/2022-2/))

Bukken - UNFC Classification

a) How would you classify it with class/category based on the presented facts ?

b) How would you classify E&F with sub-categories based on the presented facts?

E	F	G
<ul style="list-style-type: none"> • Exploration permit • Environmental impact assessment (EIA) has not been conducted. • Bukken is located in a reindeer grazing area and is ca 5km from nature reserve. In the Bukken area landslides might occur. 	<ul style="list-style-type: none"> • Scoping, pre-feasibility, and feasibility studies have not been conducted. • Signed the landowner agreement to explore the Bukken graphite with exploration rights for 10 years. • 20km from Skaland graphite processing infrastructure. Significant total carbon (TC) concentrations. • MRC planned drilling for 2023, but it has not been conducted yet. 	<ul style="list-style-type: none"> • Non-compliant resource estimation with low confidence, not compliant with international reporting standards. • Conducted exploration includes geological and structural mapping, drilling (two drill holes of 40m each), thin-section analysis, sampling, and assaying. Surveyed using various geophysical methods: helicopter-borne electromagnetic (HEM), charged potential (CP), self-potential (SP), 2D resistivity (also known as ERT), induced polarization (IP), and ground conductivity meter (Geonics EM31) by NGU in 2006, 2012, 2016, and 2018. In 2021, MRC conducted surface mapping and sampling (33 samples) and assay, along with ultra-high-resolution drone magnetic and electromagnetic surveys. Results indicate high prospectivity of Bukken.

Bukken - UNFC Classification

a) How would you classify it with class/ category based on the presented facts ?

E	F	G
<ul style="list-style-type: none"> • Exploration permit • Environmental impact assessment (EIA) has not been conducted. • Bukken is located in a reindeer grazing area and is ca 5km from nature reserve. In the Bukken area landslides might occur. 	<ul style="list-style-type: none"> • Scoping, pre-feasibility, and feasibility studies have not been conducted. • Signed the landowner agreement to explore the Bukken graphite with exploration rights for 10 years. • 20km from Skaland graphite processing infrastructure. Significant total carbon (TC) concentrations. • MRC planned drilling for 2023, but it has not been conducted yet. 	<ul style="list-style-type: none"> • Non-compliant resource estimation with low confidence, not compliant with international reporting standards. • Conducted exploration includes geological and structural mapping, drilling (two drill holes of 40m each), thin-section analysis, sampling, and assaying. Surveyed using various geophysical methods: helicopter-borne electromagnetic (HEM), charged potential (CP), self-potential (SP), 2D resistivity (also known as ERT), induced polarization (IP), and ground conductivity meter (Geonics EM31) by NGU in 2006, 2012, 2016, and 2018. In 2021, MRC conducted surface mapping and sampling (33 samples) and assay, along with ultra-high-resolution drone magnetic and electromagnetic surveys. Results indicate high prospectivity of Bukken.

E	F	G
3	3	3

versus

E	F	G
3	3	4

Bukken - UNFC Classification

b) How would you classify E&F with sub-classes/sub-categories based on the presented facts?

E	F	G
<ul style="list-style-type: none"> • Exploration permit • Environmental impact assessment (EIA) has not been conducted. • Bukken is located in a reindeer grazing area and is ca 5km from nature reserve. In the Bukken area landslides might occur. 	<ul style="list-style-type: none"> • Scoping, pre-feasibility, and feasibility studies have not been conducted. • Signed the landowner agreement to explore the Bukken graphite with exploration rights for 10 years. • 20km from Skaland graphite processing infrastructure. Significant total carbon (TC) concentrations. • MRC planned drilling for 2023, but it has not been conducted yet. 	<ul style="list-style-type: none"> • Non-compliant resource estimation with low confidence, not compliant with international reporting standards. • Conducted exploration includes geological and structural mapping, drilling (two drill holes of 40m each), thin-section analysis, sampling, and assaying. Surveyed using various geophysical methods: helicopter-borne electromagnetic (HEM), charged potential (CP), self-potential (SP), 2D resistivity (also known as ERT), induced polarization (IP), and ground conductivity meter (Geonics EM31) by NGU in 2006, 2012, 2016, and 2018. In 2021, MRC conducted surface mapping and sampling (33 samples) and assay, along with ultra-high-resolution drone magnetic and electromagnetic surveys. Results indicate high prospectivity of Bukken.

E 3.2, F3.1 versus E 3.2, F3.2



Supplementary Tables (UNFC Update 2019, UNFC Guidance Europe)

Exploration Permits

Table 20. Potential E Categories for Exploration Permits (Early Exploration)

Issue / potential CF	Level of support	Probability of approval	Potential E Category	Comments
Exploration permit (Early exploration)	Not been initiated	Unknown	E3.3	
Exploration permit	Been approved	high	E3.2	Should be E3 because it's exploration
	Not been approved	low	E3.3	
Application, submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E3.2 (high, medium probability) E3.3 (low probability)	Should be E3 because it's exploration
Exploration permit (Advanced exploration)	Not being initiated	-	E3.3	
Exploration permit	Been approved	high	E2 (feasibility) E2 (evaluation of the ore deposit) E3.2 (resource assessment)	
	Not been approved	low	E3.2	E3.2 should be assigned since early exploration can be considered granted
Application, submission to public enquiry	Being initiated and in the process of being considered	high, medium, low	E3.2 (resource assessment & medium probability) E3.2 (resource assessment & high/medium probability) E3.3 (low probability)	Estimation

Source: UNFC Guidance Europe)

Category	Sub-Category	Sub-Category Definition
E1	E1.1	Development is environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions.
	E1.2	Development is not environmentally-socially-economically viable on the basis of current conditions and realistic assumptions of future conditions, but is made viable through government subsidies and/or other considerations.
E2	No Sub-categories defined	
E3	E3.1	Estimate of product that is forecast to be developed, but which will be unused or consumed in operations.
	E3.2	Environmental-socio-economic viability cannot yet be determined due to insufficient information.
	E3.3	On the basis of realistic assumptions of future conditions, it is currently considered that there are not reasonable prospects for environmental-socio-economic viability in the foreseeable future.

Source: UNFC Update 2019

Supplementary Tables (UNFC Update 2019, UNFC Guidance Europe)

Table 28. Potential F Categories for Exploration Projects

Issue / potential CF	Potential F Category	Comments	INSPIRE category
Exploration Projects Site-specific geological studies and exploration activities have identified the potential for an individual deposit with sufficient confidence by permit to warrant drilling or testing that is designed to confirm the existence of that deposit in such form, quality, and quantity that the feasibility of extraction can be evaluated	F3.1	TRL 3 and 4	subsurface exploration
Local geological studies and exploration activities indicate the potential for one or more deposits in a specific part of a geological province, but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant drilling or testing that is designed to confirm the existence of a deposit in such form, quality and quantity that the feasibility of extraction can be evaluated	F3.2		detailed surface exploration
Earliest stage of exploration activities, where favorable conditions for the potential discovery of deposits in a geological province may be inferred from regional geological studies.	F3.3		regional reconnaissance
Conceptual studies Ongoing or Planned	F4	TRL 1 and 2	
Remaining Products not developed from identified Projects, or from Prospective Projects:			
Technology under active development	F4.1	TRL 2	
Technology being researched	F4.2	TRL 1	
Technology not under research or development	F4.3	TRL 1	

Source: UNFC Guidance Europe)

Category	Sub-Category	Sub-Category Definition
F1	F1.1	Production is currently taking place.
	F1.2	Capital funds have been committed and implementation of the development is underway.
	F1.3	Studies have been completed to demonstrate the technical feasibility of development and operation. There shall be a reasonable expectation that all necessary approvals/contracts for the project to proceed to development will be forthcoming
F2	F2.1	Project activities are ongoing to justify development in the foreseeable future.
	F2.2	Project activities are on hold and/or where justification as a development may be subject to significant delay.
	F2.3	There are no plans to develop or to acquire additional data at the current time due to limited potential.

Category	Sub-Category	Sub-Category Definition
F3	F3.1	Site-specific studies have identified a potential development with sufficient confidence to warrant further testing.
	F3.2	Local studies indicate the potential for development in a specific area but requires more data acquisition and/or evaluation in order to have sufficient confidence to warrant further testing.
	F3.3	At the earliest stage of studies, where favourable conditions for the potential development in an area may be inferred from regional studies.
F4	F4.1	The technology necessary is under active development, following successful pilot studies, but has yet to be demonstrated to be technically feasible for this project.
	F4.2	The technology necessary is being researched, but no successful pilot studies have yet been completed.
	F4.3	The technology is not currently under research or development.

Source: UNFC Update 2019



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