



Business Development Opportunities for Mongstad Industrial Park

April 2020



Short summary - main findings

Main findings

Description

Competitiveness

- Mongstad Industrial Park has a solid strategic position and location for several technologies representing the “energy shift” and sea meets land - including zoned land plots, strategic port and a large competency base from the processing industry (Refinery & TCM), Oil & Gas logistics and operations and CCS.

Win-wins and value creation of business opportunities

- Future possibilities @MIP at scale is dependent on industrial symbiosis in two dimensions:
 - There are large opportunities to expand established relationships with existing partners to achieve win-wins from key infrastructure and resources (by-products) in order to attract new players.
 - The new business models could in this symbiosis create ripple effects as well as increasing sustainability (lowering carbon footprint and costs) both for existing and new players.

Need to clarify Infrastructure & access to resources

- In order to finish the assessment of strategic options and to realize the potential for MIP we need a detailed infrastructure technical review and contracts / LOIs of cooperation with current stakeholders to assess available levels of critical infrastructure such as power, water, CO2, critical material flows etc.
- **A separate workgroup with technical competencies is suggested starting ASAP preferably representing the key MIP actors.**
- The paradox regarding power is that electrification of the North Sea production might directly eliminate the window of opportunity for ripple effects from critical re-industrial development of energy intensive industries such as green fuel sources and new materials from CO2 in Western Norway.

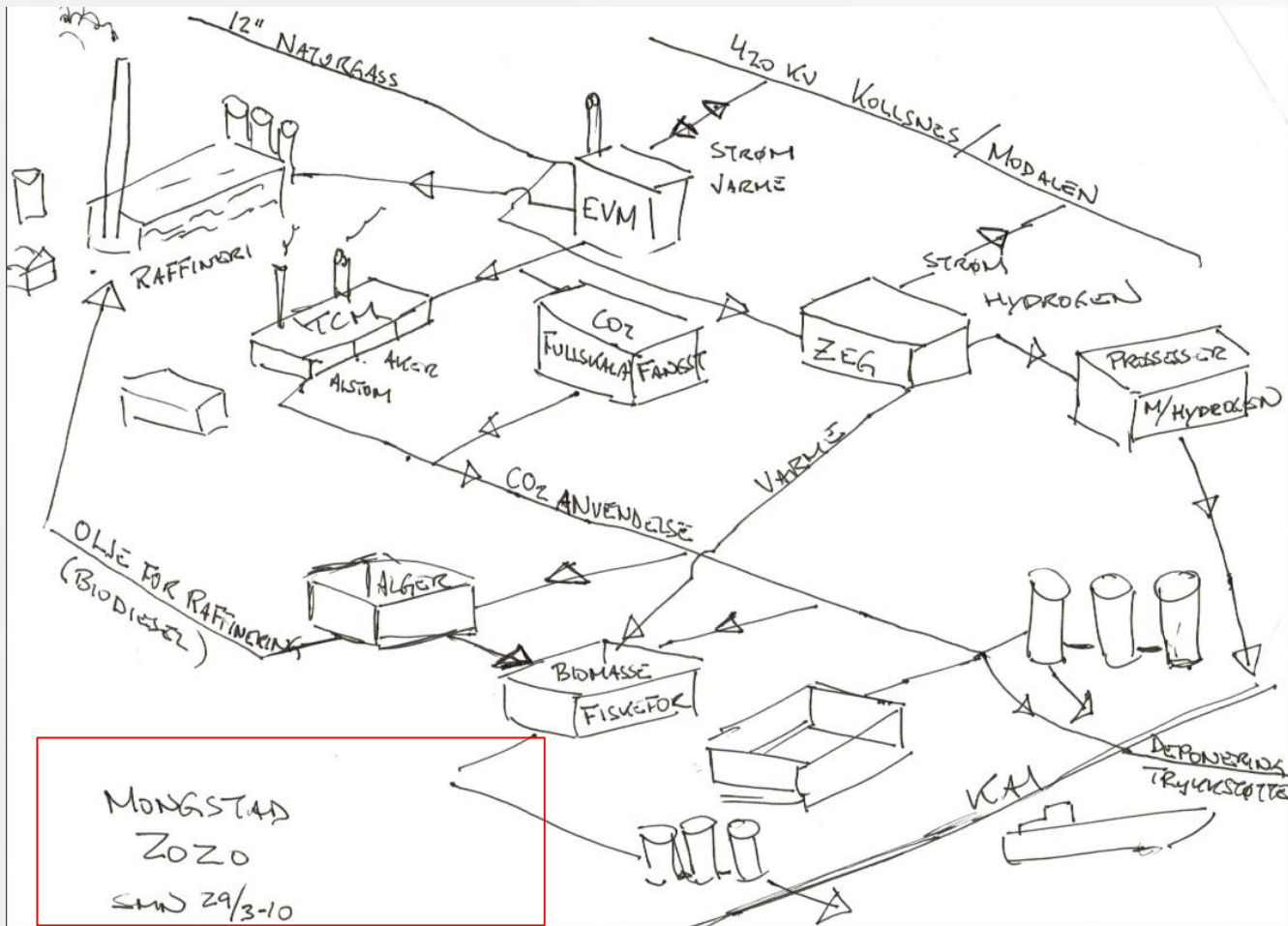
Need for management

- There is a strong need for a joint strategy for the development of MIP
- «MIP Innovation Hub» needs resources and staff to manage speed of innovation, BD activities and access funding from national&EU sources for a role within re-industrialisation of Western Norway.
- **We recommend to incorporate this in a separate business unit/company.**

Perfect timing

- With the current focus on Western Norway hit by historical low oil price, regulation for green industries, brain drain from the region and the global energy shift and need for job creation, the political incentives and support for launching and gaining support and funding for the «green spot» initiative as a problem solver is optimal.
- Easier to attract talent in the current climate

We have the perfect timing - eye of the storm - to realize and further develop great thoughts :



POINT OF VIEW

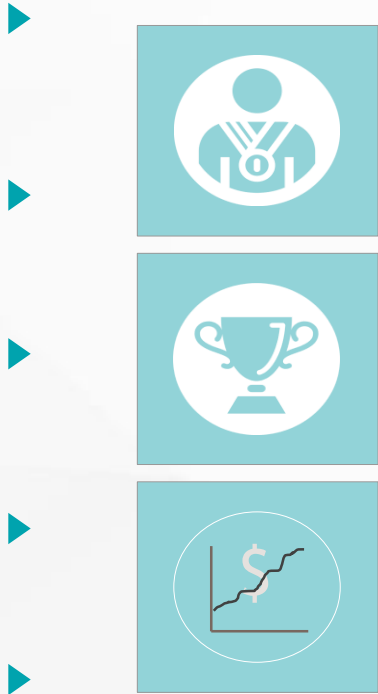
- A number of ideas for "green industries" included in this assessment have been part of previous initiatives - some are new...
- The incentives, the drivers and the competitive edge for new sustainable business models which we now (10 years later) have included in the analysis are :

The megatrends:

- ▶ Regulators and financiers demand sustainable business model and favor a green shift
- ▶ Incentives for circular economy business models - need for recycling material and energy flows
- ▶ The technological progress/maturity and decreasing cost curve of green technology in a number of industries
- ▶ Increased regulation for resources and costs of by-products and waste hitting a number of industries
- ▶ Norway and the region in need of growth in value and job creation and new industries/businesses

Critical success factors for the Greenspot initiative - these factors must be addressed to achieve the ambitions

- 1 **Align with Equinor** - Equinor is the critical actor at MIP, so business plans must be aligned with Equinor's roadmap and plans to realize new business opportunities
- 2 **Develop a symbiosis** - cooperate to share information and develop ideas on how to best utilize available infrastructure, raw materials & waste streams in and around MIP
- 3 **Create a snowball effect** - develop an opportunity ASAP to create a success story of MIP being the place where the traditional energy industry meets new green possibilities
- 4 **Address infrastructure weaknesses** - further develop electricity and water capacity to reduce limitations on development of opportunities
- 5 **Establish a formal working group** - create a dedicated long term working group to develop the business opportunities and the MIP eco-system



#	Agenda
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1	Project status
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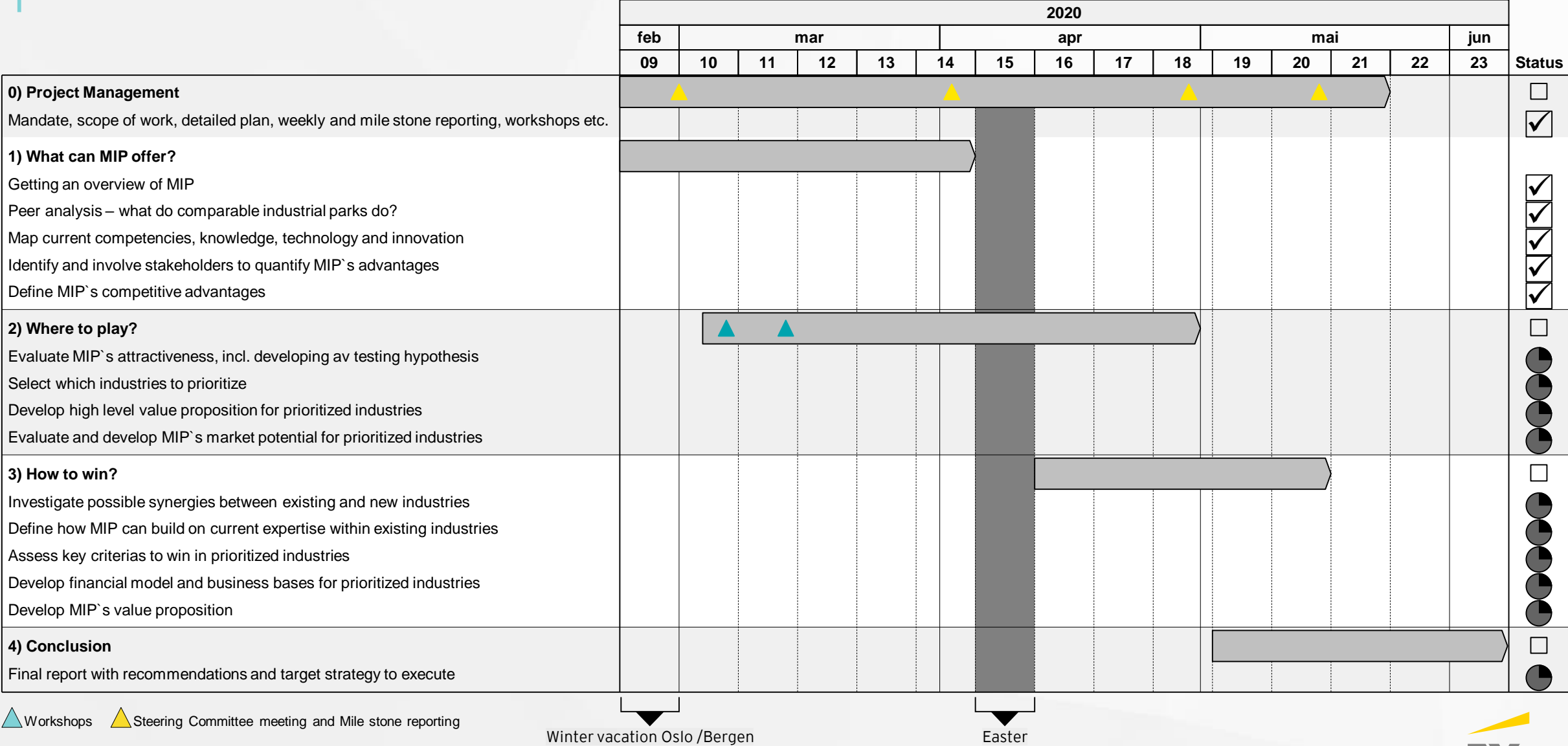
2	Competitive advantages for MIP
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3	Where to play
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4	Going forward
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Scope of Work – Background & purpose

The project is slightly behind plan. The project method is iterative, but structured according to scope of work. Report will be delivered early june.



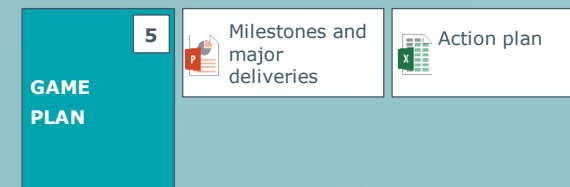
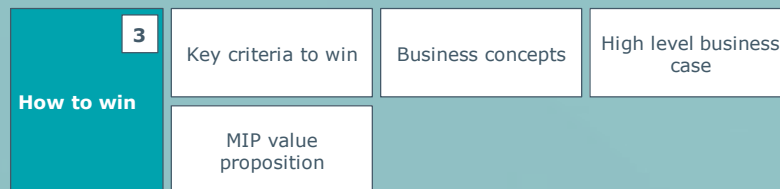
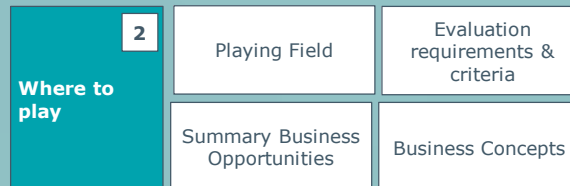
Interview list

Name	Title	Company	Interview status
Widar Salbuvik	CBO	ABP	Completed
Ernst Petter Axelsen	CEO	TCM Mongstad	Completed
Ivar Johannessen	Styreleder	Mongstad Tavleteknikk	Completed
Øyvind Langedal	CEO	CCB	Completed
Gunn Mangerud	Vice Dean, UiB	Kunnskapsklyngen Energiomstilling Vest	Completed
Vidar Totland	Senior Project Director	Invest in Bergen	Completed
Christoffer Sandal	Business Development Director	ABP	Completed
Kjell Kallestad Stolpe	Asset Management Director	ABP	Completed
Espen Norheim	Corporate Finance Partner	EY	Completed
Tore Solheimslid	Klimarådgiver	Vestland fylkeskommune	Completed
Sølve Dag Sondbø	Klima- og naturressurssjef	Vestland fylkeskommune	Completed
Børge Bruntland	CEO	Industriutvikling Vest	Completed
Tanja Hoel	Næringssjef	Alver Kommune	Completed
Hans Kleivdal	Konserndirektør	NORCE	Completed
Arne Eikefet	Infrastruktursjef	Alver Kommune	Completed
Erik Evjen	COO	ABP	Completed
Per Stensland	Special Advisor	Invest in Norway	Completed
Benedicte Fasmer Waaler	Senior Advisor	Invest in Norway	Completed
Vegard Frihammer	Green Executive Officer/Founder	Greenstat	Completed
Bernt Vagstad	Project Manager Asset Development	Equinor	Completed
Sturle Bergaas	CEO	Equinor Mongstad	Arranged
Torbjørn Sætre	Leader of Equinor Supply Base Mongstad	Equinor Mongstad	Completed
Oddbjørn Haukøy	CEO	PSW	Completed
Jannicke Hilland	CEO	BKK	Arranged
Espen Andersen	Project / Sales Manager	Schlumberger	Arranged
Other key industrial players			In process
Other key industrial clusters			In process

Table of content

Final report structure

WORK IN PROGRESS



Working documents and deliverables

- One pager per industry assessed
- Scoring model and all relevant information produced

Background

- ▶ Greenspot is a new strategic initiative to develop Mongstad Industrial Park into a diversified green industrial park, based on current industries present at Mongstad, as well as CCS, renewable energy, aquaculture and other ocean industries
- ▶ Focus is to lay the foundation for further sustainable industrial development
- ▶ Scope of this project is to establish a go-to market plan for future target industries @ Mongstad Industrial Park

Plan

- ▶ Review infrastructure @Mongstad Industrial Park
- ▶ Define MIP competitive advantages
- ▶ Asses the various business development opportunities
- ▶ Identify 3-4 main industries / target sectors
- ▶ Develop high level business case for each target sector
- ▶ Define MIP Value Proposition
- ▶ Establish go to market game plan

Vision & goals

Greenspot Mongstad is a great opportunity to reshape the business portfolio and create new growth – the ambitions are:

Vision	Transform Mongstad Industrial Park into the “green spot” of Norway by offering favorable conditions for sustainable business models
Ambition	Ensure a more diversified industrial mix moving beyond fossil fuels
Ambition	Facilitate the development of new, green value generating activities
Ambition	Increase the number of employees working in the greater Mongstad area
Ambition	Ensure profitable development of the available sites

- ▶ 
- ▶ 
- ▶ 
- ▶ 
- ▶ 

SWOT

Internal factors



Strengths

- Large zoned and flattened plots available in an already established industrial site
 - Disposable land is located far from residential areas hence reducing project development risks, e.g. objections to construction of turbines and tall buildings
- World leading CCS test center (TCM) with access to CO2
- One of Norway's largest industrial clusters (approx. 60 companies and 2400 employees)
 - Skilled workforce with specialists in process industry, maintenance and logistics
- World class port facilities with access to electricity, LNG and bunker oils
- Potential access to significant energy resources from the refinery
 - Waste hot water, natural gas and hydrogen
- Good road infrastructure on site and links to national main roads

Weaknesses

- Little to no historical focus on shared optimization and industrial symbiosis development or development of new business opportunities outside O&G sector
- No existing working group to foster innovation and green growth at MIP. Several reports has been published about the opportunities, but the recommendations have not been acted upon
- Available plots lack business prospectuses and have fragmented ownership which may hinder infrastructure investment
- MIP not recognized as a "green spot". Requires a significant shift in re-branding, and sales to create awareness of the MIP in order to increase diversification
- Whilst holding a strong market position in the Norwegian E&P market Mongstad has limited to no exposure to other industries
- Infrastructure: Current power and water situation at MIP is a threat for attracting new electricity and water intensive industries

External factors



Opportunities

- Recent downturn in the Oil & Gas Industry can increase the need for E&P Operators to consolidate Operations, Mongstad is well positioned for this
- An industrial symbiosis success case could create a snowball effect for attracting new businesses to MIP
- Newly established national/ international programs for new industry development:
 - COVID19 situation and the Norwegian government response can be a possibility for increased funding opportunities for green business development
 - EU taxonomy and green deal can provide significant funds to certain businesses
- 5G Infrastructure pilot could attract tech companies
- Nordhordland Biosphere Reserve – UNESCO status – can contribute to highlighting the sustainability appeal for MIP and the surrounding area

Threats

- Further development of much of MIP is highly dependent on 1 dominant actor (Equinor) and there is a strong dependency in matching new opportunities with key offerings and willingness from this actor
- Other international industrial parks are also looking to capitalize upon modern technologies and green growth opportunities making attracting the biggest companies potentially very competitive
- Large number of business opportunities can lead to lack of strategic focus
- Lack of Norwegian national engagement in certain EU initiatives can limit available funds for certain industries

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Competitive advantage

Competitive advantages



Potential access to critical resources:

- Natural Gas
- Hot industrial water
- Refinery products



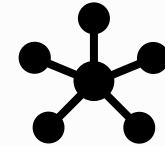
CO2 as a resource for new industrial development



Greenfield land ready for new industrial development



Competent workforce - skilled in both process industry and maritime logistics



Largest industrial energy cluster in Norway



One stop shop port services



High capacity ISPS port with deep-sea and RO-RO quay



Strategical positioned for growth in the sea meets land industries



Located far from residential area, but close to Bergen and it`s competence cluster



Easy access by sea and road

MIP Fact Pack

Key figures for Mongstad Industrial Park



59 companies

(2020)



2400 jobs

(2020)



NOK X in turnover

(awaiting input)



5-10 MW available
electrical power

(2020)



105 200 sqm
of floor space

(2020)



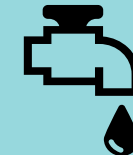
4 900 000 sqm of
available land

(2020)



2400 ship arrivals
per year

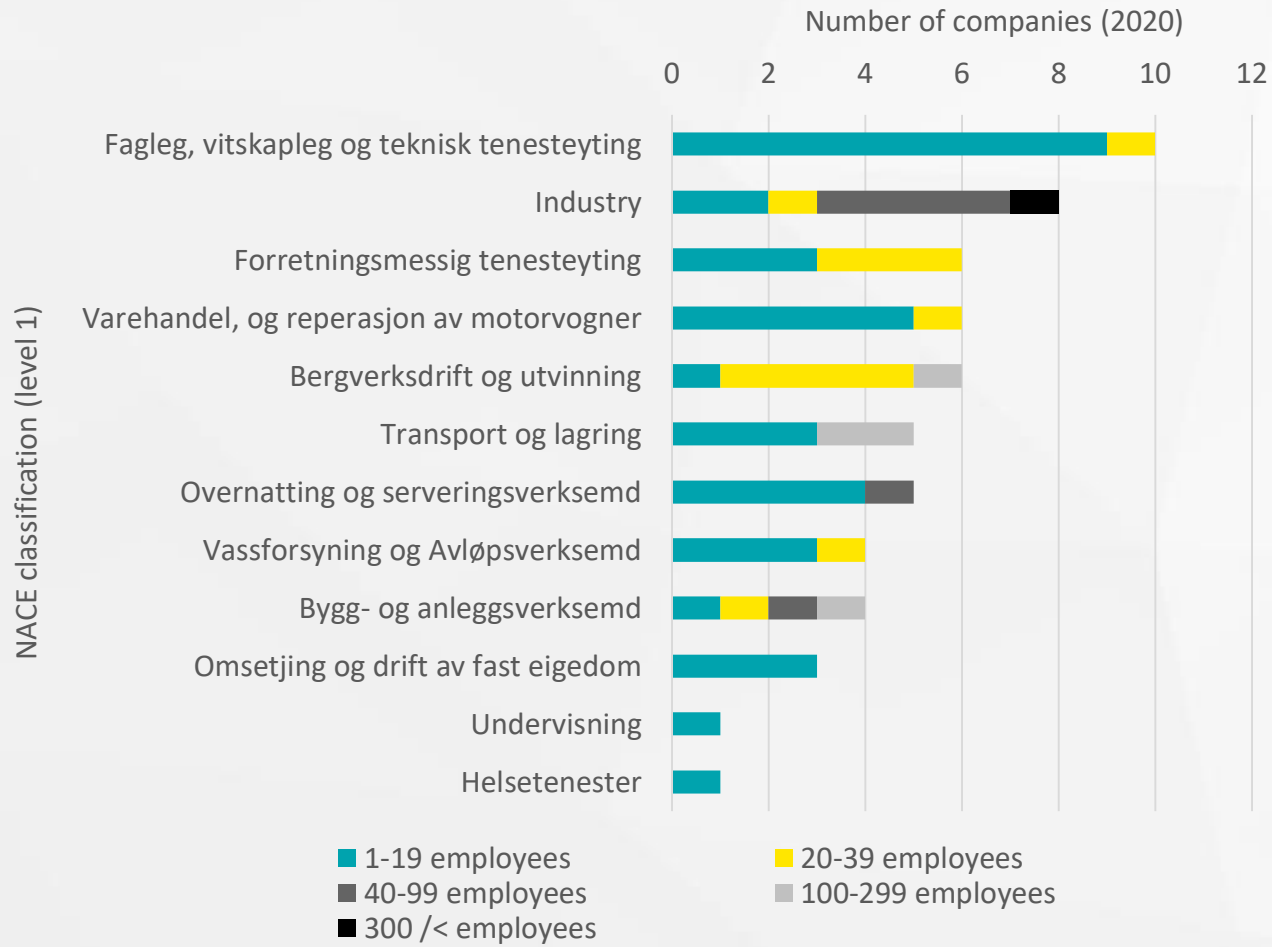
(2019)



Available capacity:
Industry water = 0 m³/h
Drinking water = sanitary
use for new industry

(2020)

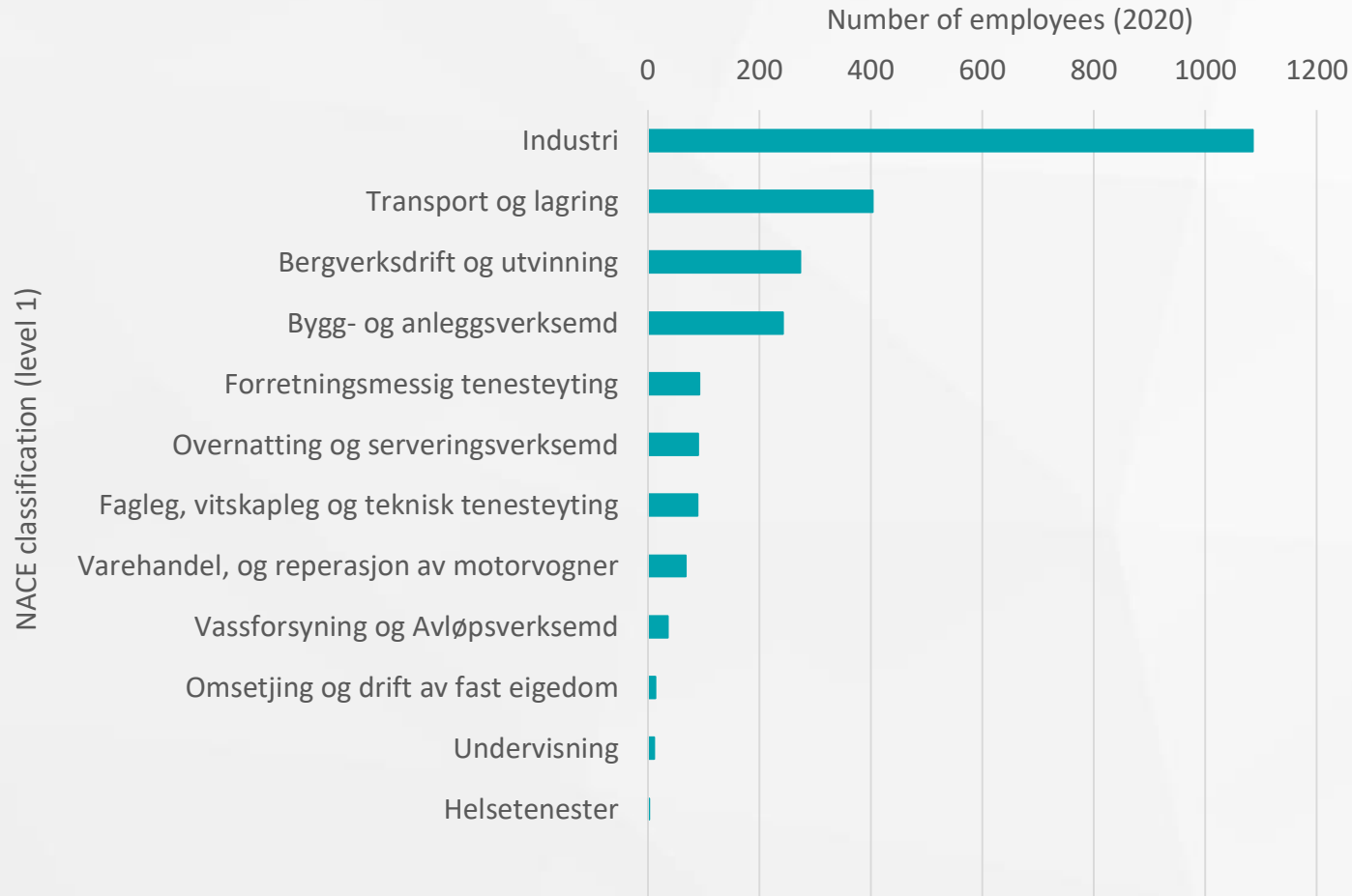
Distribution of the companies located at MIP within different industries



59 companies located at MIP

36 companies have 1-19 employees

Distribution of the employees at MIP within different industries



Approx. 2400 employees at MIP

45% of the employees work within the category "Industry"

35% of the employees at MIP work at the oil refinery

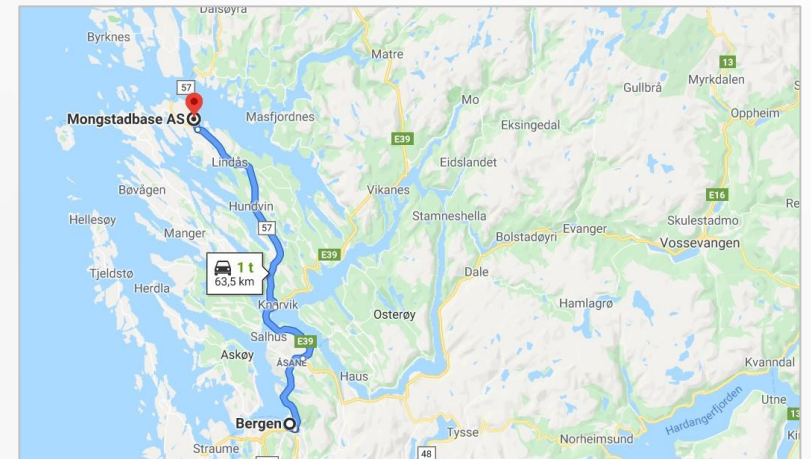
Mongstad Industrial Park - Norway`s leading industrial cluster

- Mongstad Industrial Park (MIP) is a large industrial area, where the main activities are centered around offering facilities and services to the energy industry.
- MIP has Norway`s largest port in terms of tons over quay (1.000.000 tonnes per annum), and is one of the largest energy ports in Europe handling over 3000 ship arrivals per year.
- Over 50 companies are located at the area, and has a workforce of 2000 employees with high technical competence.
- The Industrial Park is home to Norway`s largest oil refinery (operated by Equinor), Mongstad supply base (owned by ABP and operated by CCB) and the world`s largest technology center for development and testing CO2 capture technologies (Technology Center Mongstad).



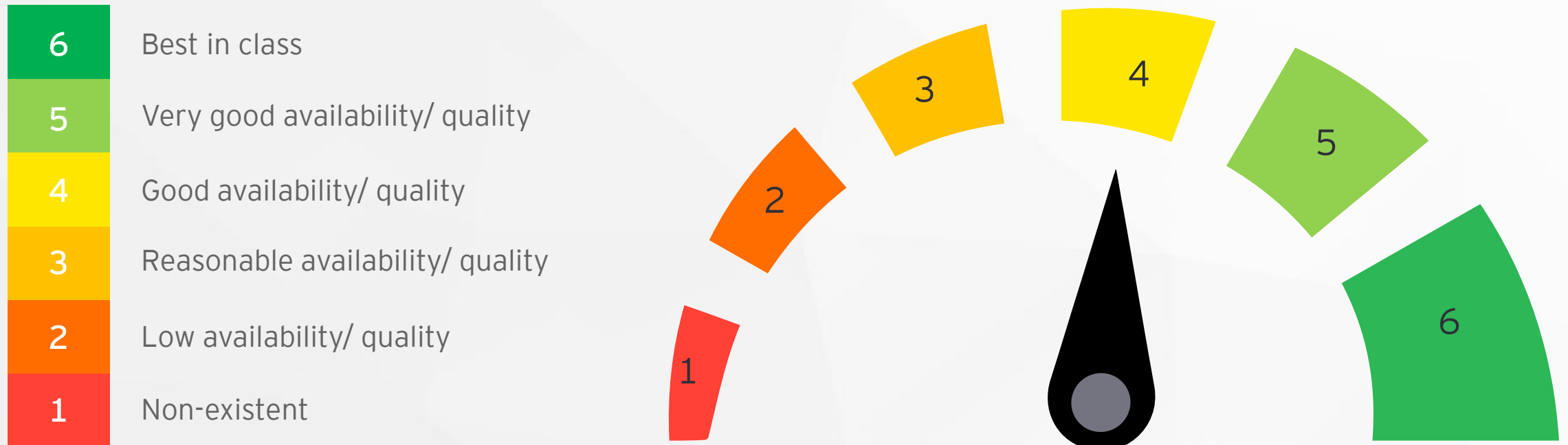
Location

- Strategically located on the west coast of Norway with proximity to important oilfields in the North Sea, and has a central position for national and international cargo transportation along the Norwegian coast.
- Located in Alver municipality, an one hour drive from Norway`s second largest city, Bergen. Bergen is the seafood capital of Norway, and is also an important city for the energy and shipping industry. Flesland, Bergen Airport, is located 18 km from Bergen city centrum (appox. 80 km from Mongstad).



Evaluation of the infrastructure at Mongstad Industrial Park

We have evaluated the infrastructure based on identified strong points and areas for improvement



Water & waste water treatment status and potential for improvement

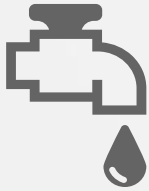
Infrastructure type

Current usage & capacity

Major issues

Potential improvement actions

Level of maturity



Drinking water

- ▶ Total capacity: 300 m3/h
- ▶ Available capacity: Sanitary use for new industry (minimal availability)

Industrial water

- ▶ Total capacity: 400 m3/h
- ▶ Available capacity: 0 m3/h

Plans

- ▶ Expansion to capacity for drinking and industrial water is planned for 2024, though not confirmed. Freshwater- 100 m³/h, industrial water - 350 m³/h

- ▶ Current available capacity for drinking and industrial water is limited due to regional availability and current usage
- ▶ Potential risk for many new business development opportunities at MIP due to lack of water. Long lead time and lack of confirmation of expansion does not negate this risk
- ▶ The fresh water rights sits primarily with Equinor. The supply is therefore highly dependent on decisions made by Equinor, and can be seen as a risk for new users who are reliant on a secure water supply
- ▶ Climate change may be further limit water supply due to prolonged dry spells

- ▶ Evaluate potential to optimize current fresh water usage and encourage water re-use
- ▶ Industrial water- confirm capacity expansion and try to accelerate deployment
- ▶ Drinking water- accelerate planned capacity expansion



Waste water treatment



- ▶ Small waste water treatment plant on site
- ▶ The refinery has waste oil slurry that could be utilized
- ▶ Large sludge storage tank which is regularly emptied and treated offsite
- ▶ Have good drainage for rainwater so flooding is unlikely

Plans

- ▶ Considering option for a larger waste water treatment plant though not confirmed

- ▶ Existing refinery waste water treatment plant is at capacity and nearing end of life
- ▶ Methane generated in the process is released to the atmosphere rather than utilized (Mongstad refinery as a whole emits over 2000 thousand tonnes of methane per year)

- ▶ Evaluate potential to capture biogas from waste treatment
- ▶ Consider whether new waste water treatment facilities at the refinery could make water available for recycling to reduce demand
- ▶ Explore options for other shared users of the waste water treatment plant



Power & energy infrastructure status and potential for improvement

Infrastructure type

Current usage & capacity

Major issues

Potential improvement actions

Level of maturity

Electricity ¹



- ▶ Current available electrical power in the local distribution network: 5- 10 MW.
- ▶ The shutdown of Mongstad thermal power plant (summer 2020) will weaken the local power system. As a consequence the transmission reliability criterion will shift from N-12 to N-0

Plans

- ▶ Planned upgrade from 300kV to 430 kV by Statnett in 2024
- ▶ Alver municipality has been asked to apply for licenses in order to secure electricity for new business development in the region

- ▶ Current availability of electrical power is limited for new industrial users
- ▶ Limited to no redundancy of supply which is essential for some players operating in energy intensive industries, e.g. most datacenter operators
- ▶ This limits the type of industries that can be established at Mongstad in the short term and could put off potential investors until it is addressed
- ▶ Electrification of industries and offshore installations puts pressure on the local power system

- ▶ Closely engage with Statnett and NVE to ensure that the upgrade to the existing power infrastructure is made as soon as possible
- ▶ Lindås transformer station is planned to be upgraded with a 300 mva transformer
- ▶ Explore delay of shutdown of Mongstad power plant until Mongstad`s power supply is strengthened
- ▶ Explore options for batteries or hydrogen fuel cells to buffer electricity supply



Industrial waste warm water



- ▶ Approx. 80MW of warm energy is discharged to the Fjord on a constant basis with a temp. of 20-21 °C (consist of several streams with different temperatures)
- ▶ One stream of 300 m3/t up to 90 °C (approx. 8MW). Exits a tie-in point
- ▶ Approx. 6000 m3/t of sea water with a temp. of >22 °C. Exits a tie-in point
- ▶ Two streams for indirect cooling. Fresh water connection will not be possible before 2028 (requires total shutdown of the refinery)

- ▶ No pipelines from refinery to other site areas where businesses to utilize the waste water and large investments (approx. 50 MNOK) to utilize the warmest hot water
- ▶ Challenge in building out pipelines whilst not affecting the refinery operations

- ▶ Utilize the industrial waste warm water from Equinor`s oil refinery in new business areas
- ▶ Revisit previous studies of potential uses of waste heat, e.g. production of tree pellets for export or usage in other processes



¹ Rapport Næringsutvikling og krafintensiv industri Nordhordland/Mongstad, Aabø Powerconsulting, 2020

² N-1 criterion states that a failure in any system component of the power system does not cause losses in electricity supply

Hydrocarbon infrastructure status and potential for improvement

Infrastructure type

Carbon Capture



Current usage & capacity

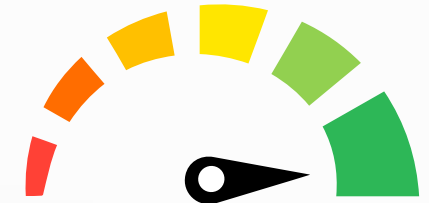
- ▶ TCM are able to capture (and release) 100,000 tCO2 per year
- ▶ Are able to test a range of technologies including amine and membrane based filtration methods
- ▶ Strong international relations and seen as a Centre of Excellence for CCS technology

Major issues

- ▶ Currently no ability to export, use or store captured CO2 (beyond very small amounts in algae production)

Potential improvement actions

- ▶ Equinor is considering building a new pipeline for CO2 export directly to the North Sea for storage. A final decision on this will be essential in order to develop a number of businesses



Natural gas & other gases



- ▶ Natural gas pipeline from Kollsnes to Mongstad
- ▶ The refinery has high pressure air and nitrogen that could be made available to other industry users
- ▶ The natural gas pipeline will not be in use after the shutdown of the power plant (summer 2020)
- ▶ The existing NG pipeline will not export CO2 to Kollsnes

- ▶ A potential issue could be if the natural gas pipeline does not stay operative after the shutdown of the power plant. Access to natural gas is a competitive advantage for MIP

- ▶ Equinor expresses the desire for the natural gas pipeline to continue stay available in case it is needed again in the future



Hydrocarbon processing and storage



- ▶ Mongstad is home to Norway's strategic oil reserves and is Norway's largest refinery
- ▶ Currently import biofuels for on site mixing

- ▶ Currently no onsite production of low carbon fuels

- ▶ Explore potential to use refinery and existing storage infrastructure in processing and distribution of low carbon fuels



Waste treatment and circular material use status and potential for improvement

Infrastructure type

Solid waste treatment



Current usage & capacity

- ▶ Supply base waste handled by SAR
- ▶ Solid waste is sent off site for treatment
- ▶ Main fractions handled by SAR are (per year):
 - ▶ ~2000tonnes of oily waste
 - ▶ 2-3000 tonnes metal
 - ▶ ~2000 tonnes of other mixed wastes

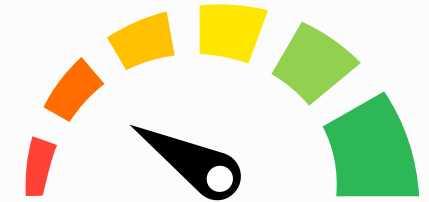
Major issues

- ▶ Lack of overview of how waste is treated at

Potential improvement actions

- ▶ Map current material and waste flows to identify potential to increase circularity
- ▶ Consider entering in to dialogue with Sløvåg and Skipavika about ways to increase circularity of the whole regional industrial area for the benefit of all actors

Level of maturity



Onsite reuse of waste & sharing of materials



- ▶ Limited onsite reuse of waste products identified
- ▶ Refinery uses own gases in heating
- ▶ Very small amounts of carbon dioxide are used in the algal test center (CO2BIO)

- ▶ Absence of coordinated facilitation for sharing of common infrastructure for the exchange of energy, raw material and product streams between landowners and existing businesses at MIP¹

- ▶ Map current material and waste flows to identify potential to increase circularity
- ▶ Mongstad base has a large amount of maintenance of oil & gas equipment which could be considered contributing to the circular economy to an extent
- ▶ The refinery produces a variety of waste substances such as sulphur that may be useful in a number of industrial processes



Logistical/ transport infrastructure status and potential for improvement

Infrastructure type

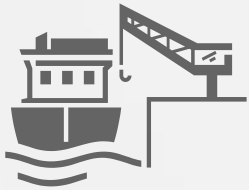
Current usage & capacity

Major issues

Potential improvement actions

Level of maturity

Berthing facilities



- ▶ 750m of available area at ABP site including:
 - ▶ Water depth of 12 meters
 - ▶ RORO quay
 - ▶ Capacity to power 5 ships electrically
 - ▶ LNG & MGO bunkering
- ▶ Capacity is mostly in use (primarily linked to Equinor's supply activity)

- ▶ Already very utilization of the existing quayside areas during the daytime hours, hence limited available capacity for new entrants

- ▶ Assess current capacity at Mongstad. Equinor has stated that they will consider making capacity available for new entrants if necessary
- ▶ Assess potential to develop more capacity on Equinor undeveloped plots if necessary



Road infrastructure



- ▶ Recently upgraded roads on site
- ▶ Route 57 is approximately an hour drive from Bergen and 75 minutes from Bergen Airport

- ▶ No major issues identified, minor issues:
 - ▶ Lack of clear overview of access points for undeveloped plots
 - ▶ Cycle route is not clearly connected throughout the site

- ▶ Ensure clear plans on access for plots
- ▶ Explore further developing cycle path infrastructure



Public transportation



- ▶ Over 2 hours by bus or train from Bergen with changes

- ▶ Long travel time and no direct public transport links from the nearest major city (Bergen) or airport (Bergen airport) to Mongstad

- ▶ Explore options for establishing a regular express bus to Mongstad from Bergen



Digital infrastructure status and potential for improvement

Infrastructure type

Fibre connection



Current usage & capacity

- ▶ Type: DWDM, Dark Fiber options 1
- ▶ Redundant network. There are several fiber paths in the area 2
- ▶ Apparently sufficient for current and planned expansion

Major issues

- ▶ Distance to major European cities could introduce a time delay limiting usage for certain datacenter applications

Potential improvement actions

- ▶ XXX



5G availability



- ▶ Telenor 4G network is in place
- ▶ Capacity, exact coverage & data speeds are unknown

Plans

- ▶ Telenor is in the process of rolling out 5G across Norway, though when this will reach Mongstad is unclear

- ▶ No major issues identified at this time

- ▶ Engage with Telenor to see if 5G can be established at an early stage in the Mongstad area
- ▶ Apply for funds for Fensjordbassenget 5G project



Agenda

1 Project status

2 Competitive advantages for MIP

3 Where to play

4 Going forward

Evaluation requirements & criteria

Each business opportunity has been evaluated on the basis of 1) some absolute requirements and 2) six design criteria

#	Requirements
1	Time horizon to realization of business opportunity must not exceed 5 years
2	Contribute to diversification and reindustrialization of Mongstad Industrial Park
3	Accessible existing market



#	Design criteria
1	Commercial attractiveness <i>Sustainable business model - long term value creation</i>
2	Ripple effects for the region <i>Tax, job creation potential</i>
3	Contribution to the "Green shift" <i>Megatrends and circular economy</i>
4	Competency development <i>Ability to attract relevant competency</i>
5	Extent of required cooperation and investment in infrastructure <i>In order to attract relevant players and realize the potential</i>
6	Competitive landscape <i>MIP competitive position</i>



Strategically attractive for Green Spot

Summary Business Opportunities

All identified business opportunities 1/2



Oil and gas services



Decommissioning of offshore oil and gas installations and pipelines



Carbon Capture and Storage (CCS)



Sustainable aviation fuel (SAF)



Blue hydrogen production



Grey hydrogen production



Green hydrogen production



Green ammonia production



Land-based grow-out fish farming of salmon



Fish processing



Post smolt production



Fish feed production



Omega 3 or other specialist substance from algae



Algal biomass production for fish feed



Microorganism culture for feed/ human consumption

All identified business opportunities 2/2



Data centers



Green fuel & feed solution test centres



General logistics hub



Autonomous warehouse



Purification and recycling of contaminated bulk material



Ship recycling



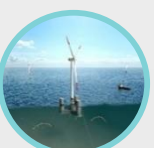
Concrete recycling



Cement production



On site land-based wind generation



Offshore Wind



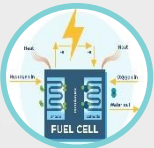
Deep ocean (seabed) mining



Floating solar



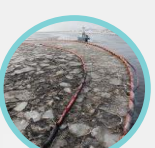
Biogas and organic fertiliser production



Fuel Cell or electrolyze Production



Battery production



Test center for acute pollution preparedness

Business opportunities that are not compliant with the requirements and therefore have not been evaluated 1/3



Floating solar

No reason for establishing a manufacturing industry at scale for Offshore Solar in Western part of Norway. Small market in Norway.



Autonomous warehouse

Part of continually investments/upgrading of the supply base. Driven by client demands.



Deep ocean mining (seabed minerals)

Potentially a long-term possibility, but not in the time perspective of 3-5 years.



Purification and recycling of contaminated bulk material

Lack of competitiveness. MIP is located far from Bergen, and has expensive rental fee for land area compared to other potential locations.



Fish feed production

Tough competition due to overcapacity in the market.



Decommissioning of offshore oil and gas installations and pipelines

Due to prolonged lifetime, decommissioning projects are delayed further out in the horizon, and should therefore not be a prioritized field to explore. Competition- 3 onshore facilities for scrapping and recycling or disposal at Vestland, as well as Arise DRS is building a facility in Gulen.

Business opportunities that are not compliant with the requirements and therefore have not been evaluated 2/3



Ship recycling

Due to uncompetitiveness of worker costs and high investment in infrastructure.



Cement production

Not strategic attractive because of high CO2-emission without CCS in place. Located far from Bergen. Very high costs of establishment. Time horizon outside the time perspective.



Concrete recycling

Lack of competitiveness. MIP is located far from Bergen, expensive rental fee for land area.



Fish processing

Is not relevant if it is not established a land-based grow-out fish farming facility.



Grey hydrogen production

It is not likely that Equinor will start production of grey hydrogen at Mongstad. Production of grey hydrogen generated significant carbon emission and is not within the green scope of Greenspot Mongstad.



General logistics hub

It is interesting to look at a mega-warehouse logistics hub for all offshore operations, flexible arrangements etc, but this does not necessarily bring Green Spot further and is not increasing the competitive advantage towards green re-industrialization.

Business opportunities that are not compliant with the requirements and therefore have not been evaluated 3/3



Green ammonia production

Time horizon for establishment, based on existing infrastructure and almost non-existent market as of today, is outside the time perspective of 3-5 years (can be considered alongside blue hydrogen as interesting for the future).



Test centre for acute pollution preparedness

Interesting case, but needs political support and processes outside the scope of Greenspot Mongstad

The following business opportunities all meet the requirements and have been evaluated in the scoring model



Consolidation of oil and gas activities



Carbon Capture and Storage (CCS)



Sustainable aviation fuel (SAF)



Green fuel & feed solution test centres



Blue hydrogen production



Green hydrogen production



Biogas and organic fertiliser production



Fuel Cell or electrolyze Production



Land-based grow-out fish farming of salmon



Post smolt production



On site land-based wind generation



Offshore Wind



Omega 3 or other specialist substance from algae



Algae biomass production for fish feed



Microorganism culture for feed/ human consumption

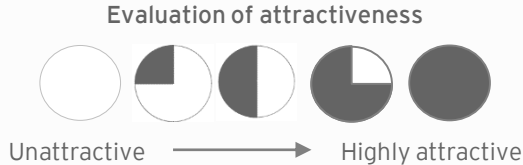


Data centers



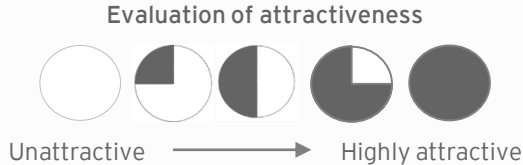
Battery production

Business opportunities and high level scoring 1/2



Business opportunity	Current attractiveness score	Contribution to the "Green shift"	Extent of required cooperation and investment in infrastructure	Competency development	Time horizon of realization of business opportunity	Ripple effects for the region	Competitive landscape	Commercial attractiveness	Contribute to diversification and reindustrialization	Accessible existing market
On site land-based wind generation	●	●	●	●	●	●	●	●	●	●
Green fuel & feed solution test centres	●	●	●	●	●	●	●	●	●	●
Green hydrogen production	●	●	●	●	●	●	●	●	●	●
Carbon Capture and Storage (CCS)	●	●	●	●	●	●	●	●	●	●

Business opportunities and high level scoring 2/2



Business opportunity	Current attractiveness score	Contribution to the "Green shift"	Extent of required cooperation and investment in infrastructure	Competency development	Time horizon of realization of business opportunity	Ripple effects for the region	Competitive landscape	Commercial attractiveness	Contribute to diversification and reindustrialization	Accessible existing market
Blue hydrogen production	1/4	3/4	1/4	4/4	1/4	4/4	1/4	3/4	4/4	3/4
Battery production	1/4	3/4	4/4	1/4	4/4	1/4	1/4	3/4	3/4	3/4
Biogas and organic fertiliser production	1/4	4/4	1/4	3/4	1/4	1/4	3/4	1/4	3/4	4/4
Sustainable aviation fuel (SAF)	1/4	4/4	1/4	3/4	3/4	1/4	3/4	3/4	4/4	1/4
Land-based grow-out fish farming of salmon	1/4	3/4	1/4	1/4	3/4	3/4	1/4	3/4	4/4	3/4
Post smolt production	1/4	3/4	1/4	1/4	3/4	1/4	3/4	1/4	4/4	4/4

Business opportunities evaluated that we will not go forward with



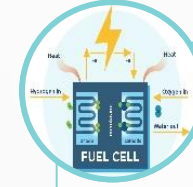
Offshore Wind

Though there is an enormous potential for this industry to grow in the future, current developments are limited due to costs therefore opportunities are limited in the timescale evaluated.



Data centers

This market is growing but highly competitive with a large number of new and established actors in the Nordics. Mongstad's electricity infrastructure is less currently poorly suited for this industry and no relevant brown field site has been identified making development unlikely



Fuel Cell or electrolyser production

Though a growing market due to the transition to zero emission transportation, there are no existing plans to establish at Mongstad. Furthermore the infrastructure and competencies at Mongstad are less well suited to developing this opportunity.



Omega 3 or other specialist substance from algae

Though an attractive and growing market for supplements for aquaculture and human consumption, there are no existing plans to establish at Mongstad beyond research scale, and the infrastructure and competencies at Mongstad are less well suited to developing this opportunity.



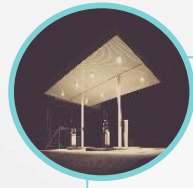
Algal biomass production for fish feed

Though a market with growth potential, there is limited scale currently and this is a low margin product. There is also no existing plans to establish at Mongstad beyond research scale, and the infrastructure and competencies at Mongstad are less well suited to developing this opportunity.



Microorganism culture for feed/ human consumption

Though an attractive and growing market for aquaculture and human consumption, there are no existing plans to establish at Mongstad beyond research scale, and the infrastructure and competencies at Mongstad are less well suited to developing this opportunity.



Consolidation of oil and gas activities

This will not contribute to green development so was excluded despite being an interesting business opportunity.

Business opportunities that we suggest to move on with designing concepts and matching with MIP competitive advantages



Blue hydrogen production



Green hydrogen production



Land-based grow-out fish farming of salmon



Post smolt production



Carbon capture & storage



On site land-based wind generation



Sustainable aviation fuel (SAF)



Battery production

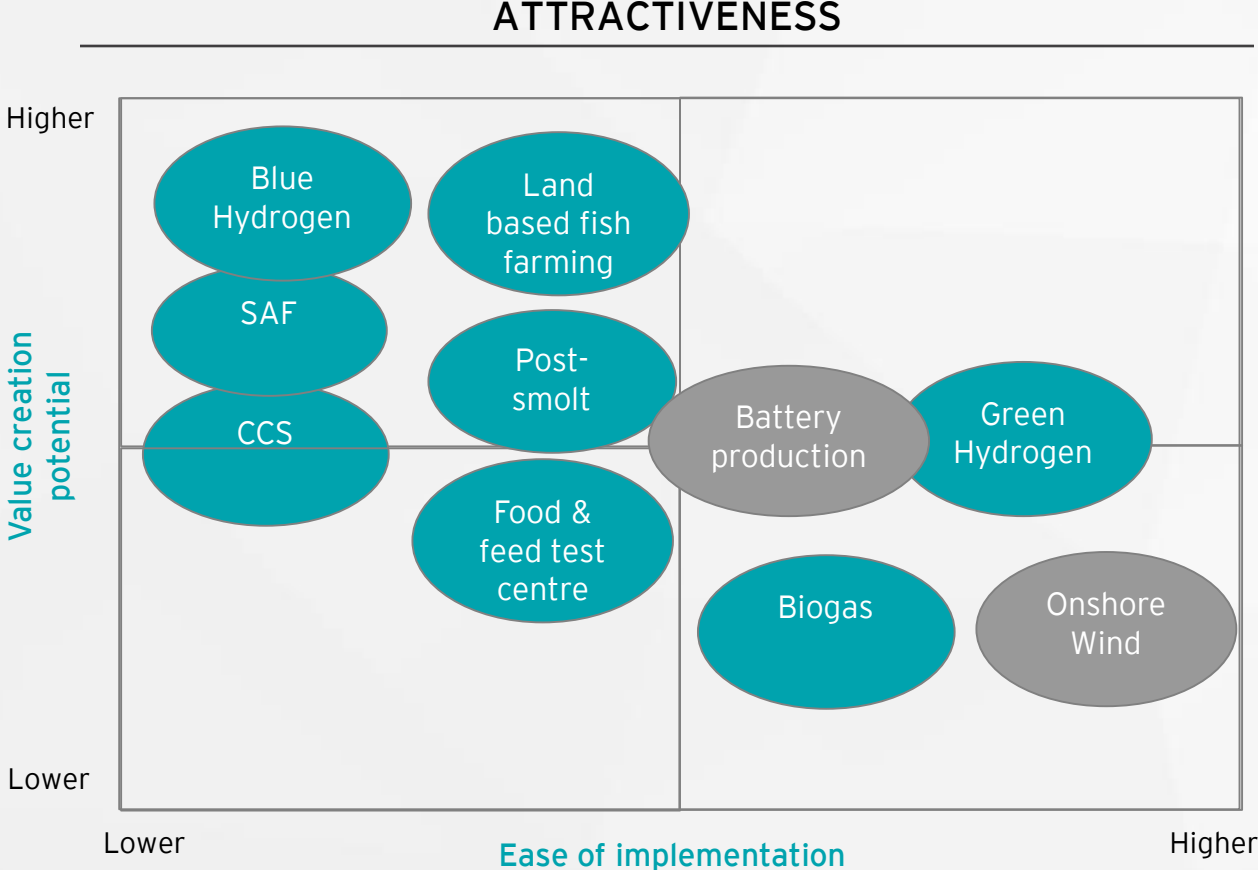


Green fuel and feed test centre



Biogas and organic fertiliser production

Business opportunities: value creation potential versus ease of implementation



COMMENTS

- The most strategically attractive opportunities are located in the top right of the figure
- Preliminary attractiveness score is the summary of evaluation:
 - Y-axis is value creation (job creation potential, etc.) = 1-3
 - X-axis ease of implementation (current infrastructure etc.) = 4-6
- We recommend to further explore these opportunities to develop business concepts including required investments and business case modelling

Agenda

1 Project status

2 Competitive advantages for MIP

3 Where to play

4 Going forward

Going forward

Process towards four industries require us to build and test the remaining concepts to validate the most attractive options. This will require entering in to phase three of the project before concluding on phase two.

