Project Low-emission
Pre-read for TG-workshops May 2-5

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Content

1. Workshop venue, dates and agenda
2. Project time schedule
3. Workshop objectives
4. Project description
   - Background & motivation
   - Problem description, opportunity statement, vision of success, project objectives
   - Details of scope
   - Project resources and governance

Workshop venue, dates and agenda

Hybrid meetings physical/digital:

- Physical: Research Center of Norway, Drammensveien 288, Lysaker
- Digital: Teams (see details in Outlook-call from Gunnar H. Lille)

Dates:

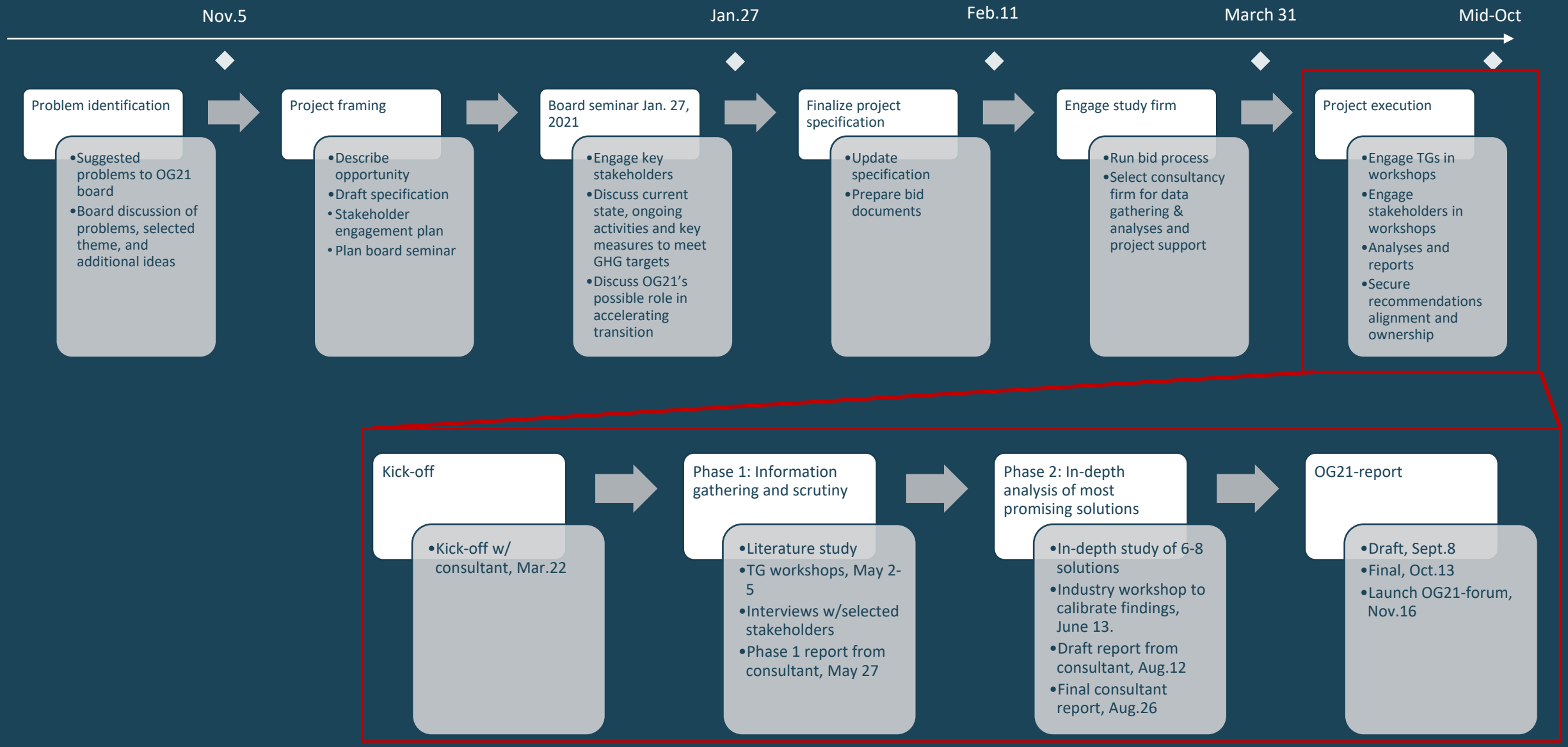
- TG1: May 5, 12-15 h
- TG2: May 3, 12-15 h
- TG3: May 4, 12-15 h
- TG4: May 2, 12-15 h
- TG5: May 5, 9-11:30 h

Agenda:

- Welcome, presentation of participants. TG-leader, 15 mins
- Introduction to the project. Gunnar, 15 mins
- Presentation of DNV pre-read. DNV, 30 mins
- Structured discussions lead by DNV. 90 mins
- Summary and next steps. DNV. 30 mins

Lunch sandwiches served for physical participants.

Time schedule – Project execution



Workshop objectives

Main objectives for TG-workshop:

- Discuss DNV suggested long-list of low-emission technology opportunities within TG-discipline, Scope 1 emissions
- Obtain TG-input on DNV identified opportunities for Scope 3 emissions including increased EU need for Norwegian natural gas
- First pass on categorization of some example opportunities
- Identify needs for further information gathering and stakeholder input/engagement

Supporting objectives:

- Engage all participants through open discussions
- Nurture and develop OG21-network to facilitate collaboration

Project background and motivation

In the OG21 board meeting Nov.5, 2021, the board asked the TG-leaders and secretariat to frame and specify a deep-dive study for 2022 on how the Norwegian O&G-industry can de-carbonize efficiently.

The new OG21 strategy describes as a part of staying competitive, the necessity for reduction of GHG emissions in the production phase as well as along O&G value chains. The deep-dive study will use the new OG21 strategy as a starting point for the new deep-dive study.

Excerpt from the Executive Summary of the OG21 Strategy:

5. Energy efficiency and cost-efficient electrification are of paramount importance to meet the industry's ambitious GHG emission target of 50% reduction by 2030. Electrification from shore and use of offshore renewables are the most important technologies to reduce operational GHG emissions. There are many costly technical challenges to be solved such as power transfer through FPSO turrets, subsea HVDC converters and long-range AC transmission. Electrification hubs and large grid systems could also reduce costs. Energy efficiency can be improved for instance with technologies to reduce water production, water processing downhole or subsea, combined cycle gas turbines, and the use of low carbon fuels in gas turbines.

6. Carbon capture and storage (CCS) is a key technology area to reduce CO2-emissions. Firstly, CCS provides an opportunity to de-carbonize natural gas either onshore or offshore (gas-to-X where X could be either blue hydrogen or electrical power). Secondly, an opportunity to apply CCS directly to offshore gas turbines to reduce operational emissions, should be explored. In addition, CCS represents an industrial opportunity for broad multi-industry application.

Problem description

- Which problems are we trying to solve with this project? Two problems that appear independent, but which possibly are intertwined:
    1. Meet industry GHG emission goals of 50% reduction by 2030 while maintaining support in the society and securing license-to-operate
    2. Stimulate the thinking on how gas and oil can be used with low emissions of GHG.
- Why are we doing this project?
    - Main measure to reduce GHG emissions, i.e. electrification from shore, is being challenged by external stakeholders.
    - Large-scale electrification from shore could cause the O&G industry to be blamed for electricity price spikes and volatility. The risk should be reduced by also exploring alternative ways including possible acceleration and scaling of alternatives.
    - Time is critical – 8 years to cut 50% of GHG emissions. Several other ideas than electrification from shore exist, but they are to different degrees associated with challenges such as low maturity, high abatement costs and safety concerns.
- What is the size of the opportunity?
    - Reducing operational GHG emissions by 50% within 2030 is a promise to the society. The license to operate is at stake if the industry fails to deliver.
    - De-carbonizing value chains, especially natural gas, is likely to become a necessity to secure markets if EU and GB succeeds in the transition to low-emission societies.

Opportunity statement:

OG21 could improve the possibility for meeting the 2030 GHG emission goals and secure the license-to-operate, by exploring ways to accelerate development and implementation of GHG reducing measures.

Vision of success:

By the end of this project in 2022, OG21 has described realistic ways to accelerate technology implementation required to meet the GHG emission reduction targets.

Project objectives:

- Obtain a thorough understanding of potential GHG emission reduction technologies, their technical and commercial readiness levels, application scope and scaling, and development and implementation obstacles.
- Identify measures and actions that could be taken to accelerate development and implementation of the most promising GHG reduction technologies with respect to GHG reduction volumes, scaling, and implementation timeline.
- Describe the business opportunity for the Norwegian state as well as for Norwegian industry enterprises in taking a leadership role in petroleum decarbonization solutions (Scope 1, 2 and 3).

Scope of work

Phase 1: Information gathering & scrutiny:

- Gather and systemize data:
  - The current level and sources of GHG emissions in the petroleum industry (Scope 1, 2 and 3).
  - Plans for electrification of the Norwegian society, including emerging as well as incumbent Norwegian industries such as the process industry and the petroleum industry.
  - Description and development status as well as obstacles for de-carbonization opportunities for Scope 1 emissions.
  - Description and development status as well as obstacles de-carbonization opportunities for Scope 2&3 emissions.
- Scrutiny and analyses:
  - Application volume, potential scaling, and scale-up timeline for Scope 1 de-carbonization opportunities on the NCS.
  - Application volume, potential scaling, and scale-up timeline for Scope 2 and Scope 3 de-carbonization opportunities related to petroleum produced from the NCS.
  - Possible links between Scope 1 and Scope 2&3 opportunities.
  - Major obstacles associated with the opportunities.
  - Industry business opportunities for Norwegian enterprises for the various Scope 1, 2 and 3 opportunities.
- Prioritized list of the Scope 1, 2 and 3 opportunities:
  - 6-8 most promising technologies with regards to potential GHG reductions, abatements costs, NCS applicability, and fast scaling, will be selected for the detailed analysis.

Phase 2: In-depth analysis:

- In-depth analysis of the 6-8 most promising technologies on:
  - Application volume, potential scaling, and scale-up timeline for the selected Scope 1 de-carbonization opportunities on the NCS.
  - Application volume, potential scaling, and scale-up timeline for the selected Scope 2 and Scope 3 de-carbonization opportunities related to petroleum produced from the NCS.
  - Possible links between the selected Scope 1 and Scope 2&3 opportunities, e.g. offshore gas power/CCS hubs connected to offshore power grid.
  - Major obstacles associated with the opportunities, and possible solutions/actions to reduce them.
  - Industry business opportunities for Norwegian enterprises for the various Scope 1, 2 and 3 opportunities
- Each of the selected technologies should in addition be described as a case. The cases could be based on real examples, but they should preferably be adjusted to be generic with large GHG reduction volumes.

Ukraine war -> Norwegian gas important to secure European energy supply and support European efforts to meet GHG emission targets

- EU imports ~40% of its gas from Russia
- Wants to eliminate dependence on Russian gas by 2030, Reduce w. 2/3 by the end of 2022
- Norway is 2nd largest provider of gas to EU (22%) and regarded as a highly reliable provider / partner
- REPowerEU strengthens business case for Scope 3 technologies such as CCS, H2/NH3, offshore wind, but also:
- Underpins Norwegian natural gas as an energy carrier to secure supply whilst meeting GHG targets

Project resources and governance

- Steering committee:
  - Merete Madland, UiS, OG21 board,
  - Tove Lie, Lundin, OG21 board
  - Espen Kjærgård, Ministry of Petroleum and Energy, OG21 board observer

- Project leader: Gunnar H. Lille, OG21 secretariat
- Project core team:
  - Inge Brandsæter, Equinor, TG1
  - Ole Eeg, CoP, TG2
  - Jan Roger Berg, Lundin, TG3
  - Kjetil Skaugset, Equinor, TG4
  - Espen F. Holmstrøm, FR, TG5
- Project extended team:
  - Members of the OG21 TGs

- Additional resources (invited to x-discipline workshop, interviews and reviews of draft reports):
  - Members of the OG21 board
  - Mette Brædstrup, Tom Jonsthovel, Schlumberger
  - Trym Edvardsson, Norsk olje og gass
  - Runar Rugtvedt, , Norsk industri
  - Gunnar Løvås, Statnett
  - Sverre Alvik, Jørg Aarnes, DNV
  - Reps. from Gassnova and Climit
  - Reps. from Petrocenters @UiS, Sintef and NORCE
  - Reps. from Energi21, Prosess21, Maritim21
  - Reps. from RCN – Energy dept., Petroleum dept.
  - Reps. from Innovation Norway

- DNV engaged for data gathering, analyses and support for the OG21 team.


OG21