nexstep NATIONAL PLATFORM FOR RE-USE & DECOMMISSIONING

Cross-border decommissioning

HACKATHON 2018

Offshore Energy

24 October 2018

Saraf Nawar

Umayer Hussain

Siddharth Kalra

Preface

Nexstep coordinates, facilitates and accelerates the agenda for decommissioning of redundant Oil and Gas Infrastructure in the Netherlands. Safety and cost efficiency are on the top of Nexstep's agenda. Nexstep's ambition is to reduce the cost of decommissioning by 30%. One of the opportunities to reduce costs lies in better cooperation with the service industry. During Offshore Energy 2018 in RAI Amsterdam, a hackathon was organised in cooperation with IRO. The aim of the hackathon was to capture thoughts and ideas from operators and the more than 50 supply chain contractors. NAM, Spirit Energy and Neptune Energy presented their challenges and dilemmas and opened up to listen to solutions from the service providers. In three intensive sessions numerous ideas were generated, which are presented in this report.

We are now investigating to translate the ideas from the hackathon into concrete projects in close cooperation with the service industry.

The Dutch part of the hackathon was part of a cross border hackathon with our colleagues form OGA. The first part took place on October 9th in Norwich and has its own report. We see this hackathon as a first step towards closer international cooperation which will be followed up upon in the future,

Jacqueline Vaessen
Managng Director Nexstep

Sander Vergroesen
Managing Director IRO

Introduction

Following the UK Hackathon on Decommissioning of Oil & Gas, the Dutch part of the Cross-border Decommissioning Hackathon 2018 was held on 24 October 2018, during the Offshore Energy Conference 2018 in Amsterdam, The Netherlands. During the Hackathon, professionals from more than 50 companies came together to participate in the brainstorming sessions and muse over the challenges posed by the three operator companies during the event. Nexstep, together with IRO (the Dutch branch organisation for the service industry) and the Oil and Gas Authority UK (OGA) organized this event on collaboration and lowering decommissioning costs of oil and gas infrastructure in the Southern North Sea basin.

The operators of this event were:

- Nederlandse Aardolie Maatschappij (NAM)
- Neptune Energy
- Spirit Energy

Three students from the Delft University of Technology (TU Delft), assisted the facilitators during the Hackathon. The Hackathon kicked off with presenters from each of the operating companies briefly presenting the challenges and warming up the participants for the heated-up brainstorming sessions. The participants were people from the service industry (IRO members). This report will describe each of the challenges put forward by each of the operators and the imperative solutions derived from the interactive discussions during the Hackathon.

The goal of the Hackathon was to bring together insightful minds, use their expertise and knowledge, brainstorm ideas and to hack the challenges of the future of the oil & gas industry as experienced by operators on both sides of the Southern North Sea, i.e. The United Kingdom and the Netherlands parts.

1. NAM Hackathon

NAM is a Dutch Exploration and Production (E&P) company with the headquarters located in Assen, The Netherlands. Its core business is exploration and production of oil and gas, both onshore and offshore in the Netherlands. The company has assets on both sides of the Southern North Sea, i.e., the UK and the Netherlands and hence, following the English decommissioning Hackathon, NAM was the first presenter in the Dutch Hackathon.

The people responsible to elaborate on the challenges posed and the ideas hunted down during the three rounds of the NAM challenge Hackathons were:

- Presenter: Radboud Bisschop and Frank de Mik, representatives from NAM
- Facilitator: Paul Rijks, Managing Director of Choicce Limited U.K.
- Assistant: Saraf Nawar, Electrical Engineering Student from TU Delft

There were three rounds during the Hackathon. Each round involved a set of new participants who discussed, challenged and hacked the problems put forward by NAM. Each of these challenges, with the amalgamated solutions from all three rounds, will be separately discussed in the following sections.

Challenge 1: Removal of Facilities - Traditional Oil and Gas Approach

The problem statement: How to place smart (technical) splits in the abandonment scope, such that the operators stay responsible, but the four contractors take over the job safely?

The background information provided during the challenge included:

- During decommissioning, the plant could be transformed from an oil & gas factory to a Sugar factory for instance and then to a new energy hub. Alternatively, the measure of complete removal can be employed.
- The traditional approach is a very strict Health, Safety and Environment (HSE) set of rules, based on high risks of the oil & gas industry from the perspective of the safety of the process (It is not applicable from a personal safety or marine perspective).
- Considering the risks, the oil and gas companies can select a more hands-on or hands-off approach. Expertise of the Exploration and Production companies lie in the management of risks related to oil & gas. The demolition requires a different area of expertise.
- Ideas must be brought forward to allow the abandonment to be split in different phases, whereby, in every phase, the appropriate risk management and expertise are maximized.

After successful discussions with bright minds representing different companies some of the commendable solutions that came forwards were:

- **Leveraging the conversation with the legislator**
  - Upon discussing the associated risks with the legislator, the assets can be transferred to lower risk regimes.
  - Additionally, coordinating with the higher and lower risk industries, for instance the Nuclear industry or Waterworks, might prove to come down to a more sustainable solution.
  - Enhancing the understanding of risk regimes in other industries and the legislation associated with it can bolster the end goal of fighting the posed challenge.
  - Furthermore, application of a common standard across different industries and countries, by, for example, piling removal depth, can prove to be favourable.
  - Defining and understanding the cleanliness criteria and employing resources accordingly can solve many of the existing issues in the industry.

- **Clarity of scope**
  - Instead of transferring the ownership, a service environment can be created. This means, more eligible service providers can be employed by the operators to do certain parts of the job, handling the risks, instead of completely giving away the ownership.
  - Bringing in the right expertise (from the service industry) in the room early enough, which takes all the parties into account, can be an effective measure for the cause.
  - Furthermore, possessing a common access to the data and transparency can reap benefits for both operators and contractors.
  - Additionally, maximizing re- use and giving the opportunities to the contractors to resell and recertify the available resources can prove to be greener for the industry. Different ideas came forward to discuss this measure. Some to name are:
    - Rectification of gas turbines for small scale generation and third world aid projects.
    - Receiving shipyard inputs into the re-use potential.
    - Creating a new platform such as Oil Bay, for buyers and sellers to enter the market or organizing open auctions to re-sell and recycle components and resources.
    - Leveraging the difference in the standards of acceptances between countries.
    - Learning from domestic waste companies, housing contractor and road infrastructure demotion organizations to gain efficiency of decommissioning in this sector.

- **Allocation of people**
  - It can be highly efficient if team members can be assigned and allocated starting from developing the strategy to decommissioning in the project development. This can be done for both contractors and operators.
  - Select people who have passion for decommissioning and will agree to do the assigned task with pleasure, taking pride in it instead of considering it as a burden and getting rid of the responsibility using cheap materials or resources.

Challenge 2: Differentiation of Contractor Landscape

The problem statement: What new alliances can be formed and who should be in the lead for the different in the process?

The background information provided during the challenge included:

- The same companies who are involved in construction and maintenance are the players in the abandonment world.
- This affects the opportunity to handle it differently and often leads to reverse construction.
- The opportunities are to see waste as value, maximize the re-use content and to use available time to the best advantage.
- Expertise outside the traditional oil gas industry, such as expertise in water well industry and abandonment beyond the oil gas, is rarely included.
- What can be offered by the service providers and which roles can they play in a more differentiated landscape of contractors with external expertise?

During the elaborate discussions of the Hackathon sessions, representatives from different participating companies and organizations came up with some effective answers to the problem statement. These can be modelled as follows:

- **Finding engineering solutions**
  - Avoiding reverse engineering in the process of decommissioning.
  - Getting the companies under the Oil & Gas industry to comply with a common standard.

- **Vessels**
  - Is it possible to have a single decommissioning vessel with everything required on it? These requirements would include:
    - Cranes and lifting equipment
    - Walk to work approaches
    - Slick and coil tubing units
    - Cutting or welding equipment
    - Well intervention machinery beside others
    - Etcetera
  - A collaborative approach such as having shared resources between operators can be advised to ensure closer and more effective teamwork between different companies with shared end goals.

Challenge 3: The Watermelon Model

The problem statement: Which commercial models suit best for execution in the Plugging & Abandoning (P&A) while maintaining a win-win situation? What is the best risk distribution between the operators and the contractors?

The background information provided during the challenge included:

- P&A of wells are like opening a water melon although they look green on the outside, one only knows how red they are when opening them
- With P&A of wells it is required to expect the unexpected due to the lack of enough data and well integrity issues
- It is difficult to provide incentives and attract contractors using the traditional commercial models because of the high risks associated to it. With the day- rate models, in principle, more scope is good news for contractors and bad for the operators. However, the alternatives do transfer risks to the contractors.
- When transferring risk, how much control can be given and how can risks of impacting prizing be avoided?
- What commercial models are best suited to cater for unknown scope, while maintaining a shared incentive to reduce the overall cost?

When the experienced lot of mindful enthusiasts brainstormed during this Hackathon, some precious ideas were put forward bolstering the motto of this event. These themes are detailed as follows:

- **Creating methods of sharing commercial risks**
  - This can be realized by allocating resources early and engaging more collaborative teams.
  - Standardizing the data risk management can open up joint operator approach which can support a win-win situation for the project.

- **Employing methods of data logging and inspection techniques.**
  - Research can be conducted to develop and apply simple screening inspection methods.
  - Additionally, it will be required to provide early access to this information or data to the contractors and executing committees.

- **A well inventory can be constructed taking into account the timing of decommissioning.**
  - This can be done by setting up risk ranking registers over time, irrespective of operators.
  - Furthermore, developing longer term work sequence for P&A of wells can highly aid the process.
  - This involves the efficient utilization of synergy between the operators and contracting the resources.
  - Additionally, creating a common transparency of risk including cataloguing, assessment of life cycles, studying integrity of the different operators and contractors can fight the posed challenge.

- If a register can be completed in conjunction with the regulator of wells to be decommissioned by area, it can create a more balanced distribution of risks and create a more pronounced win-win situation.

Concluding Remarks

The Hackathon of the NAM Challenges was concluded with positivity and hopes to fight the threats associated with decommissioning that many other participating companies, could highly relate to. It proved to be an insightful event because many great ideas came to the table. These ideas will be investigated for their possible implementation by the industry in the near and far future for a more sustainable future. Moreover, the sessions opened new view points and created new channels to see things from different perspectives. It developed more networks within and beyond the industry, leaving a warm, enthusiastic vibe in the room for the future. Like one of the participants said: ’Take pride in your work like you do!’

2. Neptune Energy Hackathon

Neptune Energy is an independent oil and gas E&P company with a regional focus on the North Sea, North Africa and South East Asia. The company's aim is to build an E&P company with material scale, operating capability and options for ultimate value realisation; quintessentially the next "BG Group". The company has active and diversified portfolio of E&P assets across the value chain.

Three sessions were held during the Hackathon. The people responsible for the sessions were:

- Presenter: Rene van der Meer, representative Neptune Energy
- Facilitator: Julian Manning, Chief Executive Officer of Paradigm Group BV
- Assistant: Siddharth Kalra, Mechanical Engineering graduate student from TU Delft

The poo-and-the-pool story was recited to everyone before each session. It's a crude analogy and the idea behind the story is to make everyone aware that we are not to counter or block each other's ideas, to defer judgements and ideate positively. The story goes like this: "You are on a vacation in a luxury hotel and decide to go for a swim in the pool. Upon reaching the pool, you see poo floating in the pool. You call the hotel authorities who diligently clean it up. Do you still feel like swimming? The general answer is "No". So, during the sessions, we cannot and should not poo in the swimming pool."

There were four challenges from Neptune Energy. All the challenges reflect the near-term problems that they are going to face. Each challenge number is followed by a name. This name comes directly from the funky title that was derived during the brainstorming session for the challenge. This is followed by the problem statement that entailed the challenge, which is followed by some other information that came out from the discussion phase of the brainstorming and subsequently, the solutions that came out of the brainstorming are presented.

Challenge 1: PAD-idea

The problem statement: As a result of updated calculations for load and safety factors in the past four decades, the lifting pad-eyes on platforms might not be enough for lifting. The structural integrity is also questionable. The centre of gravity calculations might also be incorrect. Regarding what's said previously, what are alternative lifting methods to prevent the welding of new pad-eyes?

Some other information provided during the discussion phase of brainstorming is as follows:

- The pad eye orientation needs the hook to be at the centre of the platform but there could have been changes to the centre of gravity (adding or removal of material) or miscalculations.
- Locating of calculations or Material Certificates of the pad-eyes is cumbersome or not possible.
- The pad-eyes may be hard to reuse (erosion and loss of thickness) and the current quality of the pad-eyes is uncertain.
- The overall weight of the topside is about 500 tons and it is divided into different sections.

- There are six satellite platforms that need to be decommissioned in the near future. Out of these, three are going to be decommissioned in the next one and half year or so.
- On some platforms, pad-eyes were space consuming and cut off after installation. It is also for these cases, that Neptune Energy is looking for solutions.
- Neptune Energy is currently looking into specialized Internal Lifting Tools which can be internally put into the legs of the platform and lifted. Most of the facilities of Neptune Energy is less than 1000 tons.

From the pre-ideation discussions, the participants got further understanding of this challenge from the perspective of Neptune Energy.

The participants came up with the following ideas:

- **Lifting Methods**
  - Mini "Pioneering Spirit" type lift: quintessentially, this would be a single lift removal of the facility.
  - Pin leg lift/Jack up Barge type lift: with this, the idea is to drill through and put tubular through the legs of the platform.
  - "VB 10000" type lift/Claw grab lifting: this is based on the dual truss system with ability to perform single piece topside retrievals.
  - "Nessie" Concept: this is a concept of a box section semisubmersible. It uses lifting beams for the topside and then uses lifting cables to lift the jacket structure.
  - Magnetic Lifting: use of magnets to lift the topside was also proposed.

- **Using existing pad-eyes**
  - Spreader/Lift Beams: Orientation issue can be solved with Lift beam/Spreader beams.
  - Shifting of liability: Another idea under this heading revolved around shifting of liability to the offshore contractor.

- **Legislation related**
  - Challenging of specifications: If these specifications were good to lift in the past and lifting has been successfully carried out, why are the "healthy" pad-eyes not currently used?
  - Use of salvage techniques and/or treatment as wreckage/salvage and/or:
    - The use of salvage techniques was pointed to have potential benefits for decommissioning, especially because of the creativity it requires.
    - The treatment of the platform as wreckage/salvage can also be considered. However, the legal obligations relating to such a treatment needs to be re-viewed further.

Challenge 2: DE-growth Game

The problem statement: The removal of marine growth is crucial to reduce the lifting weight of the Jacket substructure. Presently, divers are used to remove the marine growth. What are cost effective methods for removing marine growth?

Some of the other information that was provided during the discussion phase of brainstorming is as follows:

- Each kilogram that is reduced, helps. The pad-eyes and/or structural members can fail due to excess weight (due to marine growth) than they were designed for.
- The time for removal of marine growth varies depending on marine growth (local climate dependent) and depth. Generally, the depth is 25-30 meters.
- Yearly checks are done by divers to check for marine growth.
- Scraping and Jetting are the methods that are currently used to remove marine growth.
- Piles were driven into pile sleeves through the jacket legs through steam hammers and jacket was a structure that was there to provide the stiffness.

Through the pre-ideation discussions, the participants got further understanding of this challenge from the perspective of Neptune Energy. The participants came up with the following ideas for removal of marine growth from the substructure:

- **Biological treatments:**
  - Easily removable marine growth: Promoting the growth of easily removable marine growth (like anemones) instead of hard to remove marine growth on the substructure.
  - Marine growth eaters: Release of creatures that eat the marine growth.

- **Non-biological treatments:**
  - Electric Current: Passage of electric current through the legs may help in detaching marine growth from the substructure.
  - Chemical: Some chemicals may make the marine growth detach from the substructure.
  - Isolation: By isolating the marine growth in plastics, the marine growth can essentially be devoid of nutrients.
  - Light: Use of UV Light on marine growth was suggested. Another idea that was suggested was to make the marine growth devoid of light (for example, by wrapping the marine growth).
  - Lasers: This entailed the use of high intensity lasers from the top deck on the marine growth.
  - Explosives: Detonation of small explosives can locally produce shock-waves, temperature change and pH change in the water.

- **Mechanical Solutions**
  - Wave Powered Barnacle Brush: A mechanical brush with metallic hairs that is powered by up and down motion of waves. This is similar in concept to the hub cleaning mechanism used in bikes.
  - Mechanical Glove: A sleeve that run along the legs of the jacket, ripping and preventing any further marine growth.
  - Robotic Vacuum cleaning: The use of vacuum cleaning robot was envisaged. Similar technique is used in the shipping industry for hull cleaning.
  - Crawler-cum-scraper machine: Robot in the form of a Pipe shape crawler, a scraper machine and/or a jetting machine.

- **Inter geographical lessons:** The marine growth is much denser in the tropics. Are there any tropical/equatorial learnings that can be applied to North Sea? This needs to be investigated further.

- **Break up:** The problem can be averted by using two (relatively lighter) lifts instead of one heavy lift without the removal of marine growth.

Challenge 3: NOMAT

The problem statement: Jackets installed in the 1970's had wooden mud mats for stability during installation. These wooden mud mats were not required during the operational period. Currently, they are covered in rock dump which was used to stabilize the platform or prevent scouring. Some of these mud mats are also partly perished. Can these mud mats be removed in an alternative way?

Some of the other information provided during the discussion phase of brainstorming is as follows:

- Mud mats are present to provide stability to the structure before pile driving is carried out.
- A Mud mat carries the weight of the jacket before piles were driven through the mud mats.
- There is one mud mat per leg. The surface dimensions of each mat are approximately four meters by four meters and 20 cm thick.
- Mud mats are attached to the substructure with brackets and clamps.
- Mechanical sewing of mud mats is labour intensive because first the rock dump needs to be removed before the mud mats are accessible.
- It is not possible to leave mud mads on the seafloor. As part of the liability, the mud mats cannot be left and must be removed.

Through the pre-ideation discussions, the participants got further understanding of this Challenge from the perspective of Neptune Energy. The participants came up with the following ideas:

- **Treatments:**
  - Biological ("Marine woodworm"): This would be the biological dissolution or disintegration of the wood mats.
  - Chemical: The chemical dissolution or weakening of the wood structure was considered.

- **Mechanical:**
  - Robot Crawler: Mechanical crawler that can take out the wood below the rocks.
  - Drill through: Drilling through the rock dump to weaken the wood structure and get it out afterwards.
  - Cutting: Cutting the jacket above problem elevation and doing two lifts for the two separate parts.
  - Bracing: The wood mud mats can be braced on top and bottom and can then be retrieved.
  - Burial: Digging a hole and burying the whole jacket inside it. As per legislation, if the depth of burial is deeper than certain depth, than the jacket does not need to be retrieved.

Challenge 4: DECOM the Past

The problem statement: How can platform facilities be handed over to third parties, besides to other operators? How can offshore contractors take over the decommissioning liabilities, after the platform has been cleaned and the well has been abandoned?

For this challenge, the participants came up with the following ideas:

- **Gulf of Mexico learnings**: Similar situations happened in Gulf of Mexico. How was it handled there? How will the perpetual liabilities of North Sea play into this? More clarity and research into this aspect needs to be carried out.

- **Offshore contractor's scope:**
  - Early involvement of contractors: Handing over of facilities and early involvement to offshore contractors before killing of oil well was put forward.
  - Risk analysis: In line with above; conducting a risk analysis to identify, manage and mitigate risk associated with decommissioning and handing over of the platform.
  - Investigation of contracting models: Because of their experience, offshore contractors are in the best position to take the risk of decommissioning. They might save the operators a lot of hassle.

- **Regulatory scope:**
  - Challenging current laws/regulations: Challenging the current laws and regulations about handing over facilities and perpetual liabilities needs to be investigated.

- **Collaboration:**
  - Collaboration/campaigning as an industry to the government/contractors can improve conditions for every offshore operator.
  - Project Horizon: Cessation of Production (CoP) is a moving target but for the supply chain and offshore contractors to be available at short notice, they need to have an estimated project horizon as it's about being ready.
  - Benchmarking/standardization: Another remarkable idea was the standardisation across the industry and benchmarking of how decommissioning activity is carried out.
  - Sharing, knowledge transfer and transparency: Closely related to the points above, if the companies share their estimated project horizon, benchmarks, they can be used to compare and transfer the know-how amongst each other. This would be beneficial to both the offshore operators and offshore contractors.

- **Sum of parts is greater than whole:** Exploring the possibility to find and involve other players which are traditionally not considered as part of the current value chain for example: recyclers, re-users, shipbreakers. This could unlock a hidden potential for the industry.

- **Break up:** It was also noted that the transition to such a system (of handing over to third parties and offshore contractors taking over decommissioning liabilities) in North Sea should happen in steps rather than in a single burst.

3. Spirit Energy Hackathon

Spirit Energy is an E&P company headquartered in the UK and has teams across Norway, The Netherlands and Denmark. The company Spirit Energy oversees operations in Morecambe Bay, the North Sea and the Norwegian Sea. Spirit Energy was founded in 2017 after the combination of Centricas Exploration & Production business and Bayerngas Norge AS. Spirit believes collaboration, agility and courage are needed to succeed in the current energy world.

Three sessions were held during the Hackathon. The people responsible for the challenges are as followed:

- Presenters: Kosta Nazaruk and Richard Newby, representatives from Spirit Energy
- Facilitator: Jules Schoenmakers, from Well PA Expertise BV
- Assistant: Umayer Hussain, Aerospace Engineering Student from TU Delft

Challenge 1: Underwater cutting equipment for pipes and external cutting of large diameter piles

The problem statement: With what technology can we remove the pipes and various other materials which are within six meters below the seabed?

After the discussion with the representatives from various companies, the following solutions have been gathered. Some of the solutions are more risk based or are challenging the regulations and conventional methods:

- Removal of piles and obstructions; there is a lot of waste inside the pipes, therefore an idea is to first remove the waste, so the pipes can be cut internally. This can be done through:
  - Abrasive waterjet cutting.
  - Explosive charges: This has been done in the US with a 100% success rate. An idea to reduce the risk is to employ the Dutch navy to deploy for example shaped charges with ball bearings. For using explosives charges, the environment with animals can be impacted and a biologist watch for mammals is usually required.
  - Jetting: The clay could be removed through jetting. The material properties need to be first determined which can be find through testing.
  - Cut above the seabed and drill out the waste. Damage can be done to the environment.
  - Vibrate the structures: This is used in the building industry to both vibrant a steel element into the ground as well as pulling it out (e.g. 'damwanden').
  - Corrosion through a current: Acceleration through an anode/cathode arrangement and inject electrical current. Regulatory issues; needs to comply requirements. The site cannot be handed back until all obstructions are removed.
- Use high pressure to cut the steel.

Challenge 2: Underwater dredging including pile clean out equipment

The problem statement: What is the most effective way to remove (dredge) piles out of the seas?

The following solutions were presented:

- Using a pull platform. The various debris that are destroyed needs to be taken out of the sea. Around the area that needs to be cut, a dome can be used to enclose the area of interest.
- Sending divers with shovels.
- Using a dome or tent to prevent falling objects inside the pipes.
- Dredge outside the tubular pipes.

Challenge 3: Seabed recovery of concrete protection mattresses

The problem statement: How can the mattresses be recovered? Mattresses are a series of connected concrete slabs that support the end of a pipe line.

In this challenge, the recovery of grout bags was also introduced. Grout bags (e.g. polyethylene bags filled with gravel or rocks to prevent the pile surrounding against washing-out.

The following solutions are:

- Digging a hole and bury the mattresses.
- Place baskets on seabed so that the bags can be placed inside them.
- Recovery of grout bags. The exact contents of the bags are unknown, it is mostly a combination of soil, plastic and covered by gravel. One bag weigh about ten ton. The bags need to be carefully removed from the seabed or the plastics may escape and contaminate the sea. The following ideas can be used to remove the bags:
  - Fluidization of soil and gravel for separating the plastics from the other contents. Plastics are lighter than seawater and float up.
  - Dissolving the bag. This technique may damage the environment.
  - Suction hose. This method can be used to suck out all the gravel, however it is possible that the bag will be sucked as well and therefore it can be stuck inside the hose or obstruct the suction pump.
  - Conveyer belt.
  - Placing a net under the bags and then lifting. The bags can be lifted by airlifting through tubes.
  - Look at agricultural techniques for inspiration, e.g. how they grab packs of hay.

Challenge 4: A multi operator campaign approach to Walk 2 Work operations

The problem statement: What would be the most optimal approach for a Walk 2 Work operation?

These solutions and issues have been raised:

- Set up accommodation hubs offshore.
- Publish scope:
  - Database decommissioning activities
  - Supply and demand requirements (technical and timing flexibility)
  - Alignment of operating (policies, practices, procedures)
  - Legal aspects, responsibilities, insurances, etc.
- Public Transport-system. Take inspiration from the public transport system, OV-system with busses, taxis, etc. Options should be given for scheduled travelling and a backup must be available in case of delays or weather disruptions. The OV-system should be standardised. Supply vessels could be used for supply and W2W. Anchor handlers or rig move vessels could be upgraded for such service.
- Logistics planning the transportation. The logistic company could be the most suitable third party to plan and integrate the program. They can then provide the service and vessels.
- Establish a regular W2W market place, where suppliers and users meet on a say quarterly basis to match availability and demand.
- Combine oil and gas demands with wind park demand.

Challenge 5: Re-use of equipment from offshore facilities

There were four challenges presented by Spirit Energy however, a fifth challenge was introduced in the second session. This involved better means to sell used equipment from dismantled facilities on a used-goods market place.

The following solution was proposed:

- Online marketplace for reselling. This idea has been proposed by many of the participants and was heavily discussed. One of the questions is: If the mattress, which is recovered from the sea, has value, who would be the market? Suggest that the re-selling of mattresses is also added as a bullet in challenge three. By re-using it, it would have a shorter lifespan. So, the main problem with this approach is how you can connect seller to the market. Operators should take the initiative and provide documentations like specification sheets and have a database of it. They however may not invest in this because of the risk. In other industries like aviation and cars however, re-using is quite common.

Concluding Remarks

The Hackathon of Spirit Energy concluded on a positive note. Many out of the box ideas were generated and these certainly can help for a better sustainable future.