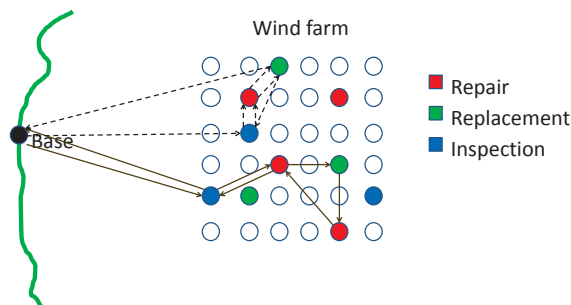


# Logistic decision support for routing and scheduling

## Innovation description

- The figure below illustrates the underlying problem that will be supported by the decision support tool.
  - There are some turbines in need of repair, some that needs parts replaced, and some that are in need of an inspection.
  - Each maintenance task is described by its duration, the number of technicians and the weight/volume of the spare parts needed, and finally a down-time cost that is incurred until the task is performed.
  - The objective is to find the route sailed by each vessel, and the time each turbine is visited.



- The innovation is an operational logistic decision support tool for optimization of vessel routing and maintenance scheduling for the O&M phase.
- The decision support tool is based on a mathematical optimization model called a path-flow model, where the most promising routes and schedules are generated a priori. Due to the complex nature of the routing and scheduling decisions of this problem, the removal of inefficient partial routes a priori is done using heuristic dominance rules and the resulting solution methodology is therefore strictly speaking classified as a heuristic.

## Impact

- The decision support tool will reduce costs by contributing to improved daily decisions on
  - which maintenance tasks to perform
  - when to perform the maintenance tasks
  - in which order to perform the maintenance tasks
  - with which resources (vessels and personnel)
- The cost reductions can more directly be attributed to reduced
  - sailing costs
  - personnel cost
  - planning costs

## Further development

- Further development depends on industry interest. We are currently exploring possible future extensions with potential industry partners.

## References

- Stålhane M, Hvattum LM, Skaar V (2015): Optimization of Routing and Scheduling of Vessels to Perform Maintenance at Offshore Wind Farms. Energy Procedia, 80, 92-99.