



Emissions Life Cycle Assessment (LCA)

Providing Emissions Life Cycle Assessments for offshore renewable, energy transition, and hydrocarbon projects, and independent assessment of emissions reduction from new technology. Helping our clients meet their objective to reduce emissions.

Regulatory compliance and increasing investor/stakeholder expectations requires operators to perform a emissions lifecycle assessment (LCA) of greenhouse gas (GHG). In addition, technology providers require independent LCA's to verify emissions savings their technology achieves. Cron dall Energy uses its design and operations experience, in the renewable and hydrocarbon space, to work with clients to provide LCAs, utilising Cron dall Energy's in-house **Zero Emissions Tracking and Assessment (ZETA)** tool. **ZETA** estimates GHG emissions from construction, transportation, installation, operation, and decommissioning.

A framework for analysis has been developed from globally accepted industry guidelines including API, GHG protocol and IPIECA. Data inputs for the tool include specific operator data, project design information, vendor data and Cron dall Energy's own inputs. The **ZETA** tool has been validated by environmental consultants, client reviews, reported emissions benchmarking and industry data.

Lifecycle Emissions Assessment

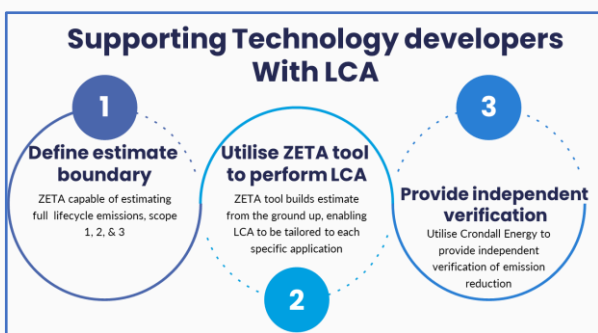
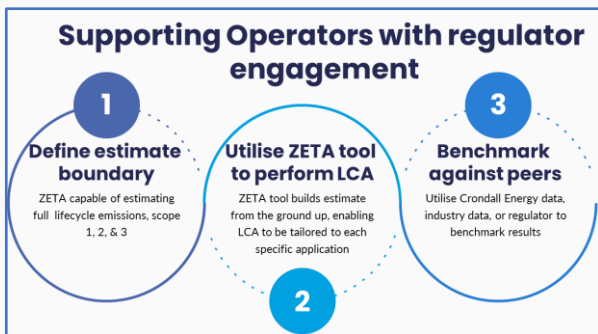


Our Service

Cron dall Energy provides emissions analysis through the development lifecycle, benchmarking against other facilities and re-assessing designs through the lens of emissions reduction. Cron dall Energy also focusses on power generation optimisation and process heat design to reduce emissions. KPIs are developed for setting emissions targets, as well as ongoing measurement and tracking through operations. In addition, Cron dall Energy assess the lifecycle emissions reduction achieved from new technologies.

Case Study

Cron dall Energy has recently completed multiple studies evaluating emission LCA for new technology, providing independent verification of claimed emissions reduction.



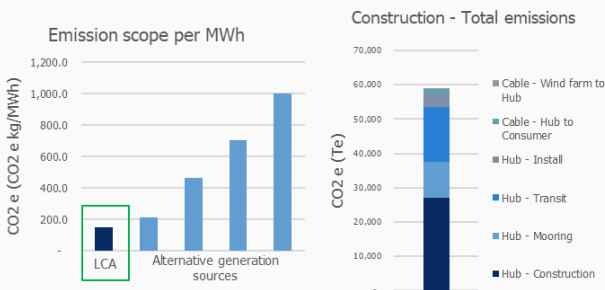
Providing a framework for measuring and reducing GHG emissions for operators, owners, technology developers and investors to support decision making for new developments and ongoing projects.



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Case Study 1: Emissions estimate for renewable back up

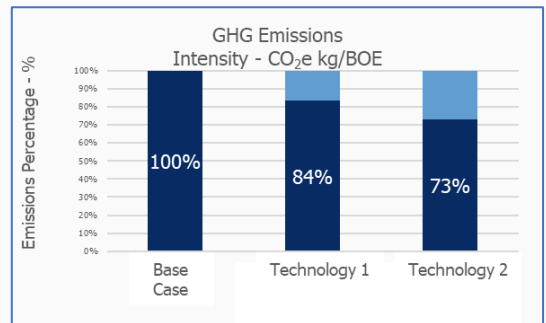
Crandall Energy was engaged to estimate the LCA for an offshore wind project that combined with gas fired generation to provide continuous power, and provide independent verification of the emissions for the developer and electricity consumer. Crandall Energy reviewed the design of the offshore wind farm and power generation and distribution facility against best practices and industry standards for emissions power generation emissions, as well as benchmarking the facility lifecycle emissions against other forms of power generation and the national grid.



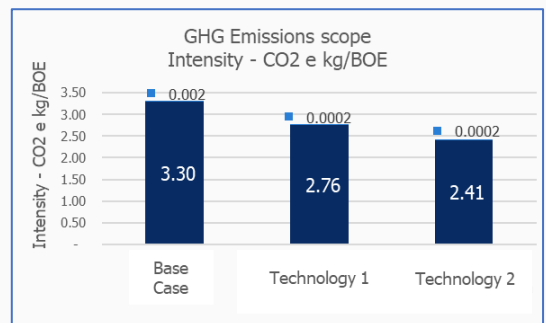
Crandall Energy estimated the energy generation from the wind farm, as well as the required spinning reserve and generation back up necessary to determine the reliability of electricity supply required. Crandall Energy's in-house **ZETA** tool was utilised perform the LCA, the **ZETA** tool can be used at any stage of the project or development life cycle. Applicable Scope 1, 2 and/or 3 emissions were estimated using data from sources such as the project developer, design parameters, vendor data and Crandall Energy's in-house data. The benchmarking comparison undertaken used industry and regulator data and enabled a comparison to be made for the complete project lifecycle as well as for discrete components of the development. This analysis enabled the developer and Lenders to have an independent GHG emission estimate as well as a comparison to other electricity sources.

Case Study 2: Technology Emissions reduction

Crandall Energy worked with a client to provide an independent emissions estimate for new technology. This enabled the client to verify the emissions reduction achieved by their technology, and also provided confidence in the technologies capability for their customers and investors. This was achieved using a multidiscipline engineering team from Crandall Energy (from process engineering and E&I engineering), and the **ZETA** tool. Crandall performed an independent engineering design, then utilised **ZETA** to estimate the operational emissions reduction.



The initial GHG emissions estimate was performed utilising **ZETA** and Crandall Energy's independent engineering, to quantify the base case emissions, without application of the technology. Subsequently Crandall Energy assessed the operational emissions reduction, for the client's 2 different technologies, when applied to the base case.



Providing the client with the final outputs in different formats helped quantify the saving for future applications.