

Reykjavik Energy (OR) Second Opinion

February 1, 2019

OR's framework is designed to effectively facilitate investment in a targeted suite of projects related to promotion and improvement of geothermal energy production and associated technologies. The eight project categories selected for new and refinanced projects demonstrate the company's strong and voluntary commitment to the low carbon transition and climate resilience. OR expects to use the majority of proceeds from the first green bond issuance for refinancing; the goal for proceeds from subsequent issuances will be to finance new projects.

OR's environmental targets and governance procedures are quantified, clearly organized, and ambitious. OR has top-level organizational mandates to reduce emissions by 60% by 2030 and has invested voluntarily in technology development like CarbFix to make significant strides towards this goal over the past 10 years. To date, CarbFix technology recaptures and stores 35% of construction and operation emissions from OR's largest geothermal plant. This presents investors with an opportunity to invest in a technology with promising broader applications.

The company's investments in innovation extend to electrification of traditionally fossil-fueled equipment and processes such borehole exploration and transitioning its entire fleet to electric vehicles. CICERO commends OR for using investments to improve its environmental footprint and invest in technologies that can be more broadly applied to contribute to important and necessary emissions reductions, in Iceland and abroad. Finally, OR's sustainable land use project category supports the restoration of disturbed areas around working sites using preserved indigenous species to minimize both waste and impact. On reporting, OR already issues an integrated annual report that uses quantitative indicators. OR commits to issuing an annual Green Bond Impact Report in accordance with the Nordic Position Paper on Green Bonds Impact Reporting. These initiatives further delineate OR's commitment to managing both environmental risk and impact and set it apart as an industry thought leader.

OR already does some resilience screening and scenario stress testing, but we encourage OR to implement a systematized approach, including on supply chains. CICERO encourages OR to continue its efforts to transition towards a fully electric fleet of vehicles and equipment.

SHADES OF GREEN

Based on our review, we rate the ORs green bond framework Dark Green.

Included in the overall shading is an assessment of the governance structure of the green bond framework. CICERO Shades of Green finds the governance procedures in OR's framework to be **Excellent**.



GREEN BOND PRINCIPLES

Based on this review, this Framework is found in alignment with the principles.





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1. Terms and methodology

This note provides CICERO Shades of Green's (CICERO Green) second opinion of the Reykjavik Energy's (OR) green bond framework **dated January 29, 2019.** This second opinion remains relevant to all green bonds issued under this framework for the duration of three years from publication of this second opinion, as long as the framework remains unchanged. Any amendments or updates to the framework require a revised second opinion. CICERO Green encourages the client to make this second opinion publicly available. If any part of the second opinion is quoted, the full report must be made available.

The second opinion is based on a review of the framework and documentation of the issuer's policies and processes, as well as information gathered during meetings, teleconferences and email correspondence with the issuer. Second opinions are restricted to an evaluation of the mechanisms or framework for selecting eligible projects at a general level. CICERO Green is not responsible for an institution's implementation of a framework, nor does it guarantee or certify the climate effects of investments in eligible projects.

Expressing concerns with 'shades of green'

CICERO Green second opinions are graded dark green, medium green or light green, reflecting a broad, qualitative review of the climate and environmental risks and ambitions of the bonds. The shading methodology aims to provide transparency to investors that seek to understand and act upon potential exposure to climate risks and impacts. Investments in all shades of green projects are necessary in order to successfully implement the ambition of the Paris agreement. The shades are intended to communicate the following:



Sound governance and transparency processes facilitate delivery of issuer's climate and environmental ambitions laid out in the framework. Hence, the governance aspects are carefully considered and reflected in the overall shading of the green bond framework. CICERO Green considers four factors in its review of an issuer's governance processes: 1) the policies and goals of relevance to the green bond framework; 2) the selection process used to identify and approve eligible projects under the framework, 3) the management of proceeds and 4) the reporting on the projects to investors. Based on these factors, we assign an overall governance grade: Fair, Good or Excellent.



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2.Brief Description of Reykjavik Energy (OR)'s Green Bond Framework and rules and procedures for environmentally-related activities

Reykjavik Energy (OR) is Iceland's largest geothermal energy producer. OR employed 509 people in 2017 and is powered 99% with renewable energy. It is the parent-company of ON Power (energy generation), Veitur (utilities and distribution) and Gagnaveita Reykjavikur (Reykjavik's fiber network). Collectively, the OR Group provides services across southwestern Iceland, where more than two thirds of the country's population live. It owns and/or operates cold water supply, hot water supply (district heating), sewerage, electricity generation and distribution, and fiber-optic network assets. ON operates two geothermal plants (303 MW and 120 MW) and one small hydro plant; it is the second largest producer of power in the country and the largest producer of geothermal power. It supplies most of the hot water to Reykjavik and electricity nationwide. Veitur distributes electricity and water and runs sewage systems in urban areas. Gagnaveita installs optical fiber networks in urban areas.

Environmental Strategies and Policies:

OR has organizational mandates to reduce greenhouse gas emissions by 60% between 2015 and 2030; to conserve and ensure long-term supply of potable water; to manage of low- and high-temperature geothermal resources responsibly; to reduce hydrogen sulphide emissions and discharge geothermal water in a responsible way; to manage sewage systems and waste responsibly; to restore disturbed areas; and to promote climate-friendly transport. OR already recaptures and stores 35% of emissions from its largest geothermal plant using its own carbon capture and sequestration technology, CarbFix, developed and piloted onsite over the past 10 years. The technology includes two parts: direct air capture and reinjection of emitted carbon dioxide into basaltic rock for mineralization. The former has broad cross-sectoral application potential. The byproducts from this process are calcium carbonate (mineralized CO₂) and pyrite (mineralized H₂S). OR considers long-term climate resilience, particularly on the utility side, by working with the City of Reykjavik to respond to uncertainty in future water temperatures, sea level rise, and waste water management.

OR's Environmental and Resource Policy consists of five principles which apply to all operating units and defines 22 significant environmental factors. The five principles are responsible resource management; value of utility operations; impact of emissions; impact on society; and operations.

OR has set up strong and transparent governance practices. OR's operations are certified in accordance with the ISO 14001 environmental management system and it issues an annual report in accordance with the Global Reporting Initiative's G.4. standard. It has been reporting emissions from its operations since 2015, using the Greenhouse Gas Protocol – Corporate Accounting and Reporting Standard. OR makes its Environmental Impact Reports available to the public on their website. Contractors are audited every two weeks for compliance with corporate policies, but the company has not yet assessed potential or real climate risks along its supply chain. We encourage OR to consider supply chain climate risks to further strengthen risk management initiatives and provide more complete information to investors and company decision makers.

Use of proceeds:

According to OR's Green Bond Framework, the net proceeds issued will be used to fund OR projects that align with its organizational goal of 60% emissions reduction by 2030, and that help supply the population of Reykjavik with low-carbon energy.

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Proceeds will be used to fund anticipated projects in eight project categories: renewable energy (25%), energy distribution and management (25%), carbon capture and storage (5%), sustainable land use/environmental management (5%), clean transportation (5%), sustainable water and wastewater management (20%), circular economy activities that lead to lower lifecycle energy and GHG use (5%), and products and technologies that support smart grid applications (10%). Proceeds will not be used to invest in stocks or investments in fossil-fuel based-technologies, nor in projects focused on energy generation using fossil fuels or other greenhouse gas-intense activities, nuclear energy generation, environmentally negative resource extraction (such as rare-earth elements or fossil fuels), weapons and defense, gambling or tobacco.

The net proceeds can be used for repayments of green bonds, new or refinanced of projects. For the purposes of this framework, new financing is defined as proceeds allocated to eligible projects initiated up to 12 months prior to the issuance of the bond. Refinancing is defined as funding projects dating back further than 12 months prior to bond issuance. OR expects to use the majority of proceeds from the first green bond issuance for refinancing; the goal for proceeds from subsequent issuances will be to finance new projects.

Selection:

The selection process is a key governance factor to consider in CICERO's assessment. CICERO typically looks at how climate and environmental considerations are considered when evaluating whether projects can qualify for green bond funding. The broader the project categories, the more importance CICERO places on the governance process.

OR's overall due diligence procedures for project selection are stringent and technically thorough. It has developed a Geothermal Sustainability Assessment Protocol, which provides a thorough review of 16 factors for each new project, such as governance, environmental and social issues management, geothermal resource management, biodiversity and invasive species, induced seismicity and subsidence, and air and water quality. The assessment flags and reports on potential challenges such as impact on geothermal reservoirs, use of cold-water resources for cooling, landscape disturbance and restoration, and air and water pollution. OR scored a 3 or above (on a scale of 1 to 5, 5 being "meets basic good practice and proven best practice) on all 16 factors in the 2018 Assessment, indicating strong environmental management and governance.

For green bond portfolio eligible projects OR has a two-step selection and approval process in addition to the due diligence described by the Geothermal Sustainability Assessment Protocol. First, eligible projects are proposed by OR subsidiaries, using the green bond framework as a basis for selection. The selection is then reviewed, confirmed or rejected by OR's green bond Selection Committee that consists of representatives from OR and each of OR's subsidiaries. The Committee has at least one sustainability expert that is given veto power in the final approval of projects.

Considered projects must align with OR's environmental priorities, as outlined in its Climate Policy, have quantifiable environmental benefits and align with this framework. The Selection Committee uses estimates of quantified environmental benefits, as conducted by internal and/or external sustainability experts. Analysis of estimated environmental impact and rebound effects are both considered as part of the screening process.

Management of proceeds:

The net proceeds from OR's Green Bond issuance will be credited to a green account and managed by OR's Finance department according to internal guidelines. The account will fund projects if they are eligible under the use of proceeds and selection criteria outlined in the issuer's framework. Proceeds are expected to be allocated to individual disbursements. A list of funded projects and the environmental impact associated with those projects is kept by OR.

Until disbursement, proceeds can be used for short-term investments in mutual funds, money market deposits, bank notes, covered bonds, and government bonds. Proceeds will not be used to invest directly or indirectly in stocks or investments in fossil-fuel based-technologies.

Reporting:

Transparency, reporting, and verification of impacts are key to enable investors to follow the implementation of green bond programs. Procedures for reporting and disclosure of green bond investments are also vital to build confidence that green bonds are contributing towards a sustainable and climate-friendly future, both among investors and in society.

OR will issue an annual Green Bond Impact Report, which will be published at the same time as its Annual Report. Both reports, along with external verification of impact reporting and this second opinion, will be made available on OR's website and other relevant investor platforms.

The Annual Impact Report will include updates on aggregated project funding under the framework; funds allocated to project categories; unallocated proceeds; proceeds allocated to new versus refinanced projects; environmental impact of each funded project (or project category), using metrics relevant to the project or project category; and the refinancing ratio. Large projects will be listed individually; smaller projects will be aggregated under project categories, and relevant data made publicly available. An external auditor confirms that net proceeds are used for funded projects; the external audit is also communicated through the Annual Green Bond Impact Report.

The reported environmental impact from funded projects will be estimated by internal and/or external sustainability experts and reported in its Annual Impact Report for investor documentation throughout the lifetime of the Green Bond. The Position Paper on Green Bonds Impact Reporting published by the Nordic Public sector Issuers will be used as a guide to select relevant indicators for each project category. Wherever possible, the quantifiable impacts will be provided per invested monetary unit. The Annual Report will include an overview of methodology used to estimate environmental impact.

3. Assessment of OR's Green Bond framework and policies

The framework and procedures for OR's Green Bond investments are assessed and their strengths and weaknesses are discussed in this section. The strengths of an investment framework with respect to environmental impact are areas where it clearly supports low-carbon projects; weaknesses are typically areas that are unclear or too general. Pitfalls are also raised in this section to note areas where issuers should be aware of potential macro-level impacts of investment projects.

Overall shading

Based on the project category shadings detailed below, and consideration of environmental ambitions and governance structure reflected in OR's green bond framework, we rate the framework **CICERO Dark Green**.

Eligible projects under the OR Green Bond Framework

At the basic level, the selection of eligible project categories is the primary mechanism to ensure that projects deliver environmental benefits. Through selection of project categories with clear environmental benefits, green bonds aim to provide certainty to investors that their investments deliver environmental returns as well as financial returns. The Green Bonds Principles (GBP) state that the "overall environmental profile" of a project should be assessed and that the selection process should be "well defined".

Category	Eligible project types	Green Shading and some concerns
Renewable energy ••••••••••••••••••••••••••••••••••••	 Development, construction and operation of geothermal energy facilities with GHG emissions less than 100 gCO2e/kwh Exploration and exploitation of new geothermal wells Development of reinjection strategies to best sustain the geothermal resources Hydrogen production 	 Dark Green ✓ Issuer has confirmed that no fossil fuel sources are used for hydrogen production at the Hellisheidi geothermal power plant. ✓ The issuer's emphasis on electrification of traditionally fossil-fueled equipment in construction and maintenance is commended. ✓ Issuer has confirmed that long-term climate resilience is considered; OR is working with the City of Reykjavik to assess the impact of sea level rise and shifting temperatures on geothermal and water utility operations. ✓ Construction materials like cement, and equipment for construction and well exploitation are likely to be fossil fuel intensive. Issuer has confirmed that emissions from construction and maintenance are considered. ✓ Consider local environmental impacts on biodiversity and ecosystem services



		✓ Issuer considers risks for earthquakes – the design and construction of all powerplant structures and equipment is based on detailed analysis of earthquake hazards on site.
Energy distribution and management	Installation and maintenance of infrastructure to deliver electricity and hot water for district heating	 Dark Green ✓ Issuer has confirmed that no fossil fuel sources are used in the operation of the district heating system; it relies entirely on renewable energy, except for the GHGs emitted during construction. ✓ Consider emissions from construction equipment and materials
Carbon capture and storage	• Mineralization of CO ₂ and H ₂ S from power plant operations	 Dark Green ✓ CCS is a critical component of a sustainable low carbon future. OR's investment in and application of this technology advances much needed innovation that can have broad, positive impacts. The direct air capture process and technology proven by CarbFix has broad cross-sectoral application potential.
Sustainable land • use and environmental management	 Geomonitoring of various activity in the areas surrounding OR operations such as H₂S emissions, restoration of disturbed areas and earthquake activity GPS monitoring of areas affected by operations 	 Dark Green ✓ Per the issuer, activities include both monitoring of restoration and earthquake activity, as well as actual restoration of disturbed areas with preserved indigenous species. Consider emissions from disturbed land and construction equipment. ✓ OR has confirmed that emissions are monitored from the start of borehole drilling.
Clean transportation	Installation of charging stations for EVs on national highways and in populated areas.	 Dark Green ✓ Electric modes of transportation are a key factor in the transition to a low carbon economy; however, we should continue monitoring indirect GHG emissions stemming from construction of roads and other transportation infrastructure, production and use of vehicles, and strive to keep increasing their efficiency.

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	Susta and w mana	inable water vastewater gement	Development and operation of systems to deliver potable water and to handle wastewater Water conservation to ensure future quality of wholesome and untreated water	Da √	Issuer has confirmed that proceeds can be used for construction of treatment plants, powered by renewable energy. Consider emissions from construction materials and equipment. OR adheres to EU standards for wastewater treatment. Per the issuer, water conservation initiatives do not include construction of stormwater ponds or reservoirs.
	Circu econo activi lead t lifecy and C	alar • omy ities that to lower ycle energy GHG usage	Industrial symbiosis: to develop opportunities for industrial symbiosis by utilizing waste streams from geothermal production, such as geothermal gases and warm geothermal effluent, to create value from waste	Da √	rk Green Per the issuer, this category will find productive uses for thermal energy, electricity and geothermal gas from the Hellisheidi plant.
	Produ techn suppo grid a	ucts and • iologies that ort smart applications	Installation and maintenance of infrastructure to deliver information for smart grids	Da r√	ark Green Smart grids and grid upgrades are necessary to manage and increase the share of intermittent and decentralized renewable energy.

Table 2. Eligible project categories

Governance Assessment

In assessing the governance quality of the issuer, four aspects are studied: 1) The policies and goals of relevance to the green bond framework; 2) the selection process used to identify eligible projects under the framework; 3) the management of proceeds; and 4) the reporting on the projects to investors. Based on these aspects, an overall grading is given on governance strength falling into one of three classes: Fair, Good or Excellent.



The overall assessment of OR's governance structure and processes gives it a rating of Excellent. CICERO considers OR's proven and applied governance processes a clear strength of this green bond framework. In order to strengthen this even further, CICERO encourages the issuer to develop and implement systemized resiliency planning to protect against potential impacts from more extreme weather events, such as flooding; and further management of environmental impacts along its supply chains.

Strengths

Governance

OR's environmental targets and governance procedures are quantified, clearly organized, ambitious, and proven. OR has top-level organizational mandates to reduce emissions by 60% by 2030, and has invested voluntarily in technology development like CarbFix to make significant strides towards this goal over the past 10 years; to date, CarbFix technology recaptures and stores 35% of construction and operation emissions from OR's largest geothermal plant. In addition, the company has mandates for responsible waste water management, disturbed land restoration, and promotion of climate friendly transportation. The five principles in its Environmental and Resource Policy are supported with 22 factors. OR implements its environmental policies and targets with ISO 14001 certified management systems, and reports with Global Reporting Initiative G4 compliance reports using the Nordic Position Paper on Green Bonds Impact Reporting as guidance for indicators. Compliance with certifications and guidance such as ISO 14001, GRI G4 and the Nordic Position Paper are important signals of high standards for performance, transparency and accountability in management. It also contributes to a common language around green bonds that makes them measurable and comparable.

OR's approach to project identification, screening and approval is thorough and technically sound. The company has voluntarily adapted existing sustainability assessment protocols to the geothermal sector to screen all potential projects before initial consideration for the green bond portfolio, and includes a sustainability expert with veto power on its Selection Committee during final screening and approval. Additionally, OR considers life cycle emissions and climate resilience, which demonstrates a long-term view on environmental issues.

Project Categories

OR's framework is designed to effectively facilitate investment in a targeted suite of projects related to promotion and improvement of geothermal energy production. The eight selected project categories provide further evidence of the company's strong and voluntary commitment to the low carbon transition and climate resilience; CICERO commends OR for using investments to improve not only its own environmental footprint but to contribute to national level emissions reduction targets.

With regards to the renewable energy project category, CICERO notes that OR's geothermal projects fall well below the Climate Bonds Initiative's suggested threshold of 100gCO₂/kwh¹, with an average of 10gCO₂/kwh. Global geothermal power capacity is expected to rise to just over17 GW by 2023, with the biggest capacity additions expected in Indonesia, Kenya, Philippines and Turkey.² However, geothermal can be a significant source of emissions, with some plants generating higher GHG emissions than fossil fuel equivalents. In order to be considered net environmentally positive, new and existing geothermal projects should have direct emissions of less than 100gCO₂/kwh.³ OR's projects fall well below this threshold, with average direct emissions of less than 10gCO₂/kwh. This is a critical underlying strength for the overall, long-term impact potential of OR's geothermal portfolio.

OR invests heavily in research and development of technologies to continue improving its environmental performance – most notably GHG sequestration – and builds its environmental policies and approaches on this research, which is considered particularly progressive. The GHG sequestration research and resulting technology, CarbFix, has been voluntarily applied to operations of OR's largest geothermal plant successfully for ten years. The technology captures CO₂ through direct air capture (DAC) and reinjects emitted carbon dioxide from geothermal plant operations into basaltic rock for mineralization. OR's progressive investment in and application of this technology has raised the bar for CCS technology and represents exciting potential for broader application across Iceland and abroad. Approximately 35% of emissions from construction and operation of OR's largest geothermal plant are now recaptured and stored using the CarbFix technology. OR is investing to expand the technology's capacity to capture a larger share of the plant's emissions.

¹ <u>https://www.climatebonds.net/standard/geothermal</u>

² <u>https://www.iea.org/topics/renewables/geothermal/</u>

³ <u>https://www.climatebonds.net/standard/geothermal</u>

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OR is also investing in several other notably progressive environmental initiatives. The company's investments in innovation extend to electrification of traditionally fossil-fueled equipment and processes such borehole exploration, and the company is transitioning its entire fleet to electric vehicles.

Transportation is among the most important sources of greenhouse gas emissions worldwide. To meet global goals, direct transport emissions must peak around 2020 and then fall by more than 9% by 2030. Consequently, electric vehicles are an essential component of a low carbon future. CICERO commends OR's investment in this technology and other electrification initiatives, not least because of the positive impact it will have on upstream and downstream value chains. In addition, OR's anticipated investments in smart grid applications may help to increase the overall capacity of Iceland's power systems to handle variable renewables efficiently and to help reduce overall systems costs, which is a clear strength.

Finally, OR's sustainable land use project category supports the restoration of disturbed areas around working sites. OR preserves indigenous species from disturbed areas and replaces them in its restoration efforts to minimize both waste and impact. These innovations, like the CarbFix technology, represent a valuable step towards a long-term, low carbon and climate resilient future that separates OR as an industry thought leader.

Weaknesses

No weaknesses perceived.

Pitfalls

Governance

Although OR does consider resilience issues, it does not systematically incorporate climate scenario stress testing, TCFD recommendations, or supply chain climate risk assessment into its management practices. This is partially mitigated by the fact that OR does work with the City of Reykjavik to consider long-term climate resilience challenges like wastewater management and sea level rise. We encourage OR to explore these initiatives to improve upon its already strong sustainability policies and environmental mandate, thereby protecting long-term investor interests. We also encourage OR to continue its efforts to electrify its fleet, construction materials, and operational technology along its supply chain.

Project Categories

Within the renewable energy and sustainable water and wastewater management project category, CICERO notes that investments may include construction of facilities and other supporting infrastructure. Construction materials like cement, and equipment for construction and geothermal well exploitation are likely to be fossil fuel intensive. OR partially addresses this concern by considering emissions from construction and maintenance and investing in electrification of traditionally fossil fueled equipment, an initiative that is highly commended. CICERO encourages OR to continue its efforts to transition towards a fully electric fleet of vehicles and equipment, and to consider alternatives to emissions intensive construction materials.



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Appendix 1: Referenced Documents List

Document Number	Document Name	Description	
1	OR Framework January 29, 2019	OR's updated Green Bond Framework	
2	District heating in RVK	Estimates of losses in district heating system	
3	District heating in RVK	Usage and chemistry of water in 2017	
4	CarbFix	Review of CarbFix technology, a carbon sequestration technology that reinjects geothermal waste water and carbon dioxide into basaltic rock for mineralization and storage	
5	Hellisheidi Assessment Report_final_22062018	Comprehensive assessment of 16 sustainability factors tailored to geothermal energy production	
6	OR Annual Report 2017	GRI G4 compliant report detailing environmental, social, governance, and financial company performance	
7	Jardhitagardur - Geothermal Park - overview	PowerPoint presentation reviewing plans, environmental considerations, and operations for geothermal power plant	

Appendix 2: About CICERO Shades of Green

CICERO Green is a subsidiary of the climate research institute CICERO. CICERO is Norway's foremost institute for interdisciplinary climate research. We deliver new insight that helps solve the climate challenge and strengthen international cooperation. CICERO has garnered attention for its work on the effects of manmade emissions on the climate and has played an active role in the UN's IPCC since 1995. CICERO staff provide quality control and methodological development for CICERO Green.

CICERO Green provides second opinions on institutions' frameworks and guidance for assessing and selecting eligible projects for green bond investments. CICERO Green is internationally recognized as a leading provider of independent reviews of green bonds, since the market's inception in 2008. CICERO Green is independent of the entity issuing the bond, its directors, senior management and advisers, and is remunerated in a way that prevents any conflicts of interests arising as a result of the fee structure. CICERO Green operates independently from the financial sector and other stakeholders to preserve the unbiased nature and high quality of second opinions.

We work with both international and domestic issuers, drawing on the global expertise of the Expert Network on Second Opinions (ENSO). Led by CICERO Green, ENSO contributes expertise to the second opinions, and is comprised of a network of trusted, independent research institutions and reputable experts on climate change and other environmental issues, including the Basque Center for Climate Change (BC3), the Stockholm Environment Institute, the Institute of Energy, Environment and Economy at Tsinghua University and the International Institute for Sustainable Development (IISD).





