



SK innovation

Green Financing Second Opinion

July 26, 2019

SK innovation (SKI) is Korea's largest petrochemical company. SKI was founded as the first oil and chemical company in Korea and has built an entire vertical value chain in the petroleum and chemicals industry. SKI's activities are in the oil and gas exploration business as well as in the battery and materials business. The company is currently expanding its battery and materials business in Korea, China, Georgia (USA) and Hungary.

The proceeds of raised funds through issuing green bonds and/or loans through this framework can be used to finance or refinance projects in the project categories **low carbon transportation, energy efficiency and green buildings.** The project categories aim to finance or refinance projects for research, development and manufacturing of batteries for low-carbon transport vehicles including production facilities and energy storage as well as construction of green buildings. SKI does not refinance projects with a look-back period of more than 24 months.

Under this green financing framework, SKI as well as its battery business and materials subsidiaries will be able to raise funds through issuing green bonds and/or borrowing green loans. These subsidiaries are SK Battery America Inc., SK Battery Hungary Kft., SK Hi-tech Battery Materials Poland sp. z o.o., SK Hi-tech Battery Materials (Jiang su) Co.,Ltd., SK Battery Manufacturing kft., Blue Dragon Energy Co., Limited, and SK IE Technology.

SKI confirmed that project selection and reporting will be conducted on the group level and management of proceeds will be conducted on subsidiary level upon allocation instructions from SKI. SKI will review and verify that the management of proceeds by the subsidiaries is aligned with the framework.

Based on the overall assessment of the project types that will be financed or refinanced by green financing, governance and transparency considerations, SKI's green bond framework receives a **CICERO Light Green** shading with a governance score of **Good**. The categories low carbon transportation and energy efficiency are rated Light to Medium Green and green buildings Medium Green.

SKI's framework could receive a better governance score or higher shading, e.g., by including a more ambitious emission threshold for plug-in hybrids and/or range requirements and by more ambitious climate, battery recycling and environmental strategies and targets. In addition, SKI could raise requirements regarding raw material sourcing as well as supply chain assessments, life cycle emissions, production facilities and new green buildings. SKI's governance could benefit from decision making that includes environmental experts, third party environmental experts' involvement, TCFD implementation as well as publishing green loan reporting and external verification of reporting.

SHADES OF GREEN

Based on our review, we rate SKI's green financing framework **CICERO Light Green**.

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



GREEN BOND PRINCIPLES and GREEN LOAN 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 client's framework dated June 2019. This second opinion remains relevant to all green financing 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 client's policies and processes, as well as information gathered during meetings, teleconferences and email correspondence.

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. 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:

CICERO Shades of Green



Dark green is allocated to projects and solutions that correspond to the long-term vision of a low carbon and climate resilient future. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Ideally, exposure to transitional and physical climate risk is considered or mitigated.



Medium green is allocated to projects and solutions that represent steps towards the long-term vision, but are not quite there yet. Fossil-fueled technologies that lock in long-term emissions do not qualify for financing. Physical and transition climate risks might be considered.



Light green is allocated to projects and solutions that are climate friendly but do not represent or contribute to the long-term vision. These represent necessary and potentially significant short-term GHG emission reductions, but need to be managed to avoid extension of equipment lifetime that can lock-in fossil fuel elements. Projects may be exposed to the physical and transitional climate risk without appropriate strategies in place to protect them.



Brown is allocated to projects and solutions that are in opposition to the long-term vision of a low carbon and climate resilient future.

Examples



Wind energy projects with a strong governance structure that integrates environmental concerns



Bridging technologies such as plug-in hybrid buses



Efficiency investments for fossil fuel technologies where clean alternatives are not available



New infrastructure for coal

Sound governance and transparency processes facilitate delivery of the client'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 financing framework. CICERO Green considers four factors in its review of the client's governance processes: 1) the policies and goals of relevance to the green financing 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.



2 Brief description of SKI's green financing framework and related policies

SK innovation (SKI) is Korea's largest petrochemical company. SKI as well as its five main subsidiaries (SK energy, SK global chemical, SK lubricants, SK Incheon petrochem and SK trading international) are headquartered in Seoul, Korea. SKI was founded as the first oil and chemical company in Korea and has built an entire vertical value chain in the petroleum and chemicals industry. The subsidiaries have activities in oil development, refining, chemicals, lubricants and trade.

SKI's activities are in the oil and gas exploration business (currently 13 production and 4 LNG projects globally with 53,000 barrels per day of production and 520 million barrels reserves) as well as in the battery and materials business (the latter is focusing on battery materials and flexible display materials). The company is currently expanding its battery and materials business in Korea, China, Georgia (USA) and Hungary. This is part of a globalization as well as a green innovation strategy.

In 2018, SKI's battery business generated 0.6% of its revenue (up from 0.3% in 2017) and an operating loss of 15% compared to the total profit. A large majority of the 99.4% of SKI's other business activities' revenues were fossil fuel based. SKI anticipates that in 2019 the production of oil will increase, and it will develop two new oil exploration projects in China and Vietnam.

SKI and its subsidiaries SK Battery America Inc., SK Battery Hungary Kft., SK Hi-tech Battery Materials Poland sp. z o.o., SK Hi-tech Battery Materials (Jiang su) Co.,Ltd., SK Battery Manufacturing kft., Blue Dragon Energy Co., Limited, and SK IE Technology will be able to raise funds through issuing green bonds and/or borrowing green loans under this framework.

Environmental Strategies and Policies

In 2018, SKI had total emissions of 12.9M tCO₂e (Scope 1 and 2), which have increased 1% compared to 2016. According to SKI, a guideline for Scope 3 emission accounting is currently developed which is subject to further verification and might be included in future sustainability reports. The largest shares of SKI's emissions are generated by the subsidiaries SK energy, SK global chemical and SK Incheon petrochem. SKI's own emissions account for 2% of total emissions of the whole SKI group and are mostly generated at its production sites related to battery and material business Seosan, Jeungpyeong (Cheongju) and Daejeon. Emissions. Oil and gas exploration activities are not included as they are not related to Korea's GHG emission trading scheme and, therefore, are also not subject to emissions reduction targets. These emissions would also fall under the guidelines currently developed for SKI's emission assessments. SKI has a 2025 emission target of reducing emissions by 7.8% compared to a 2025 business-as-usual level. According to SKI, business-as-usual is determined according to the growth projection made by Korea Institute for Industrial Economics & Trade ("KEIT"). This reduction target is also applicable to SKI's energy consumption, which was 52TWh in 2018 (75% fuel based, 21% electricity based).

SKI has targets in place to expand its battery sales from 1.7GWh in 2020 to 100GWh in 2030. SKI also plans to increase its low-density quality base oil production line-up to improve fuel efficiency by up to 2% compared to widely used products as defined by SKI. Further SKI strategies include expanding plastics production (HCCP) for lightweight vehicles by 40% until 2021.



The company recognizes climate change as an emerging risk but currently does not implement TCFD recommendations. It forecasts risks depending on climate scenarios related to the Paris Agreement responding, e.g., falling fossil fuel demand, increased battery demand and increased carbon credit prizes in Korea. SKI has a strategy in place to respond to carbon credit regulation changes and is currently developing a low-cost carbon capture and sequestration technology with carbonic anhydrase (CA). In 2019, a new environmental committee is established to manage climate change governance of the company. Major activities include carbon trade processes among subsidiaries, risk and scenarios analyses and response, carbon credit management and emission reduction.

SKI has a sustainable supply chain policy that includes requirements for environment-friendly business sides, fair trade and ESG analysis of suppliers, which becomes mandatory for all suppliers by 2023. SKI has a waste management plan in place that leads to 60% of total waste being recycled and more than 90% recycling in the main battery facilities. According to SKI, the remaining portion is converted to energy. The recycling process is outsourced to companies that recycle according to government guidelines.

SKI reports according to the GRI, supports the UN Global Compact and complies with its ten principles.

Use of proceeds

The proceeds of raised funds through issuing green bonds and/or loans through this framework can be used to finance or refinance projects in the project categories low carbon transportation, energy efficiency and green buildings. The project categories aim to finance or refinance projects for research, development and manufacturing of batteries for low-carbon transport vehicles incl. respective production facilities and energy storage as well as construction and renovation of green buildings. According to SKI, the majority of green financing will be allocated to the project category “clean transportation”. Proceeds for the first green loan will be used for future projects only according to SKI and the energy efficiency category is intentionally kept very broad to allow for future energy storage related projects that have not yet been developed.

The framework excludes any fossil-fuel related projects, activities and investments (including but not limited to transportation of petroleum products, crude oil refining, petrochemicals related, etc.). SKI confirmed that nuclear related activities are excluded as well as direct investments in fossil fuel infrastructure such as heating in new buildings and production facilities and manufacturing equipment as well as energy efficiency improvements for fossil fuel infrastructure in green buildings and production facilities. Despite being excluded from green financing, fossil fuel equipment could be part of buildings and production facilities.

Selection:

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

SKI has established a green bond working group consisting of representatives from the corporate finance department, investment project teams, CSR department and other units which are responsible for the eligible green projects on the group level. SKI stated that the working group will take into consideration relevant departments’ opinion and conduct a review. Decisions will be made through internal decision-making processes, e.g., by the CEO or board of directors.



According to the ownership of each approved eligible green project, the working group will send an instruction to each borrowing entity of green loans and/or issuing subsidiary entity of green bonds (subsidiaries) to confirm allocation. Green financing can be allocated to SKI as well to relevant subsidiaries, but not to SK Group.

Prior to issuance, projects are selected by the investment team and representatives of the working group according to the framework's criteria and the company's sustainability policies including a safety, health and environmental (SHE) risk assessment. The green bond working group prioritizes and approves each eligible project. The project list is reviewed annually to ensure alignment with the framework.

Management of proceeds

CICERO Green finds the management of proceeds of SKI to be in accordance with the Green Bond Principles. Each subsidiary will create a dedicated database to record the allocation of proceeds. Subsidiaries will make the allocation upon receiving allocation instruction from SKI, and is responsible to track the Proceeds via a formal internal process to ensure linkage to eligible green projects. Green financing can be allocated to projects that include different subsidiaries, but SKI will be responsible to consolidate allocation and impact information.

The subsidiaries commit to fully allocate the proceeds within 24 months after issuance of a bond or loan. In addition, SKI does not refinance projects with a look-back period of more than 24 months.

Unallocated proceeds are held in the subsidiaries' liquidity reserves and are subject to the framework's exclusion criteria. SKI confirmed that unallocated proceeds will not be allocated to stocks or other investment types of companies that are involved in fossil fuel activities.

On a timely basis, but at least annually, SKI will review and verify the databases to ensure the management of proceeds by the subsidiaries is aligned with the framework.

Reporting

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

SKI will consolidate and report on a timely basis in case of material changes, but at least annually on allocation and impacts until full allocation of proceeds to eligible projects. The allocation report will entail the amount of allocated proceeds; when possible, descriptions of the projects finance such as project locations and amount allocated; and selected examples of projects financed. The reporting will likely be conducted on a portfolio basis and not on a project-by-project basis. SKI's green loan working group will be responsible for creating the report and the corporate finance department will take the lead.

The impact reporting will entail amount of electric vehicle batteries produced; number of electric vehicle supported; annual CO₂ emission reduced or avoided (tons); annual amount of energy saved (MWh/); Green building rating agency and rating obtained, building location, and energy consumption level of building showing at least 20% improvement over the respective government regulation consumption level. In addition, the methodology as well as key assumptions are disclosed. Baseline and methodology will be disclosed.

SKI will not make the green loan reporting publicly available, but will share the details/impact with the institutions that will participate in the upcoming deal. For any green bond issuance, SKI will make the reporting public.



3 Assessment of SKI's green financing framework and policies

The framework and procedures for SKI'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 SKIs 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 SKI's green financing framework, we rate the framework **CICERO Light Green**.

Eligible projects under SKI's green financing 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 investors with certainty 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
Low Carbon Transportation	The financing or investments in the development and manufacturing in batteries and including, research and development (R&D) expenditure into new, more efficient and safe battery technologies, for pure-electric and hybrid vehicles ¹ , motorcycles or bicycles; and the construction of such production facilities.	Light to Medium Green <ul style="list-style-type: none">✓ This project category includes aspects of the Green Bond Principle categories "Clean Transportation", "Eco-efficient and/or circular economy adapted products, production technologies and processes"✓ Lithium-ion batteries (LIB) are crucial for electric transportation. Electric cars contribute to the transition to a low-carbon society.✓ No recycling policies/targets: SKI is in R&D and management planning stage on battery recycling if recycling makes sense✓ No broader requirements for new production facilities such as climate resilience, public transport access or vehicle charging stations✓ Limited sustainability considerations regarding rare-earth material and lithium sourcing

¹ Hybrid vehicles shall subject to the direct emissions threshold of $\leq 75\text{g CO}_2$ per km



		<ul style="list-style-type: none"> ✓ Plug-in hybrid cars that cover significant distances powered by battery facilitate the development of a charging infrastructure and a non-fossil fuel based short-range transport ✓ Be aware that a maximum emission threshold does not necessarily safeguard against high fossil-fuel consumption of hybrid vehicles. ✓ Non-plug-in hybrid vehicles are excluded ✓ Fossil fuel investments are excluded (e.g., manufacturing equipment etc.)
Energy Efficiency	<p>The financing or investments in the construction of energy storage systems, (for example that could be applied to 1) Home Residential, 2) UPS, 3) Peak-shifting & Energy Demand) and the research and development expenses for the relevant technologies.</p>	<p>Light to Medium Green</p> <ul style="list-style-type: none"> ✓ Storage systems are crucial for long-term renewable energy supply security ✓ No projects are currently planned ✓ According to SKI, this category targets emergency power supply systems (UPS) ✓ Risk of lock-in by investing into storage system for infrastructure that might become obsolete in the future (e.g., climate risk exposed infrastructure) ✓ Nuclear or fossil fuel related investments are excluded (e.g., storage for fossil fuel/nuclear companies, manufacturing equipment etc.)
Green Building	<p>Construction and renovation of Green Buildings that obtain at least LEED Gold or equivalent certification (equivalent certification including but not limited to: Green Standard for Energy and Environmental Design (G-SEED) “Green 2” or above, BREEAM with a provisional/ final rating at “Excellent” or a “Green Star” rating under Global Real Estate Sustainability).</p> <p>Buildings which have reduced annual energy consumption levels of at least 20% less than government regulation consumption levels.</p>	<p>Medium Green</p> <ul style="list-style-type: none"> ✓ Voluntary environmental certifications such as LEED or equivalents provide varying levels of measurement of environmental footprints for a building. However, they do not guarantee a reduction in GHG emissions ✓ Setting an energy intensity threshold of 20% better than regulation for new buildings and renovations is an important step toward a 2050 solution but is not ambitious enough considering the long-term nature of the underlying assets. SKI confirmed that the energy consumption criteria are additional to the certification requirements. ✓ In a low carbon 2050 perspective passive and plus house technologies become mainstream ✓ Energy intensity not in line with IEA recommendations of at least 30% improvement for renovation and the requirements of near-zero emissions for new construction. ✓ No broader building requirements for new buildings such as climate resilience, public transport access or vehicle charging stations ✓ Fossil fuel investments are excluded (e.g., heating systems, manufacturing equipment etc.) from financing but could still be part of the buildings.

Table 1. Eligible project categories



Background

Global transport emissions grew by only 0.6% in 2017 (compared to 1.7% annually over the past decade), as efficiency improvements, electrification helped limit the growth in energy demand. To meet the 2°C target goals, however, direct transport emissions must peak around 2020 and then fall by more than 9% by 2030.² The largest amount of carbon savings come from switching from inefficient modes of transport (e.g., private cars) to mass transit.³

For projects aimed at like-for-like replacement of transport infrastructure, the improvements in environmental performance depend on the fuel type and efficiency. In order to assess the environmental impacts of the electric cars the emission factor for the electricity grid should be considered. While electric modes of transportation are preferable both when it comes to reducing carbon emissions and local pollution to those that directly use fossil fuels, we should nevertheless be aware of the indirect GHG emissions stemming from the production and use of cars and strive to keep increasing their efficiency.

In regions where the electricity grid is highly based on low carbon sources such as in the Nordic countries and/or have in place ambitious policies to make the grid greener (such as in the EU), electric cars clearly represent environmental benefits compared to fossil fuel cars in the longer term. The charging infrastructure for electric cars needs to be developed in parallel to greening the grid. We consider clean transport projects that include fossil fuel elements such as plug-in hybrid cars with significant electric range as bridging technologies. Hybrid cars that can cover significant distances powered by battery can contribute to the development of a charging infrastructure.

Battery chemistry and expansion of production capacity remains vital to sustain the increased uptake of electric vehicles according to the IEA.⁴ The IEA provided a positive outlook for increased deployment of electric vehicles predicting 23 million sales in 2030. The EV30@30 campaign⁵ even aims to reach 30% sales share for electric vehicles by 2030 which requires sales to reach 43 million in 2030. The IEA also points out bigger demand for new materials and increased attention to raw materials supply. Sourcing and especially production of rare earth metals can be very energy intensive due to heat and treatment demands according to ICCT⁶. According to ICCT, battery manufacturing life-cycle emissions debt is quickly paid off, however, ICCT estimates that materials production causes about 50% of the battery production's GHG emissions. According to a report from IVL, up to 17% of the battery's life cycle emissions could be reduced through recycling processes, which translates to a reduction of up to 10% in battery emissions on a per kilometer basis.⁷ IVL also notes, that despite the emissions reductions for rare earth recycling currently has no big impact on the life-cycle emissions, certain rare earth materials' abundance in the earth's crust are relatively low which calls for recycling measures to make electric vehicles long-term sustainable. According to the IEA, transparency and traceability of raw materials are key instruments to address issues associates with sourcing of these materials. In addition, recycling and waste management as well as environmental design of the batteries remain crucial to reduce risks of shortages in supply.

Governance Assessment

Four aspects are studied when assessing SKI's governance procedures: 1) the policies and goals of relevance to the green financing framework; 2) the selection process used to identify eligible projects under the framework; 3)

² <http://www.iea.org/tcep/transport/>

³ https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter8.pdf

⁴ <https://www.iea.org/publications/reports/globalevoutlook2019/>

⁵ <http://www.cleanenergyministerial.org/campaign-clean-energy-ministerial/ev3030-campaign>

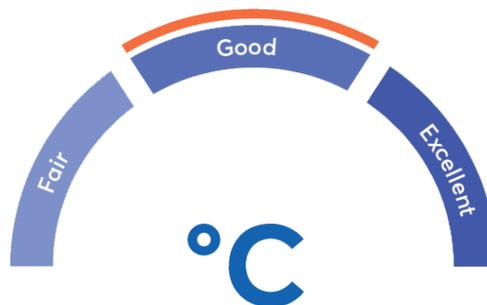
⁶ https://theicct.org/sites/default/files/publications/EV-life-cycle-GHG_ICCT-Briefing_09022018_vF.pdf

⁷ <https://www.ivl.se/download/18.5922281715bdaebede9559/1496046218976/C243+The+life+cycle+energy+consumption+and+CO2+emissions+from+lithium+ion+batteries+.pdf>



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.

SKI has some environmental policies and climate targets in place. This includes a 7.8% better than business-as-usual target by 2025 falling short compared to South Korea's 37% below business-as-usual target by 2030. Emissions are only accounted where this is necessary due to emission trading requirements and currently do not include Scope 3 or supply chain emissions. TCFD recommendations are currently not implemented, but in 2019 a new environmental committee is established to manage climate change governance of the company. Projects are selected by a working group and decisions are not made in census but follow internal decision-making processes, e.g., by the CEO or board of directors. SKI will publish annual impact reporting on a portfolio level. The reporting will not be externally reviewed. SKI will not publish a green loan report on impacts/details, but will publish a report for any green bond issuance in the future. The overall assessment of SKI's governance structure and processes gives it a rating of **Good**.



Strengths

Under this framework, SKI aims to invest into research and manufacturing of batteries which constitutes a crucial building block for the transition to electrified transport globally and is in line of the IEA's projected uptake of electric vehicles.

SKI has the ambition to build and renovate green buildings according to LEED Gold, BREEAM Excellent or equivalent certification schemes. A minimum energy intensity requirement of 20% better than regulations for new as well as for renovated buildings is a strength. In addition, fossil fuel equipment (e.g., heating) is excluded from financing according to the issuer.

It is a clear strength of SKI's framework to exclude battery production for vehicles above the emission threshold of 75 gCO₂/km. Applying this threshold globally can avoid financing of vehicles with high emission intensity.

It is a strength that SKI recognizes climate change as an emerging risk. It forecasts risks depending on climate scenarios related to the Paris Agreement responding, e.g., falling fossil fuel demand, increased battery demand and increased carbon credit prizes in Korea. This is also reflected in establishing a new environmental committee to manage climate change governance of the company.

Weaknesses

CICERO Green sees a potential risk in the sustainability of sourcing raw materials as well as associated shortages in supply due to transparency and traceability of raw materials. SKI has a Sustainable Supplier Check List in place but currently does not disclose this list or other information on materials sourcing, battery related targets or policies due to a high level of competition, market practices and confidentiality and has not yet obtained third party verification for these activities.

Pitfalls

The sustainability of rare-earth material and lithium sourcing can manifest as a pitfall. Both can have significant environmental and climate implications and are currently not fully considered by SKI. According to SKI, a network of suppliers contributes to its raw material input demands. This diversified supplier base enables SKI to be resilient against shortage of raw materials from any one supplier. Additionally, these suppliers are reviewed before onboarding for sustainability considerations via a mandatory Supply Chain Sustainability Assessment Check List



which covers various ESG issues. This Supply Chain Assessment Check List is in Korean, but SKI will endeavor to translate to English and make public in the future subject to investor demand. CICERO Green has not reviewed these guidelines.

SKI currently does not implement TCFD recommendations or any other comprehensive climate risk screening mechanisms for physical climate risks for green buildings and production facilities. Stronger hurricanes in combination with sea level rise in coastal areas, in addition to increases in heavy precipitation and flooding in urban areas, have already been observed and are expected to increase, e.g., in the US, where one of the new plants is planned, by mid-century across the range of climate scenarios explored in the IPCC 4th Assessment Report.^{8,9} In addition, while building certifications such as LEED Gold include several important building aspects it does not guarantee reduced emissions or other environmental benefits constituting the risk of lock-in of emissions in fossil-fuel infrastructure. Fossil fuel equipment in production facilities and buildings (e.g., heating and manufacturing equipment etc.) is excluded from financing, but could still be part of the production facility or the building.

SKI's emission targets fall short compared the South Korean reduction target and currently does not have any targets or policies regarding battery recycling that are publicly available. The company is currently investigating if battery recycling is economically viable and are in the management planning and R&D stage. This is a clear pitfall, as battery recycling is a crucial part for long-term supply of battery technology and an integral part in the production planning. Currently batteries are sent to an external waste recycling company which extracts nickel, cobalt and manganese from the batteries and manufactures the leftover into black powder (gun powder) sold to precursor companies. This is a pitfall as the objective of this framework might be undermined by recycled materials use in industries that do not support the transition to a low-carbon and climate resilient future. Further, while SKI is committed to build green buildings, it has not yet implemented additional requirements regarding related transportation infrastructure, supply chain and construction emissions and building materials.

Concerns and uncertainty exist in carbon emission data from plug-in hybrid car manufacturers and actual charging behavior of hybrid car owners. As an example, the gap between official and real-world CO₂ emissions from new European passenger cars are growing. The International Council on Clean Transportation (ICCT) found a difference of 42% for 2015 passenger cars, which challenges the emission reductions indicated by the producers in recent years.¹⁰ A related major concern is that heavy weight hybrid personal vehicles with small battery capacities, but extra battery weight can de facto emit more CO₂ than conventional diesel and petrol cars. The actual range of electric cars does in most cases not reach the level specified and is dependent on additional factors such as speed and temperature. Despite viewing an emission threshold for eligible vehicle types as a clear strength of the framework, a threshold of 75 gCO₂/km can be misleading as actual emissions depend on user behavior and calculations of electric range are standardized. In addition, the threshold of 75 gCO₂/km is still higher as conventional combustion vehicles such as the Toyota Prius.

SKI currently does not plan to publish a green loan report, but does publish a green bonds report. Despite the fact that loans involve fewer parties decreasing the need to publish due to practicality reasons, CICERO Green views publications of impacts that are associated with the framework as supporting transparent green financing market development. CICERO Green encourages the issuer to also publish green loan impacts.

SKI's framework could receive a better governance score or higher shading, e.g., by including a more ambitious emission threshold for plug-in hybrids and/or range requirements and by more ambitious climate, battery recycling

⁸ Flood Risk for Investors, CICERO 2018 (<https://www.cicero.oslo.no/en/posts/news/half-of-flooding-damage-left-uninsured>)

⁹ Shades of Climate Risk, CICERO 2017 (<https://cicero.oslo.no/en/climateriskreport>)

¹⁰ https://www.theicct.org/sites/default/files/L2R17_ICCT-fact-sheet_EN_vF.pdf



and environmental strategies and targets. In addition, SKI could raise requirements regarding raw material sourcing as well as supply chain, life cycle emissions, production facilities and new green buildings. SKI's governance could benefit from decision making that includes environmental experts, third party environmental experts' involvement, TCFD implementation as well as publishing green loan reporting and external verification of reporting.



Appendix 1: Referenced Documents List

Document Number	Document Name	Description
1	SK innovation's Green Financing Framework	
2	SK innovation Sustainability Report 2018	SK innovation's sustainability report
3	SK innovation – ESS Business	Presentation SK innovation's battery business expansion



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).

