

Finland on the road to a carbon-neutral society - Business Finland's role in promoting low-carbon solutions

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Finland is committed to strict emission reduction targets and the goal is to be carbon neutral by 2035. Time is short but the long-term RDI investments have created a good platform for future innovations to reach the target in time.

What is the role of public RDI support in achieving national carbon-neutral targets?

Business Finland (BF) as well as Tekes and Finpro before BF, have directed considerable RDI investments to Finnish companies to promote low carbon solutions. In the spring 2020, BF launched a study of its long-term effects on achieving low carbon goals. Research questions of the study were the following:

1. What has been the significance of BF RDI funding and support for the development of low-carbon solutions in Finnish companies?
2. What is the role of BF's customer companies in achieving carbon neutrality goals a) in Finland and b) globally?
3. What has been the role of low-carbon solutions for the competitiveness of BF's customer companies?

Low carbon solutions are high on corporates' business strategies

Low carbon solutions are 2020 "new normal"

As a part of the study, an extensive round of interviews with the top management of Finnish large multinational companies was done. Regulation has been a major driver in shaping the market for low carbon solutions from the early 2000s to the present day. Finland has been forerunner in many areas implementing EU regulation which has given Finnish companies often a good competitive edge, but has also increased risks when being first mover on the market. Years 2000-2010 focused on energy efficiency and Finland succeeded to improve energy efficiency in many industries, but in general market demand for low-carbon products was slow and partly business interest was "green washing". Customers' demand for low-carbon products has become a business reality in the 2010s and the business strategic priority for low-carbon solutions has increased - a clear turnaround took place after the 2009 financial crisis. Different industries are still at very different stages in terms of whether low carbon is a 'license to operate' or a 'business', but major Finnish companies are now taking this seriously and low-carbon solutions are on the top of the strategic agenda. The climate business or the provision of low-carbon solutions is no longer its own business but cuts across all businesses - at the same time global competition is intensifying. New business models and business potential are now being sought from disruptions and from sector

Even large Finnish companies are globally small but agile - Competitiveness is based on pioneering quality

coupling. Finnish large companies have a good position in their core areas and competitiveness is based on high quality and innovations. Even the big Finnish corporations are often small in global scale but this also means that they can be relatively agile.

Examples of Finnish core areas:

- Forest industry - energy efficiency, proximity to raw and intensifying competition have been drivers for pioneering solutions - Fossil Fuel Free factories, biobased materials
- Biofuels - tackling regulatory demand and research-based exploitation of new raw materials
- Digital solutions - The Nordic countries have been ahead of others and the foundation for building digital solutions has been good, especially to promote energy efficiency (Smart Grids, IoT)

BF's customers are critical for achieving carbon neutrality goals

Large companies' own low-carbon operations and the provision of low-carbon products and services are essential in achieving national goals. The study covered 17 case study companies which are BF's largest customers. These companies covered also 55% of Finland's industrial CO₂ emissions in 2019. In addition to emissions from own operations, large companies have a significant impact on the emissions over their entire value network. Most of the companies do not report the emission reductions of their customers using their products ("carbon handprint") but identify this to be the most significant CO₂ reduction impact in terms of global emissions.

In practice, all large Finnish companies that develop low-carbon solutions are BF's customers. Also, Finland's emissions especially in industrial production have decreased, although production and consumption are increasing. Emission reductions have been achieved by investing in energy production (renewable energy sources) and industrial energy efficiency, which have also been the main targets of BF energy financing.

Public RDI support is needed to develop low-carbon solutions

Overall arguments for public RDI investments and support are the same for low-carbon solutions as for any other innovation area. There are, however, some special features that shape the RDI activities in this field.

Special feature 1: Common goals and policies shape the market

- Public authorities have a strong role to play in creating a market for low-carbon solutions.

Without big companies' efforts and innovations Finland will not reach climate goals

Markets for low-carbon solutions are shaped by common target setting and policy decisions.

- Business risks are increased by the uncertainty of policy development.
- Public funders, researchers and companies also influence policy development and create new knowledge for policy makers.

Special feature 2: Low-carbon goals require system change

- Actors at different levels need to work together to remove barriers and create new structures.
- Also local and practical experimentation is needed which means that the role of domestic markets and cities is often large.

Special feature 3: The journey from innovation to market is slow

- Investments in demonstration and pilot infrastructures is often needed.
- Creation of viable business case can take decades.
- Digitalisation also brings new faster opportunities.
- Right timing for RDI activities still remains as a challenge.

Also big companies need public RDI support to develop low-carbon solutions

Even for a large company, the risks are often too great for the company to develop low-carbon solutions alone. Public RDI support can help to build wider networks and guarantee long-term RDI activities. Often the risks have also materialized. Wrong choices have been made with respect to technologies in relation to regulatory changes. Even in these cases the RDI investment have been useful over the long term due to increased knowledge base. In addition to innovation support, investment support has been essential for many large companies for piloting and adopting new technologies.

BF has consistently financed low-carbon solutions over a long term

Energy-targeted funding has been about 1/3 of BF's total innovation funding in 2006-2019

The classification and tracking of investments to low-carbon solutions is not straightforward. The development covers a wide span of innovation areas. Tekes has been tracking the thematic content of R&D projects with a detailed energy and environmental categorization. The categories are overlapping and most projects are classified to more than one category. Roughly one can assume that all energy related RDI activities are in some way linked to low-carbon solutions. One can estimate that overall BF's (and Tekes) energy-targeted funding has accounted for about 1/3 of BF's total innovation funding 2006 – 2019 and all together the public RDI investments to this field have been € 2 billion. BF and Tekes have accounted for 83% of all public funding for energy research and experimental activities in Finland in 2006 – 2019.

The BF funding received by the 17 case companies was mostly focused on the development of energy solutions. The combined BF innovation support for case companies in 2006–2020 was € 364 million. The companies' own investments in

BF has consistently invested in the cleantech, bioeconomy and energy sectors creating positive effects in companies

these BF-funded projects in the period was approximately € 550 million and this is only a small part of the total RDI investments of large companies.

The effects of BF support in companies are larger than only funding

BF and before this Tekes and Finpro have had the cleantech, bioeconomy and energy sectors high on their strategic agenda throughout their existence. As a part of this study a meta-analysis of 20 previous studies, impact assessments and evaluations was completed. These show that the greatest impact from BF support is generally on start-ups and SMEs. These impacts and development of low-carbon solutions do not differ from any other innovation areas. The effects and impact for large companies have generally been moderate according to previous studies, but on the other hand, in 2015–2018 the support allocated to large companies was sharply reduced and this has been estimated to have had a negative impact. Especially when looking the emission reduction targets and development of low-carbon solutions, it is important to understand that the impacts of RDI support for large companies spill over along value chains to a wider range of SMEs and research entities.

Previous studies show that it has been possible to utilize BF's various subsidies and programs in an overlapping manner. There have been over 20 innovation programs since 2000 targeted to the low-carbon solutions. The longer-term effects of the programs have arisen during the following programs and programs have created a clear continuum. BF has often been ahead of the markets and challenged Finnish companies to participate in the growing international market for low-carbon solutions. BF has also used innovation programs in strengthening Finland's vision and shaping national policy for the development of low-carbon solutions. One challenge for RDI support in the area of developing low-carbon societies has been the big role of the domestic market and cities. BF's funding is directed to the international growth of companies and there are obstacles in financing public sector innovation activities.

Interviews done in this study with Finnish large companies highlighted further following impacts from BF support for developing low-carbon solutions:

- BF's long-term investments are especially valued as an enabler of RDI for future themes - higher risk and long-term issues remain on the RDI agenda of large companies.
- In terms of emission reductions, it is effective to support large companies in the ecosystems that, due to their leading position in the value network, contribute to reducing emissions in their procurement and customer networks.

The need for low-carbon solutions is growing - BF has supported the creation of a strong foundation for Finnish companies

- BF funding has had a positive effect on attracting experts and maintaining the knowledge base in Finland – within companies in R&D units and nationally through research funding.
- Tekes / BF project reporting and monitoring requirements have contributed to forcing to describe the development of new low-carbon solutions in “business language” - this development has been partly ahead market requirements.
- The integration of Tekes and Finpro into BF was perceived as a good change. This has for example strengthened the development of demonstration/testbed platforms.

Conclusions and recommendations

BF has invested significantly and in a consistent manner in the development of low-carbon solutions over the long term. The results of the long-term investment are also visible - the investments have created business for Finnish companies, strengthened pioneering capabilities and reduced emissions. When low-carbon solutions are now mainstream, BF must ensure that public support supports disruptions and the development of ecosystems to the next level.

Recommendations for BF

1. Large companies have a key role to play in achieving the national carbon neutrality target. Support for low-carbon solutions for these is justified and long-term investment must be continued.
2. Sector coupling models and wider ecosystems are playing an increasingly important role in realizing the great business potential of low-carbon solutions. This is a natural place for BF to target bets and now is the right time.
3. Promoting national carbon neutrality targets and investing in low carbon would be an opportunity for BF to further strengthen its brand and visibility.

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