

Research on Opportunities and Challenges of Clean Energy Cooperation in Canada Based on the New Canada Growth Fund

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Abstract: With the challenges of global climate change and energy transition, Canada, as a wealthy developed country, actively develops clean energy to reduce greenhouse gas emissions and improve energy security and economic competitiveness. This article analyzes the concept, classification, development status, prospects, and policy support of clean energy in Canada, focusing on the establishment, implementation, effect, and impact of the Canadian Growth Fund and the opportunities and challenges of Canadian clean energy cooperation. This article believes that the Canada Growth Fund is a major investment plan launched by the Canadian government to respond to the COVID-19 pandemic and promote economic recovery. It is designed to support Canada's innovation, infrastructure, skills, and regional development, of which clean energy is an important area. Canada's clean energy cooperation is conducive to strengthening Canada's domestic energy interconnection and regional coordination and strengthening Canada's energy dialogue and cooperation with international partners, especially with important energy markets and consumers such as the United States, the European Union, and China. Canadian clean energy cooperation also requires continuous innovation to improve the technical level, cost-effectiveness, and social acceptance of clean energy and contribute to the sustainable development of Canada and the world.

1. Introduction

Clean energy is one of the main responsibilities of the Canadian government and is also the collective name for Canadian energy. It can be divided into basic clean energy and non-basic clean energy, composed of renewable and low-carbon energy, respectively. The Canadian government has also commissioned the private sector to invest and develop clean energy in response to climate change. Since 2015, clean energy has become key to the Canadian economy, and clean energy cooperation has become a metric. Unlike traditional energy cooperation, clean energy cooperation emphasizes innovation, mutual benefit, and sustainability. Therefore, the Canadian clean energy cooperation topic was raised, and the Canada Growth Fund provided new opportunities for Canadian clean energy cooperation.

The Canada Growth Fund stems from an economic recovery that puts Canadians at its core. Its goals include fairness, greenness, and inclusion, which are also tools of the Canadian government. From the growth fund structure perspective, the Canadian government pursues high-quality clean energy and realizes clean energy modernization through a combination of funds and policies. However, this is only domestic. Today, the Canadian government has embarked on a unique path of clean energy cooperation. The comprehensive advancement of the Canada Growth Fund will not only revolutionize Canada's energy relations with the United States, the European Union, China, and other countries and regions and reflect Canada's international responsibilities. However, it will also revolutionize Canada's energy structure and challenge Canada's energy security. Therefore, it must have a global perspective and structure when discussing Canada's clean energy cooperation. As a result, Canada's clean energy cooperation proposition has been put forward after the COVID-19 epidemic. In short, Canada's clean energy cooperation is the necessary condition and guarantee for realizing Canada's clean energy. From the perspective of Canadian clean energy, Canada's clean energy cooperation has made progress, but there are also shortcomings. Canada's clean energy

cooperation has not yet fully identified an effective path for clean energy technology, cost, and social acceptance, and it continues to work hard. Therefore, Canada's clean energy cooperation still needs innovation, which will not only help strengthen Canada's energy competitiveness but also Canada's international obligation.

Based on the above background analysis, this article proposes a research method for Canadian clean energy cooperation, aiming to explore the opportunities and challenges of Canadian clean energy cooperation and solve the problem of clean energy cooperation through the theory and methods of policy analysis and case studies. Its main content provides theoretical and practical significance for the development and policy support of Canadian clean energy, the establishment and implementation of the Canadian Growth Fund, and the opportunities and challenges of Canadian clean energy cooperation. It effectively dealt with the risks of clean energy cooperation and has theoretical and practical significance.

2. Canadian Clean Energy Development and Policy Support

2.1 The Concept and Classification of Clean Energy in Canada

Clean energy is a concept that has developed in parallel with climate change, which is "soaked" in low-carbon concepts, demonstrating Canada's green orientation and reflecting Canada's energy transformation strategy since 2015. However, it is still difficult to achieve consensus when we try to construct the definition and essence of clean energy using certain emission or pollution level standards. Therefore, Canada adopts a flexible classification method to divide clean energy into two categories. The first category is renewable energy, such as hydro power, wind power, solar energy, geothermal energy, ocean energy, etc., which produces little or no greenhouse gases or other pollutants during use [1]. The second category is low-carbon energy, such as nuclear, natural gas, biomass, etc., which can significantly reduce the emission of greenhouse gases or other pollutants compared with traditional fossil fuel energy during use. Canada believes that both types of clean energy are important components in achieving the transformation of the energy system and combating climate change. The concept and classification of Canadian clean energy are shown in Figure 1.

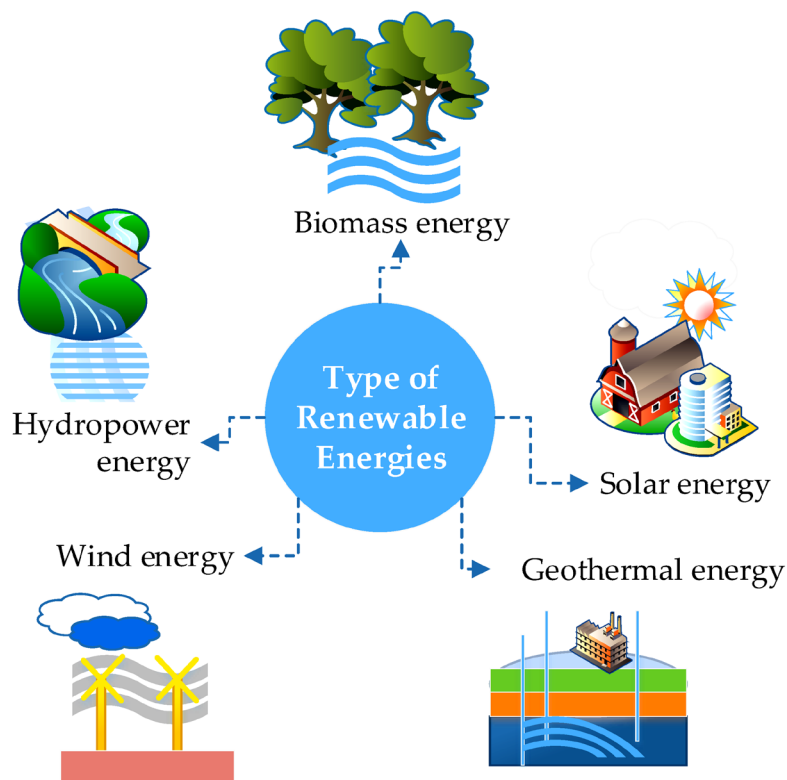


Figure 1 Concept and classification of clean energy in Canada

2.2 The Development Status and Prospect of Clean Energy in Canada

The development status and prospect of clean energy is an important criterion for evaluating Canada's energy transformation and an intuitive expression of Canada's energy strategy [2]. The International Energy Agency and the Canadian government have discussed different definitions of clean energy from energy supply and demand perspectives, energy structure, and energy efficiency. Some scholars believe clean energy is carbon neutral or environmentally friendly. It is precisely because clean energy is somewhat more sustainable and belongs to energy science to mitigate climate change [3]. The history of the development of clean energy can even be traced back to the 19th century, and its main activities include hydropower, wind power, solar power, etc. The concepts and policies of clean energy are closely related to Canada's international responsibilities and domestic interests. By joining *the Paris Agreement*, formulating *the Pan-Canadian Framework*, and establishing *the Canada Growth Fund*, clean energy has become important for Canada's energy transformation. The main contribution of the clean energy theory in 2023 is to put forward the path and goal of clean energy transformation. Therefore, the concept of clean energy initially focused on clean energy metrics based on standard attributes of greenhouse gas emissions or pollution levels.

2.3 Policy Support and Framework of Clean Energy in Canada

Compared with traditional energy cooperation, Canada's clean energy cooperation emphasizes the interrelationship of innovation, mutual benefit, and sustainable development, and it is transnational and long-term. Although some scholars question that clean energy may not directly relate to economic growth, most scholars maintain that clean energy can rationally evaluate economic growth. Stern et al. proposed a classic triple-bottom-line model of sustainable development that includes economic, social, and environmental factors. Since then, the model has become a typical tool for clean energy cooperation, thus developing the concept of clean energy. These scholars believe clean energy has many benefits and is the pillar of "green growth." Only when economic growth, environmental protection, and social development promote each other can clean energy cooperation achieve long-term results. Thus, clean energy cooperation is the result of sustainable development. Some scholars also summarize clean energy cooperation as a multi-level, transnational, and cross-field cooperation model, that is, clean energy cooperation based on technological innovation and policy coordination. The former focuses on technology transfer and sharing, while the latter focuses on policy coordination and standard unification, that is, the dual drive of technology and policy. Although clean energy cooperation has experienced some practical failures, from the perspective of sustainable development, it can promote economic growth and improve environmental quality [4]. As a result, the concept of clean energy has gradually become a consensus in international social research and practice.

3. The Establishment and Implementation of the Canada Growth Fund

3.1 Background and Motivation of Canadian Growth Fund

The essence of the concept for creating and implementing the Canada Growth Fund is focused on addressing economic challenges and promoting development. The growth fund applies the Canadian government's smart thinking in economic policy. In order to overcome the shortcomings of economic downward pressure, it has entered the research field as a new alternative model-promoting growth framework. The basic idea of this framework is that the government should ensure that funds are effectively realized, set professional standards for project outputs, "capture" project results through monitoring and other technologies, and use evaluation methods to measure investment effects. The growth fund framework reconstructs the government investment model, emphasizing the need to enhance project sustainability and build investments' transparency, quality, impact, and effectiveness.

3.2 Canada Growth Fund Contents and Structure

The content and structure of the Canada Growth Fund are the main components of Canada's economic policy, emphasizing the government's support for economic development and directly reflecting the reality of economic and social development through capital investment. Some

components of the development of growth funds are gradually taking shape, and various evaluation systems are gradually receiving attention. However, from a practical perspective, the implementation of some projects is still in the initial stage and is still inconsistent with the logical framework and generation mechanism of economic development, leading to problems in project management and execution.

3.3 The Effectiveness and Impact of the Canada Growth Fund

From the perspective of effect and impact, the Canada Growth Fund is a basic link in promoting economic development and the core embodiment of the government's economic policy. Therefore, the Canadian Growth Fund uses capital investment as its main generation logic. The effect and influence of the fund are the main evaluation objects of the government's economic policies and are also the execution subjects of the government. At this stage, the Canada Growth Fund strengthens the control of project effects and impacts from the management control perspective. There are three main forms: First, project management. Clarify the path to achieve results and impact during project preparation and implementation. Second, develop project standards. Through the development of project evaluation standards and monitoring standards, and open to the public project evaluation standards, to achieve standardized control of the project [5]. The third is the internal process of reengineering the project. Recently, funds have used digital means to improve project management, effectiveness, and impact. However, compared with the expected effect, the implementation of the current project needs to be further improved [6].

4. Opportunities and Challenges of Canada's Clean Energy Cooperation

4.1 Domestic Opportunities and Challenges of Canada's Clean Energy Cooperation

The fundamental difference between Canada's clean and traditional energy cooperation lies in its environmentally friendly nature. The standards and guidelines for clean energy cooperation aim to mitigate climate change and improve environmental quality, and cooperative development mainly reflects environmental protection and sustainable development. In the domestic framework of clean energy cooperation, accurate understanding, comprehensive coordination, common development, and sharing are the core values and highest standards of cooperative development. The diversity of clean energy types and differences in development stages lead to multi-level cooperation [7]. Although the cooperation has been launched, the policy system is still incomplete, and it lacks a unified supervision mechanism. Therefore, this creates "shortcomings" in cooperation, which affects the depth and breadth of cooperation.

4.2 International Opportunities and Challenges of Canada's Clean Energy Cooperation

From an international perspective, Canadian clean energy partnerships do not provide the exact information that international partners need. The main form of cooperation results in satisfaction evaluation, but cooperation lacks standard relevant information and a unified evaluation mechanism. The core of this problem may be information asymmetry. In cooperation, Canada is often described as a "clean energy power," and its commitment to environmental protection directly reflects its international image [8]. However, there is a lack of information from international partners on cooperation results and other information. The effects of clean energy cooperation are often difficult to capture or measure. Information asymmetry and imperfect evaluation standards directly lead to obstacles to cooperation.

4.3 Innovation Opportunities and Challenges for Canadian Clean Energy Cooperation

From an innovation perspective, traditional models have long restricted the ability to cooperate on clean energy. Since the 21st century, the centralized clean energy cooperation model has reshaped the cooperation pattern through technological innovation, but the shortcomings of the traditional cooperation model still restrict cooperation. Cooperation has yet to be improved not only due to technical limitations but also due to policy influences. Under digitization, new technology is regarded as a direct way of innovation. However, the actual effect of technology-based innovation on

cooperation remains to be discussed. At the same time, due to the difficulties in implementation, the cooperation is lack of continuity. Therefore, innovation does not always seem to achieve the desired goals. Innovation is not only a technical problem but also a problem of implementation.

5. Conclusion

Clean energy cooperation has gone through a period of time that poses new challenges and requirements for sustainable global development. Cooperation is a "green" symbol for responding to climate change and an important means to promote sustainable development. There is also an urgent need to achieve energy security and maintain environmental ecology, embodying sustainable development's inherent requirements. Cooperation is guided by technological innovation to build a theoretical analysis framework and practical mechanism for sustainable development. In recent years, modern information technology has promoted cooperation, empowered cooperation through data analysis, and made decision-making more accurate and scientific. Its value is in line with the inherent logic of sustainable development. Therefore, technological innovation also provides new paths for cooperation. In short, the sustainable improvement and development of cooperation will help to better realize the energy transition, help protect the environment, and maintain global ecological balance.

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