August 2022 Journal of ÿÿÿ ÿÿÿÿ
Volume 44 Issue 4 Latin American Studies ÿÿÿ ÿÿ ÿÿ ÿ

Research on Xi Jinping's Thoughts on Major Power Diplomacy in the New Era

An analysis of China-Latin America clean energy cooperation in the context of energy transition

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Abstract: Promoting international cooperation in clean energy is an important strategic choice for China to respond to global climate change and achieve its own economic and social sustainable development goals in the context of energy transformation. Latin America is a key region for China's clean energy to go global. From the perspective of development history ÿ China-Latin America clean energy cooperation has experienced common development in multiple fields from hydro energy to solar energy, wind energy, biomass energy and nuclear energy. It has transformed from the project contracting model to the integrated development model of "investment and financing + construction + operation". In terms of politics, economy and finance, On the basis of overall cooperation and complementary resources and technological advantages, China-Latin America clean energy cooperation is progressing smoothly, achieving policy interoperability and supply and demand docking. The realistic requirements for China to respond to global climate change, promote Latin American economic recovery in the post-epidemic era, and realize Latin American economic transformation are Sustainable cooperation in clean energy between Latin America and the Caribbean provides development opportunities. However, China-Latin America clean energy cooperation still faces many challenges, including political and economic risks within Latin America, competition from the United States, and pressure from China itself. Difficulties in building clean energy systems and financing difficulties. Looking to the future, further expanding cooperation with Central American and Caribbean countries, increasing third-party market cooperation with developed countries, and strengthening the ability of the Chinese government and enterprises to coordinate and respond to risks can deepen the clean energy cooperation between

China and Latin America. Prospects for cooperationÿ Keywords: energy transition, energy cooperation, clean energy, climate change, economic transformation Third party cooperation

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Document identification code: A Article number: 1002 - 6649 (2022) 04 - 0117 - 19

Promoting energy transformation and building a new energy consumption structure with clean energy as the main body has become a global trend. In line with the global development trend, the status of clean energy in the world's energy structure is increasing day by day. From the perspective of consumption structure, from 2009 to 2019, the proportion of clean energy in global primary energy consumption increased from 13.3% to 1.3% in terms of ÿÿ ÿÿ , Among them, the proportion of non-water renewable energy increased from 18% to 5%. ÿ installed capacity. Look, between 2009 and 2019, the global installed capacity of solar, wind and geothermal energy jumped from 182.6 GW to 1,223.1 GW, a cumulative growth of 669.8%. In terms of power generation, during the same period, the cumulative growth of global hydropower was 123%. The cumulative growth of non-aqueous renewable energy is 440.6%. It can be seen from this that global clean energy, especially non-aqueous clean energy, is developing rapidly. At present, China is the world's largest solar and wind energy producer and overseas investor in renewable energy, and is the world's largest producer of solar and wind energy. A leader in clean energy. Moreover, for a long time to come, supporting the development of clean energy at home and abroad will become the only way for China to cope with global climate change and promote the realization of sustainable development goals for all mankind. It is also the only way to achieve its own economic and social development goals. Necessary requirementsÿÿ

Latin America and the Caribbean (hereinafter referred to as "Latin America") is one of the regions with the most active clean energy market and the fastest growing clean energy installations in the world. In 2015, Brazil, Mexico and Chile were among the top ten renewable energy markets in the world. ÿ Latin America is an important participant in the "Belt and Road Initiative" and is also a key area for China's clean energy to go global. At present, China has carried out extensive clean energy cooperation with Brazil, Argentina, Chile, Ecuador and other countries. China-Latin America Clean Energy Cooperation What is the specific current situation? Judging from the existing results, what is the driving force for China-Latin America cooperation to achieve clean energy cooperation? In the context of global energy transformation, what opportunities and challenges does China-Latin America clean energy cooperation face? This article aims to focus on the above Question: From a holistic perspective, let's explore the whole picture of China-Latin America clean energy cooperation.

ÿ Since BP company data separately counts the consumption, power generation and installed capacity of hydro energy, nuclear energy and renewable energy, the clean energy here refers to the sum of hydro energy, nuclear energy and renewable energy. The original data comes from BP Data statistics, the proportion is calculated by the author. See BPÿ "Statistical Review of World Energy" ". https: / / www bp com/ en / global/ corporate / energ y - economics/statistical - review - of - world - e energy html [2021-06 -28]

ÿ The white paper "China's Energy in the New Era" released in December 2020 and the "The Fourteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long-term Goals to 2035" released on March 1, 2021 both emphasized the promotion of energy The importance of transforming and promoting the construction of green energy system and low-carbon economy. See "China's Energy Development in the New Era", Xinhuanet, December 21, 2020, http://www.xinhuanet.com/ ÿÿÿÿÿÿ/ 2020-12/ 21 / c_1126887608 html [2021-04-10] ÿ «Outline of the Fourteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China and Long-term Goals for 2035», Xinhuanet, March 13, 2021 ÿ ÿÿÿ: / / www xinhuanet com/ 2021 - 03 / 13 / c_1127205564 html [2021 - 04 - 10]

ÿ ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ (ÿÿÿÿÿ ÿÿÿÿÿÿÿ)ÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿ ÿÿÿÿÿ: / / ÿÿÿ ÿÿÿÿÿ ÿÿÿ / ÿÿÿ ÿÿÿÿÿÿÿÿÿ/ ÿÿÿÿ / ÿÿÿ / ÿÿÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

The development history and current situation of clean energy cooperation between China and Latin America

At present, the academic community's understanding of clean energy can be divided into three types. The first view is that clean energy and renewable energy are equivalent. ÿ According to the definition of the International Energy Agency, renewable energy refers to recyclable energy that comes directly from the sun. Or energy within the earth, including solar energy, wind energy, tidal energy, water energy, biomass energy, geothermal energy, and biofuels and hydrogen produced from renewable resources. The second view is that clean energy should include renewable energy and Non-renewable energy. Zhang Yuzhuo, an academician of the Chinese Academy of Engineering, believes that equating clean energy with renewable energy ignores the resource integration, technological coupling and coordinated development of various energy sources, and actually limits the connotation of clean energy. He It is believed that clean energy not only includes renewable energy, but also includes clean-processed and less polluting fossil energy (such as natural gas and coal-bed methane). The third view is that although the pollution emissions are lower than those of oil, natural gas and coal-bed methane are among the Strictly speaking, it still belongs to traditional fossil energy. Although nuclear energy is a non-renewable energy source, it has low pollution emissions and should be included in the category of clean energy. Therefore, clean energy should be the sum of renewable energy and nuclear energy. 4. What is discussed in this article The third perspective on promoting clean energy cooperation

It is carried out

under the current circumstances. Traditional energy cooperation includes energy trade, energy investment, energy project contracting and energy financial cooperation. Energy trade mainly refers to trade with the host country in oil, coal, natural gas and other trades. Different from traditional energy cooperation, in the field of clean energy Cooperation rarely involves energy trade. This is because clean energy trade mainly manifests as cross-border power trade within the region. China and Latin America are far apart, and the cost of cross-border power trade is too high. Funding the development of clean energy in Latin America and promoting intra-Latin America power trade are important The main forms of cooperation. Therefore, China-Latin America clean energy cooperation is mainly reflected in energy investment, energy financial cooperation and energy

Three aspects of project contracting

From a time perspective, China-Latin America clean energy cooperation can be divided into two stages. The initial stage of cooperation is based on China's

Zhang Rui, Kou Jingna: «The Rise of Global Clean Energy Governance: Subjects and Issues», published in «Comparison of Economic and Social Systems», 2020 ÿThe 2nd issue of the year, page

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Zhang Yuzhuo: "Strategic Research and Development Countermeasures of China's Clean Energy", published in "Proceedings of the Chinese Academy of Sciences", Issue

ÿ 4, 2014, ÿPage 431, Xu Bin, Chen Yufang, Shen Xiaobo: "Clean energy development, carbon dioxide emission reduction and Regional Economic Growth», Published in "Economic Research", Issue 7, 2019, Page 189, Li Xinlei: « China's Clean Energy Diplomacy under the "One Belt, One Road" Framework - Opportunities, Challenges and Strategic Capacity Building», Published« International Outlook», Issue 3, 2017, Page 37.

Foreign economic aid and energy project contracting, as well as technical exchanges between China and Latin America, are mainly carried out in the field of hydropower. In 1984, on the basis of the "Basic Agreement on Economic, Technological and Scientific Cooperation" and the "Loan Cooperation Agreement" between China and Ecuador, China established For the project of assisting the construction of 8 small hydropower stations in Ecuador, China is responsible for providing power generation equipment and technical guidance. ÿ Since the 1990s, President Jiang Zemin, Premier Li Peng, Vice Premier Zhu Rongji, Chinese managers and technical personnel have visited Itaipu many times. Hydropower station, "Learning experience" from Brazil on the preparation, production, operation and other aspects of the Three Gorges Project. ÿ In 1998, Suriname's "Polo Copondo Rural Power Transmission and Distribution Project" (the power supply of this transmission and distribution network is taken from the Afobaka Hydropower Station) was designed by the East China Survey and Design Institute of China State Electric Power Company, constructed by Jiangsu Jintan International Economic and Technical Cooperation Company, and completed under the supervision of China Youfa International Engineering Consulting Company. It was successfully connected to the grid for power transmission in 1999. Entering the 21st century, in the With the implementation of the "Going Global" strategy, clean energy cooperation has expanded in an orderly manner. International project contracting is still the mainstream, but the scale has expanded compared with the 20th century. For example, from 2003 to 2004, China Hydropower Consulting Engineering Group Corporation participated in the Venezuela Expo Survey and design of Gonotos Hydropower Station and Larivesa Hydropower Station. In 2003, China National Hydropower Construction Group (hereinafter referred to as "Sinohydro") won the bid for the Belize Charillo Hydropower Station construction project. This was signed since the establishment of China Hydropower Group. China's first project in the Americas. However, in comparison, at this time, the destinations of China's hydropower projects abroad are still mainly concentrated in Africa and China's periphery, and cooperation with Latin America is very limited.

The international financial crisis in 2008 and the proposal of the "Belt and Road" initiative in 2013 provided development opportunities for China-Latin America clean energy cooperation, and the cooperation entered a stage of rapid development. From the perspective of cooperation fields, China-Latin America water energy cooperation developed rapidly and gradually Expanding into fields such as wind energy, solar energy and nuclear energy. From 2009 to 2020, China-Latin America hydropower cooperation reached a climax. China's Global Power Asset Database of Boston University's Global Development Policy Research Center tabase) Data displayÿÿ 2009-2020 During the year, Chinese companies invested and financed an installed capacity of 15,572 MW in Brazil's water energy field, accounting for 77% of the total installed capacity of investment and financing in Latin America. In addition, China Development Bank (hereinafter referred to as "China Development Bank") and China Development Bank The Export Bank has also carried out projects in the hydropower fields of Ecuador, Argentina and other countries.

ÿ The eight small hydropower stations built with China's aid in Ecuador are Longbaki, Kinsaloma, El Estado, Ancamarca, Moyeturo, La Bonita, Chaucha and Indago hydropower stations. See Chang Liu and Wang Bo, editors-in-chief: «China Hydropower Yearbook (1989-1991)», Beijing: Water Conservancy and Electric Power Press, 1992, page 508.

ÿ Han Qi: «The spirit of international cooperation in infrastructure construction in Latin America: Taking the Itaipu Hydropower Station as an example», published in «Latin American Studies»ÿ Issue 6, 2016, Pages 18-19.

ÿ The China Overseas Power Assets Database is an interactive data platform that displays overseas power plant information (transaction type, installed capacity, lenders) involving China's foreign direct investment and/or development financial institutions (China Development Bank and China Export-Import Bank). , energy type, project status, etc.) and its carbon footprint estimate. See Kevin P Gallagher et al "China's Global ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ ? lang ÿ zh [2021-04-11]

During the same period, the installed capacity of wind energy, biomass energy and solar energy investment and financing in Latin America by Chinese enterprises and policy banks was as high as 2765 MW, 788 MW and 567 MW respectively. For example, the Export-Import Bank of China provided financing to Cuba. Financing of solar and biomass energy projects, China Development Bank's financing of Chilean solar projects, State Grid's acquisition of Brazilian wind power companies, etc. ÿ In addition to policy banks, other types of commercial banks and credit companies also invest in clean energy in Latin America. financing, so its scale is larger. For example, in 2012, China Export and Credit Insurance Corporation participated in the financing of the wind power project in Loma Blanca, Argentina. This was also the first clean energy project that a Chinese company participated in in Argentina. ÿ On January 22, 2021, the Roma Blanca Phase I and III projects were officially integrated into the Argentine National Grid System. The total installed capacity is up to 100 MW, which can meet the electricity consumption of 100,000 households. ÿ

From the perspective of cooperation forms, China-Latin America clean energy cooperation has evolved from a single project contracting to an integrated development of "investment and financing + construction + operation". Since the end of the 20th century, international project contracting has shifted from a "construction-financing separation" model to a "funded contracting" model. Model changes, the Chinese government also strongly supports the overseas expansion of China Electric Power Company to the "build-operate-transfer" model (BOT) and "contracting with capital" model. After the 2008 financial crisis, the investment and financing capabilities of Western countries declined, and Chinese enterprises , banks have increased the pace of overseas investment. From 2009 to 2020, Chinese enterprises and policy banks invested and financed the clean energy field in Latin America in the form of mergers and acquisitions, greenfield investments and loans, with a total installed capacity of up to 24.3 GW. Currently, The "investment and financing + construction + operation" model that combines investment and financing with project contracting and project operation has gradually become the mainstream of China-Latin America clean energy cooperation.

From the perspective of institutional construction, China-Latin America bilateral and multilateral policy communication mechanisms and clean energy system construction pave the way and build bridges for cooperation. First of all, China-Latin America clean energy cooperation has always centered on overall cooperation. Since entering the 21st century, China and Latin America have continued to build on the existing foundation. Deepen bilateral and multilateral policy communication mechanisms. From a bilateral perspective, China and Latin America have actively promoted bilateral dialogue mechanisms, such as the China-Brazil High-Level Coordination and Cooperation Committee, the China-Argentina Intergovernmental Standing Committee Mechanism, and the China-Mexico Strategic Dialogue Mechanism . Look, since the 18th National Congress of the Communist Party of China, a large number of China-Latin America and Caribbean multilateral cooperation mechanisms have been established. In July 2014, the leaders of China and Latin American and Caribbean countries met for the first time and adopted the "China-Latin America and Caribbean Community"

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et For more cases of Chinese policy banks and enterprises investing and financing in Latin American wind energy, solar energy and other fields, see Kevin ÿ P Gallagher al "China's Glob ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿCenterÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿ HTTPS: / / ÿÿÿÿÿÿÿÿ/ cgp / ? lang ÿ zh [2021-04-11].

ÿ «More projects in Argentina's largest wind power project group invested and constructed by Chinese companies are put into operation», Xinhuanet, January 25, 2021 ÿÿÿÿ: / / ÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿ/ ÿÿÿÿÿ/ ÿÿÿÿ ÿ ÿÿ / ÿÿ / ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ Bing Fengshan Editor-in-Chief: «China Hydropower Yearbook (2004)» Beijing: China Electric Power Press, 2005, page 334 Jiang Shixue: «The Belt and Road

ÿ Initiative extends China-Latin America cooperation into a new stage», contained «Contemporary World», Issue 6, 2019, Page 25.

Joint Statement of the Leaders' Meeting in Brasilia», announcing the establishment of the China-CELAC Forum (hereinafter referred to as the "China-CELAC Forum"). Under the leadership of the China-CELAC Forum, it includes the China-CELAC Infrastructure Cooperation Forum, China-CELAC Science and Technology Innovation Forum, China-CELAC Forum, Cooperation mechanisms including the Latin American and Caribbean Think Tank Forum have been established one after another, «China's Cooperation Plan with Latin American and Caribbean Countries (2015-2019)» «Joint Action Plan for Cooperation between China and CELAC Member States in Priority Areas (2019-2021)» « Cooperation documents such as the Special Statement on the "Belt and Road Initiative" were also successfully signed, which greatly promoted the overall cooperation process between China and Latin America. Especially, as Latin America has become a natural extension of the "Belt and Road Initiative" and an indispensable important participant In this regard, the "Belt and Road" institutional framework has become a new driving force to achieve the strategic development docking of both parties. The China-Latin America multilateral cooperation mechanism has a strategic position and has become a policy and institutional guarantee for China to promote clean energy cooperation in Latin America. Secondly, China and Latin America actively promote clean energy-related projects. Institutional construction. In 2010, entrusted by the governments of both countries, the China-Brazil Climate Change and Energy Technology Innovation Research Center (referred to as the "China-Brazil Climate and Energy Center") was established at Tsinghua University, aiming to promote China-Brazil climate change and energy technology innovation cooperation. Matchmaking. In 2015, based on the China-Brazil Climate and Energy Center, the China-Latin America Joint Laboratory on Clean Energy and Climate Change was established with the support of the Ministry of Science and Technology of China. It aims to promote the cooperation between China and Latin America in clean energy, climate change, and sustainability. Cooperation in development and other aspects. On April 25, 2019, the "Belt and Road" Green Development International Alliance was officially established. It aims to promote the joint construction of a green "Belt and Road" and help achieve the United Nations 2030 Sustainable Development Goals. Cuba and Guatemala are the founders. Partner countries ÿ Finally, from the corporate level, Chinese companies are actively building institutional foundations to open up the Latin American market. For example, in the field of hydropower, since 2009, China Hydropower Group has successively established representative offices and offices in Venezuela, Ecuador, Costa Rica, Colombia and other countries. The branch has become the bridgehead for China-Latin America hydropower engineering cooperation. At present, Latin America has become the third largest market for China's foreign contracting engineering business. In 2019, China Gezhouba Group Co., Ltd., China Hydropower Group, China Water Conservancy and Hydropower Tenth The First Engineering Bureau and the Eighth

Engineering Bureau are among the top 30 Chinese enterprises in Latin America's foreign contracted engineering business. ÿ From a specific field perspective, water energy is the focus of China-Latin America clean energy cooperation. Data from the China Overseas Power Assets Database shows that in 2000 —In 2020, Chinese enterpris

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ÿ «China-CELAC Forum» Ministry of Foreign Affairs February 2021 http://infogate fmprc gov CN / web / wj b_673085 [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ «Introduction to the "Belt and Road" Green Development International Alliance»ÿ The Belt and Road Green Development International Research Instituteÿ ÿÿÿ: / / ÿÿÿ ÿÿÿÿ ÿÿÿ / ÿÿÿÿ/ ÿÿÿÿ/ ÿÿÿÿÿÿ / ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ Ministry of Commerce of the People's Republic of China, China Overseas Contracting Projects Chamber of Commerce: «China's Overseas Contracting Projects Development Report (2019-2020)» November 25, 2020 http:// images mofcom g ov cn / am/ 202101 / 20210120014101403 pdf [2021-04-25] In addition to directly participating in the construction of hydropower stations, wind power plants, and solar power plants, Chinese companies are also involved in the construction of power transmission and distribution infrastructure, so the actual scale of cooperation is larger.

The total installed capacity of investment and financing in the field of hydropower is 34,232 MW, and in Latin America it is 20,174 MW. It is mainly concentrated in the four countries of Brazil, Ecuador, Argentina and Chile. Among them, China's installed hydropower capacity in Brazil and Chile is 15,572 MW and 15,572 MW respectively. 501 MW, mainly mergers and acquisitions and greenfield investment, 2284 MW and 1817 MW in Ecuador and Argentina, both financed by China Development Bank and China Export-Import Bank. Within the current plan, China's investment in Latin America from 2021 to 2033 The installed capacity of hydropower investment and financing will increase by another 234 MW (see Figure 1). In addition to direct investment and financing of hydropower stations, Chinese companies are also actively involved in local power transmission and distribution construction in Latin America. The most typical one is China State Grid's investment in Brazil. The investment, construction and operation of the first and second phases of the Belishan Hydropower Station transmission project. This project not only promotes the development of Chinese enterprises and Chinese technology The technology has been exported, which has effectively solved the problem of electricity shortage in southern Brazil and improved the local people's livelihood and well-being.ÿ

China's cooperation with wind and solar energy in Latin America came later than hydropower, but it has developed rapidly in recent years. Brazil is the main cooperation partner, and the most typical way of cooperation is investment. From a formal point of view, Chinese solar and wind energy companies took the lead in mergers and acquisitions. However, the future development trend is more inclined to greenfield investment. According to the China Overseas Power Assets Database, from 2010 to 2020, most of the investment projects of Chinese enterprises in the Brazilian solar and wind energy fields were realized in the form of mergers and acquisitions, and After 2020, a large number of planned greenfield investment projects have emerged. In addition to Brazil, China also has solar and wind energy investments in other Latin American countries, but the scale is smaller. For example, including Canadian Solar Group and Trina Solar Co., Ltd. Chinese solar companies including JinkoSolar and JinkoSolar Holding Co., Ltd. are expected to invest in seven projects in Mexico, with a total installed capacity of up to 942 MW. In 2018, China State Power Investment Corporation invested in Punta Serra in Chile. (Punta Sierra) wind power project, with a total installed capacity of 82 MW. Chinese policy banks have also participated in financing the solar and wind energy industries in Latin America, but the scale is smaller than the investment. In the field of wind energy, from 2000 to 2020, only China Development Bank provided financing to Ecuador Financing was carried out for the Villonaco wind power station, which is also the country's first wind power station. In the field of solar energy, the first and second phases of Argentina's largest solar project, the Gauchari Photovoltaic Park, were both imported and exported from China. Banks provide financing. In addition to investment and financing, Chinese companies also actively participate in cooperation in the development of wind and solar energy in Latin America through international project contracting. For example, four wind power projects in Roma Blanca, Argentina, are funded by China Goldwind Technology Co., Ltd. The company invests and Power China Group serves as the general contractor of the project. After completion, it will reduce the country's carbon emissions by 1.8 million tons every year and greatly promote Argentina's energy transformation.ÿ

ÿ «China Electric Power Highway in "Beautiful Mountain"», Xinhuanet, February 12, 2016, http://www.xinhuanet ÿÿÿ/ ÿÿÿÿÿ / ÿÿÿÿ ÿ ÿÿ / ÿÿ / ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ «China's "big windmill" helps Argentina's energy structure upgrade», Xinhuanet, April 8, 2019, http://www.xinhuanet.com/ pow er/ 2019 - 04 / 08 / c_1210102409 html [2021 - 04 - 20]

In recent years, cooperation between China and Latin America in the fields of biomass energy and nuclear energy has also increased. According to data from the China Overseas Power Assets Database, the installed capacity of biomass power generation invested by Chinese companies in Brazil is as high as 768 MW. Among them, State Grid International Development The Brazilian CPFL New Energy Company, a subsidiary of the company, controls multiple projects. In 2018, Sanfeng Covanta Company, a subsidiary of Sanfeng Environmental Industry Group Company, signed a supply contract for incinerators and waste heat boiler equipment for the waste-to-energy project in Baluli City, Sao Paulo State, Brazil, becoming a Chinese company. One of the representative projects of Brazilian biomass energy cooperation. ÿ Argentina is a key country in China-Latin America nuclear energy cooperation. In February 2015, China and Argentina signed the Agreement on Cooperation in the Construction of Pressurized Water Reactor Nuclear Power Plants in Argentina and the Agreement on Cooperation in Argentina The Memorandum of Understanding on the Construction of Heavy Water Reactor Nuclear Power Plants» marks the official export of China's nuclear power technology to Latin America. At present, China's "Hualong One" technology has been successfully used in the construction of Argentinian nuclear power plants (such as Atucha 3), opening up China-Latin America nuclear energy A new chapter in technical cooperationÿ

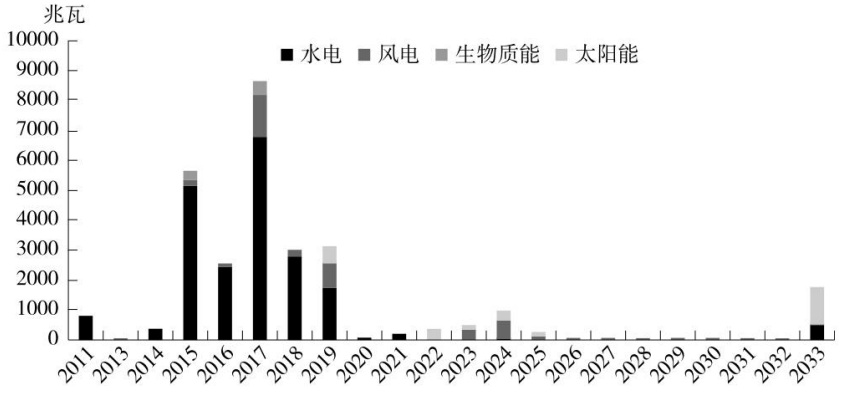

Figure 1 Changes in total installed capacity of China's investment and financing in Latin America's clean energy sector

(2011-2033) Source: Kevin P Gallagher et al , "ÿÿÿÿÿ'ÿ ÿÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿÿ"ÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿ: / / ÿÿÿ ÿÿ ÿÿÿ / ÿÿÿ / ? ÿÿÿÿ ÿ ÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

Generally speaking, since 2008, especially after 2013, China-Latin America clean energy cooperation has progressed rapidly. From a field perspective, early cooperation was mainly in water energy, and cooperation in wind energy, solar energy, nuclear energy and biomass energy has expanded rapidly in the past 10 years. As it develops, it has become a highlight of China-Latin America clean energy cooperation. In terms of cooperation partners, South American countries such as Brazil and Argentina are the main cooperation countries. In terms of cooperation forms, in the early days of cooperation, international project contracting was the main focus, but now a " The integrated development model of investment and financing + construction + operation. Generally speaking, China-Latin America clean energy cooperation has developed rapidly in the past 10 years. Latin America has become China's

ÿ «There is broad space for China-Brazil renewable energy cooperation», Xinhuanet, June 8, 2021, http://www.xinhuanet.com/energy / 20210608 / f58e406ee203411dacc9a9687754970ec / c html [2021 - 04 - 20] «Hualong One: The

ÿ original third-generation nuclear power technology attracts attention (visit the central enterprises to see innovation) and is currently actively promoting cooperation with many countries in the nuclear energy field», Xinhuanet, 2016 June 11, 2016 http://www.xinhuanet.com/politics/2016-06/11/ c_12905 1028 html [2021-04-20]

One of the key areas for clean energy to go global.

2. The development basis of China-Latin America clean energy cooperation

Judging from the existing results, China-Latin America clean energy cooperation parallels and mutually reinforces China-Latin America cooperation in politics, economy, trade, finance, and traditional energy. It is the product of the combination of China's clean energy technology and practical advantages and Latin America's clean energy resource advantages. It is specifically reflected in the following: In the following aspects:

First of all, the increasingly established political mutual trust and the sustained development of economic, trade and financial relations between China and Latin America are the fundamental guarantee for the smooth development of clean energy cooperation. Politically, since the founding of the People's Republic of China, China-Latin America relations have experienced from scratch, from small to large, and from small to large. Development process from low to high. ÿ Currently, 24 Latin American countries have established diplomatic relations with China, 10 Latin American countries have established "strategic partnerships" with China, and 19 Latin American countries have signed cooperation documents on the "One Belt, One Road" initiative with China. ÿÿ The political mutual trust between the governments of China and Latin America has played a guiding role in guiding Chinese companies and banks to enter the clean energy industry in Latin America. On the one hand, it helps Chinese companies and banks avoid political risks by building a platform for policy coordination between China and Latin America. On the other hand, it helps Chinese companies and banks avoid political risks through Through intergovernmental coordination, China understands the demands for domestic clean energy market development in Latin American countries, and the Chinese government can promote enterprises to go global in a targeted manner. Economic and trade relations are the "ballast stone" for China-Latin America clean energy cooperation. In the field of trade, the trade volume between China and Latin America in 2000 It was only US$10 billion. It reached US$180 billion in 2010. It exceeded US$300 billion for the first time in 2019. China has become Latin America's second largest trading partner and third largest export market. In the field of investment, according to Chinese government statistics, as of 2019, China's 198% of China's total overseas investment stock , The stock of direct investment in Latin America is US$436.05 billion, accounting for Latin America and becoming the second largest destination for China's overseas investment. ÿ In the field of financing, China and Latin America carry out pragmatic cooperation in a bilateral and multilateral form. In a bilateral form, China's policy banks and commercial banks to actively promote China-Latin America development financial cooperation and RMB clearing business. Data from the China-Latin America Financial Database of Boston University's Global Development Policy Research Center show that China's national

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Cui Shoujun: «Characteristics, motivations and challenges of the transformation of relations between China and Latin America», Published in "Journal of Renmin University of China", Issue 3, 2019, Page 98,

«Countries that have signed cooperation documents with China on jointly building the "Belt and Road" At a Glance » One Belt and One Road Network March 12, 2021 ÿ https: / / www yidaiyilu gov com / gbjg / gbgk / 77073 h tm [2021-04-20] Ministry of Commerce of the People's Republic of

ÿ China, National Bureau of Statistics: «Statistical Bulletin on China's Overseas Direct Investment (2019)»ÿ September 16, 2019 Japan http: / / images mofcom gov CN / hzs / 202010 / 2020102917202765 2 pdfÿ Note: Wang Yongzhong and Xu Peiyuan believe that China's official statistics of total direct investment in Latin America will also include the amount flowing to the Cayman Islands and the British Virgin Islands. , leading to obvious deviations and distortions in reflecting the distribution of investment by country (region). They reanalyzed China's direct investment in Latin America based on micro-project data from Dealogic, FDI Information and the Heritage Foundation. The results showed that in 2016, China's real direct investment stock in Latin America is US$107.5 billion, making it the fourth largest destination for China's foreign investment. See Wang Yongzhong and Xu Peiyuan: "Characteristics and Risks of China's Direct Investment in Latin America", published in "Latin American Studies", 2018 Issue 3 of the year, page 51.

China Development Bank and the Export-Import Bank of China have financed a total of US$136 billion in Latin America, making Latin America the main destination for Chinese policy banks' overseas financing. ÿ In addition, commercial banks including China Construction Bank and Industrial and Commercial Bank of China have also cooperated with Chile, Argentina and other countries. It has launched RMB clearing business, which has effectively promoted the process of RMB internationalization. In the multilateral format, on the one hand, Argentina, Brazil, and Ecuador have actively joined the Asian Infrastructure Investment Bank, and Bolivia, Chile, Peru, and Venezuela have also become intended member states. On the other hand , On the one hand, China led the establishment of the "China-Latin America Development Financial Cooperation Mechanism" in 2019, which is the first multilateral financial cooperation mechanism between the governments of China and Latin America. China-Latin America clean energy cooperation is an integral part of economic, trade and financial cooperation. The achievement of bilateral and multilateral economic, trade and financial cooperation and the establishment of financial mechanisms between China and Latin America have effectively promoted clean energy cooperation. In turn, China-Latin America clean energy cooperation can also promote the further development of overall economic, trade and financial relations. In general, China-Latin America clean energy cooperation It has always been carried out in the context of good political, economic, trade, and financial cooperation between the two sides. For example, in the field of financing, from 2000 to 2020, Chinese policy banks provided financing to Ecuador, Argentina, Chile, Cuba, etc. in the fields of hydro energy, solar energy, wind energy, and biomass energy. countries provide loans (see Figure 2), and these countries have established good political and economic ties with China.

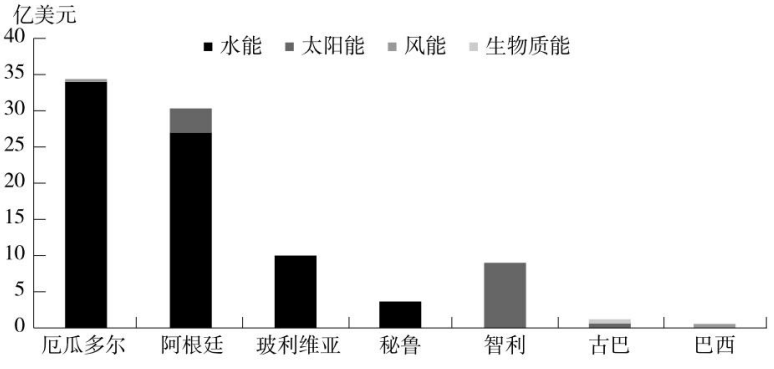

Figure 2 China Development Bank and China Export-Import Bank's clean energy financing status in Latin American countries

(2000-2020)

Source: Kevin P Gallagher nance"ÿ Global Development Policy Center
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Secondly, Latin America's abundant clean energy resources and high dependence on clean energy are prerequisites for cooperation. Latin America has abundant water energy resources. The Amazon River is the river with the largest flow, the widest basin area, and the most tributaries in the world. Within the basin area Brazil is the world's richest water energy resource, with the highest hydropower utilization rate

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One of the highest countries in the world, Brazil's high dependence on hydropower is the key to China and Brazil's continued cooperation in the field of hydropower.

An important reason for this. At the same time, Latin America has the richest solar and wind energy resources in the world.

According to a World Bank report, 20% of the world's population lives in 70 countries with excellent photovoltaic power generation conditions.

Home, the long-term average daily photovoltaic power output (PVOUT) level exceeds 45 kWh/day, Argentina, Chile

Chile, Mexico, and Peru are among them. ÿ For example, the average annual sunshine hours in northern Chile reaches 4,000.

hour, with high radiation levels, it is one of the most active areas for solar energy investment in Latin America. Latin America also has

It is the region with the greatest wind energy potential in the world. Colombia, Brazil, and southern Argentina have abundant wind energy.

resources. At the same time, Latin America is highly dependent on clean energy. In 2018, Latin America's primary energy

Petroleum accounts for 40% of the source supply and water energy , Bioenergy is 22% , Natural gas is 20% ,

ÿÿ , Coal is 7% , Solar and wind energy 2% , Nuclear energy is 1% , Clean energy accounts for primary energy consumption

The proportion of fees exceeds 30% , Much higher than the world average. ÿ In addition, from the perspective of the power system, it is not

A small number of countries have formed a power system with the lowest carbon emissions in the world. ÿ Taking hydropower as an example, Latin America is

One of the regions with the highest utilization rate of hydropower in the world. More than half of the region's electricity supply is hydropower.

Among them, Brazil, Paraguay, Panama, Uruguay, Venezuela, Colombia and other countries account for hydropower generation.

The proportion of the country's total power generation even exceeds 60%. 4. The existing energy consumption pattern of clean energy in Latin America

The important position in China has become one of the reasons why China and Latin America can carry out clean energy cooperation.

Thirdly, China has the technical foundation and practical experience to carry out clean energy cooperation with Latin America. China

China's clean energy technology has matured since 2000. Currently, China is the world's largest producer of renewable energy.

Equipment manufacturing country. In the field of hydropower, China has experience in exporting hydropower equipment to the world. Early in the new China

Hydropower infrastructure construction has been included in early foreign aid. Since the 1950s, the Chinese government has

In the form of foreign aid, we cooperated with North Korea, Albaria, Guinea, Congo and other countries to build hydropower stations.

While assisting hydropower production in developing countries, we have accumulated a lot of experience and laid the foundation for China's development in the new era.

International water energy cooperation has laid a solid foundation. 5. In the field of solar energy, China has world-leading technology and comparative

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ÿ Zhang Rui: «Latin America's Energy Transformation Under the Impact of the COVID-19 Epidemic», published in «Latin American Studies», Issue 1, 2021, Page 129.

ÿ ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿ "ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿÿ "ÿ ÿÿÿÿ ÿÿÿÿÿ: / / ÿÿÿ ÿÿÿÿÿ ÿÿÿ / ÿ / ÿÿÿÿÿ / ÿÿÿÿÿ/ ÿÿÿÿÿ/ ÿÿÿÿÿ / ÿÿÿÿÿÿÿÿÿÿÿ / ÿÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ In the 1950s and 1960s, the Chinese government cooperated with the North Korean government to repair the Shuifeng Hydropower Station and jointly built the Yunfeng Hydropower Station, Laohushao (Weiyuan) Hydropower Station and Taipingwan (Sinuiju) Hydropower Station, and began to cooperate with African countries to establish the Guinea Hydropower Station in the 1960s. Jinkang Hydropower Station, Congo Buenza Hydropower Station, Equatorial Guinea Bikomo Hydropower Station, etc. See editors-in-chief: Chang Liu, Lu Qinkan, and Pan Jiazheng: «China Hydropower Yearbook (1949-1983)», Beijing: Hydropower Magazine, 1985, pp. 543-547.

A complete industrial chain. From a geographical perspective, the global solar energy technology center has shown a transfer phenomenon of "United States-Japan-China". China is currently the country with the most active solar patent activitiesÿ, Chief Economist of the "American Prosperity Alliance" (CPA) Jeff Ferry also claimed that Chinese manufacturers are in a dominant position in the global solar energy market. ÿ From the perspective of the industrial chain, unlike chips, China's photovoltaic industry has huge market share in terms of raw materials, batteries and their assembly technology, and market share. A complete industrial system has been formed. First, the most important raw material in the photovoltaic industry is crystalline silicon, and China is the world's main producer of crystalline silicon. Second, seven of the top ten photovoltaic module companies in the world are Chinese companies. More than 70% of the modules in the global photovoltaic market are manufactured in China. Third, China is in a leading position in the global solar market. According to a Forbes report, 8 of the top ten solar companies in the world are Chinese companies. China's wind power industry has also experienced It has developed from scratch and from weak to strong. At present, China's wind power installed capacity and power generation rank first in the world. 6. Although the scale of China's wind power industry going global is not as good as that of hydropower and solar energy, it already has the ability to go global. technology and practice. Chinese wind energy companies including Goldwind Technology and Envision Energy have successfully launched projects in the Latin American market.

Finally, China-Latin America traditional energy cooperation has laid a good foundation for clean energy cooperation. The history of China-Latin America traditional energy cooperation can be traced back to the 1990s. In 1993, China National Petroleum Corporation won the bid for the Talara Oilfield in Peru. China-Latin America oil and gas cooperation was established by This kicked off. Since then, China has carried out extensive cooperation with Brazil, Venezuela, Peru, Ecuador, Colombia, Mexico and other countries in the fields of trade, investment and financing, and project contracting. In the field of oil trade, with the gradual advancement of urbanization and industrialization, ÿ China's demand for oil continues to grow, and China-Latin America oil trade has also developed rapidly. At present, Brazil and Venezuela have become China's main sources of crude oil. ÿ China has reached agreements with Brazil, Venezuela and other countries .

ÿ Luan Chunjuan, Song Bowen: "Research on the transfer of global solar energy technology centers and the evolution of core themes", published in "China Science and Technology Forum" Issue 12, 2019, Page 68 ÿ

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ÿ "Several Opinions of the State Council on Promoting the Healthy Development of the Photovoltaic Industry", Central People's Government of the People's Republic of China, July 2013 Mon 15th ÿ http: / / www nea gov cn / 2013 - 07 / 15 / c_132542911 htm [2021 - 04 - 25]

ÿ «National Energy Administration: China's photovoltaic industry supplies more than 70% of modules for the global market», Xinhuanet, April 1, 2021 ÿÿ ÿÿÿÿ: / / ÿÿÿ ÿÿÿÿÿÿÿÿÿ ÿÿÿ/ ÿÿÿÿÿ/ ÿÿÿÿ ÿ ÿÿ / ÿÿ / ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

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ÿ Wang Qia: "40 years of development achievements and prospects of China's wind power industry", published in "China Energy", Issue 9, 2020, page 28. Zhang

ÿ Shirong, Zhang Shuguang: "Latin American structuralism and the prospects of China-Latin America energy cooperation in the new era" In "Latin American Studies" Issue 6, 2012, page 20.

ÿ Cheng Zhonghai, Nan Nan, Zhang Yaru: "Spatial and temporal pattern, development difficulties and trend prospects of China's oil import trade", published in "Economic Geography", Issue 2, 2019, page 7.

On the one hand, the “loan-for-oil” model has diversified the sources of China’s oil resources, and on the other hand, it has also relieved the host country's debt “bottleneck” and achieved a mutually beneficial and win-win situation. ÿ China is not only a major participant in Latin American oil development, but also Actively participate in the construction of oil and gas infrastructure in Latin America. Since 2006, China Petrochemical Corporation has begun to undertake the construction of the Gasene natural gas pipeline project, which runs from the southeast to the northeast of Brazil. The Gasene project has a total length of 1,277 kilometers. After completion, the annual gas transmission volume will be With a capacity of 7.2 billion cubic meters, it can be called Brazil’s “West-to-East Gas Pipeline” project. With the careful construction of Sinopec, the Casene project was successfully completed, which not only effectively alleviated the shortage of power supply from local hydropower stations in the dry season, but also provided local It has created about 30,000 jobs and generated positive external effects. ÿ China-Latin America oil and gas cooperation and clean energy cooperation are mutually reinforcing. In Brazil, China-Brazil oil cooperation has won a good reputation and opened up the market for clean energy cooperation. At present, Brazil is not only China’s main fossil energy partner, but also the main destination for China’s clean energy going global.

Prospects and challenges of clean energy cooperation between China and Latin America

In the context of the smooth progress of the global energy transformation and the steady progress of global economic recovery in the post-epidemic era, China and Latin America's clean energy cooperation complement each other's advantages and promote each other, and the cooperation prospects are broad. This is specifically reflected in the following aspects. First, maintain climate stability, The global development trend of implementing energy transformation provides a broad development space for China-Latin America clean energy cooperation. In the context of global energy transformation, promoting the sustainable development of clean energy will be a common strategic choice for China and Latin America for a long time to come. 2020 On September 22, 2019, President Xi Jinping promised at the 75th United Nations General Assembly to contribute China’s strength to the “green recovery” of the world economy in the post-epidemic era, striving to peak carbon dioxide emissions before 2030 and striving to achieve a peak before 2060. Carbon Neutrality ÿ On December 21, 2020, the Chinese government released the white paper "China's Energy Development in the New Era", emphasizing the importance of promoting green energy cooperation in the continued implementation of the new energy security strategy of "Four Revolutions, One Cooperation" ÿ To combat climate change and fulfill the commitments of the Paris Climate Agreement

ÿ Some Western scholars have maliciously misinterpreted this "loan-for-oil" model as an act of "neo-colonialism." In fact, this "loan-for-resources" model is a common phenomenon in the history of global financial development. The first oil crisis broke out After that, China and Japan gradually formed a "win-win" model of "resources for loans" - Japan promised to provide technology, equipment, construction equipment and infrastructure financing support, and China agreed to repay with an equal amount of crude oil and coal. ÿ See [US] Deborah Brautigam, translated by Shen Xiaolei and Gao Mingxiu: "The Dragon's Gift: The True Story of China in Africa", Beijing: Social Science Literature Press, 2012, No. 26 - Page 28. «Oil builders from China and Brazil

ÿ build Brazil’s “energy lifeline”», Central People’s Government of the People’s Republic of China, March 2013 Mon 15th ÿ http: / / www gov cn / jrzg / 2013 - 03 / 15 / content_2354603 htm [2021 - 04 - 28]

ÿ «Speech by Xi Jinping at the General Debate of the 75th Session of the United Nations General Assembly», Xinhuanet, September 22, 2020. ÿÿÿÿ: / / ÿÿÿ ÿÿÿÿÿÿÿÿ ÿÿÿ/ ÿÿÿÿÿÿÿ/ ÿÿÿÿÿÿÿ/ ÿÿÿÿ ÿ ÿÿ / ÿÿ / ÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

ÿ "China's Energy Development in the New Era", Central People's Government of the People's Republic of China, December 21, 2020, http:// ÿÿÿ ÿÿÿ ÿÿ / ÿÿÿÿÿÿ / ÿÿÿÿ ÿ ÿÿ / ÿÿ / ÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

Nuo, Latin American countries have also formulated new emission reduction policy plans. In April 2020, Chile announced a new emission reduction plan, committed to reaching a carbon peak in 2025 and achieving carbon neutrality in 2050. ÿ December 9, 2020 On the same day, Brazilian Environment Minister Ricardo Salles announced a 43% emission reduction target by 2030 and carbon neutrality by 2060. ÿ Achieving the emission reduction targets in Latin America requires more investment and financing. Development of the Americas The bank's report shows that in the field of power infrastructure alone, Latin America will need to increase investment by approximately US$100 billion to achieve the goal of carbon neutrality in 2050. ÿ Overall, China and Latin America's shared commitments to combat climate change and Latin America's financial needs to achieve its emission reduction goals provide development opportunities for China-Latin America's long-term clean energy cooperation.

Second, the sustained power demand in Latin America is a prerequisite for China-Latin America clean energy cooperation. Although Latin America currently has relatively high power acquisition indicators, its power demand will still continue to grow with population growth and the need for sustainable economic development. The Inter-American Development Bank report shows that the electricity demand in Latin America will increase to 297 billion kilowatt hours by 2040, which is equivalent to 18 times the power generation in 2014. It is estimated that more than 80% of the electricity demand will come from Argentina, Brazil, Countries such as Chile, Colombia, Mexico and Venezuela, of which Brazil and Mexico account for more than half (see Table 1). On the one hand, hydropower is the main electricity consumption component in Latin America. By 2040, in order to support the achievement of sustainable development goals and reduce Carbon emissions from the energy sector are still likely to maintain potential growth, and China-Latin America hydropower cooperation still has room for development. On the other hand, Latin American countries hope to achieve a balance between hydropower and other clean energy. The strengthening of awareness will provide opportunities for China-Latin America and Africa water clean energy cooperation. For example, in order to improve the energy structure, the Argentine government proposed to achieve 20% of renewable energy power generation by 2025 and provided preferential tax reduction policies for wind power construction projects.

Third, China-Latin America clean energy cooperation can help Latin American countries achieve energy transformation and economic transformation. First, Latin America's energy and economic transformation is necessary. A considerable number of Latin American countries are rich in oil resources, especially Brazil and Venezuela, which are the world's major oil producers. The country's economy is heavily dependent on petrodollars. The only way to achieve energy and economic independence is to transform to renewable energy, because expanding the utilization of clean energy can diversify energy sources and increase the flexibility and stress resistance of the country's sustainable economic development. ÿ Secondly, Latin America's energy and economic transformation is feasible. On the one hand, energy transformation can bring real economic benefits.

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Table 1 Estimated growth of electricity demand in Latin America (unit: billion kilowatt hours)

country / region)	Electricity demand		Total growth rate (%)
	2013	2040	
Argentina	ÿÿÿ	ÿÿÿ	ÿÿ ÿ
Brazil	ÿÿÿ	ÿÿÿÿ	ÿÿ ÿ
Chile	ÿÿ	ÿÿÿ	ÿÿÿ ÿ
Colombia	ÿÿ	ÿÿÿ	ÿÿÿ ÿ
Mexico	ÿÿÿ	ÿÿÿ	ÿÿ ÿ
Venezuela	ÿÿÿ	ÿÿÿ	ÿÿ ÿ
Other	ÿÿÿ	ÿÿÿ	ÿÿ ÿ
Latin American regions	ÿÿÿÿ	ÿÿÿÿ	ÿÿ ÿ

Source: Lenin H Balza and Thomas Ser ebriskyÿ Energy Needs in Latin America

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economic benefits. According to estimates from the World Economic Forum, in the next 10 years, the transformation of the global power system may

can bring more than 24 trillion US dollars in net economic benefits. ÿ According to predictions, solar and wind energy are used to generate

Generation of 500 GW of coal-fired power generation would cut costs by up to $23 billion and generate $940 billion worth of electricity.

The U.S. dollar's economic stimulus. ÿ Reports from the Inter-American Development Bank and the International Labor Organization also show that by 2030

Latin America's transition to a zero-carbon economy will result in industries related to the fossil fuel industry, animal food processing, etc.

7.5 million jobs will disappear, but at the same time, 22.5 million new jobs will be created with renewable electricity

It arises from the development of low-carbon industries such as energy and forestry. In other words, after offsetting the loss of jobs in fossil energy,

There are also 15 million new jobs that will be created with the development of the low-carbon economy. ÿOn the other hand, clean energy

sources, especially non-aqueous clean energy power generation costs continue to decrease, paving the way for Latin America to shift from fossil energy to clean energy.

Transformation provides development opportunities. Data from the International Renewable Energy Agency (IRENA) show that the global

The cost of solar and wind energy has been showing a downward trend. From 2010 to 2019, the global solar photovoltaic

(PV) costs have dropped by 82%, concentrated solar power (CSP) costs have dropped by 47%, and offshore wind power costs have dropped by , Onshore wind power

40% and 29% respectively. 4Finally, China has not only achieved success in the field of clean energy

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It already has technological advantages, and it also has the advantage of continuous technological innovation in clean energy. The International Energy Agency report believes that China is good at integrating rapid prototyping technology (RP technology), public procurement, low-cost financing and internal market deployment. A high tolerance for trial and error in clean energy technology innovation is China's unique advantage in the development of clean energy. ÿ China's existing advantages in clean energy and continued technological innovation advantages will become a catalyst for Latin America's economic structural transformation. Fourth, In the post-

epidemic era, clean energy has become an important part of stimulating economic recovery in Latin America. The compound effect of the COVID-19 epidemic has made the overall economic situation and job market in Latin America more severe. The report of the United Nations Economic Commission for Latin America shows that Latin America is the region most affected by the COVID-19 crisis. Severe areas, 2020 was the The average annual economic contraction is 77% ， highest in 120 years. ÿ Moreover, the economic turmoil caused by the new crown epidemic has seriously affected the labor market in Latin America, especially leading to a significant reduction in the consumption of labor-intensive services. Millions of Latin American workers have become unemployed. ÿ As A complete industrial chain, clean energy itself can absorb new investment, financing and employment. However, the debt burden of a considerable number of Latin American countries' power sectors continues to increase under the impact of the COVID-19 epidemic, and they have almost no ability to build new projects. ÿ Although China has also suffered from the COVID-19 epidemic Despite the impact of the epidemic, the good economic recovery, sufficient foreign exchange reserves, and excellent clean energy technology have provided impetus for the continued cooperation between China and Latin America in clean energy in the post-epidemic era.

Although China-Latin America clean energy cooperation has broad prospects, it still faces challenges, which are specifically reflected in the following three aspects. First, from a third-party perspective, China-Latin America clean energy cooperation faces challenges from Western powers, especially the United States. Spain «Country A report by El País claims that if the struggle between major powers is first and foremost trade, and secondly technology, then the key battlefield in the next few decades will be climate, and the country that masters clean energy technology in dealing with climate change will be The dominant player in the 21st century economy. Therefore, competing for dominance in clean energy investment, financing and technology will become the key to the future game between great powers. ÿClimate issues

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Takuji Komatsuzaki et al Latin American Labo rMarkets During COVID - 19ÿ International Mone taryFundÿ October 2020 file: / / / Users/spring/Down loads/Labor pdf [2021-05-12] The OECD report shows that the COVID-19 epidemic has killed 2.7 million people in Latin America Companies closed and 8.5 million jobs were lost, most of them micro-enterprises, see OECD Latin American Economic Out look 2020: Digital Transformation for Building B ack Better y org / docserver [2021-05- 12]

ÿ Zhang Rui: «Latin American Energy Transformation under the Impact of the COVID-19 Epidemic», published in «Latin

ÿ American Studies», Issue 1, 2021, Page 123, Óscar Granadosÿ “La Batall a Climática Determinará Quién Lidera la Economía ÿÿÿÿÿÿ ÿÿÿÿÿ ÿÿÿ ÿÿÿÿ ÿÿÿÿÿ: / / ÿÿÿÿÿÿ ÿÿÿ/ ÿÿÿÿÿÿÿÿ / ÿÿ ÿÿ ÿ ÿÿ ÿ ÿÿ [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ]

And clean energy, which is closely related to climate, has become a new geopolitical competition field. As the center of climate geopolitics, China and the United States are bound to launch new technological and market competitions. ÿ The Biden administration proposed an ambitious climate plan at the beginning of the campaign The plan strives to achieve carbon-pollution-free power generation in 2035 and zero-emission goals in 2050 through sustainable development of infrastructure and clean energy investment. ÿ After taking office, Biden not only restarted the "Green New Deal", but also regarded it as the key to addressing climate challenges and practicing economic recovery. The thinking framework ÿ also identifies combating climate change as an important part of U.S. foreign policy and national security. It attaches particular importance to international cooperation on clean energy with developing countries and proposes a commitment to reduce solar energy costs by 60% within 10 years.

ý Investing US$174 billion to support the development of electric vehicle manufacturing and other specific policies to support the development of the clean energy industry. Latin America has always been Biden's key area of focus. During his tenure as vice president, Biden visited Latin America 16 times, and environmental issues were his core concern. One. ÿ At the climate summit to be held in April 2021, the U.S. State Department announced that it would expand technical assistance to the Latin American Renewable Energy Initiative and would cooperate with the Inter-American Development Bank, the Latin American Energy Organization and the Global Power System Transformation Alliance to promote Latin American renewable energy capacity. Improvement ÿ It is foreseeable that China and the United States are likely to form a new round of competition and cooperation in the field of clean energy. In view of Latin America's traditional position in U.S. geopolitics, China's rising influence in the field of clean energy in Latin America is bound to arouse concerns and suspicions in the United States. ÿ The competition between China and the United States in the clean energy field in Latin America is likely to intensify in the future.

Second, from the perspective of the host country, the uncertainty of national governance and differences in social governance constitute obstacles to long-term cooperation in clean energy between China and Latin America. ÿ From the national level, the discontinuity and instability of Latin American political and economic policies The sustainability of clean energy cooperation between China and Latin America will affect the sustainability of China-Latin America clean energy cooperation. Whether it is from the perspective of investment, financing or project contracting, long-term nature is one of the important features of energy cooperation. For example, in the hydropower industry, the investment, financing, construction and Operation management lasts for several years or even decades.

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Li Kunze, Qi Kai: «The Biden Administration's "Green New Deal" and the Democratic Party's Green Transformation», published in «International Forum», Issue 3, 2021

119ÿ ÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿ “ÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿÿ ÿÿÿ ÿÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿ”ÿ ÿÿ ÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿ ÿÿ ÿÿ ÿÿ ÿÿÿÿ ÿÿÿÿÿ: / / ÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ/ ÿÿÿÿ / ÿÿ / ÿÿ / ÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿ ÿ ÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿ ÿ ÿÿÿÿÿÿÿ / [ÿÿÿÿ ÿ ÿÿ ÿ ÿÿ] ÿÿÿ ÿÿÿÿÿ ÿÿÿÿÿÿ “ÿÿÿÿÿÿÿÿÿ ÿÿÿÿÿ”ÿ ÿÿÿÿÿ

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ÿ Chen Taotao and others believe that there are many differences between China and Latin America at the country, industry and enterprise levels. These differences pose challenges for Chinese companies to invest in Latin American infrastructure. See Chen Taotao, Xu Run, Jin Ying, Gu Lingjun: «Latin American Infrastructure Investment Environment and Investment Capabilities and Challenges of Chinese Infrastructure Enterprises», Published in "Latin America Research", Issue 3, 2017, Page 36.

Therefore, the long-term stable political and economic environment of the host country is a key consideration for investment and financing. The complex political situation, frequent changes in political parties, and unpredictable economic policies in Latin America are all uncertain factors that affect the continued cooperation between China and Latin America in clean energy. From the perspective of social governance It can be seen that the differences between China and Latin America in terms of labor laws and environmental regulations constitute obstacles to China-Latin America clean energy cooperation. For example, Condor Cliff and La Barranco in Argentina ÿÿ) The construction of hydropower stations was initially started by Chinese policy banks provided financing, but because its environmental impact assessment did not comply with local environmental regulations, the Argentine Supreme Court ordered a suspension of the project.ÿ

Third, from a domestic perspective, China-Latin America clean energy cooperation faces the dilemma of incomplete institutional construction, inconsistent industry regulations, and difficult financing. First, China's clean energy going global is still in its infancy. Therefore, in terms of institutional construction and industry Standards are still in the exploratory stage, which poses a challenge to the continued cooperation between China and Latin America in clean energy. From the perspective of institutional construction, on the one hand, the fit between the government and enterprises in the process of China-Latin America clean energy cooperation still needs to be improved. One way is to compete with enterprises. The new path of internationalization, which is mainly based on government guidance and supplemented by government guidance, needs to be further improved. On the other hand, many current clean energy cooperation projects are still in the exploratory stage. Some Chinese companies are facing difficulties in bidding competition, project construction process, and management transfer. Chinese clean energy companies still need to continuously improve their own institutional construction in the process of going global. From the perspective of industry standards, it is difficult to unify the standards between Chinese-funded companies in different clean energy sources and between Chinese-funded companies and companies in host countries, resulting in differences between Chinese-funded companies and companies in host countries. There are communication barriers among enterprises in the host country. Secondly, China-Latin America clean energy cooperation faces the dilemma of financing difficulties. Energy financing has the characteristics of large financing amount and long financing cycle. Policy banks with China Development Bank and China Export-Import Bank as the main bodies have National credit and huge national savings have made it the main body of overseas financing of China's traditional energy. However, at present, China's non-water clean energy financing is mainly provided by private enterprisesÿ, and the same is true in Latin America. Data from the China Overseas Power Assets Database show that in 2000 - In 2020, most of the financing of clean energy in Latin America by Chinese policy banks was concentrated in the field of water energy, with less financing in the field of non-water clean energy. 4. Due to the small asset scale of private enterprises, they often face the dilemma of shortage of funds. In order to solve the problem , Financing difficulties, increase policy

ÿ Rebecca Ray et al "China in Latin America: Less ons for South - South Cooperation and Sustaina ble ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ ÿ: ÿÿÿÿÿÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ April 2015 ÿÿÿÿ: / / www bu edu / gdp / files/ 2015 / 04 [2021 - 05 - 15] Li Ziying: "Political Risks and Countermeasures of Chinese Enterprises' Investment in Latin America", published in "International Economic Cooperation", Issue 3, 2011, Page 22.

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ÿ Ma Tianjie: «Financing Challenges for China's Renewable Energy "Going Global"», China Dialogue, April 9, 2020, https:// ÿÿÿÿÿÿÿÿÿÿÿÿ ÿÿÿ ÿÿ / ÿÿ / ÿ / ÿÿÿÿÿ / [ÿÿÿÿ ÿ ÿÿ ÿ ÿ ÿ] ÿÿÿÿÿ ÿ ÿÿÿÿ

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The participation of banks is necessary.

Four Conclusions

China-Latin America clean energy cooperation has made good progress on the basis of complementary advantages, providing a model for China to carry out international cooperation in clean energy in other regions. First of all, the smooth progress of China-Latin America clean energy cooperation is the result of adapting measures to local conditions and mutual benefit. Clean energy The smooth development of international energy cooperation requires the Chinese government to Governments and enterprises should strengthen research on the national conditions of the host country, balance the distribution of interests with the host country's government and enterprises, and achieve the "greatest common denominator" of the interests of both parties. Secondly, China-Latin America clean energy cooperation is good at making use of China's capital advantages and foreign exchange savings. The technological advantages in the field of clean energy have helped Chinese clean energy companies go abroad, establishing a new trend in international cooperation in clean energy in China. Finally, China-Latin America clean energy cooperation attaches great importance to innovation in investment and financing forms, forming the integration of policy banks, corporate mergers and acquisitions, and greenfield investment. To a certain extent, China-Latin America clean energy cooperation has become a “test field” for China to practice South-South cooperation, and it has also provided valuable experience and lessons for Chinese clean energy companies to deepen their “going out” strategy.

In the new stage of development, the Chinese government and enterprises can further expand the space for clean energy cooperation with Latin America from the following three aspects. First, strengthen clean energy cooperation with Central American countries. At present, most of the clean energy cooperation projects between China and Latin America are concentrated in South America. The scale of cooperation with Central American and Caribbean countries is still limited. Since the 1990s, Central American and Caribbean countries have made significant progress in power supply through "bilateral and multilateral power interconnection" and encouraging public and private investment competition. However, this There are still millions of people in the region who do not have access to electricity supply. Therefore, China can use its own advantages to assist the construction of power systems in low- and middle-income countries in Central America and the Caribbean. For example, it can establish model projects to gain recognition from regional countries, and it can pay attention to cooperation with the region. Cooperation with external development aid agencies to minimize competition, etc. Secondly, strengthen third-party market cooperation with developed countries. Developed countries in Europe and the United States have comparative advantages in industry regulations, consulting, operation management, etc. of international cooperation in clean energy, and China has international The technical and experience advantages of clean energy cooperation. Therefore, looking to the future, seizing the third-party market cooperation opportunities in the process of clean energy cooperation can give full play to their respective advantages and improve cooperation efficiency. Finally, strengthen the communication mechanism between enterprises and the government. At present, In the internationalization process of China's clean energy, especially non-water clean energy, private enterprises have a higher degree of participation. However, private enterprises themselves face the dilemma of insufficient funds and lack of credit in the process of going global. It is necessary to establish and improve a normal communication mechanism between the government and private enterprises. It is particularly important to continue to use development finance to support China-Latin America clean energy cooperation.

(Editor Gao Han)

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