International Cooperation in Energy Efficiency in China: a preliminary Comparison of European and American approaches

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Introduction

China's energy demand and its impact on issues of global energy security have received ever-increasing attention in international politics, academia and the media over the past decade. Decreasing the national energy demand and changing consumption patterns are subjects of intense discussion in this debate. This marks an important development, since these issues pertain directly to global environmental problems. Energy consumption and environmental degradation are not restricted by the geographical borders of a nation state, and thus become issues of international concern. Therefore, international cooperation becomes crucial in managing these matters, particularly for China, the world's largest energy consumer and carbon emitter. International cooperation can provide the necessary additional expertise and technological know-how; it can serve as a platform to exchange different experiences and, in successful cases, can set examples for other types of cooperation. The need for international assistance in order to enhance technological capabilities and to build the necessary capabilities of human resources in energy sectors are

[1] This is a revised version of a Master's Degree thesis the author did, under the supervision of Professor Zha Daojiong. The thesis was passed in July 2012.

reiterated in "China's National Climate Change Programme."[2]

It is the ambition of this paper to illustrate the following points:

- The different mechanisms employed by the US and EU in their cooperation efforts with China
- The different understandings of what cooperation is meant to achieve
- Areas in international cooperation that leave room for improvement. Measures to adjust cooperation strategies
- Distinguishing the different trends in international cooperation with China on energy efficiency and the implications this has for future research on this topic.

Assessing this progress is important for two reasons. Firstly, the globalization and interconnectedness of human security issues, such as energy security, increases the importance of international cooperation. These trends are likely to become even more pronounced in the future. Analyzing the development of international cooperation on energy efficiency can therefore provide meaningful insight into the challenges facing international cooperation and how these are best addressed. Secondly, international cooperation requires a significant amount of public funding. Core issues in this respect are the effectiveness and sustainability of resource allocation. In other words, does the money for international cooperation show results that satisfy all actors involved and does it stimulate cooperative actions that can operate without further public funding. Thus, this assessment can provide some answers to questions of

[2] National Reform and Development Commission, "China's National Climate Change Program," National Reform and Development Commission 2007, pp. 58-62, http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf (accessed February 25, 2012).

resource allocation in international cooperation.

By comparing cooperation practices between the European Union and China, and between the United States and China, the different approaches to and accomplishments of bilateral international cooperation on energy efficiency can by analyzed. The selection of the EU and the US as case studies is reasonable, both due to their respective importance for China as trading partners, as well as due to their roles in addressing and managing global issues on energy security.[3]

The research for this paper is largely based on primary and secondary literature on international cooperation on energy efficiency in China. The author also conducted a series of interviews with people directly involved in either the cooperation negotiations or project execution, on the Chinese and the foreign sides.[4] Despite certain reservations, interviews serve as a useful tool to access information that is otherwise not readily available or talked about.[5] Researchers at the Laurence Berkeley National Laboratory (LBNL) have published some of the most comprehensive English studies on

[3] As a regional entity, representing 27 different member states, international cooperation conducted through the EU institutions is different to actions taken by individual member states. Decisions leading to cooperation are subject to agreement among all member states, rendering the consultative process more complex than in the case of individual member states. Nevertheless, once the process of deliberation has been concluded, the organizational structure for the implementation and the fashion, in which the EU conducts its cooperative efforts with the Chinese government, allow for an academic treatment similar to that of an individual country. EU officials have the task to represent all member states as one body, and the administrative body in charge of managing international cooperation is also comparable.

[4] The names of the interviewees have been omitted to the sensitivity of their work.

[5] The analysis of bilateral cooperation and its effectiveness suffers from a series of constraints. Information on bilateral cooperation is not always readily accessible, due to the confidential nature of the issue as a matter of national interest. Furthermore, people involved may not be as willing to share information, because it is not clear what can be disclosed.

energy efficiency issues in China.[6] Furthermore, some studies on benchmarking and energy auditing have recently been published.[7] With regard to international energy efficiency cooperation, or energy cooperation in general, only a few in-depth studies have been conducted to date.[8] Generally speaking, however, there is very little academic work on the evolution of international cooperation with China on energy efficiency and energy demand-side management, especially in talking about what has been achieved.[9] There is hardly any comprehensive information available tracking the historical development of the bilateral cooperation efforts with China on energy efficiency. A comparison evaluating the different approaches of cooperation partners has not been undertaken at all.

This may be due to the nature of the subject. Apart from a relative lack of publicly accessible information, the discussion of the accomplishments of international cooperation struggles with another set of limitations, namely the quantification of achievements. Due to its confidentiality, quantitative

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[6] E.g. see: Jonathan Sinton, Mark Levine, and Wang Qingyi, "Energy Efficiency in China: Accomplishments and Challenges," *Energy Policy* Vol. 26, No. 11, 1998, on the assessment of early energy efficiency policies in China; Zhou, Nan, Mark Levin et. al., "Overview of Current Energy Efficiency Policies in China," *Energy Policy* Vol. 38, 2010, on most recent energy efficiency policies in China; Lynn Price, Mark Levine et. al*., The Greening of the Middle Kingdom: The Story of Energy Efficiency in China*," Berkeley : Laurence Berkeley National Laboratory, LBNL-2413, 2009 summarizing the history of energy efficiency in China.

[7] See: 沈波，蒲思琳，鲁虹佑：《中国能源审计的实践：全国与地方的做法及潜在的问题》，劳伦斯伯克利国家实验室，LBNL-4159 E 2010 年版，on energy efficiency auditing in China.

[8] Most notably see: Taishi Sugiyama and Stephanie Ohshita, eds., *Cooperative Climate: Energy Efficiency Action in East Asia*, Winnipeg, San Francisco : International Institute for Sustainable Development and University of San Francisco, 2006, for a discussion on energy efficiency cooperation in East Asia; and: Lynn Price and Stephanie Ohshita, "Lessons for Industrial Energy Efficiency Cooperation in China," in *China Environment Series* Vol. 11, 2010/2011, for a discussion of international cooperation on energy efficiency in the industrial sector.

[9] One example of an assessment of cooperation efforts has been the evaluation of the science and technology cooperation between the EU and China. See: Manfred Horvat and Nannan Lundin, *Review of the Science and Technology (S&T) Cooperation between the European Community and the Government of the People's Republic of China*, Brussels : European Commission, 2008.

information on the assessment of cooperation projects is rarely accessible. Besides, certain achievements in cooperation, such as capacity building or legislative assistance, are simply impossible to quantify. In some cases, the broad, vague definitions of goals for cooperation projects can add to the difficulty in evaluating international cooperation on energy efficiency.[10]

For the assessment of international cooperation the author generally follows and builds on Ohshita et al. in analyzing success factors involved in international cooperation on energy efficiency.[11] Accordingly, the following nine success factors are identified:

1) Top-Down Approaches: Cooperation is developed and agreed upon at a central government level, creating a "top-down" push. Ideally, this creates stimuli for market development, thus combining technology cooperation with economic incentives.[12]
2) Bottom-Up Approaches: Joint cooperation and development of pilot projects supporting the implementation of policies on lower levels of the governmental hierarchy, connecting individual projects to specific policy initiatives.
3) Joint Strategy Setting: Adapting strategies to the specific Chinese institutions and conditions.
4) Deepening and Expanding Working Relationships with Chinese Decision-Makers: This requires a conscious choice of cooperation

[10] Because of these restrictions, the paper's analysis relies on other related publications in its evaluation of cooperation projects.

[11] L. Price and S. Ohshita, "Lessons for Industrial Energy Efficiency Cooperation in China", pp. 74.

[12] The emphasis on market incentives is a feature distinctive of American approaches to cooperation.

partners, using high-level advisory boards, and regular communication.[13]

5) Capacity Building: The development of skilled personnel within Chinese institutions is crucial for the lasting success of cooperation efforts.
6) Industry Specific Plans and Tools: Establishing management tools that work across the country, such as benchmarking tools or energy auditing frameworks.
7) Coordination with other international cooperation efforts: Thus the efficiency of limited resources can be maximized.
8) Financing: Complementing policies with incentives for private businesses to contribute funding and enabling local implementation.
9) Keep Project Development Flexible: Due to the occasionally long periods in between project design and implementation, it is key that the project objectives can be adapted, in case priorities of either cooperation partner should change.

The rest of the thesis is split into two main parts discussing the cooperation between the EU and China, and the US and China. Both chapters will offer insight into the historical efforts, as well as the current initiatives and projects dealing with energy cooperation in general, and energy efficiency in particular.[14] The last chapter will conclude this analysis by assessing EU-China and US-China cooperation efforts more

[13] The establishment of advisory boards is only possible for projects that have relative freedom in agenda setting and are more detached from direct government guidance. This is generally difficult to achieve for EU funded projects and depends very much on the attitude of the Chinese partner.

[14] This will include both a topical discussion of the specific projects and what they aim to achieve, as well as on the structural set-up of international cooperation, such as project funding, design, supervision, and implementation.

directly.

2. China-EU Energy Efficiency Cooperation

Today, the EU is, arguably, the most active partner of China addressing energy efficiency issues, in that it is the single largest funder of energy efficiency project in China, with an aggregated amount of over € 1 billion, including cooperation projects and development loans.[15] Agreements pertaining to energy issues have been signed already in the 1980s. Specifically targeted initiatives and projects, however, have only been undertaken in the past fifteen to twenty years and have intensified significantly over the past ten years.

A look at the current energy efficiency cooperation initiatives and projects in place, however, shows that the academic and political discussion on the potential of trade involvement in driving cooperation on energy is premature. All projects funded by the European Union's Delegation to China to date are considered development aid. This means, that the promotion of European businesses in China or greater market penetration for EU businesses are not goals of the EU's development aid and such projects do not receive funding. As one EU official in charge of energy stated: "Cooperation projects must aim solely at supporting China's development."[16]

Most recently, China and the EU signed three agreements and

[15] This funding is, however, not only targeted directly at energy efficiency projects, but also at other projects mitigating climate change and CO^2 emissions. For development loans provided by the European Investment Bank (EIB), the Chinese government is in charge of the allocation of funds through the Ministry of Finance.

[16] Presentation of EU Cooperation on Energy in China at Peking University, April 13, 2012.

declarations pertaining to energy security, urbanisation and energy pricing at the 14th EU-China Summit in 2012. The "EU-China Joint Declaration on Energy Security" reiterated the common goal of "mutually beneficial cooperation, diversified forms of development and common energy security through cooperation."[17] The other two documents signed at the event both vow to increase cooperation on energy efficiency in the context of urbanisation and electricity markets, and thus singled out two of the major sectors wherein bilateral cooperation projects can be expected in the future.[18]

Table 2: Timeline of Key EU-China Cooperation Agreements, MOUs and Joint Declarations

1985	Trade and Economic Cooperation Agreement
1994	"EU-China Energy Cooperation Forum" Framework
1994	1st bi-annual Energy Conference
2005	Dialogue on Energy and Transport Strategies MOU
2009	Cooperation Framework on Energy Performance and Quality in the Building Sector
2012	Partnership on Urbanisation
2012	EU-China Joint Declaration on Energy Security
2012	Joint Statement for Enhanced Cooperation on Electricity Markets

Source: European Commission, 2012.

2.1.3. Cooperation Structure and Mechanism

Today, cooperation covers four distinct areas with funding by the EU or through the European Investment Bank (EIB):

[17] European Union and the Government of the People's Republic of China, "EU-China Joint Declaration on Energy Security", signed May 3, 2012, http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/20120503_eu_china_joint_declaration_energy_security_en.pdf (accessed May 11, 2012).

[18] See: European Union and the Government of the People's Republic of China, "Joint Declaration on the EU-China Partnership on Urbanisation," signed May 3, 2012, http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/20120503_eu_china_joint_declaration_urbanisation_en.pdf (accessed May 11, 2012); and: European Union and the Government of the People's Republic of China, "Joint Statement for Enhanced Cooperation on Electriciy Markets," signed May 3, 2012, http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/20120503_eu_china_joint_statement_electricity_markets_en.pdf (accessed May 11, 2012).

1) Legal Framework and Energy Pricing: projects are seminars, training and workshops
2) Industrial Energy Efficiency: projects on energy efficient production processes, promotion of industrial standards or energy efficient products;
3) Energy efficiency in buildings: projects on energy efficient building materials, training, and standardisation;
4) Financing of energy efficiency projects.[19]

High level policy dialogues and initiatives are conducted with various partners on the Chinese side, including:

- The State Council and NDRC for legal and energy pricing
- The Ministry of Industry and Information Technology (MIIT) or the NDRC for industrial standardisation and pilot carbon trading schemes
- The Ministry of Housing and Urban-Rural Development (MoHURD) for energy efficiency in buildings
- The Ministry of Finance (MOF) for energy efficiency finance

All projects funded by the EU have a limited timeframe, generally between four to five years and funding may amount to 70-80%, while total

[19] European Union, "Energy Efficiency Table of EC-China Dialogues and Cooperation Projects," document obtained in a personal discussion with European Commission to China staff on November 2, 2011.

funding usually ranges between EUR 500,000 and 2,000,000. For major flagship incentives project funding can amount up to EUR 20 million.[20] Projects are expected to establish sustainability mechanisms that allow for a continuation of operations after public funding stops.

On-the-ground projects in China are assigned is either through direct arrangement, a top-down decision process, in which objective, structure, funding etc. of a project are defined, or through "Calls for Proposals" (CfPs), such as in the case of the NGO-guided projects – as well as, in certain cases, in combination with top-down projects. According to the EU guidelines for project cycle management, CfPs allow for a bottom-up, decentralized structure.[21] A Chinese project participant from the Chinese National Institute for Standardization (CNIS) identified the independence from the usual administrative hierarchies as one of the key benefits of this approach. This bottom-up project design and implementation gives project participants, the necessary liberty to address issues that would normally fall out of the scope of projects designed at the top of the bureaucracy.[22] Additionally, this form of cooperation ensures a high on-the-ground visibility of EU projects, thus potentially increasing political preference for such projects.

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[20] EU contributions in cash and Chinese contributions in-kind, as was the case with EU-China Energy and Environment Programme (EEP) in 2003. In the context of EU-China cooperation equal funding by both the Chinese and the EU side remains the exception.

[21] EuropeAID, *Aid Delivery Methods: Project Management Cycle Guidelines*, Brussels : Euoropean Commission, 2004, pp. 17.

[22] One key reason for the relative liberty of NGO-guided projects is that the CfPs are put out on a regional basis, meaning that the competition for funds takes place in Asia, not only China. This gives the funding body, the European Union, more competencies in deciding on what projects to support than if the initiative was only targeted for China. Thus, the direct influence of the central Chinese authorities and line ministries on projects is limited for this kind of cooperation.

Project design and implementation for EU cooperation is defined as a five-step process, including project programming, identification, formulation, implementation, and evaluation and audit. However, EU bodies are relatively detached from the actual project management.[23] This can lead to a situation, in which the EU bodies lose managerial oversight and supervision. According to people that have worked extensively on EU-funded projects, officials may sign off project progress reports that have been drafted to satisfy the expectations, without being able to critically evaluate the real impact of a project. Furthermore, assessment of project results is based on the originally stated goals of the project during the formulation stage. As a consequence, originally stated objectives may not suit the needs of the current circumstances of the country when a project is implemented.

In assessing the success of such bottom-up projects the first issue is a matter of sustainability. When there is an incentive for the Chinese government to take over the operation of these institutions and integrate them into domestic efforts to reduce energy intensity. Given its nature as a development aid project this can be seen as a success. The second matter of concern relates to the evaluation of the value of the project's output. It is pivotal that sufficient emphasis is placed on the results that the project's output stimulates.

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[23] See: EuropeAID, *Aid Delivery Methods*, pp. 18.: ". . . pre-feasibility studies and feasibility studies and the production of annual operating plans and regular monitoring reports should generally be the lead responsibility of implementing partners, not the European Commission (although the European Commission may contribute or provide the resources to support these tasks). The European Commission need not therefore prescribe the exact format of these documents, as they should be 'owned' primarily by implementing partners. The European Commission must nevertheless ensure that it is provided with adequate information (quantity and quality) on which to assess its investment decisions, monitor implementation and remain accountable for the resources it commits."

Table 3: Current EU- China Energy Efficiency Cooperation

Type	Dialogues and Initiatives	Cooperation Projects
Legal Framework and Energy Pricing	- Draft Energy Law (DG ENER) - EU-China Partnership and Cooperation Agreement	- EC-SCLAO workshop on Energy Law - Seminar on "Demand Side Management – Transforming Business Models in the Energy Sector
Energy Efficiency in industry	- Working Group on "Industrial Energy Efficiency and € GHG reduction" (DG Enterprises & Industry/MIIT) - Promotion of European Standards and Certificates (Standards and Energy Audit)	- Asia Invest: "Cleaner Production" campaign in 11 provinces - SWITCH-Asia: • Industrial Symbiosis • Energy-Saving Motors, high-efficiency transformers
Energy Efficiency in Buildings	- MoHURD-EC (Energy & Enterprise) cooperation framework on energy-efficient buildings	- SWITCH Asia: Train the Trainers in EE construction - EUCTP: Workshop on EE performance certificates - EC² (Europe-China Clean Energy Centre)
Financing Energy Efficiency	European Investment Bank China Climate Change Framework Loan: 2 x 500m EUR	- District Heating in Jinan (31m EUR) - Coking/Steel Plant Pollution Reduction Guangdong (35m EUR) - Chemical/fertilisers plant emission reduction Hunan (30m EUR)

Source: European Commission. "Energy Efficiency Table of EC-China Dialogues and Cooperation Projects." Document Obtained in a Personal Conversation with European Commission to China Staff on November 2, 2011.

In summary, China-EU cooperation on energy efficiency is characterized by a two-pronged approach, involving both top-down and bottom-up projects. The main Chinese cooperation partner is the NDRC, complemented by other line ministries where cooperation touches upon their respective areas of governance, such as urban development or financing. The EU contributes most monetary funding for cooperation

projects, with the Chinese partners generally contributing through provision of infrastructure and human resources. In theory, cooperation is based on the principles of mutual benefit and reciprocity. However, the research suggests that it has been difficult for the EU to generate tangible benefits from the involvement in energy efficiency cooperation in China.

Often, the implementation of energy efficiency projects operates on a very fragmented level of authority, which, in fact, positively affects bottom-up project implementation. Secondly, it shows energy efficiency cooperation, particularly when it comes to pilot projects and on-the-ground activities, depends also on local or decentralized initiative. Thirdly, the European Union successfully engages in what can be judged as a two-pronged approach for development assistance, both supporting bottom-up initiatives, as well as implementing agreements reached at the top of the bureaucratic hierarchy. From 2006 onwards, cooperation between the EU and China intensified and there are today more projects in place than ever before. The establishment of the Europe-China Clean Energy Centre as a permanent institution that facilitates bilateral cooperation bodes well for the future development of this relationship.

As an entity at the forefront of climate change and green development, the EU remains an attractive partner for China. Many lessons drawn from policy actions taken in the EU can be translated to China and thus assist the country in achieving its goals towards higher energy efficiency. Furthermore, through its decentralized assistance, the EU can generate higher on-the-ground visibility and promote its objectives in this manner. These factors could contribute to a higher political acceptance of and preference on the Chinese side for cooperation with the EU on matters of energy efficiency.

2.2. China-US Cooperation on Energy Efficiency

As the world's two largest CO^2 emitters, cooperation between the United States and China on energy efficiency has great potential in mitigating the threats of climate change. Despite noticeable differences in their respective roles regarding responsible involvement in international climate change negotiations, as evidenced at the most recent summits in Copenhagen and Durban, China and the US have a long history of cooperation on energy efficiency.

2.2.1. A Chronological Mapping of China-US Cooperation

In 1979 presidents Deng Xiaoping and Jimmy Carter laid the foundation for future assistance in the energy sector by signing the Agreement on Cooperation in Science and Technology, which comprised areas, such as hydropower, high energy physics and the environment. This was soon complemented by the 1980 Protocol for Scientific and Technical Cooperation in the Field of Environmental Protection.

From the late 1989 to 2001 cooperation efforts were limited to joint research, capacity building and the exchange of best practices through workshops or pilot projects.[24] Thereafter, both parties shifted their joint efforts to include predominantly public-private partnerships, most decisively so with the 2008 US-China Ten Year Framework for Cooperation on Energy and Environment and the ensuing agreements of 2009.

As a permanent source of cooperation projects, the China Energy Group at the Laurence Berkeley National Laboratory (LBNL) is involved at almost

[24] As a consequence of the 1989 Tiananmen incident, the U.S. congress imposed a trade embargo that restricted the U.S. Trade and Development Agency to operate in China.

every level of Sino-US bilateral cooperation, from policy formulation, to harmonization of standards, to energy auditing, to emission forecasting. There is, arguably, no other foreign research institution with a comparable network and experience working on energy efficiency in China today. This basis is crucial in formulating new cooperation projects and policies, as well as evaluating existing undertakings.

Table 4: Timeline of Key US-China Cooperation Agreements, MOUs and Joint Declarations

1979	Cooperation in Science and Technology Agreement
1980	Protocol for Scientific and Technical Cooperation in the Field of Environmental Protection
2004	US- China Energy Dialogue
2006	US- China Strategic Economic Dialogue
2007	MOU for Cooperation on Industrial Energy Efficiency
2008	Ten-Year Framework for Cooperation on Energy and Environment
2009	MOU to Enhance Cooperation on Climate Change, Energy and Environment

Sources: United States Department of State, 2012; K. Sims-Gallagher, "US-China Energy Cooperation"; and: L. Price and S. Ohshita, "Lessons for Industrial Energy Efficiency Cooperation in China" 2009.

2.2.2. Cooperation Approach

Unlike cooperation initiatives between China and the European Union, every single agreement includes both the Chinese and US private sectors as integral parts of the cooperation process, both in financing, as well as in design and implementation. This may have several reasons: First of all, it is extremely difficult, if not impossible, for the US government to justify spending US taxes on development aid for China to its constituents, particularly in an areas other that the promotion of democracy, freedom of speech, or other human rights related subjects. Furthermore, some of the

most recent trade disputes and media reports on unfair subsidies and intellectual property fraud between both states were centred on the energy sector, albeit on renewable energy supply.[25] Secondly, many state-owned Chinese companies in the high energy-consuming sectors have already reached high levels of technological sophistication, such that it would put US companies at a disadvantage if they were not to be involved in the cooperation process. Thirdly, given that estimates for market potential in green technologies in China reach USD 500 billion per year, it can be argued that timely interconnection between bilateral cooperation and private entrepreneurship can boost the competitiveness of American companies - if not with other major Chinese players, then with other international competitors. Fourth, the US holds the promotion of free market competition as a strategic goal, wherefore the inclusion of the private sector is crucial in any collaborative initiatives.

The most distinctive feature of US-China cooperation on energy efficiency is that all government funding from the US must have a clear benefit for US institutions or companies. Indeed, the fact that, bar one project,[26] the US does not provide any development aid for cooperation on energy efficiency is a sign that expectations for continued cooperation rest with the ability to generate incentives for private enterprises to engage.

From an institutional and structural point of view, China-US cooperation projects are designed and implemented in a top-down fashion, with agreements signed between the heads of state and then passed down the

[25] E.g. *Bloomberg Business Week*, 19 – 25 March, 2012: "Hey China, Stop Stealing Our Stuff!" Focusing, however, on industrial espionage in the renewable energy sector and not on energy efficiency.

[26] United States Agency for International Development (USAID) is involved in the US-China Partnership on Climate Change (PCA), which aims to increase the capacity to reduce greenhouse gas (GHG) emissions in the Jiangsu and Guangzhou provinces.

different line ministries. As the ministry in charge of energy affairs, the Chinese NDRC figures as the dominant cooperation partner with the US, with exceptions in cases when initiatives target areas under the control of other line ministries. Project objectives are very detailed and allow for a more precise judgment of achievements reached. Funding is shared equally between China and the US, thus raising the interest of both parties to ensure a continuation of cooperation projects on energy efficiency. On the other hand, the emphasis on strict reciprocity and equality might raise the barriers of political acceptance of such projects on a wider scale within China. The Clean Energy Research Centre (CERC), the current China-U.S. flagship initiative, is exemplary for this cooperation approach. It is characterized by a very detailed outline of its goals, the means to achieve them and how to evaluate its operations. Furthermore, according to a person currently involved in the assessment of the CERC as a third-party auditor, the project features three key innovative strategies to cooperation.[27]

1) Collaboration builds on mutual interest, common priorities and complementarities in research and development
2) The commercialization and market development of the areas of cooperation are an integral part of the cooperative efforts
3) Pre-negotiated IPR terms and conditions guarantee that the products of joint research and development are protected in the respective jurisdictions of China and the US for all involved parties.[28]

[27] Interview with a third-party auditor of the CERC on May 20, 2012.

[28] As with other cooperation projects, the question of sustainability remains a key concern. With the establishment of a public-private partnership, it seems that there is a higher likelihood of the continuation of the project once public funding ceases. This depends, however, largely on the success of each working group and must be monitored in the future.

Table 5: Current US-China Energy Efficiency Cooperation

Electric Vehicles Initiative	Joint standards/testing, demonstration projects, R&D roadmap for developers, public awareness and engagement.
US – China Clean Energy Research Centre	Technological Cooperation for bldg. EE, vehicles (and clean coal)
US – China Ten Year Energy and Environment Cooperation Framework	-Establishment of 7 EcoPartnerships between US and Chinese companies and academic institutions to improve EE in industry - DoE and MoHURD to conduct EcoCity study - USTDA and NDRC to develop training curriculum for provincial gov. and company managers for auditing, benchmarking and best practices - USTDA, NDRC, EX-IM banks to raise funds for EE projects
Energy Cooperation Program	Promote commercialization of EE projects in industry and buildings.
US – China Partnership for Climate Action	Energy Efficiency through GHG reduction: Industry: EHS Academy Jiangsu (and Guangdong, since 2008), conferences on sustainable suppliers. Power Sector: Overcoming policy and financing barriers. Sharing of best practices, case studies and training. Building and City Planning: Peer-to-peer networking with US cities, introduction of Climate Leadership (CLA) model for large EE programs.

Sources: U.S.-China Clean Energy Center, 2012; United States Department of State; U.S.-China Chamber of Commerce, Energy Efficiency Program, 2012; and: Institute for Sustainable Communities, 2010.

Since 2001, US- China bilateral cooperation on energy efficiency has become much stronger. The scope of cooperation has been widened from research, capacity building and the execution of pilot projects with government funding, to include joint conferences, joint technology development and the active participation of private partners.

As with bilateral cooperation between the EU and China, there is a high level of fragmentation with the administrative bodies involved in cooperation on both sides. This has to do with the allocation of resources

coming from different agencies, the differences between parties involved in the design or negotiations of cooperation and in the execution, as well as the specific areas of energy efficiency efforts pertaining to different fields of competency among administrative bodies. Since there are no bottom-up projects, which could benefit from such a fragmentation, this is a

Conclusion

Assessing Cooperation Efforts: The Road Ahead

The assessment of successful projects is challenging and not always straightforward. While the input can always be measured in monetary terms, the outputs are often more obscure. Furthermore, often the positive effects of a given project may only become apparent after the completion of the cooperation, such as in the case of capacity building or public outreach. Similarly, the concrete monetary value of new standards is also difficult to assess.[29] Nevertheless, the author provides a preliminary assessment of EU-China and US-China practices on energy efficiency cooperation in China, based on the criteria outlined in the introduction.

Nevertheless, the United States and the European Union design their cooperation projects to include many of the factors outlined in the introduction. Both parties have established cooperation projects through top-down, as well as bottom-up approaches. However, the relative liberty of its development aid instruments, through Calls for Proposals, allow the European Union to engage more flexibly in bottom-up cooperation. US

[29] While development aid usually relies on the so-called Logical Framework Approach (log frame) to judge the efficiency and the effects of a project, it has not been possible for this paper to gain access to any such documents for the cooperation projects at hand, due to the confidential nature of the data.

governmental restrictions obstruct decentralized initiatives for bilateral cooperation between China and the US. In cases where this form of cooperation happens, it is usually through private initiatives that have gained government endorsement, but do not receive government funding.[30]

Joint strategy setting to complement current policies in China is a point that is equally stressed in EU and US cooperation with China. Bilateral cooperation also works on every level of the Chinese hierarchy, with partners from various Chinese line ministries and institutions engaged with a great number of foreign actors. As a result of the fragmented nature of institutional setup on energy policy both in China and in its foreign partner countries, as well as the broad spectrum of areas significant for energy efficiency, a wide and well functioning network of cooperation is needed. The activities of the LBNL on the US-China side are evidence that the successful establishment of such relations can facilitate future and increase the effectiveness of current international cooperation projects.

Capacity building and industry or issue specific plans and tools are accepted as fundamental to successful international cooperation, and have been described as one of the most important contributions that foreign partner countries can make to China.[31] The lasting impact of these efforts can be seen in the support for energy auditing standards, the BEST-Cement benchmarking tool or energy efficiency labelling. In fact, both the EU and the US side claim that they excel at their contribution made in the areas of best practices and standardization.[32]

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[30] E.g. The US-China Energy Cooperation Program, implemented by the US-China Chamber of Commerce.

[31] Interviews with CNIS researcher and former U.S. Department of State Official.

[32] Interview with and former US Department of State Official., and EU project associates, 2012.

Coordination with other international efforts is implemented in both the US and EU cooperation efforts, as is the case with the current EU-China flagship initiative's support of other EU initiatives on energy cooperation with China, as well as the pollution prevention and energy efficiency financing project by the US Environmental Protection Agency (EPA) and China's Ministry of Environmental Protection (MEP) of 2006, which tied its efforts into project led by the World Bank and the Asia Development Bank.[33]

Leveraging financing through public-private partnerships is currently only embraced by the US-China efforts. Since the EU currently views its efforts as development aid, private European actors that may not benefit from the cooperation. Despite stressing the importance of public engagement in cooperation on energy efficiency, it is yet an opportunity, which the European Union has left unexplored. Although there is a possibility that this approach may change to one emphasising more mutually beneficial cooperation, it can only be speculated whether this will actually happen. The United States on the other hand has made the benefit of the United States, the inclusion of the private sector as well as the promotion of market incentives pertaining to energy efficiency in China a condition for cooperation, as is evident in all cooperation agreements, and even more pronounced in the cooperation efforts exerted by the US-China flagship initiative.

This is indeed the most fundamental difference in EU-China and US-China cooperation on energy efficiency. However, given the fact that many successes in EU-China cooperation stem from the decentralized

[33] L. Price and S. Ohshita, "Lessons for Industrial Energy Efficiency Cooperation in China", pp. 69.

structure of bottom-up projects. There is, however, an argument to be made that exactly the development aid nature of the projects makes the EU an easier, if not more desirable cooperation partner for China.

Another issue, which is mainly troubling for the EU cooperation issues, but has also poses obstacles for US-China cooperation in some cases, is that the time period between project design, which cannot be altered once it has been approved, and project implementation may take so long, that priorities for cooperation have shifted. This in turn can lead to a misallocation of funds.

All interviewees, who are involved in cooperation efforts, have confirmed that fragmented institutional structures present a problem for China, the European Union and the United States respectively, but can also become an obstacle for international cooperation. Institutional fragmentation is a fact of governing structures in modern nation states and as such of international cooperation, pertaining by no means only to China. The way this issue can be addressed – and this is also a success factor for international cooperation – is through wider, more in-depth relations between cooperation partners and regular communication between all parties involved.

Future Research Questions

With regards to the specific sectors of bilateral cooperation on energy efficiency in China, it is important that future research pay attention to more in depth assessment of current cooperation projects. In the area of policy making the efforts of the China-EU and China-US flagship initiatives (EC2 and CERC) have to be measured against the new policies implemented by the Chinese government, as well as against the goals

pursued in bilateral policy dialogues. Policy recommendations will have to be congruent with the declared goals of the Chinese government, as well as the EU and US respectively. One way of assessing this would be to compare policy papers published by the EC2 and the CERC. This would illustrate the common and differing views, identify synergies, and could thus stimulate coordination and communication between both research centers.

With a view of industrial energy efficiency, an area of relative neglect in recent EU-China and US-China cooperation efforts, research should focus on the progress that is being made in the Chinese government's efforts to enforce a national industrial auditing standard, and how international cooperation could support this aim. Furthermore, the development of energy an energy service and management sector could, be an area, in which there is increased room for international cooperation.

Both the US and the EU have made cooperation on energy efficiency in buildings a center point of their work with the Chinese government. Tracking the evolution of current projects and their impact can show the successes of the two-pronged top-down and bottom-up approach of the EU-China projects, in contrast to the top-down design of China-US projects, such as the CERC. This is particularly important with a view of the most recent bilateral declarations between the EU and China, and the US and China.

The greatest difference in cooperative approaches is in the area of energy efficiency financing. It is relevant to see if the EU and the US will include this sector in future cooperation with China.

Generally speaking, following the achievements of the EU and US flagship initiatives will be the most important task for future research on

international energy efficiency cooperation in China. This will give crucial evidence as to the feasibility and appropriateness of the two approaches. Other key factors in the future development of international cooperation include the shift in cooperation approach by the European Union in 2013[34], as well as the success of the push for further market liberalization promoted in US-China cooperation efforts.

China's goal for the 12th Five-Year Plan of reducing further energy intensity by 16-17% requires even more aggressive action than during the previous five-year period. International assistance from the European Union and the United States can facilitate this through the current projects in place. Even though accomplishments are difficult to measure for researchers, the current projects by the European Union and the United States leave room for impact assessment. Furthermore, China experiences incredibly fast-paced developments in the energy sector, industry specific adjustments may create new opportunities for international cooperation, such as in energy financing, as well as the energy services and management industries. It is crucial that the Chinese, EU and US governments recognize the importance of international cooperation in the field of energy efficiency. With energy demand continuously rising in China, so is the need for comprehensive and sustainable policy approaches to demand-side management of the energy sector.

[34] As mentioned by a EU official at a presentation on EU Cooperation on Energy in China at Peking University, April 13, 2012, this form of project assistance, as development aid, may change by 2013, when the EC will review its priorities for development assistance with regard to China. The shift to a stance that emphasizes more mutually beneficial cooperation has already happened on a political level and must now be implemented concretely in cooperation projects. There are many voices today within the EU that question the necessity of one-sided benefits in the cooperation on energy efficiency, which could mean that in the near future, the hopes of many analysts for increased public-private cooperation may become reality.

References

Secondary Literature:

Dai, Yande, "Implementation Progress and Next Steps of the Top-1000 Enterprises Energy Efficiency Program." Proceedings of the Tenth Senior Policy Advisory Council Meeting on Enhancing the Implementation of China's 2010-2020 20-Percent Energy Efficiency Target, Tianjin, November 16, 2007.

EuropeAID, *Aid Delivery Methods: Project Management Cycle Guidelines*. Brussels : European Commission, 2004.

European Union, "Energy Efficiency Table of EC-China Dialogues and Cooperation Projects." Document received at meeting with European Union's Delegation to China Staff on November 2, 2011.

Freeman, Duncan and Jonathan Holslag, *Climate for Change: The EU, China and Climate Change*. Brussels : Brussels Institute of Contemporary Chinese Studies, 2009.

European Investment Bank. "CCCFL District Heating Energy Efficiency." Factsheet posted on October 13, 2009. http://www.eib.org/projects/pipeline/2009/20090343.htm Accessed December 21, 2011.

Institute for Sustainable Communities and U.S. Agency for International Development. "US-China Partnership for Climate Action Fact Sheet." November, 2010. http://www.iscchina.org/who_we_are/publications/PCA_Fact_Sheet_v1(11-24)_(2).pdf. Accessed April 10, 2012.

Fridley, David, et al., *The Sino-US CFC-Free Super-Efficient Refrigerator Project Progress Report: Prototype Development and Testing*. Washington, D.C. : United States Environmental Protection Agency , 1997.

Holzer, Constantin and Zhang, Haibin, "The Potentials and Limits of EU-China Cooperation on Climate Change and Energy Security." *Asia Europe Journal* Vol. 6, No. 2, 2008, pp. 217-227.

Horvat, Manfred and Nannan Lundin, *Review of the Science and Technology (S&T) Cooperation between the European Community and the Government of the People's Republic of China.* Brussels : European

Commission, 2008.

Jiang, Kejun, "Energy Efficiency Improvement in China: A Significant Progress for the 11th Five Year Plan." *Energy Efficiency* Vol. 2, No. 4, 2010, pp. 401-409.

Lee, Bernice, et. al., *Changing Climates: Interdependencies on Energy and Climate Security for China and Europe*. London：Chatham House, 2007.

Lema, Adrian and Kristian Ruby, "Between Fragmented Authoritarianism and Policy Coordination: Creating a Chinese Market for Wind Energy." *Energy Policy* Vol. 35, 2007, pp. 3879-3890.

Lieberthal, Kenneth and Michel Oksenberg, *Policy Making in China.* Princeton：Princeton University Press, 1988.

刘文强：《中国能效标准标识的实施现状及国际合作》，《中国能源》2001 年第 11 期，第 3 版，第 3 至 5 页.

People's Republic of China. *Zhonghua Renmin Gongheguo Jieyue Nengyuan Fa* ("People's Republic of China Energy Conservation Law"). Legal Document Posted on October 28, 2007. http://www.gov.cn/flfg/2007-10/28/content_788493.htm.
Accessed December 15, 2011.

Price, Lynn and Stephanie Ohshita, "Lessons for Industrial Energy Efficiency Cooperation in China." *China Environment Series* Vol. 11, 2010/2011, pp. 49-88.

Price, Lynn, Levine, Mark, et. al., *The Greening of the Middle Kingdom: The Story of Energy Efficiency in China.* Berkeley：Laurence Berkeley National Laboratory, LBNL-2413, 2009.

Reuter, Etienne, "China-EU: A New Agenda." *Asia Europe Journal* Vol. 5, No. 2, 2007, pp. 171-179.

Riley, Michael and Ashlee Vance, "Hey China, Stop Stealing Our Stuff!" *Bloomberg Business Week*, 19 – 25 March, 2012.

沈波，蒲思琳，鲁虹佑。《中国能源审计的实践：全国与地方的做法及潜在的问题》。劳伦斯伯克利国家实验室，LBNL-4159 E：伯克利，2010 年。

Science and Technology Section of the European Commission, *Overview of Europe-China Science and Technology (S&T) Cooperation.* Brussels：

European Commission, 2011.

Sims-Gallagher, Kelly, "US-China Energy Cooperation: A Review of Joint Activities Related to Chinese Energy Development Since 1980." BCSIA Discussion Paper 2001-21, Energy Technology Innovation Project, Kennedy School of Government. Cambridge : Harvard University, 2001.

Sinton, Jonathan, Mark Levine and Wang, Qingyi, "Energy Efficiency in China: Accomplishments and Challenges." *Energy Policy* Vol. 26, No.11, 1998, pp. 813-829.

Sugiyama, Taishi and Stephanie Ohshita, eds., *Cooperative Climate: Energy Efficiency Action in East Asia.* Winnipeg, San Francisco : International Institute for Sustainable Development and University of San Francisco, 2006.

SWITCH-Asia, *Train the Trainers: A SWITCH-Asia Project to Train Chinese Construction SMEs in Energy Efficiency in Buildings.* Beijing : European Union, 2011.

United States Department of Energy, *US-China Clean Energy Cooperation: A Progress Report by the U.S. Department of Energy.* Washington, D.C. : U.S. Department of Energy, 2011.

Yan, Xueliang and Zuo, Yan, "Transition to Low-Carbon Energy Policies in China – From the Five-Year-Plan Perspective." *Energy Policy* Vol. 39, 2011, pp. 3855-2859.

Yang, Ming "China's Energy Efficiency Target 2010." *Energy Policy* Vol. 36, 2008, pp. 561-571.

Zhou Nan, David Fridley, et al., *China's Energy and Carbon Emissions Outlook to 2050.* Berkeley : Laurence Berkeley National Laboratory, LBNL-4472 E, 2011.

Zhou Nan, Mark Levine, et. al., "Overview of Current Energy Efficiency Policies in China," *Energy Policy* Vol. 38, 2010, pp. 6439-6452.

Web Sources and Official Documents:

Eco Partnerships. "Current Eco Partnerships."

http://www.ecopartnerships.gov/current/. Accessed March 10, 2012.

Europe - China Clean Energy Center. http://www.ec2.org.cn/. Accessed March-April, 2012.

European Union and Government of the Peoples Republic of China, "Joint Declaration on the EU-China Partnership on Urbanization." Signed May 3, 2012.
http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/20120503_eu_china_joint_declaration_urbanisation_en.pdf. Accessed May 11, 2012.

European Union and Government of the Peoples Republic of China, "Joint Statement for Enhanced Cooperation on Electricity Markets." Signed May 3, 2012.
http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/20120503_eu_china_joint_statement_electricity_markets_en.pdf. Accessed May 11, 2012.

European Union and Government of the Peoples Republic of China, "Cooperation Framework on Energy Performance and Quality in the Building Sector." Signed November 30, 2009.
http://ec.europa.eu/energy/international/bilateral_cooperation/china/doc/summit/2009_30_11_signed_mou.pdf. Accessed May 4, 2012.

Laurence Berkeley National Laboratory, "What is Energy Efficiency." http://eetd.lbl.gov/ee/ee-1.html. Accessed December 10, 2011.

Li, Jing, "Carbon Intensity Targets Unveiled." *China Daily.* Article posted on March 1, 2011.
http://www.chinadaily.com.cn/china/2011-03/01/content_12092285.htm. Accessed December 15, 2011.

National Development and Reform Commission (NDRC), "The Mid and Long-Term Plan for Energy Conservation" (*Jieneng Zhongchangqi Zhuanxiang Guihua*). Document posted on December 4, 2010. http://wenku.baidu.com/view/6ac02e78168884868762d6df.html. Accessed November 25, 2011.

Price, Lynn, Jonathan Sinton, et. al., *Industrial Energy Efficiency in China*. Berkeley : Lawrence Berkeley National Laboratory, 2001. http://escholarship.org/uc/item/8x24s7nx. Accessed December 10, 2011.

US-China Clean Energy Centre, "Joint Work Plan for Collaborative

Research on Clean Vehicles." Published January 18, 2011. http://www.us-china-cerc.org/pdfs/US/CERC-Vehicles_JWP_english_OCR_18_Jan_2011.pdf. Accessed March 25, 2012.

US-China Clean Energy Centre, "Joint Work Plan for Research Projects on Building Energy Efficiency." Signed January 18, 2011. http://www.us-china-cerc.org/pdfs/US/CERC-Buildings_JWP_english_OCR_18_Jan_2011.pdf. Accessed March 23, 2012.

United States Department of State and the Government of the People's Republic of China. "US-China Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment." Signed July 28, 2009. http://www.state.gov/documents/organization/126802.pdf. Accessed April 05, 2012.

US-China Energy Cooperation Program. http://www.uschinaecp.org/working-groups/. Accessed April 12, 2012.

World Resources Insitute: http://www.chinafaqs.org/. Accessed March-May, 2012.

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