

CHAPTER III

INTERNATIONAL COOPERATION EFFORTS IN CHINA

3.1 International Cooperation on Renewable Energy

The idea of international cooperation is nothing new, yet modern technology has made it possible for international cooperative initiatives to flourish. Communication is instant, and setting up branches or offices abroad is common practice. International cooperation is important for China to increase the share of renewable energy and reduce the amount of imported energy. Through international cooperation, developed countries and developing countries, in this case, China, are able to use their strengths and maximize mutual gains. For example, production and installation costs in China are low. China also has abundant renewable energy resources. Its energy infrastructure is in the process of developing, which accounts for the annually high growth rates in energy demand. Developed countries, on the other hand, are usually the ones with the highest growth rates in renewable energy (REN21, 2006). However the potential for growth within the renewable energy sector is not as high as with a developing country as the energy sector is already quite developed. If developed countries share their technology and financial and human resources, they would benefit from the lower production costs and buy themselves time to transition their energy sector to a more sustainable one. China would benefit from gaining possession of renewable technology without research, gain markets for renewable technology components and increase energy security.

International cooperation over renewable energy comes in many forms in China. The partnerships involve governments with governments, non-profit organizations and governments, and cooperation between non-governmental organizations (NGO). Due to the restrictions stated in chapter one, this paper will look at notable cooperation efforts within these categories. The US-China Energy Policy Dialogue (EPD) with its Green Olympic Protocol and the Asia-Pacific Partnership on

Clean Development and Climate (APPCDC) are great examples of governments working with governments. Renewable Energy Policy Network for the 21st Century (REN21) and the China Renewable Energy Scale-up Program (CRESP) demonstrate how public-private partnerships operate while the Energy Foundation and the China Rural Energy Enterprise Development (CREED), the result of cooperation between various NGOs, reveal the strengths and weaknesses of non-governmental involvement.

3.1.1 Governmental Partnerships

There are many governmental cooperation efforts over energy in China as many countries are concerned over China's energy growth. The US is particularly concerned as they see China as a direct competitor for energy resources. To effectively deal with energy concerns, the US established the EPD in 2004 after Chinese Vice Premier Zeng Peiyan expressed to US Secretary of Energy Spencer Abraham on his visit to Beijing the desire for closer cooperation on energy with the US (Xinhua, Vice Premier, 2004). The EPD consists of policy level exchanges on energy security, economic issues and energy technology options between the US Department of Energy (DOE) and China's Reform Commission. In order to further facilitate these exchanges, the DOE opened an office in Beijing. There is hope from the Chinese that the office will provide the DOE with a better understanding of developments in China's energy sector and help ease some anti-Chinese stance over energy deals, such as the incident in which Washington pressured China into withdrawing its bid for Unocal (Barboza, 2005). By having a dialogue that is about energy, mutual energy security concerns can be dealt with and tensions reduced. However, as a contributor to renewable energy, the EPD is not as successful. There have been two meetings, in which were mostly discussions over the definition of energy security, the differences in each country's definition; the value of a strategic petroleum reserve, something that the US already has and China is embarking on, the effect on the global energy market when China fills that reserve; and explicit details of the energy plans of both countries (Harbert, 2006). While renewable energy programs are discussed, such as the deployment of renewable energy including

biofuels, they are not given as much consideration overall. (US Department of Energy, 2006, *DOE Assistant Secretaries*).

Currently, the EPD has not contributed to any renewable energy changes. This is not very surprising as the EPD is, after all, a dialogue, a place where the two countries meet to discuss issues of mutual concern and is not equipped to initiate projects. However, according to the Chinese Embassy in the US (2006), China and the US agreed at the 2006 meeting that efficient energy and renewable energy will be key targets of their future energy cooperation and this could result in an increase in commitment and cooperation from both sides on the issue.

Nonetheless, as renewable energy becomes more viable, the EPD could become a great tool for integrated cooperation between the two countries. As EPD is a very high level dialogue, it could result in policy formation, increase in expertise-sharing with regard to technology and training. Nevertheless, the EPD is able to facilitate agreements, for instance, the Green Olympics Protocol. Due to the high level of decision-making power in the dialogue, once the Chinese representative expressed a desire to improve the environmental image of Beijing in accordance with the Green Olympics Protocol which started in 2000 with Sydney, the US became more involved in “greening” the 2008 Olympics. The protocol, in addition to clean technology and energy efficiency projects, has a very interesting renewable energy project that, if well implemented, could serve as pilot and be replicated in other cities in China (Environment News Service, 2005, *Beijing Enlists*). One of the goals of the Green Olympics is to make the Olympic Village a model of sustainable development. China has asked the US to facilitate bids from US companies for the construction of the village which will be powered by renewable energy sources with solar photovoltaics converting sunlight into energy to light the street lamps, and heat bathwater and the pool. This will consist of 6,000 square meters of solar panels on the roofs of 18 buildings and reduce the amount of energy needed to heat water (BOCOG, 2007). The numbers of street lamps are not listed and their energy savings can therefore not be determined. The village will be converted into a residential area and sold as high-end condos after the Para Olympics. If it is able to maintain its

renewable energy sources, and is competitively priced, renewable energy buildings in urban areas could become more widespread, and not remain a Green Olympic gimmick.

A more diverse intergovernmental effort can be found in the APPCDC, a partnership that brings together six major countries of the Asia-Pacific – Australia, China, India, Japan, South Korea and the US. The APPCDC is a purely voluntary gathering of governments interested in pursuing renewable energy and other clean energy technology. China is deeply involved in APPCDC's projects as it funds or is a participant in many of the projects (APPCDC, 2005, *APPCDC*). The APPCDC has many advantages to the EPD and leaves little wonder as to why it performs better. Though the APPCDC was created later, in 2005, it is built on the foundations of existing bilateral and multilateral initiatives of the partner countries and is clearly organized – eight taskforces were assigned to the eight key sectors that they had identified. One of the taskforces that the Partnership created is on renewable energy and distributed generation. This taskforce operates on the premise that renewable energy will be critical to the energy mix of all six countries in the future, partly because of energy security, energy access, poverty alleviation, and environmental considerations. One of its tasks is to identify barriers against mass deployment of renewable energy technology and complement work undertaken by the member countries and the international community to address the issues. Projects undertaken are done with the goal of enabling renewable energy to become a viable alternative to conventional fuels (APPCDC, 2005, *APPCDC*).

APPCDC taskforces are managed by the APPCDC policy and implementation committee, which is currently chaired by the US. The organization is administered from the Administrative Support Group, also located in the US. In contrast with its heavy involvement and potential benefit from the APPCDC projects, China seems to be taking somewhat of a back seat in the administration of the Partnership. According to the Partnerships website, it holds only two co-chair positions out of a total of sixteen offices in the organization. These co-chair positions are in the Power

Generation and Transmission, and Cleaner Fossil Energy Task Forces (APPCDC, 2005, *APPCDC*).

The projects undertaken within the renewable energy taskforce are diverse as each member's contribution and needs differ. Since its inception, according to its project roster, the taskforce has been involved in 27 projects, 10 of which concern renewable energy and China. Two of the projects are working on deploying renewable energy on a large scale, five on market enabling projects and three on research and development. The first deployment project aims to build critical mass for ultra high efficiency solar power through commissioning breakthrough ultra-efficient photovoltaic concentrators developed by Solar Systems, an Australian company, and used in collaboration with cell technology from Spectrolab, a US company, which will make it possible to produce solar power for 1/6th of the current cost. Solar Systems will work with local partners to manufacture, construct, own and operate the power stations. This project is still in its developmental phase as funding is still being sought.

The second deployment project aimed at creating renewable energy rural business hubs in India and China. The program in India is already underway with the United States Agency for International Development (USAID) contributing \$600,000 to the program while General Electric Company (GE) and its network of experts, technology centers and Partner countries have agreed to invest up to \$2.7 million in direct and indirect funding. This program utilizes renewable technology from GE's Ecomagination portfolio while customizing power solutions based on local resources. This project aims to bring reliable power and decrease dependence on transported fuel of rural villages. The project is being extended to China but has not yet started. There are no projected figures on how much conventional energy these two projects will save, or how much renewable energy they will produce, as their implementation sites have yet to be chosen and therefore cannot be calculated (APPCDC, 2005, *Project roster*).

The first of the five market enabling projects is the identification and categorization of high-prospect geothermal energy projects sites, as in a company will be contracted to survey for yet undiscovered geothermal sites. In 2005, according to the Ministry of Land and Resources of China, geothermal energy utilization reached 10,779 MW, ranking first in the world (TMC, 2006). The clean and plentiful geothermal energy has a high potential in raising the energy mix and reducing pollution. Petratherm Limited, an Australian company, with an innovative "Exploration Model," has finally reached an agreement in June 2007 with the Chinese government to produce a portfolio of high-prospect geothermal projects in exchange for an equity position in the most promising sites as they will bear the exploration costs which is estimated at approximately \$750,000. The portfolio, once done, will allow further investment from interested private companies and increase geothermal power stations (TMC, 2006).

The second project consists of analysis of regulatory barriers to renewable energy uptake in China. It aims to identify and remove the barriers so as to expand the renewable energy market. It will also catalogue domestic best practices so that an enabling environment can be promoted. The outcome would consist of a written report and workshops to disseminate the key findings. This project is being conducted by the Renewable Energy and International Law (REIL) Project. They have finished their report, which offers a comprehensive look at the 2006 Renewable Energy Law and gives advice on undertaking projects in China. The report also suggests areas in which the law should be improved on. Currently, a series of seminars named RELAW Assist, are being conducted to assist and aid in the understanding of the emerging legal issues around China's Renewable Energy Law and regulations (RELAW Assist, 2006; 2007).

The third project involves setting a standard for renewable energy in China by setting up an Institute of Sustainable Power (ISP) office in China to oversee the accrediting of renewable energy training courses. The project has a budget of approximately \$500,000. The effects of the project are not yet felt as the office was only set up this year. However, once the office is settled, it will provide assurance of

quality and similarity of training for those involved in the renewable sector in China, as one of the fears is about inferior quality of manufactured products or lack of human resource capable of maintaining sites once installed (APPCDC, 2005, *Project roster*).

The fourth project is about improving human capacity over renewable energy in China, India and South Korea. Five full scholarships of Ph.D. study and forty 50% tuition scholarships for the Masters program will be given to students or scientists from these three countries each year to study at the Photovoltaic and Solar Energy Engineering School at the New South Wales University in Australia. The sponsorship has started this year and the first Ph.D. graduates will return to their countries in 2010 and the Masters students in 2008. This project will increase the experts in these fields and hopefully accelerate the uptake of photovoltaic manufacturing and application in these countries and the Asia-Pacific region (APPCDC, 2005, *Project roster*).

The last project in the market-enabling series aims to enhance capacity building for renewable energy promotion policies and measures by having the Institute of Energy Economics, Japan, hold an annual or biannual training seminar for ten to thirty Chinese and Indian policy makers to assist them in formulating efficient renewable energy promotion policies and measures that respond to each nation's local context. The funding is expected to come from the Japanese government, totaling \$150,000 for each training seminar. The seminars have not yet been held but are expected to commence in the near future (APPCDC, 2005, *Project roster*).

The three research and development projects are all in the development phase and none are ready for commercialization yet they all show potential for transforming and scaling up the renewable energy sector once the technology is complete. It is important, however, to keep in mind that outcomes from such research and development projects are usually slow and can have unpredictable outcomes. The first project aims to create a flexible biomass gasification technology that improves on the current models that are based on coal gasification experience. The current models utilize high temperature and pressure, and therefore incur high operating costs. They intend to bypass the high costs of collection and transportation of wet biomass as

biomass fuel resources are usually distributed in rural areas. The new technology will separate the gasification into a two step process. The first step, pyrolysis, will convert the biomass into bio-oil and char which will facilitate and reduce the cost of the transportation process as they are less bulky (APPCDC, 2005, *Project roster*).

The second step reforms the bio-oil and gasifies the char, producing gaseous fuel suitable for fuel cells and gas engines. This allows them to transport the fuel more cheaply and efficiently and reduces the operational costs, making biomass gasification more competitive as a fuel source. The budget for this project is estimated at approximately \$7,200,000. The second project plans to create a fully integrated process for biodiesel production from microalgae grown in salt water. The project will cover the entire process, from species selection, culture system design, construction and operation growth conditions, culture management, harvesting, recycling waste products, oil extraction and biomass disposal and/or reuse. The first phase of the project will reveal preliminary outcomes of the economic viability of the project on a large scale. If it is found to be viable, the project will continue into its second phase which will attempt to discover what the optimal species, growth cycles and extraction processes are and produce a detailed assessment of the overall economics (APPCDC, 2005, *Project roster*).

The third project will build, install and test a new generation of small 5 kilowatts (kW) wind turbines that will be suitable for remote areas and extreme weather. As China is a vast country with different terrains, a turbine that can handle the variations is very important. The turbine should be able to operate in remote areas, as in able to function off-grid, and in larger communities, on-grid. It should be able to handle extreme weather conditions, as in typhoon winds that often hit the Eastern coast from May to December and dust storms that permeate the northern and western provinces. This new turbine is highly efficient, with good performance under low wind conditions, has relatively low noise levels and is designed for mass production. The project will test the controller designs, the performance of the system in an unconnected electricity grid, under typhoon conditions, and under extreme temperature and dust conditions in a grid connection. These tests will be done along

with local training in operation and maintenance to recreate actual conditions the turbines would function under once operational. The results of the tests will lead to design modifications that will enhance power generation, safety and reliability, and reduce cost. The design of the blade and controller will allow the turbine to be scaled up to potentially 150 kW (APPCDC, 2005, *Project roster*). This will increase the flexibility of the turbine so that it will function unconnected to a grid or connected, in rural villages or for larger communities. The new turbines will make it possible to fully use the high wind energy potential of China, which consists of a total of 235 GW, without being deterred by remoteness or extreme weather (Feller, 2006). The budget for the second and the third project has not yet been allocated as they have been recently proposed.

China's involvement in governmental partnerships is very high. In the instance of the EPD, though it was formally established by the US, it was only at the request of the Chinese government for closer cooperation on energy. As for the APPCDC, though China is not actively involved in the administration of the partnership, it is deeply involved with the administration, funding and implementation of the projects within China. Government partnerships offer the benefit of close relationships with decision-makers which can result in the facilitation of agreements, as in the case of the creation of EPD. They are also well funded as the known budget allocated to APPCDC renewable energy total is approximately \$11.9 million. Though this amount may seem insignificant when compared to the amount that China spends on securing oil deals overseas, with \$2.3 billion spent on gaining a 45 % stake in an offshore field in Nigeria, consider also that non-renewable energy consists of 90 % of total energy consumption while renewable energy consists of only 7.5 % (Embassy of the PRC in the US., 2006; EIA). Securing access to respond to 90% of the demand is extremely crucial, so financial commitment will lean towards securing energy deals on conventional fuels. A possible pitfall of the governmental partnership could be the support of too many different projects, resulting in a stretch in financial and human resources which may lead to poor project execution as high level decision makers take on too many projects without studying the feasibility of simultaneous project executions. Though this has not happened yet, there is a real danger as the decision-

makers involved in the acceptance of a project are not the ones that are involved in the execution.

3.1.2 Public – Private Partnerships

Governmental partnership initiatives always receive the most media attention whether they are effective or not. However, projects initiated by public-private partnerships are not less valuable even though they may receive less media attention. Renewable Energy Policy Network for the 21st Century (REN21) is a global policy network which, though not an actor itself, assists in international cooperation by connecting governments, international institutions and organizations, partnerships and initiatives, stakeholders on the political level, and those “on the ground.” Born on a shared vision of renewable energy and energy efficiency as important components of the future and concern for the environment, it provides a forum on renewable energy with the goal of encouraging policy development and decision making on sub-national, national and international levels to expand the renewable energy sector globally. According to its mission statement, REN21 plans to expand the renewable energy sector globally through encouraging action in policy, advocacy and exchange. In the area of policy, REN21 will engage key leaders and stakeholders and encourage the inclusion and deliberation of renewable energy matters in relevant national and international processes. In advocacy, REN21 will host high profile international events and produce authoritative and influential issue papers to increase understanding of the subject and highlight the benefits of increasing renewable energy. In the area of exchange, REN21 provides links to knowledge bases and encourages ongoing dialogues, joint work and transparency so as to fill knowledge gaps and build capacity.

According to the REN21 website and global reports, REN21’s physical base is at its Secretariat in Paris. China is keenly active in REN21 as a Chinese representative, who represents the interests of the National Development and Reform Commission (NDRC), the Energy Research Institute, and the Chinese Renewable Energy Industries Association, is the vice chair of the Steering Committee. From this

committee, the elected Chair and Vice-Chairs along with the head of the Secretariat comprise a Bureau which exercises executive authority over REN21. This is an active level of involvement at the highest level on China's part as the Bureau's executive authority involves decision-making in between meetings of the Steering Committee which initiates and executes all REN21 work plans. Members of the Steering Committee include representatives from fourteen different governments and government agencies, five intergovernmental organizations, five NGOs, four industries, one financial, one regional, one local and four members-at large.

REN21 originated from a planning and consultation process initiated at the International Conference for Renewable Energies 2004 that was held in Berlin. China has been represented on the Steering Committee since the first interim committee was established by the German Government in 2005 at the request of the stakeholders (REN21, 2005, *REN21*). Since its inception, REN21 has built a website in which interested parties could exchange ideas. It also publishes a yearly renewables global status report which gives an overview of current market and industry trends along with the policy landscape in different countries. This allows different actors to access and assess how other countries are approaching the renewable energy. By compiling the different programs and how each is faring, these actors may seek to adopt or adapt a specific approach to their own situation. It allows governments to review the progress of other countries, compare their own progress, and business and NGOs to survey opportunities for further investment and development. REN21 has facilitated access to and increased the amount of information on renewable energy, making it easier to use for policymakers, researchers, businesses, and other stakeholders. China's progress is included in the reports and China is lauded for its increases in solar, wind and hydro projects. For instance, in REN21 2005 Global Status Report (2005: 5, 17), it details how five of the largest electronics and aerospace companies have entered the wind power business and over 500 enterprises produce hydrogenerators. China has also begun manufacturing solar photovoltaic equipment, producing 100 MW in 2004, and 70 MW in cell production (REN21, 2005: 17). Similar projects in other countries are listed together, allowing those involved in similar projects to seek each other out and discuss the various obstacles and their

solutions. Access to the right information is, at times, more valuable than action as developing the same expertise independently in each country or organization would waste more and would be much more costly in terms of time and money than participation in REN21.

Having information without action is also useless. China Renewable Energy Scale-up Program (CRESP) is an organization that exemplifies how well researched information can be put to action. The program is the result of cooperation between the government of China, the World Bank, and the Global Environmental Facility (GEF). Previous World Bank and GEF cooperations have resulted in one-off projects (Meier, 2006). CRESP, was created in 2005, to deal with the problems encountered in earlier projects with the goal of scaling up renewable energy deployment. It will research the elements necessary to create an environment conducive to large-scale, renewable-based electricity generation through legal, regulatory, and institutional measures and demonstrate early success in large-scale, renewable energy development to encourage growth within the sector (World Bank, 2005, *CRESP*). CRESP plans to increase the share of renewables by introducing mandatory market shares (MMS) policy aimed at creating buyers for the energy produced, a problem encountered in earlier projects. In earlier projects, once the renewable energy plant was built, the power was considered expensive and had no buyers. By introducing supporting policies that reduce the initial set up costs and financial incentives, along with MMS, the program will have effectively dealt with those barriers.

China is fully involved in CRESP as it is one of the main partners, partly funds the project and is solely responsible for the administration of the project. Current financial commitment to CRESP stands at \$30.08 million from the Government of China, \$86.33 million in specific investment loans from the International Bank for Reconstruction and Redevelopment which is part of the World Bank, and \$16.01 million from financial intermediaries of the Government of China (World Bank, 2006, *Follow up*). A \$40.22 million grant from GEF, and an additional \$36.82 million from the Chinese government has also been committed to the program (World Bank, 2005, *CRESP*). The combined financial commitment totals \$209.46 million. The funds were

applied for and are disbursed by the Chinese Ministry of Finance. A steering committee in which several Ministries are represented meets once a year to advise on the program and coordinate between agencies and CRESP.

CRESP is a long term project which is expected to last 10-12 years. It is divided into 3 phases and is currently in the first phase, which takes 4 years to complete. Currently in its first phase, CRESP is involved in two pilots, a 100 MW wind farm at Huitengxile in the Inner Mongolia Autonomous Region, and the construction of seven new small hydropower plants and rehabilitation of eleven small hydropower plants in Zhejiang Province. This will provide CRESP the opportunity to conduct research on MMS implementation support while tailoring it to the different needs of an autonomous region and a province. It will also help with long term capacity building as local developers participate in the project (World Bank, 2006, *Follow up*). The energy output of the first phase is negligible but since the aim of the first phase is to research a favorable environment and build capacity for a bigger growth in the future, and not to replace conventional energy, the output is therefore not important. The second phase will involve the national adoption of the MMS policy but will only be implemented in ten provinces. The final phase sees the MMS policy implemented nationally. A gradual rollout was deemed necessary so it takes into account the implementation capacity of the administrative and regulatory bodies as well as the commercial renewable energy sector. The project is expected to induce investments of around \$212 million in Phase 1 and \$7-10 billion over its lifetime from various sources, such as, loans from the World Bank, grants from GEF, the Chinese government, other international organizations and private companies (Vidaeus, 2001: 5-6). Moreover, the project is built to be sustainable so as it progresses, funding is expected to come from private sources investing in renewable energy and not from the grants. As the project is still in its first phase, outcomes are variable. However, considering the adaptive nature of the project, the program should be able to achieve its goal of significantly scaling up the renewable energy sector.

The Chinese government's involvement in public-private partnerships is also very high. For instance, a Chinese government representative is the vice chair of the

steering committee, the executive authority of REN21, and part of the Bureau, the body that takes care of decision-making during the intervals between the meetings. China's influence on REN21's activities is therefore very high. Though China did not actively seek this set but was offered it at the request of stakeholders, it is nonetheless active because the position of vice chair does not allow it to be passive. China is even more deeply involved with CRSEP as it is one of the main partners, and funds and executes the programs, with the World Bank and GEF offering additional funding and acting in a more advisory capacity.

The funding for public-private partnerships exceeds many governmental partnerships as private funding is available in addition to the public fund. The projects are more sustainable as mostly projects estimated to bring financial returns are selected for execution. The total of known budget allocation for the CRESPP project is approximately \$7-10 billion, however, it is for a period of 10-12 years. Nevertheless, the current financial commitment of \$209.46 million for CRESPP exceeds the total budgeting for all of APPCDC's projects. Within this type of partnership, a possible flaw may lie in the very component that makes the projects more sustainable; as private companies are likely to be interested in investing in projects that make financial returns, projects that could leverage change but will not make substantial financial returns, if any, may be dropped.

3.1.3 Nongovernmental Partnerships

Without the support of local governments, it is impossible to initiate any project. In China, the Energy Foundation, a philanthropic grant-making organization, has managed to collaborate effectively with government and non-government agencies, even without having any government or governmental agency as one of its partners. The Energy Foundation is a partnership of major foundations that concentrate on energy problems in the US and China, and, according to their 2006 Annual Report, has an annual budget of \$50 million. The Energy Foundation partners are all private foundations, which include The William and Flora Hewlett Foundation,

The John D. and Catherine T. MacArthur Foundation, The McKnight Foundation, The Mertz Gilmore Foundation, The David and Lucile Packard Foundation, The Pew Charitable Trusts, The TOSA Foundation, The Simons Foundation, Randi and Robert Fisher, Nat Simons and Laura Baxter-Simons, and the Schmidt Family Foundation, and being privately financed, are in control of their funds. Their projects cover a wide range as they grant funds to various energy projects that they think would be effective at leveraging change (The Energy Foundation, 1990).

In 1999, the Energy Foundation and the Packard and Hewlett Foundations launched the China Sustainable Energy Program (CSEP). The CSEP is comprised of Chinese energy policy experts who serve as a bridge to China's policy makers and international experts as the CSEP is in direct contact with ministers and directors general of China's energy related ministries. The CSEP aims to assist Chinese policymakers, experts, agencies and entrepreneurs in solving energy problems by themselves and provides international expertise when requested. However, the Energy Foundation does not fund research and development of technology, demonstration projects, community energy projects, or local projects that do not have broad national and regional implications because their main objective, at the moment, is to assist China in the development of new aggressive renewable energy policies and their implementation through such measures as MMS, public benefits wires charges, wind concession programs, and renewable energy pricing regulations (Heitz and Wooley, 2006: 26).

Most of the projects funded are, subsequently, policy-building in nature and makes them difficult to quantify. So even the non-governmental agencies that CSEP has direct contact with are working on changing policy and must contact relevant government agencies. The Chinese government is, therefore, closely involved with CSEPs projects. Though the Chinese Government does not have a representative on the Board of Directors, who are ultimately responsible for CSEPs activities, eleven out of the seventeen members of the CSEP Senior Policy Advisory Council are officers or former officers of the Government of China. Chinese research institutes are engaged in developing policy proposals, and proposed policies are finally assessed by

Chinese officials as to their worthiness for pilot schemes (CSEP, 1999). Policy plays a very important role in China's energy change. Without the right policies, strategies and planning, energy security would be unachievable because of the magnitude of the demand of an economy on the scale of China's.

CSEP's crowning achievement to date is the passage of the 2006 Renewable Energy Law. For the law to become reality, grantees worked on and introduced, from 2001, best policy practices at several forums involving China's top ministers. The analyses done by the grantees were then assessed by the Environmental Protection and Resources Conservation Committee of the National People's Congress (NPC) and the National Development and Reform Commission (NDRC) which finally resulted in the law in 2005 and became effective in 2006 (The Energy Foundation, 2007). They have not rested on their laurels but continue to work on making changes in China. According to the Energy Foundation's 2006 annual report about its activities in China, CSEP gave one-year grants to six agencies working on renewable energy, five Chinese and one American, for the 2006 period. The Fujian Energy Research Society was given \$50,000 to develop a detailed roadmap for renewable energy development in the province. This includes obstacles and strategies to overcome them as Fujian is host to many renewable energy projects. The Gansu Huineng New Energy Design and Research Institute received \$50,000 to draft an action plan that would help Gansu province achieve its provincial renewable energy development target. Sichuan University was given \$50,000 to support the development and implementation of MMS policy in Sichuan Province. Tsinghua University Education Foundation received \$50,000 to develop a program that will train provincial government officials in renewable energy policy development and set up a fellowship program for graduate students studying renewable energy. The Energy Research Institute, under the NDRC, received two one year grants. The first grant of \$80,000 went into research and development of strategies that would ensure the stability of China's wind energy market while the second grant of \$120,000 went to aid capacity building of provincial governments in the development and implementation of plans and policies promoting renewable energy development. The second program may have been considered as

extremely important as a further \$180,000 was given to the Center for Resource Solutions, the American agency, with the same objective (Heitz and Wooley, 2006).

On a smaller scale, CREED has also managed to make a difference. Part of the REED series, similar projects can be found in Africa (Africa Rural Energy Enterprises Development – AREED) and Brazil (Brazil Rural Energy Enterprises Development – BREED), with the African project being the most advanced (UNEP, 2003). According to the REED Report, CREED was established after the success of the other two sites. The Yunnan province, the site of CREED, was chosen because of concerns over biodiversity loss in the area rather than energy security, adding to the existing TNC efforts to conserve the biodiversity in the region. CREED, along with its other counterparts, is the result of the partnership of the UNEP, TNC, and E+Co. Though the Chinese government is not an official partner, CREED engages with them as they aim to promote cooperative efforts between the public and private sectors to provide rural clean energy sources. CREED is working with the government to develop understanding and ability to plan and execute programs similar to CREED's. The local government in Yunnan is also cooperating with CREED and several other organizations to give effect on the various components of the plan (CREED, 2004).

As suggested by the name, CREED only focuses on rural areas and is currently only involved in the Yunnan province. However, considering that the majority of urbanization and industrialization is concentrated in the eastern coastal areas of China, CREED's model could be applied elsewhere in the Western provinces, which are rural, poor and especially rich in renewable energy resources. Another strength of CREED is its design as it was built to be sustainable. Funding is given to small and medium sized energy entrepreneurs rather than to the construction of the energy facility or the villagers themselves. The villagers must then get loans from their rural credit cooperatives, which, in turn, get the loan capital from CREED, buy the equipment for renewable energy from the entrepreneurs and from the freed labor, such as fewer hours spent collecting firewood, generate more income and pay back the loan. This creates business for the entrepreneurs who are then able to develop their business and, in the process, make renewable energy more affordable and

accessible. The renewable energy technology involved are mostly simple small units such as solar water heaters, biogas digesters integrated with a greenhouse and micro hydropower generators. The project, which was initiated in early 2004, has had a total budget, as of June 2007, of \$786,550, \$400,000 of which is set as the revolving fund for loans while the rest are operational costs and is expected to reduce consumption by 15,000 to 20,000 cubic meters over the 15 to 20-year life of the installed sustainable energy system (CREED, 2004). Of the six villages chosen as projects sites in the Yunnan province, most have participated actively. Out of 613 households, 574 of them, 93.6%, took energy loans, as CREED only gives out loans to households for that purpose. If the project is expanded, it could cover large areas and help develop many renewable energy enterprises, making the sector stronger and ready for further development. Also, even though rural areas are not heavy consumers of energy as they generally still rely on firewood for fuel and therefore their transition to renewable energy would not make a huge impact on China's energy consumption, improving the livelihoods of people in rural areas would decrease the rate of rural-urban migration and the increased consumption that comes with an urban lifestyle. Furthermore, renewable energy allows rural villages access to electricity that would otherwise have to be connected to the grid, increasing expense for the government and consuming conventional fuels such as coal.

The Chinese government involvement in non-governmental partnerships is much less than in the two previous partnerships as they are not official partners. This does not, however, mean that they are not involved. With CSEP, Chinese government agencies receive grants while others lobby the government for change. As stated earlier, eleven out of the seventeen members of the CSEP Senior Policy Advisory Council are officers or former officers of the Chinese government, indicating a close working relationship with the government on the execution of projects. CSEP projects are policy in nature and would not become actual policies without the approval of the government. In CREED, the Chinese government is not very active as CREED has to initiate any interaction. The local government is, however, much more involved with the process. This is probably the result of the localized nature of the project.

The funding for non-governmental partnerships is entirely dependent on private sources and can result in less funding. The budget of CSEP projects and CREED total approximately \$1.3 million, less than some APPCDC project or CRESP on its own. This is not a negative aspect as it encourages more creative thinking and can result in more sustainable projects as with the CREED program, where the funding is not sunk into buying and building the technology but as seed capital which will aid in the growth of the sector, allowing a more sustainable growth. However, non-governmental partnerships often result in smaller, more localized projects rather than national, most likely due to the smaller budget. Projects that do have national change leverage are generally over policy, which can be an effective approach even with a comparatively small budget.

3.2 Security Through Cooperation

The increase in renewable energy from current projects is sadly not enough to change the contentious energy security measures that China is currently following as renewable energy will need more time to develop before it can contribute in a major way. China cannot possibly stop its controversial energy deals with foreign countries in the near future without compromising its energy security as China would not have enough energy to respond to the increasing demands. There is a possibility of conflict over resources yet the possibility of such a conflict is remote. Initiation of conflict on the part of China is unlikely, considering that China's past record over the use of force was mainly over territorial issues (Feigenbaum, 2004: 6). In addition, China's high economic growth ensures a deep pocket for future oil deals, giving China little incentive to initiate conflict as it can gain access to energy through its current methods.

Initiation of conflict from a foreign power is possible but also unlikely. Conflict over access to oil will most definitely interrupt transportation of global oil, causing global prices to rise as supplies decrease, nullifying the initial reason for conflict. Occupying an oil producing country, as in the case of Iraq, does not ensure lucrative oil deals either, as the US is finding, much to its consternation. Four years

after US troops first entered Iraq, oil deals in Iraq are not given to US companies on a silver platter. On the contrary, US companies are watched much more closely by the international community to ensure that the US government is not unduly interfering with the fledging Iraqi government. As the country goes through the process of recovery, it is finding that the different regions and their population have a hard time reconciling and agreeing on a national law on oil. When Hunt Oil, a US oil company, signed a deal with the government in the Kurdish region in September 2007, the central Iraqi government declared the deal illegal and that such a deal would undermine the government's efforts to come up with a national plan for oil revenue sharing (Fletcher, 2007). The US has, inarguably, the most powerful military force and yet has not been able to successfully use it to increase its access to oil. Other countries with less powerful military capabilities will most surely not seek this option.

Possibility of conflict in human rights abusing regimes will increase as China increases the number of oil deals it has with these countries. As China increases deals, and in the process, increases funds, the resentment of the oppressed groups will grow and eventually target Chinese personnel and property as these people will see that China plays a part in funding the weapons that the government uses to keep them oppressed. China's increased investment in renewable energy will not stop human rights abuses from happening in countries that China has energy deals with. It will, however, provide an incentive for China not to increase investment in the energy sector of those countries and, in the process, not increase the funds to said governments.

China's need for energy will ensure that it continues to rely on conventional fuel for most of its energy needs for the near future. Nevertheless, as long as renewable energy is continually invested in, there is hope that China will come to rely increasingly on renewable energy as renewable energy gains in efficiency and becomes a viable alternative, and thus reduce the possibilities of conflict even further.

International cooperation is key in increasing China's energy security as it can make the progress of renewable energy advance at a more rapid pace. There are many

reasons for the international community to engage in international cooperation over renewable energy in China. Of the various motivations, four stand out the most: energy security, economic reasons, the environment and global security. On the part of energy security, an increase in international cooperation over renewable energy will help China achieve a higher ratio of renewable energy which will help diversify China's fuel source as well as increase domestic supply. A higher ratio of renewable energy will help ensure self-reliance by letting China "keep the initiative in [their] own hands" (Downs, 2006: 11).

From an economic sense, the international community would benefit from China's increased usage of renewable energy as it helps to slow the increasing amounts of energy that China will need over the years. For example, instead of fueling the millions of buses in their cities with oil, continued investment in renewable energy could translate into a fleet of biobutanol, a fuel that burns more efficiently than ethanol but is still in development, powered buses (The Economist, 2007). Considering that most of China's predicted oil demand is expected to come from the rapid increase in vehicle ownership, a shift to new generation biofuels that can be produced domestically could drastically make a difference in China's self-reliance for energy. According to an International Monetary Fund (IMF) projection, by 2030, China's car fleet would surpass the US by a considerable amount, reaching over 387 million (Cornelius and Story, 2007: 10). The rise in vehicles will likely make China more dependent on oil imports with an estimated figure reaching 76 % (Cornelius and Story, 2007: 10). The increase in oil demand will, in a best-case scenario in which oil production continues to accommodate global demand, contribute to a rise in global oil prices while, in a worst-case scenario in which oil production is unable to accommodate global demand, China's gargantuan demand will only increase stress on a limited resource and contribute to even higher oil prices. As all developed countries are dependent on oil for a smooth-running economy, the increase in oil prices will have dramatic repercussions on the global economy. Helping China develop renewable energy resources at a time before energy scarcity becomes an issue will help maintain global economic stability. Waiting for energy to become scarce before investing seriously in renewable energy will be too late as renewable energy

still needs much research and development and cannot, as it is, replace conventional fuels. By increasing cooperation with China, the international community will benefit from a slower rise in oil demand from China, giving the rest of the world time to either increase oil production capabilities or to research alternative fuels of their own.

The environment is another important factor for the rest of the world to become involved in cooperation with China. It is an uncontested fact that China pollutes. As previously stated in Chapter two, coal is China's main energy source and China's coal plants release toxic pollutants that travel as far as the US (Bradsher and Barboza, 2006). China's pollutants therefore not only affect Chinese citizens and US citizens, but also Korea and Japan are some of the other countries that are in the wind path. The carbon released from burning coal also contributes to climate change. Without commitment from China, combating global warming is impossible as China, as of 2007, is the world's biggest CO₂ emitter (Vidal and Adam, 2007). By helping China increase its renewable energy resources, countries can contribute to lowering pollutants in their own countries and slow global warming.

As for the issue of global security, China's connections with countries involved in conflict are a controversial matter. Investment in renewable energy will not sever those ties in the near future, if ever. As stated above, increased involvement in these countries only increases the scale of the conflict as China supplies the government in power with the financial capability to buy more arms, if not straightforward arms deals, and increases the risk of China getting caught in the conflict as China establishes a commercial presence in the area. Cooperation on renewable energy will not solve this problem, but can help prevent China from making more deals with these countries and deepening their connections.

Not only should the international community be keen to engage in cooperation with China, but China itself has many reasons to encourage and develop such cooperative initiatives. China's incentives for cooperating are very similar to the reasons why the international community should cooperate with China. China wants to cooperate to increase its energy security. Renewable energy diversifies its fuel

composition and increases the supply of domestically available fuel and thus reduces dependence on foreign imports. Development of an alternative liquid fuel would help China in its goal of maintaining a low level of dependence on foreign energy imports. Successful cooperation will also help economically, as China will have access to fuel that it produces and be less affected by global oil price fluctuations. Environmentally, China is becoming more acutely aware of the severity of the situation as, according to the World Bank, pollution kills 750,000 people a year in China (McGregor, 2007). An increase in renewable energy would lower the number as renewable energy pollutes less. It would also contribute to the economy, in that, as the pollution lessens and the workers become healthier, they are less likely to take sick days off.

A final reason, one which differs from the previously stated reasons, is China's attempt at cultivating a more positive image. For the first time, China asked Myanmar to "act with restraint" following Myanmar's brutal crackdown on a protest by monks against the regime (CNN, 2007). This can be viewed as a change in policy as China has previously consistently insisted that any such action is within a nation's sovereign rights and any meddling from the international community is impinging on that sovereignty. Increasing its commitment to renewable energy will enhance its image as a responsible superpower. As the biggest carbon emitter, though under no condition to reduce emissions because of its status as a developing country, China is making an effort to curb its contributions to climate change.

While international cooperation over renewable resources has been relatively limited, when compared to the efforts over fossil fuels, China is certainly one of the more active players in the developing world. Though much of the effort has been concentrated on securing access to conventional fuel sources, China, for the reasons stated above, has a large stake in ensuring that renewable energy gains a bigger share of the country's energy composition.

Renewable energy, though it has advanced in leaps and bounds in the past decades, is still a fledgling sector and in need of further investment and research. Investment in this sector has great potential for growth but will need commitment and

time. The cooperative initiatives that are reviewed in this chapter are, on the whole, able to make very little difference in energy contribution and are endowed with a minute amount of financial investment when compared to efforts over conventional fossil fuels. This is partly because renewable energy is seen as a sector still in need of development. Renewable energy is still undergoing changes that make it more efficient and viable. Investment and commitment to renewable energy will increase as the sector becomes more established and as renewables are seen as a viable alternative to fossil fuels. Without investment and commitment, the development of the sector is not possible. The Chinese government, through its commitments in the various partnerships, has shown that it is committed to investing in renewable energy. Although the amount of commitment at this moment is still minor, the potential for growth is as great as the potential for the development of the technology.

The Chinese government has had various levels of involvement in the organizations mentioned. Government partnerships and public-private partnerships are fully engaged in by the Chinese governments while a more hands-off approach is taken with the non-governmental partnerships. This bodes well for future cooperation as it indicates that no matter the type of partnership, China is committed to growth in the renewable energy sector.

China is very interested in what renewable energy has to offer. In 2005, it hosted the Beijing International Renewable Energy Conference (BIREC) which emphasized the global development of renewable energy especially in the context of developing countries. International cooperation initiatives over renewable energy are not limited to the ones cited in the paper. Another international cooperation effort regarding renewable energy sources is the economic influence of the Kyoto treaty to which China is a signatory. While China's environmental policy emphasis has historically been aimed at a move to natural gas to reduce pollutants with local impact such as particulates and sulfur dioxide produced by their heavy use of unwashed coal, the Kyoto treaty provides financial incentives to support renewable energy sources instead of natural gas. Aside from China's commitment to reduce greenhouse gasses



under the treaty, China's designation as a non-industrialized country allows Chinese businesses to profit from the Clean Development Mechanism (CDM) scheme. The CDM scheme allows developed countries to buy credits towards their greenhouse gas reduction obligations from businesses and projects that reduce the greenhouse gas emissions of unindustrialized countries. Non-renewable energy sources are generally heavy producers of carbon dioxide; this is one of the gaseous emissions targeted by the treaty, so replacement with renewable energy sources can produce Certified Emissions Reductions that can be sold to polluting companies in industrialized countries (The Kyoto Protocol, Article 12). Though this scheme is not aimed at improving energy security but at gaining carbon credits, the result is the installation of numerous renewable energy power plants that supply renewable energy to China and increase energy security.

There are currently thousands of projects related to renewable energy in China, counting those initiated by international cooperation and of Chinese origin. According to REN21 2005 Global Status report, China plans to increase its renewable energy sector to 60 GW, up from 37 GW, that is 10% of total electric consumption by 2010 and reaching 15% of China's national energy consumption by 2020 (Biopact, *China unveils*). Though this may seem like a slight increase, considering that China's overall energy consumption increased, on average, by 7.5% each year, as stated earlier, 15% of total energy consumption in 2020 would be a considerable increase. In order to do this, China has entered into multiple international cooperative efforts that have allowed it to formulate new policy that will create a favorable environment for renewable energy.

China is, within developing countries, one of the leaders in renewable technology advancement and actively engages in renewable energy development. It is actively engaged in numerous activities with other governments and organizations to change the policy landscape, build capacity, and initiate new research and development. Considering the favorable changes in policy landscape surrounding renewable energy, and if China is able to fully implement its new renewable energy

law and supporting measures, it should be able to achieve its target and in turn reduce, albeit by a slight amount, its dependence on foreign imports.