Getting Back in the Game

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EXECUTIVE SUMMARY

THE challenges to realizing a secure and sustainable energy future are both significant and pressing. Under current proposals, we are on track for close to 4°C (7.2°F) of warming over the coming century, a threat large enough to be catastrophic (Climate Interactive, 2010). Significantly reducing United States emissions must be a cornerstone of any successful approach, but slowing climate change will occur only with a global response. Three-fourths of the increase in global energy use between now and 2050 is predicted to occur in developing countries. Achieving necessary global emissions reductions will require altering the course of world energy development through widespread clean technology innovation and commercialization.

While these challenges are great, the economic opportunities associated with responding to them are also great. The International Energy Agency (IEA) estimates that responding to climate change could create $27 trillion in market demand for clean technologies in developing countries over the next 50 years. **If US businesses capture a 14% market share in just a subset of this new clean technology market, it would result in up to 850,000 new American jobs.**[1]

Realizing this job creation potential requires two things:

(1) **To maximize and accelerate market development, carefully targeted public finance is critical.** This will create policy environments that enable clean energy demand, reduce risk and leverage private financing.

(2) **The US must adopt a comprehensive climate and energy law putting a declining limit on carbon pollution.** This will deliver a market signal to American companies, mobilizing long-term capital investment and strengthening US competiveness in these new markets.

At present, neither of these key actions has occurred and the result is predictable: A handful of nations are poised to dominate clean technology markets. The US is currently not one of them.

History has shown that early movers have an advantage and it matters where the industries are first established. **In 2009, the United States trailed Europe and China in aggregate clean technology financing and investment and we are losing market share in key regional markets**.

As the largest future market, developing economies present an important opportunity to regain lost ground. By supporting clean energy policies and technology partnerships in developing countries, the US can help lay the foundation for developing countries to leapfrog polluting energy technologies and reduce emissions, while building competitive clean technology markets open to US firms.

Pending US climate legislation has recognized the opportunities created by expanding US clean energy exports to developing country markets. Both the House Waxman-Markey bill and the Senate Kerry-Boxer bill included programs that set aside a modest 1% of emissions allowances for this purpose. **In order to maximize the job creation benefits of any US climate bill and lower costs for American consumers through a more robust global demand for clean technologies, final US energy and climate legislation should set aside similar resources for these purposes.**

Multiple Benefits of Accelerating Clean Energy Markets in Developing Countries

Domestically:

- Potential to create hundreds of thousands of jobs from exports
- New market opportunities for US companies
- Improved trade balance through increased exports
- Lower compliance costs for US firms by securing high-quality offsets
- Lower costs for consumers through greater economies of scale and innovation in clean technologies.

Internationally:

- Deeper global emission reductions to reduce climate impacts at home and abroad
- Increased access to energy and reduced poverty
- Enhanced diplomatic standing by supporting commitments made under the Copenhagen Accord

[1] 14% reflects current US exports in environmental goods and services to developing countries; this analysis considers just four technologies.

Why invest in clean energy markets in the developing world?

In short, developing country markets offer the greatest potential for growth (creating opportunities for expanding US exports) but realizing this potential will require targeted public investments.

Growth in clean technology[2] investment is growing worldwide, largely driven by urgent concerns about climate change, energy security, and the need to revitalize economies. A report by the Pew Charitable Trusts (2010) found that clean energy advanced to a $162 billion global industry in 2009, a more than five-fold increase over 2004. Solar photovoltaics (PV), wind, solar hot water, and biofuels all continued double-digit growth, with solar PV leading in 70% gains in 2008 (REN21, 2009).

Trade in clean technology is the fastest growing area of venture capital, on the order of $8.4 billion in 2008. Although market potential exists throughout the world, the majority of the future investment in clean technologies is predicted to take place in developing countries (CleanTech Group, 2009). The International Energy Agency (IEA) estimates that of the $45 trillion needed in clean technology investments for a 50% reduction in global emissions by 2050, approximately 60% will be in developing countries (IEA, 2008). This potential market of $27 trillion over the next four decades represents an enormous potential for economic growth.

But to realize this great economic potential in developing country markets, policy conditions must change to promote emissions reductions and associated demand for clean energy technologies. These changes have already begun. Under the Copenhagen Accord, negotiated in December 2009, over 100 countries agreed to emissions reduction policies. Many, including China, India, Brazil and South Africa are already implementing policies to fulfill these targets.

These domestic emissions reduction frameworks are critical. But to achieve the full economic potential of these clean energy markets quickly some international public finance is necessary. Especially in the early stages, such assistance will help remove institutional, policy, and technology barriers and create supportive policy environments that will increase the size and certainty of markets for low carbon technologies.[3] This, in turn is fundamental to driving private investment and spurring further innovation (Tomlinson et al, 2008).[4] In most developing countries, insufficient public finance is available to implement these policy frameworks and accelerate both emissions reductions and associated clean energy markets.

Is the US doing enough to grow these markets and tap into their potential to create American jobs?

In a word: no. US market share is declining and other countries are taking the lead.

As clean technology markets grow, several countries, particularly China, Germany, Denmark and Spain, are leading the way; United States investment and market share is lagging. China surged to tie the US in total renewable energy capacity in 2009 while leading total worldwide investments in renewables (Pew Charitable Trusts, 2010). Meanwhile, relative to the size of its economy, the US has fallen behind many other G-20 countries in clean energy investments and fell to 19th place in terms of total clean technology product sales in 2009 per unit of GDP (Pew Charitable Trusts, 2010; Gordan et al, 2010). The Breakthrough Institute (2009) found Japan, Korea, and China alone will out-invest the US in clean energy technologies 3:1 over the next five years, even after taking into account the unprecedented funding in the Recovery Act and possible funding under the House-pass climate bill.

At the same time, US competitiveness is slipping in global trade of clean technologies as market share and economic opportunities go to other countries (Wyden, 2009; REN21, 2009). In today's

[2] The term 'clean technologies' can encompass many sectors and types of technology. At the broadest level, clean technologies include both mitigation and adaptation/climate resilient technologies. Clean technologies for mitigation generally include renewable energy and energy efficiency technologies in the power, industrial, buildings, and transport sectors. This analysis narrows the focus further to quantify only the economic opportunities associated with clean energy technologies deployed in power and transport sectors of developing countries. The economic opportunities presented by the full suite of clean technologies would be even greater.

[3] It is important to note that while China and India are still considered developing countries, both countries have explicitly stated they do not expect to receive any public climate assistance from developed countries. In the context of this analysis, China and India present a significant portion of long-term export opportunities but they will not receive upfront public finance from the US.

[4] See section on capacity building and deployments needs below for more discussion on creating the right enabling environment.

global, interconnected economy, ignoring overseas markets risks forgoing substantial opportunities to manufacture and export clean technologies that can create new American jobs.

The failure to support our own clean technology industries has already allowed other major exporters to capture larger market share. Today, Germany is the largest exporter of environmental goods globally, followed by China and Japan. Meanwhile, the US is the largest import market and demand for renewable energy products is increasingly being met through imports from the European Union and Asia (Wyden, 2009). Globally, only one of the top five wind turbine manufacturers and one of the top 10 solar panel manufacturers are American (Hogan, 2010). According to Senator Ron Wyden's (D-OR) report on trade in environmental goods and services (EGS), the US trade deficit in renewable energy products increased 1,400% to $5.7 billion between 2004 and 2008.

US market share in EGS (which includes clean energy technologies as well other environmental categories) has been declining in the majority of regional markets over the past five years while other countries are seizing the economic opportunities, namely China and many small European countries (Wyden, 2009). In contrast, both Germany and China have increased their market shares in most regional markets over the same period. Chinese presence, in particular, has grown rapidly in Asian and European markets, which make up 71% of total global trade in EGS.

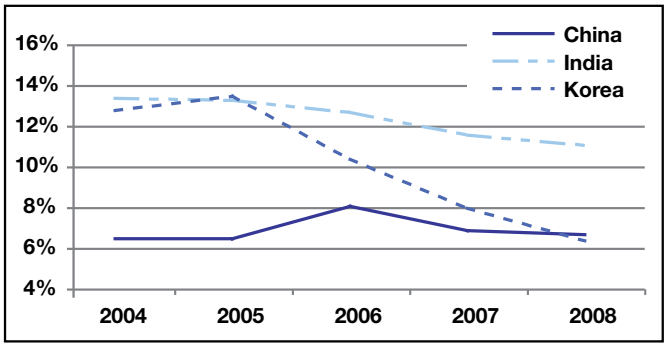
Table 1: Change in Regional Market Shares in EGS for China and the US between 2004 and 2008

	China	US
Africa	+4%	0%
Asia	+11%	-1%
EU	+11%	-1%
Latin America	+5%	+1%
NAFTA partners	+5%	-3%
Middle East	+4%	-1%

Source: Wyden, 2009

Also notable is the fact that the US is being nudged out of the fastest growing import markets, losing 5% in EGS market share in key industrialized countries from 2004 to 2008 (including key EU countries, Japan, Canada and Russia), and an overall 3% drop in China, India and South Korea over the same period (Figure 1) (data from Wyden, 2009).

Figure 1: Declining US Export Share in Environmental Goods and Services in Fastest Growing Developing Country Import Markets (2004-2008)



Source: Wyden, 2009

Getting the US economy back in the game will require two things: First, we need to place a declining limit on carbon pollution at home. This will create incentives for American businesses to innovate and produce the technologies that will be needed to satisfy markets at home and abroad. Second, we need early support for emerging markets in developing countries to help them become booming markets for clean technologies in the years to come.

The economic crisis creates an even greater incentive to revitalize jobs by building new clean energy markets, catalyzing enormous economic opportunities both in the US and internationally. Domestically, investing in clean energy is expected to add a net 1.7 million jobs (Pollin et al, 2009). Internationally, by expanding clean energy markets in developing countries, the US has an opportunity to capture market share in clean technology exports. **This report concludes that by capturing 14%[5] of just one portion of the potential clean technology export market in developing countries (covering 4 technologies), American businesses have the potential to create between 280,000 and 850,000 long-term jobs.** Moreover, greatly increasing the demand for clean technologies will promote increased supply, creating greater economies of scale and lowering costs for American consumers.

[5] A 14% market share matches average recent market share for US companies in the environmental goods and services trade in developing countries (Wyden, 2009)

What Level of Financing Is Needed to Launch Clean Energy Markets in Developing Countries?

While estimates vary, financing in the tens of billions of dollars annually is needed.

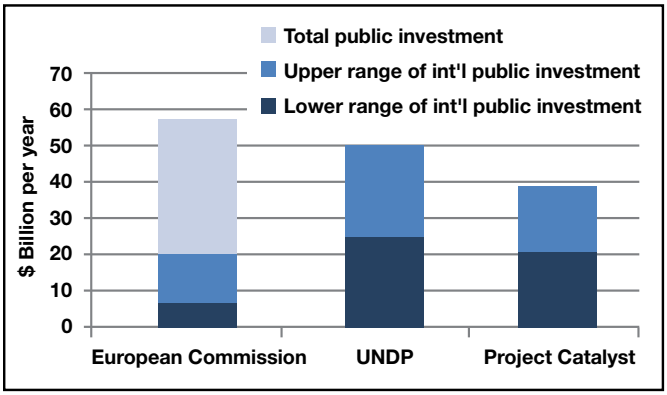
A global market for clean technologies driven by ambitious emissions caps in developed countries is crucial to generate both public and private finance that can stimulate investment in low carbon technologies in developing countries. Project Catalyst (2009b) found that scenarios that are consistent with a 50:50 chance of limiting warming to 2°C (3.6°F) above pre-industrial levels will require developed countries to reduce emissions by a *minimum* of 25% by 2020[6] (producing approximately 8 gigatons (Gt) of reductions through both domestic abatement and international offsets) as well as an additional 9 Gt of abatement to be achieved in developing countries.[7] In order for the 9 Gt of developing country abatement to be "additional" to the amount needed from developed countries, non-carbon market financing through targeted international public finance and private domestic financing will be needed. Targeted public finance will be able to leverage private sector finance, for example, by covering the financing needs for the early uptake of new technologies.

Estimates for the international public finance needed to create enabling environments for dynamic clean technology markets in developing countries vary. Project Catalyst (2009c) estimates that financial flows to achieve 9 Gt in non-carbon market abatement in developing countries to be $77-112 billion per year by 2020. Of this, non land-use based reductions requires about 50-54% of total abatement financing, or $42-56 billion per year.[8] Of that, public financing is estimated to be 50-70% of the early total, or about **$21-39 billion** (estimates derived from Project Catalyst, 2009c; 2009b).

The European Commission (2009) estimates that a total of $46 billion in public finance per year by 2020 would be needed to implement clean technologies in the energy and industrial sectors beyond what the carbon market would likely cover. The Commission assumes that because many energy efficiency measures can generate high financial returns they should be financed domestically, leaving 10-20% in international public support, or about **$4.6-$9.2 billion** per year. International support for capacity building, research cooperation and technology demonstration add an additional $2.8-8.4 billion by 2020. The Human Development Report suggests that **$25-50 billion** per year, through a mix of grants, concessional aid and risk guarantees for investment, would be needed to support low-carbon transitions in developing countries (UNDP, 2007).[9]

Using these estimates, if we assume $40 billion annually is needed in international public investment, a fair US share (25%, based on GDP) would be approximately $10 billion annually.

Figure 2: Annual Public Financing Needed for Clean Technologies in Developing Countries



Source: European Commission, 2009; UNDP, 2007; adapted from Project Catalyst 2009(c). All estimates assume a global emissions reduction target of 50% by 2050.

[6] The Project Catalyst report estimated that a collective 25% reduction would likely result in approximately 5 gigatons (Gt) of domestic abatement plus 3 Gt from international offsets.

[7] The 4th Assessment Report of the Intergovernmental Panel on Climate Change calls for developed countries to reduce emissions at least 25-40% below 1990 levels by 2020. In our view, given recent findings that the IPCC may have underestimated the risks of climate change, and that, at best, a 25% reduction is only a 50% chance of staying within 'safe' temperature limits, developed countries should reduce emissions by an aggregate of 40% below 1990 levels by 2020.

[8] Abatement in developing countries is generally broken down into land-use based emission reductions (forestry and agriculture) and the deployment and dissemination of clean technologies to reduce emissions in all the remaining sectors, including the power, industrial, buildings, transport, and waste sectors.

[9] It's important to keep in mind that clean technology finance estimates often cover different subsets of sectors. For example, the European Commission figure is just for the energy and industrial sectors in developing countries, while the UNDP estimate refers to the entire low carbon transition in developing countries, and the Project Catalyst figures cover all non land-use based sectors.

Of course, under this analysis, necessary public finance levels will depend on the level of ambition in developed country emissions targets. If developed countries fail to bridge the gap between their current emissions reduction pledges and what science requires, they will face increasing pressure to finance additional reductions in developing countries. Lower developed country targets means less carbon market finance because there is less demand for offsets; and the less the carbon market delivers, the higher the demand for public finance for mitigation will be.

Analysis by the European Commission indicates that if developed countries increase their aggregate target to -30% below 1990 emissions levels, $14-28 billion per year by 2020 in international public finance for mitigation in developing countries (including agriculture and forestry abatement) will be required. But if developed world pledges remain at current levels—about -10% below 1990—an additional $168 billion per year in public finance will be required (European Commission, 2009).

How will international public financing be used?

As in America, promoting emissions reductions and incentivizing clean energy deployment in developing countries will require new policies, like renewable energy standards, and greater institutional capacities to implement these policies. Public financing will support these new policy and institutional reforms (and the low carbon action plans that will guide such reform) as well as provide incremental capital to reduce private sector risk in early project development.

Low Carbon Action Plans to Guide Policy and Institutional Reforms

In general, international investment has not been forthcoming largely because many developing countries lack stable policy and institutional frameworks needed to stimulate innovation and private investment. Therefore, accelerating demand for clean energy technologies in developing countries starts with creating an enabling environment for market transformation. There are many types of barriers that impede the entry of clean technologies in developing countries, primarily related to policy and regulatory frameworks, inadequate institutional capacity, lack of access to advanced technologies, weak technical knowledge of implementation and operation, immature delivery methods, and lack of capital to cover the incremental cost of cleaner technologies (Thomlinson et al, 2008; IEA, 2008; NREL; 2008).

To build vibrant markets that will attract significant levels of private finance, international public support should not be narrowly directed towards traditional "technology transfer" but rather towards enabling developing countries to generate their own innovation systems. This means assisting developing countries in implementing policies and institutions which will enhance a country's ability to support, adapt, manage and develop new technologies for use in their economies (Thomlinson et al, 2008; UNFCCC, 2007a).

Low carbon action plans, developed with full government buy-in and consultation with non-governmental interests, including private sector experts, offers an important path to designing this

Table 2: Select policy mechanisms to support the deployment of clean technologies

Clean Energy Policy Mechanism	Description
Renewable Electricity Standard (RES)/ Renewable Portfolio Standard	An RES mandates a percentage of the total power supply to be generated from renewable sources (e.g. 30% renewable electricity by 2020). To increase success, an accompanying tax incentive (such as a production tax credit) can be implemented.
Tax Incentives	Tax incentives can be used to reward installers or generators of clean energy. These can include instruments such as: production tax credits (amount per unit of clean power produced, e.g. 2.1¢ per kWh of wind electricity); investment tax credits (percentage of the installed cost); and other clean energy subsidies.
Feed-in Tariffs (FiT)	These typically offer a guaranteed purchase price for electricity generated from renewable energy sources over a period of time, along with guaranteed access to the grid, long-term contracts, and a minimum purchase price, designed to phase out over time.

How will jumpstarting clean technology markets actually work?

How do we know these approaches can work? Existing networks and partnerships to deploy clean technologies in developing countries provide models for how the US government and other multilateral institutions can help create policy and innovation frameworks. These examples also provide confidence that these investments can work, while recognizing that some programs would have to be substantially scaled up to provide the needed rapid transformative effect.

World Bank's Clean Technology Fund: Financing to Scale-up Private Investments

The multilateral Clean Technology Fund (CTF), partially supported by the US, promotes scaled-up financing for low-carbon technologies in the power and transport sectors by providing positive incentives for clean technology demonstrations, scaling up deployment by funding projects and programs within national low carbon strategies, and furthering international cooperation that facilitates knowledge sharing of experiences and lessons learned.

In one such project, Indonesia has received $400 million in co-financing to support their national goal to increase renewable energy to 17% and improve energy efficiency by 30% by 2025. CTF investments also mobilize financing of up to US$2.7 billion from multilateral financiers, state-owned enterprises, and the private sector to scale up large-scale geothermal power and accelerate initiatives to promote energy efficiency and renewable energy. Specifically, CTF financing will be used to:

(i) mitigate investment risk and provide a hybrid of debt and equity financing with participating state-owned or private commercial banks to increase access to financing for small and medium enterprises and cover the incremental risks of clean energy investments;

(ii) provide direct lending to large end-users of clean energy to reduce the cost of financing;

(iii) include technical/advisory services to help local banks evaluate clean energy projects with the aim to increase the confidence of local banks to jumpstart and mainstream clean energy business opportunities.

The CTF model demonstrates the need for targeted public support for clean technology deployment and examples of how it can be delivered through innovative financing structures and partnerships. However, in executing its programs, the CTF could improve.. A full analysis of the CTF is beyond the scope of this report, but examples of its needed improvements include streamlining developing country access to these funds, funding only truly clean, zero-carbon, new renewables and energy efficiency projects, and improving transparency.

Source: World Bank, 2010

Connecting Clean Energy Projects with Financing

The Private Financing Advisory Network (PFAN), of which USAID is a partner, connects small- and mid-size clean energy developers with international financiers and financial consultants. During the network's initial phase in 2006, 10 projects were selected to receive support, including a small hydroelectric power station in Mexico and a biodiesel refinery in Brazil. The two projects raised a total of **$35 million in private sector investments**. In South Africa, PFAN also supported a project that converts biomass materials to clean fuel pellets for furnaces, **leveraging about $1 million of investment from Sephaku Holdings Ltd.**, a company active in the mining, commodities, and energy sectors in Southern Africa. In addition, over a dozen new projects are currently undergoing initial review and analysis, including a small hydro facility in China, biofuel facilities in Mozambique and Zambia, and waste-to-energy projects in Sri Lanka and South Africa. To further stimulate clean energy investment PFAN also utilizes USAID's financing mechanism, the Development Credit Authority, which uses partial credit guarantees.

Source: Green and Shah, 2009

The International Clean Energy Initiative: A Partnership Model to Revisit

To accelerate the development and deployment of clean energy technologies around the world, President Clinton in 2000 proposed the International Clean Energy Initiative – a $200 million multi-agency effort involving USAID, DOE, the Export-Import Bank, the Trade and Development Agency, and the Department of Commerce.

This initiative aimed to better assist US firms wishing to invest in clean energy projects in developing and transition countries. In doing so, the program sought to encourage public-private partnerships with foreign counterparts to demonstrate clean energy technologies, drive down their cost, and facilitate private sector financing for their large-scale deployment. It also sought to encourage open, competitive markets while protecting public interests. The initiative was to employ a range of proven policy tools, including US technical and policy assistance to developing countries through personnel exchanges, conducting collaborative R&D with key foreign research groups, developing integrated clean technology pilot projects, and providing a range of trade supports to expand clean energy exports. **The Initiative had the goal of doubling clean energy technology exports by 2005, creating as much as $5 billion in new export revenues for US companies and as many as 100,000 new US jobs** along with other more technical goals in reducing emissions and deploying clean technologies.

The program was partially funded for one year. Ten years later we still face the same need to scale up clean technologies and bend the emissions curve. This initiative shows that these concepts are not new or untested. Public-private partnerships can deliver both capacity building in developing countries and help domestic industries capture new market opportunities.

Source: International Clean Energy Initiative, 2000

type of country-specific policy framework that removes barriers to low carbon investment and supports innovation. However, developing country governments often lack the resources and capacity to develop these plans and implement them without some upfront international public finance.

To operationalize low carbon action plans, public finance will be used to support policy reforms and institutions that favor low carbon technologies over carbon-intensive ones, such as public R&D support, purchasing policies, and direct support to overcome the incremental cost of policies that will create movement towards low carbon options at the sectoral level (Project Catalyst, 2009a). Direct support can include subsidies/grants, rebates, loan guarantees, renewable energy standards and tax incentives, for example (see Table 2 at bottom of page 5 for explanation of a few example mechanisms).

Attracting technology financing and technology transfer also requires improving the functioning of basic market institutions, including improved governance of financial markets, competition policies, simplification of business procedures, property rights reforms, labor market reforms, etc. (IEA, 2008). Here, transfer of developed country lessons and successful policies, while helping developing countries tailor these to specific circumstances can be particularly instrumental.

Public Finance to Catalyze Private Capital Investment

In addition to domestic policy support and capacity building, capital support is needed to overcome limited access to capital because of various investment risks. Both traditional models of concessional debt and innovative financing mechanisms could help overcome policy and country risks that affect the availability of private sector capital and increase project costs (Project Catalyst, 2009a). One such innovative mechanism includes debt guarantees for certain types of risk, for example, to cover policy risks during the construction phase of projects supported by feed-in tariffs. Innovative approaches such as this will be important to improve project finance structures so that they attract greater amounts of private investment (ibid).

Cooperative country-to-country agreements, including public-private partnerships, will also play an important role in supporting investment and furthering innovation. Technology-driven sectoral agreements to incentivize and facilitate technology uptake by fostering research, development and deployment capabilities are advantageous because they can speed up learning and address multiple barriers by enabling mitigation actions along the full innovation chain; for example, through renewable energy standards, niche market zero-carbon building standards, and supply chain creation (Thomlinson

Table 3: Key areas for supporting uptake of clean technologies

Policy and Investment Frameworks	• Assitance in establishing frameworks and low carbon action plans (LCAPs) to attract further public and private sector investments and technology transfer. • Implementing policy reforms, including feed-in tariffs, mandates or tax breaks; improved regulatory frameworks; and more effective financial markets. • Reducing investment risks for the privatge sector and improving access to capital through innovative mechanisms such as debt guarantees.
Institutional Capacity Building	• Improve the capacity of a range of institutions, including government ministries/agencies, research centers, trade associations, and civil society, to enhance strategic planning ability and technical capabilities, including monitoring, reporting and verification (MRV) techniques. • These institutions are essential to collectively enforce policy and develop, manage, and adapt technologies to local conditions.
Technology Cooperation and Transfer	• Cooperative partnerships to share knowledge and best practices will facilitate learning as well as develop the tacit knowledge needed to continue deployment and dissemination without support. • Technology transfer schemes that focus on cooperative research and development and demonstration projects such as building a network of innovation centers, and exchange programs, including partnering with the private sector, donor countries and international institutions.

Sources: IEA, 2008; Project Catalyst, 2009a; Thomlinson et al, 2008; UNFCCC, 2007a

et al, 2008). Such joint ventures can also provide a platform to develop two-way sharing of knowledge and best practices across countries, establishing the groundwork for long-term collaborative relationships. Similarly, public-private partnerships offer an adaptable approach to overcoming barriers in the marketplace and can facilitate coordination at all levels of government.

Public private partnerships also provide an important opportunity for the US to position itself to capture market share. By involving the private sector in market-building partnerships designed to address challenges throughout the value chain, US firms have opportunities to establish in-country connections and trusted relationships with host governments, procurement programs, technology vendors, trade groups, researchers, etc. This type of collaboration helps partners navigate the domestic system and could help facilitate further joint venture partnerships with US investors, service companies, manufacturers.

What are the economic rewards for providing public finance to expand clean energy markets?

The clean energy market potential within developing countries is enormous. If we invest small amounts of public money, we can maximize this potential. By passing comprehensive clean energy and climate legislation we can position US companies to capture a substantial share of this market. Examining only a limited segment of this market (4 clean technologies), increased US exports could result in approximately 280,000-850,000 new American jobs.

The IEA estimates that to cut global emissions in half by 2050, $27 trillion will need to be invested in developing countries to transition to low carbon sources of energy. Assuming the level of investment over the next four decades matches these levels, developing countries together present a total investment market of $600 billion per year. If half the total investments in developing countries are open to imports and the US is able to capture just 14% of the export market—on par with our current global export share for environmental goods and services—this report finds that **approximately 280,000-850,000 jobs could be created in the US**. This is based on the analysis of the export of just four clean energy technologies: smart grid equipment, mass transit (rail cars, buses, etc.), wind turbines and solar PV. These technologies represent just a slice of a large suite of clean energy and climate resilient technologies in multiple sectors, from industrial efficiency technologies and other renewables to sustainable materials and water management technologies. This estimate is consistent with other studies that have looked at job creation potential (NREL 2008; Pollin et al, 2009).

Job creation calculations, based on analysis in *Pollin et al (2009)*, assume that 13.5 jobs will be created for each $1 million in exports in the above four clean technologies. *The manufacture of clean technologies for export to developing countries would require a range of skilled and manufacturing workers including: engineers, iron and steel workers, millwrights, sheet metal workers, machinists, electrical equipment assemblers, welders, metal fabricators, technicians, and production supervisors.*[10] Job estimates also include indirect jobs—jobs created throughout product supply chains—and induced effects from the additional spending that occurs in the economy from newly employed workers. Moreover, direct and indirect job creation for the four clean technologies included in this analysis create more jobs per $1 million investment than jobs created relative to the oil, natural gas, or coal industries (Pollin et al, 2009).[11]

Are there other reasons for these public investments?

Yes. In addition to job creation benefits, these public investments will help (1) promote further economies of scale in clean technologies industries, reducing costs for all consumers; (2) reduce global emissions which in turn will reduce climate impacts here at home and around the world; (3) satisfy US commitments made under the Copenhagen Accord and other international treaties; (4) increase exports which will reduce the

[10] Methodology: WWF assumes that of annual clean technology investments estimated by the IEA ($600 billion/yr) to be made in developing countries in coming decades, 25%-75% of these investments could be open to clean technology exports. Of that, if the US maintains its current average EGS export market share in developing countries at 14%, expanded US exports would be worth $21-63 billion per year. Adapting clean energy job creation estimates per $1 million investment, developed in *R. Pollin et al (June 2009)*, commissioned by the Center for American Progress, a $21-63 billion annual clean technology export market would yield between 280,000-850,000 jobs. PERI's job figures were designed for domestic job creation so in this analysis only technologies and jobs associated with exports were counted, leaving an unweighted estimate of 13.5 jobs created per $1 million investment for the export of four technologies.

[11] Green jobs to produce clean exports cost approximately $75,000 per job versus an average of $204,000-$270,000 per job in the oil, natural gas, and coal sectors. (Pollin et al, 2009).

The National Renewable Energy Laboratory has estimated the economic benefits from increasing clean energy technology cooperation globally.

- Direct economic benefits to the US resulting from increased adoption of US technologies internationally include:
- Up to $40 billion per year in increased clean energy technology exports, generating 250,000-750,000 new jobs by 2020;
- $10-50 billion in savings per year by 2020 from reduced oil import costs as result of decreasing oil prices and declining demand for oil;
- $25 billion annually in benefits from an improved trade balance and a stronger dollar, resulting from both increased clean technology exports and reduced oil expenditures.

Source: NREL, 2008

US trade deficit and strengthen the US dollar.

Ultimately, the deployment of clean technologies not only provides economic opportunities but it lies at the heart of solving the climate crisis. Meeting the goal of keeping global average temperature increases below 2°C requires rapid and broad innovation and dissemination of new, clean technologies worldwide to reduce global emissions by 80% or more by mid-century.

These investments also are needed to meet US obligations under international treaties and agreements. In Copenhagen, the US pledged to contribute its fair share of $100 billion in annual financing by 2020 to develop and disseminate clean technologies in developing countries, alongside other mitigation and adaptation priorities. Meeting that commitment is important to enhancing US diplomatic standing by building trust and showing that America keeps its promises.

Furthermore, increased clean technology deployment, by shifting energy demand to cleaner energy sources, will not only reduce pressure on oil prices (see inset box) but also contribute to reducing climate impacts and improving the resiliency of developing countries to deal with climate change. This will be vital to US national security and protecting the supply chains of many US companies whose operations overseas are already being affected by climate change.

In the longer term, stimulating clean technology markets will enhance technological learning which will reduce the cost of technologies for all consumers. A vibrant global clean technology market that encourages innovation also increases the chance that breakthrough technologies emerge which can lower the costs of mitigation.

Finally, building developing country capacities and promoting deeper emissions reduction can help produce a steady supply of high-quality offsets for purchase by US firms, lowering compliance costs for US companies under a carbon cap.

Why is the climate bill the appropriate place to finance these investments?

Setting aside revenues from a US pollution permitting program to finance these clean technology markets is good policy and good politics. The need for these policies and investments is driven by the risks of climate change, as well as the market opportunities this challenge creates. The US has a long history and broad political support for the "polluter pays principle." Using a small portion of polluter permit revenues for this purpose is consistent with this long-standing policy.

Moreover, the kind of sector transformation and development of policy frameworks discussed in this paper cannot be achieved through one-off projects and uncertain annual appropriations. A predictable stream of financing is necessary to create confidence in the governments that are taking the leap toward significant policy reforms as well as in private sector investors helping to shape the new economy. A climate bill provides an option for such predictable financing.

Climate bills in the House and Senate have recognized the importance of these public investments and the wisdom of including them in US climate framework. Both the House's American Clean Energy and Security Act (H.R. 2454) and the Senate's Clean Energy Jobs and American Power Act (S. 1733) contain specific provisions implementing the policies discussed in this paper. Unfortunately, in contrast to the international public financing needs discussed above, both bills

allocate only 1% of allowances per year by 2020. Despite insufficient funding levels, the frameworks created in these bills are generally sound and vital to the job creation potential of any US climate bill.

The programs in both the House and Senate bills are substantively similar:

- All investments must be approved by a cabinet-level task force chaired by the Secretary of State and with the involvement of the Secretary of Energy, the Administrator of USAID and the Secretary of Commerce, among others.
- Any funded activity must meet eligibility criteria including requirements for co-financing that maximize opportunities to leverage other financial support, including private investment.
- Funding must be deployed in a way that protects intellectual property rights (IPR).
- Funded activities that have the potential to produce national or sector-wide transformation and wide-scale emissions reductions will be prioritized.
- The bills identify a broad list of potentially qualifying activities, including deployment of clean technologies facing financial or other market barriers, policy reforms and other technical and institutional capacity improvements designed to promote clean technology markets.

Although modest in length and funding commitments, this program would help to realize the full potential for unlocking clean energy markets in developing countries. In doing so, it would be an integral component of the job creating engine of US climate policy. Without it, we will leave hundreds of thousands of jobs uncreated, fail to reduce compliance costs for US industry, and ignore opportunities to reduce the price of clean technologies for the benefit of consumers everywhere. Some might say we cannot afford these modest investments; this report shows we cannot afford to proceed without them.

Key Conclusions:

- The US is being out-competed by early movers, particularly in Europe and Asia, who are positioning themselves to capture market opportunities and revitalize their economies. America is falling behind both in terms of export share and domestic investment in our own clean technology industries.
- In recapturing a leading role, the US cannot afford to ignore some of the most important and sizeable markets – developing countries. These countries present significant opportunities for clean technologies as they transition to low carbon growth pathways, which most have agreed to do domestically and through the Copenhagen Accord.
- To take full advantage of the economic and emissions reduction potential of developing country emerging markets, international public finance is crucial.
- Public financing to create and expand markets for clean and climate resilient technologies and services would spur further private sector investments, innovation, and job growth in the US through increased clean technology exports.
- Collaborative technology relationships with developing countries not only accelerate the uptake of cleaner technologies along with export opportunities, but provide opportunities for innovation and learning on both sides, creating a stronger market and the international cooperation needed to fight climate change.
- Increasing the size and certainty of the global market for clean technologies will be essential to pull innovative technologies into the marketplace. By providing international finance, we also help to improve our standing in the world, promote global cooperation on climate change; and with increased scale in global carbon markets, prospects for cost decreases improve with greater learning and innovation.
- A comprehensive climate and energy law that creates a strong price signal for US companies is vital to combating a declining US market share in clean technologies and to ensure that US companies can be globally competitive and take advantage of new and expanded global markets for these technologies.

References

Dechezleprêtre, A. et al., (February 2009). *Invention and Transfer of Climate Change Mitigation Technologies on a Global Scale: A Study Drawing on Patent Data.* CERNA, Mines Paris Tech, February 2009). Available at http://www.cerna.ensmp.fr/images/stories/fnal_report_090224.pdf.

CleanTech Group, 2009. *Clean technology venture investment reaches record $8.4 billion in 2008 despite credit crisis and broadening recession.* Press Release. Available at: http://cleantech.com/about/pressreleases/010609.cfm

Climate Interactive, 2010. Climate Scoreboard. Available at: http://climateinteractive.org/

CSRwire, 24 September 2009. *U.S.-China Public-Private Partnership to Green the Supply Chain*. CSR Press Release. Available at: http://www.csrwire.com/press/press_release/27734-U-S-China-Public-Private-Partnership-to-Green-the-Supply-Chain

Tomlinson et al, 2008. *Innovation and Technology Transfer. A Framework for a Global Deal*. Third Generation Environmentalism (E3G), London.

European Commission, 2009. *Stepping up international climate finance: A European blueprint for the Copenhagen deal.* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, October 9, 2009

Green and Shah, October 2009. *Developing Countries Get Financing for Clean Energy*. Frontlines. United States Agency for International Development. Available at: http://www.usaid.gov/press/frontlines/fl_oct09/p14_energy091028.html

Gordan et al, March 2010. *Out of the Running: How Germany, Spain and China are Seizing the Energy Opportunity and the United States Risks Getting Left Behind.* Center for American Progress, Washington.

Hogan, P., 11 March 2010. *Breaking the Ice on U.S. Clean Energy Opportunities*. Climate Compass: The Blog of the Pew Center on Global Climate Change. Available at: http://www.pewclimate.org/blog/hoganp/breaking-ice-us-clean-energy-opportunities

IEA, 2008. *Energy Technology Perspectives*. International Energy Agency, Paris.

International Clean Energy Initiative, 3 February 2009. Press Release. Office of the White House Press Secretary. Available at: http://clinton5.nara.gov/textonly/WH/EOP/OSTP/html/0029_2.html

NREL, 2008. *Strengthening US Leadership of International Clean Energy Cooperation. Proceedings of Stakeholder Consultations.* National Renewable Energy Laboratory, Golden, CO.

Pew Charitable Trusts, 2010. *Who's Winning the Clean Energy Race? Growth, Competition and Opportunities in the World's Largest Economies*, Washington. Available at: http://www.pewglobalwarming.org/cleanenergyeconomy/pdf/PewG-20Report.pdf

Project Catalyst, 2009a. *Potential uses of 'fast start' funding in 2010-12. Briefing Paper, 2009*. Available at: http://www.project-catalyst.info/index.php?option=com_content&view=article&id=92&Itemid=74

Project Catalyst, 2009b. *Project Catalyst Brief: Financing Needs.* Available at: http://www.project-catalyst.info/index.php?option=com_content&view=article&id=92&Itemid=74

Project Catalyst, 2009c. *Scaling up Climate Finance. Finance Briefing Paper,* September 2009. Available at: http://www.project-catalyst.info/index.php?option=com_content&view=article&id=92&Itemid=74

R. Pollin, et al., June 2009. *The Economic Benefits of Investing in Clean Energy*. Department of Economics and Political Economy (PERI), University of Massachusetts, Amherst. Commissioned by the Center for American Progress.

UNFCCC, 2007a. *Expert Group on Technology Transfer: Five Years of Work*. United Nations Framework Convention on Climate Change, Climate Change Secretariat, Bonn.

UNFCCC, 2007b. *Investment and Financial Flows to Address Climate Change*. Climate Change Secretariat, Bonn. Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/application/pdf/background_paper.pdf

World Bank, 18 February 2010. *Clean Technology Investment Plan for Indonesia*. Available at: http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF%20Investment%20Plan%20for%20Indonesia2.pdf

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