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New policy approaches are key to attracting massive private capital needed to scale up renewable energy

Governments should consider scaling up of renewable energy as part of their robust economic development strategy, rather than as an environmental strategy with the secondary benefits of job creation. Such an approach is fundamental for attracting new private-sector investment to finance renewable projects at a scale that is needed to address climate change. Proven mechanisms should not be abandoned, but new policies have to target ways to reduce the risk-to-reward ratio in order to enhance private sector investor confidence for investment in large scale renewable energy.

These are the main conclusions and recommendations from the report '*Strategies To Finance Large-Scale Deployment Of Renewable Energy Projects: An Economic Development And Infrastructure Approach*', a report authored by Clean Energy Group, commissioned by IEA-RETD (Renewable Energy Technology Deployment). IEA-RETD is a cooperation of nine countries under the umbrella of the International Energy Agency IEA.

> *Matthew Kennedy, IEA-RETD co-chair: "This report concludes that governments need to consider new and more innovative approaches to address the challenge of scaling up finance for the deployment and delivery of large-scale renewable energy projects in the short term."*

Making the switch to large scale renewable energy systems will require the significant investment with magnitudes in trillions of dollars. The necessary transformation is on the scale of the information technology revolution of the past three decades.

Renewable energy investments are on a growth trajectory, reflected by $ 243 billion of globally CAPEX in 2009. However, these recent figures do not reflect international consensus among many policymakers on the future levels of investment required to finance the large scale deployment of renewable energy technologies to address climate change risks. Such commitments have been made all the more difficult in the current financial crisis.

However, the level of capital is available with new, conventional investors, but only on terms that are within their investment parameters. Governments have an important role in providing the right conditions. Simply scaling up of public subsidies is not a viable solution.

Policies should specifically reduce the technical, institutional, policy risks associated with renewable energy technologies and, at the same time, increase the profit potential of these investments. An economic and infrastructure systems-approach is required.

The report highlights the menu of options for policy and decision makers, focusing on the years up to 2015. Some major recommendations are:

- Build local markets for a country's renewable energy products.
- Fill identified gaps in industry value chains such as manufacturing support or workforce development.
- Institutionalize – e.g. with an investment bank - the functions to manage the economic development, finance mechanisms, and technology innovation.
- Create investment incentives that will attract investments from new pools, e.g. corporations.
- Consider creation of 'green bonds'.
- Increase private and public research and development in renewable energy technologies.
- Combine feed-in tariffs (FITs), national tax credit schemes, and mandatory renewable procurement for utilities into successful instruments.
- Public procurement of renewable energy and mandatory use of renewable technologies in new buildings are possible 'quick wins' in policies.
- Establish the 'emerging technology renewable auction mechanism' (ET-RAM) that requires local utilities to procure renewable energy project outputs from specific technology classes. This would be a driver for innovative renewable energy technologies to enter the market.

In the phase 2016-2020 policies have to build on these experiences, stimulating reinvestment and attracting even more cautious investors. In the period 2020-2050 a fully formed 'infrastructure investment' portfolio will continue along the new renewable energy economy path, producing jobs, wealth, and environmental benefits.

The report can be downloaded at:
http://iea-retd.org/publications

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EXECUTIVE SUMMARY

There appears to be universal global consensus among many policymakers that trillions of dollars of new investment must be raised to finance the massive deployment of clean energy technologies to address climate change risks. While undoubtedly some results can be gained from energy conservation and efficiency, there remains an unavoidable need for new energy generation. The absolute amounts of funding for financing large-scale deployments of renewable energy projects remain significantly larger than the levels invested to date.

Despite the dire need for high levels of finance for future large-scale deployments of renewable energy, neither the funds nor any convincing mechanisms to produce them in these needed amounts have been forthcoming from the public- or the private-sector. Such massive financial commitments have been made all the more difficult in the current financial crisis, with historic budget deficits in OECD countries.

The fact of the matter is that the level of capital is available if new conventional, investors are brought into the clean energy space on terms that are within their investment parameters. But new approaches are required in order to access, attract, and direct those funds for the benefit of building a clean energy infrastructure.

Over the past two decades, governments have learned a lot about effective clean energy finance mechanisms, which has helped achieve the current levels of renewable energy deployments. There is no need to abandon these proven mechanisms. However, to date, existing mechanisms have failed to sufficiently reduce the risk-to-reward ratio enough to give private-sector investors sufficient profit levels and confidence in clean energy opportunities for the game-changing investment levels needed for the future.

Therefore, new approaches to scale up financing for the acceleration of clean energy investment are needed—approaches that answer the following questions:

- What's holding back both public and private investors?
- What actions could policymakers and the private sector take to spur higher levels of investments into the clean energy sector?
- What fundamental change—such as national clean energy economic development plans—will appeal to all political persuasions to gain rapid consensus for new and effective policies?
- Is it possible to develop cheaper, innovative technologies that can achieve a scale-up of clean energy with much lower incremental costs?

The world is faced with the challenge to secure sufficient investment to achieve the scale of deployments that will drive down costs and, in turn, attract increased investment levels. The solution is unlikely to be action to simply to scale up more of the same public subsidies— an unviable option with many countries facing unprecedented national deficits.

Rather, a possible alternative path forward could come from combining existing support mechanisms with new public finance measures that are now used to finance infrastructure like roads, bridges and other public projects. These new measures could require new policies and establishment of new funding institutions like public national clean energy investment banks.

To be successful, new financial mechanisms must be structured to reduce the burden on highly leveraged public-sector budgets while providing sufficient returns to conventional private-sector investors. The plan to achieve this over the next few years must be an integrated one. It must bring together economic development, finance, innovation and energy policies.

To develop such an approach, it is important to understand the larger technology and finance context. The financing challenge is only one part of a massive technological transition needed to shift the global economy away from its dependence on high-carbon energy. The necessary transformation is on the scale of the information technology (IT) revolution of the past three decades, but it will be even more complex. This is because, unlike IT, energy technologies are embedded within a capital-intensive, highly networked infrastructure system with powerful incumbent interests. From an investor's perspective in this environment, financing clean energy technology means more risk, higher capital costs, longer timeframes, and uncertain rewards.

These factors -- and the lack of allocated capital to finance the development of new technology with new risks from proof of concept to commercial deployment, known as the "valley of death"-- are only a few of the technological and competitive problems making scale-up difficult.

In addition, there are some well known market failures that further complicate this financing problem: carbon and other emissions are mostly un-priced making renewable technology currently more costly as compared to incumbent generating technologies that free ride on externalized pollution and health impacts; innovation is hindered through "spillover effects"; infrastructure is a public good with reduced incentives for private investment; and intermittent renewable energy requires complementary investments in energy storage and related technologies to make deployment of renewable power economical at-scale.

In this context, a fundamental task for public finance and policy is to improve the clean energy investment risk-to-reward ratio needed to entice private investors.[i] The risk-to-reward ratio is a comparison of how much money an investment could lose compared to its profit potential. To encourage private investors to direct capital into clean energy technologies, governments have an important role to reduce the risks associated with clean energy technologies (technical, institutional, policy) and, at the same time, increase the profit potential of these investments.

Governments have a critical role to play in reducing clean energy technology risks while simultaneously making the returns sufficiently attractive for private investors.

Investors have different comfort levels that match the wide range of risks and rewards. Venture capitalists take on high risk for the expectation of high returns. On the other hand, institutional investors, such as pension funds, look for lower-risk investments with reliable lower returns—for example, infrastructure bonds.

In order to better align these conventional investor needs with the funds that are required for financing large-scale deployment of renewable energy projects, other questions arise:

- Which policies can influence clean energy infrastructure investments to perform like (or better than) traditional infrastructure, industrial, and municipal bonds?
- What kinds of policies will reduce risk and generate competitive returns for clean energy?

- Are existing investment institutions sufficient or should new institutions help restore investor confidence where it has been eroded by a history of changing or short-term policies?

Framed in this way, in order to solve the finance problem, policymakers must consider taking a host of non-finance as well as finance-based actions as a package of integrated solutions.

Clean energy is no longer simply an environmental strategy but is part of an economic development strategy.

It is important to understand the non-financial circumstances that will help mobilize the capital markets. Clean energy is no longer simply an environmental strategy. It is now an economic development strategy gaining interest across the globe, one that could help lift the world out of the economic downturn or, in the case of countries unaffected by it, provide a new market strategy for growth and poverty alleviation.

The public sector has begun to do its share. Today, the accumulated public finance investments in the clean energy sector demonstrate that governments have an increasing stake in commercial success of the renewable energy market. Global clean energy investment reached a level of USD 243 billion (Euro 174 billion) in 2009. However, much of that was from China and other countries offering a massive, one-time stimulus package to spark the industry.[ii]

Consider viewing the clean energy challenge as a 50-plus year infra-structure–building exercise.

But public funding is not enough. The major task for governments and the private sector is to conceive of the clean energy challenge as an infrastructure-building exercise for the next thirty to fifty years. This challenge will require a set of many tools that were employed by industrial economies over the last century to build out the existing transportation, telecommunication, and energy infrastructure systems that dominate today. Of course, many of these systems have produced other environmental and social problems, but it is unquestionable that these systems achieved the kind of scale that is desired for the renewable energy sector.

The four strategies (economic development, financial innovation and mechanisms, technology innovation support mechanisms, and public policies) require new institutional structures.

These infrastructure systems relied on at least four kinds of targeted public and private approaches to achieve their unprecedented dominance. They include:

- *Economic development policies* to address and link the many actors throughout the economic system, using: “innovation economics” to create incentives, overcome institutional barriers and build the case for a large scale technological transition. Our current forms of embedded infrastructure (rail, road, water, gas and electricity) have been spurred by economic development and competitiveness as drivers for their investments.
- *Financial innovation and mechanisms* that made it possible for a diverse range of private investors to obtain safe and predictable returns because of public interventions that reduced investor risk and created stable investment environments, and thereby made trillions of dollars in capital available for major infrastructure investments.
- *Technology innovation strategies* that drove cost reductions and performance improvements in new technologies and crucial enabling technologies that created and supported the integration of new infrastructures into mainstream society.

- *Enabling energy policies* that mandated investments in infrastructure created a stable investment demand that gave investors confidence to invest based on a predictable, long-term returns horizon.

In short, an economic and infrastructure systems-approach made it possible for societies to scale up major technological transitions throughout history. It is the way built infrastructure becomes culturally dominant.

It is also the way that clean energy must evolve for it to achieve scale and technological dominance.

Then, this proposed new vision builds on established successes from which new are developed and incorporated. This is usually how progress is made—a combination of emerging disruptive approaches blended with those that are proven.

In line with historical successes in these other areas, it would put economic development at the forefront for developing national clean energy infrastructure approaches. This contrasts with many current strategies that see economic development merely as a secondary benefit from deployment of clean renewable energy projects. Seen in this different way, a national clean energy, economic development initiative will require the integration of finance, innovation, and policy**.**

Framed in this way, certain strategies should be considered:

- Recast public support around a national, economic-development initiative, whereby investment in a new energy infrastructure could produce both short term returns in the form of jobs and wealth creation, as well as the longer-term advantage of putting clean energy at the forefront of economic competitiveness.
- Design policies to improve the risk-to-reward ratio, which would decrease risk and increasing profit potential for private investors, thus providing sufficient and reliable long-term returns.
- Make investment in new energy infrastructure as attractive as investments in non-energy infrastructure such as broadband, airports, and municipalities, and provide an array of new investment opportunities for conventional investors that control the bulk of private capital in most countries.

The body of this report highlights the menu of options for each of the core strategies, which will have to match to the unique circumstances of each nation. The infrastructure building challenge is not limited to a single country. The challenge is universal, and nations are likely to consider technologies that match their natural resources.

Each section of the report provides specific, relevant recommendations, which are proposed based on proven practices and emerging ideas from the OECD and non-OECD countries. While there is urgency to make an immediate impact of enormous scale for the benefit of the planet's environment and to meet national as well as regionally agreed goals, some of the recommended solutions are complex and will take time to build.

However, we should not despair at the size or scale of the task as societies have performed similar undertakings in the past. Perhaps in some ways, we are better equipped than earlier generations to

make this transition as we have the benefit of history, combined with newly available technology. This should enable us well to plan and take incremental steps that will create long-term success to transition to a new, sustainable energy infrastructure.

The recommendations of this report are intended for the immediate short-term period (present-2015) and are given so that national governments can adopt them quickly as initial steps in attaining the solutions proposed in this report. This could be seen as the "stand up" period when new economic development strategies, finance, technology innovation, and policies are put in place in an integrated manner to support the build-out of the new, renewable energy infrastructure.

A summary of the recommendations for each solution set is detailed below:

Economic Development

Policies should support clear national economic development strategies that can attract step-change levels of capital to invest in a new clean energy economy. Infrastructure investment offers the economic development potential for nations to grow their economies. These policies could include:

- Fill identified gaps in various technology industry value chains such as manufacturing support, workforce development, and supply chain mapping.
- Create high-tech, clean energy clusters that optimize productivity by co-locating different links of the supply chain and factors of production (supply of different components and a skilled work force). Regional governments could administer the clusters and provide appropriate financial support mechanisms such as grants, tax breaks, and discounted land to attract industry.
- Build local markets for a country's clean energy products.
- Bolster business enterprises specializing in overseas resources development that seek cooperative green-growth endeavors abroad.

Finance

A country could look to build a robust clean energy infrastructure that highly leverages public funds to achieve national goals by attracting high amounts of private capital investment. These policies and practices should include:

- Institutionalize (possibly under a new structure such as an investment bank) the functions to promote, integrate, coordinate, or manage the economic development, finance mechanisms, and technology innovation required for massive clean energy technology deployment.
- Create investment incentives with reassurances that will attract funds from new and wider range of well-resourced investment pools—including profitable corporations (using appropriately designed tax incentives).
- Explore the creation of "green bonds" to provide long-term, widespread capital for renewable infrastructure projects.
- Align investment reduced risk-to-reward ratio clean energy opportunities and appropriate returns.

Innovation

Countries might adopt and support technology innovation programs to:

- Increase private and public research and development in renewable energy technologies.
- Use "systems innovation" to increase innovation all along the technology development value chain—from lab to product development, to business and finance models.
- Use "open and distribution" innovation to tap the dispersed, global talent and collaborate across institutions because of the evolution of Internet tools and "open innovation" companies that link seekers and solvers on particular product development challenges to supplement in-house research and accelerate the technology development cycle.
- Look to "reverse innovation" strategies and partnerships—designing, creating, and manufacturing climate technology products in partnership with developing countries to make them less expensive and then later adapt and export them to OECD countries.

Enabling Energy Policies and Mandates

Countries could consider a host of technology push and pull demand strategies and policies to support the scale-up of existing technologies and increase support for emerging technologies. These policies could:

- Adopt a combination of either or both national or sub-national feed-in tariffs (FITs) or national tax credit schemes, combined with mandatory renewable procurement for utilities, to achieve much greater penetration of renewable power into the existing generation mixes of those countries.
- Mandate more public procurement of renewable power from national governmental agencies such as defense which are often the largest consumers of energy with enormous procurement power.
- Implement mandatory use of renewable technologies in new buildings to reduce demand on already stressed national grids.
- Encourage more technology turn-over and avoid technology lock-in. Using a leasing-type model where a developer does not sell the technology but retains ownership of the project and leases the technology for a long term contract rate that is comparable to the regular price of electricity.
- Address "Valley of Death" commercialization gaps by putting in place an "emerging technology renewable auction mechanism" (ET-RAM) that would require locally regulated utilities to procure clean energy project outputs from specific technology classes up to a predetermined cost limit, at guaranteed prices competitively bid by the winning developers; such a mechanism would be designed to overcome the concerns about available demand and price levels that typically face efforts to finance emerging technologies.

Of course, this is not the end of the story and more work will follow. A second phase (2016-2020) would incorporate and advance the demonstrated positive results from the earlier deployments of large-scale renewable energy projects. Initial investment returns would then be reinvested for subsequent deployments, with the results designed to gain the attention and confidence of more cautious investors. With each recycling of capital, the levels of funding will increase. In other words, the results from the efforts in the first phase would become apparent, which in turn could increase investment in the next.

The next generation of policies and programs would be devised to build on the first-generation, integrated strategies so that a fully formed "infrastructure investment" portfolio would drive new clean energy investment for the next half century (2020-2050).

This report intends to provide recommended steps to countries that have started and can advance along this new clean energy economy path. It is a promising direction for the 21st century infrastructure creation that could produce jobs, wealth, and environmental benefits through proven public and private investment structures and strategies.

[i] Risk/Reward ratio is a ratio used by many investors to compare the expected returns of an investment to the amount of risk undertaken to capture these returns. This ratio is calculated mathematically by dividing the amount of profit the trader expects to have made when the position is closed (i.e., the reward) by the amount he or she stands to lose if price moves in the unexpected direction (i.e., the risk).

[ii] UNEP, "Renewable Energy: Investing in Renewable and Energy Efficiency," Available at http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_6_RenewableEnergy.pdf (2011).