The background of the cover features a photograph of a solar farm with rows of solar panels mounted on tall poles. In the distance, several wind turbines are visible against a clear sky. The lighting suggests a bright, sunny day.

**Why Clean Energy Public Investment  
Makes Economic Sense -  
*The Evidence Base***

**a SEF Alliance publication**

**EXECUTIVE SUMMARY**

# a UNEP SEF Alliance publication

prepared by  
Management Information Services, Inc.

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## **ABOUT THIS REPORT**

This is a publication of the UNEP SEF Alliance, an international coalition of public and publicly-backed clean energy funding organisations. The SEF Alliance began operating in January 2008 under the remit of the Sustainable Energy Finance Initiative (SEFI) of the United Nations Environment Programme (UNEP). In 2009, member organisations include the UK Carbon Trust, Sustainable Development Technology Canada (SDTC), Sitra, the Finnish Innovation Fund, and Sustainable Energy Ireland (SEI). The Alliance is governed directly by its members, and its activities are currently funded by the member organisations and by UNEP.

In response to the global economic downturn, SEF Alliance members identified the economic impact of public clean energy investment as an area of high interest for specialised research. In particular, preliminary research indicated that countercyclical investment in sustainable energy could be a sound response to global economic recession. The SEF Alliance therefore commissioned this report from Management Information Services, Inc. (MISI), an internationally recognised economic research and management consulting firm, in order to assess the evidence base and provide a comprehensive analysis of why and how clean energy public investment makes economic sense.

**This is the Executive Summary of the UNEP SEF Alliance report, 'Why Clean Energy Public Investment Makes Economic Sense – The Evidence Base'.**

**To download a copy of the full report, visit:**

**<http://www.sefalliance.org/english/publications.html>**

## **ACKNOWLEDGEMENTS**

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## Executive Summary

There is a growing interest in many nations in using “green” spending programs (renewable energy, energy efficiency, environmental initiatives, etc.) as economic stimulus and job creation programs. Nevertheless, there remains substantial controversy and uncertainty about the desirability and effectiveness of such initiatives, and the following questions must be addressed:

1. Do green programs facilitate economic growth and job creation?
2. Do green programs create more or fewer jobs than other types of economic stimulus programs, per dollar of spending?
3. How do the stimulus effects of green spending programs compare to those of tax cuts?
4. What barriers are inhibiting the rapid growth of green energy?
5. What are the most effective incentives for renewable energy and energy efficiency programs?
6. What information is required to inform policy-makers and elected officials as to the benefits of green stimulus programs?

We address these and related questions, and our major findings are summarized below.

### **Issue 1: Do Green Programs Facilitate Economic Growth and Job Creation?**

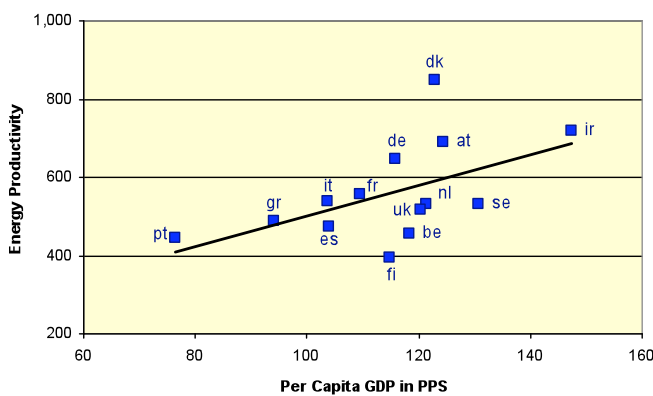
This is a timely and important issue:

- There has been substantial controversy over the years as to whether green programs act as a driver or a drag on nations’ economies and job markets.
- The current severe worldwide economic recession makes it imperative to determine if such investments are fostering economic recovery and job growth.
- Many nations are rapidly increasing their investments in green stimulus programs and it is important to know whether these investments are compatible with economic growth and job creation.

**The answer to this question is “Yes.”** We find that green programs facilitate economic growth and job creation. Government investments in these programs stimulate economic growth and job creation as well as providing various other economic and environmental benefits. We thus conclude that there is a strong positive relationship between clean energy/energy efficiency/environmental investments and economic prosperity and job growth. For example:

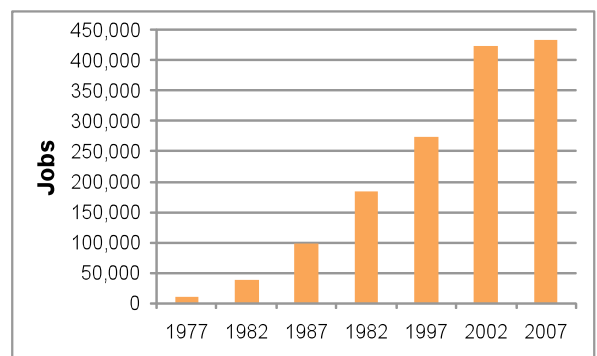
- Figure EX-1 shows that the relationship between economic efficiency and economic prosperity is positive; the more energy efficient the economy, the more prosperous it is.
- Figure EX-2 shows the net job creation in the USA state of California over the past three decades from investments in green energy programs – total job gains in excess of the jobs lost in the fossil fuel industries and the carbon fuel supply chain. By 2007, annual net job creation totalled nearly 450,000 in the state.

**Figure EX-1:**  
Energy Efficiency and Economic Prosperity - 2006



Source: Eurostat and Management Information Services, Inc., 2009

**Figure EX-2:**  
Net Job Growth in California Resulting From Green Program Investments



Source: University Of California and Management Information Services, Inc., 2009

**GOVERNMENT INVESTMENTS IN GREEN PROGRAMS ARE GOOD FOR THE ECONOMY: THEY STIMULATE ECONOMIC GROWTH AND CREATE JOBS**

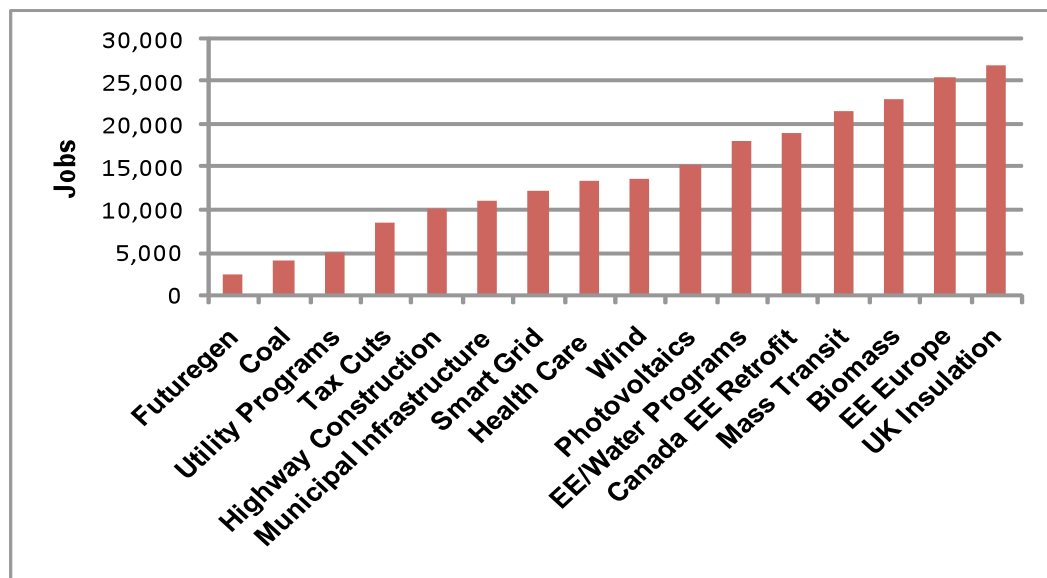
Thus, investments in clean energy and energy efficiency programs increase GDP, incomes, and jobs, reduce pollution and greenhouse gas (GHG) emissions, save energy, reduce energy costs, and reduce energy price fluctuations. Further, the relationship between i) clean energy, energy efficiency, and environmental programs and ii) economic growth and job creation is positive, not negative.

## Issue 2: Do Green Programs Create More Jobs Than Other Types of Economic Stimulus Programs, Per Dollar of Spending?

**The answer to this question is “Yes.”** We find that government spending on green stimulus programs is, dollar for dollar, more effective in creating jobs as is equivalent spending on more traditional alternatives, such as road construction or fossil fuel energy programs. These findings are summarized in Figure EX-3, which illustrates the relative job creation of different types of government spending programs. For example, it shows that per dollar of spending:

- Photovoltaics create more than 50 percent more jobs than highway construction.
- Biomass creates nearly twice as many jobs as does health care.
- Insulation programs create nearly three times as many jobs as municipal infrastructure.
- Mass transit creates more than four times as many jobs as utility programs.

**Figure EX-3: Jobs Generated Per Billion Dollars of Expenditure on Selected Programs**  
(billion constant 2008 U.S. dollars)



Source: Management Information Services, Inc., 2009

More generally, this figure shows that:

- Investments in green stimulus and infrastructure programs usually generate, per dollar of expenditure, more jobs than most alternatives.
- Investments in energy efficiency programs are especially beneficial and cost effective, and often have negative net economic costs.
- Clean energy programs are powerful job creators, but the job creation effects depend importantly on the specific clean energy program and technology.

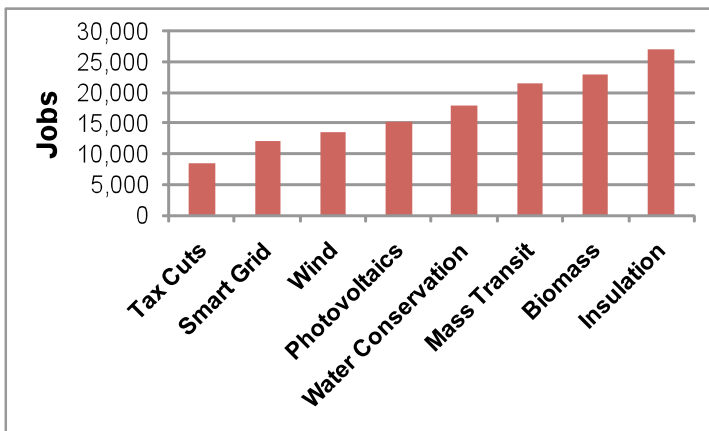
**GREEN STIMULUS SPENDING CREATES MORE JOBS, PER DOLLAR, THAN MOST OTHER PROGRAMS**

We thus conclude that green stimulus programs can act as expeditious and effective job creation mechanisms.

**Issue 3. Do the Stimulus Effects of Green Spending Programs Have Greater Impacts Than Tax Cuts?**

**The answer to this question is “Yes.”** Green stimulus programs generate about three or four times as many jobs, per dollar, as do tax cuts. This is illustrated in Figure EX-3 and emphasized in Figure EX-4. Figure EX-4 shows that, per billion dollars:

**Figure EX-4: Jobs Generated Per Billion Dollars of Expenditure on Tax Cuts and Selected Green Programs**  
(billion constant 2008 U.S. dollars)



- Smart grid investments create 50 percent more jobs than tax cuts.
- Wind programs create 60 percent more jobs than tax cuts.
- Photovoltaics creates nearly twice as many jobs as tax cuts.
- Water conservation programs create more than twice as many jobs as tax cuts.
- Mass transit creates nearly three times as many jobs as tax cuts.
- Biomass creates nearly three times as many jobs as tax cuts.
- Insulation programs create more than three times as many jobs as tax cuts.

Source: Management Information Services, Inc., 2009.

**GREEN STIMULUS PROGRAMS GENERATE 3 TO 4 TIMES AS MANY JOBS, PER DOLLAR, AS DO TAX CUTS**



#### Issue 4. What Barriers are Inhibiting Rapid Growth of Green Energy?

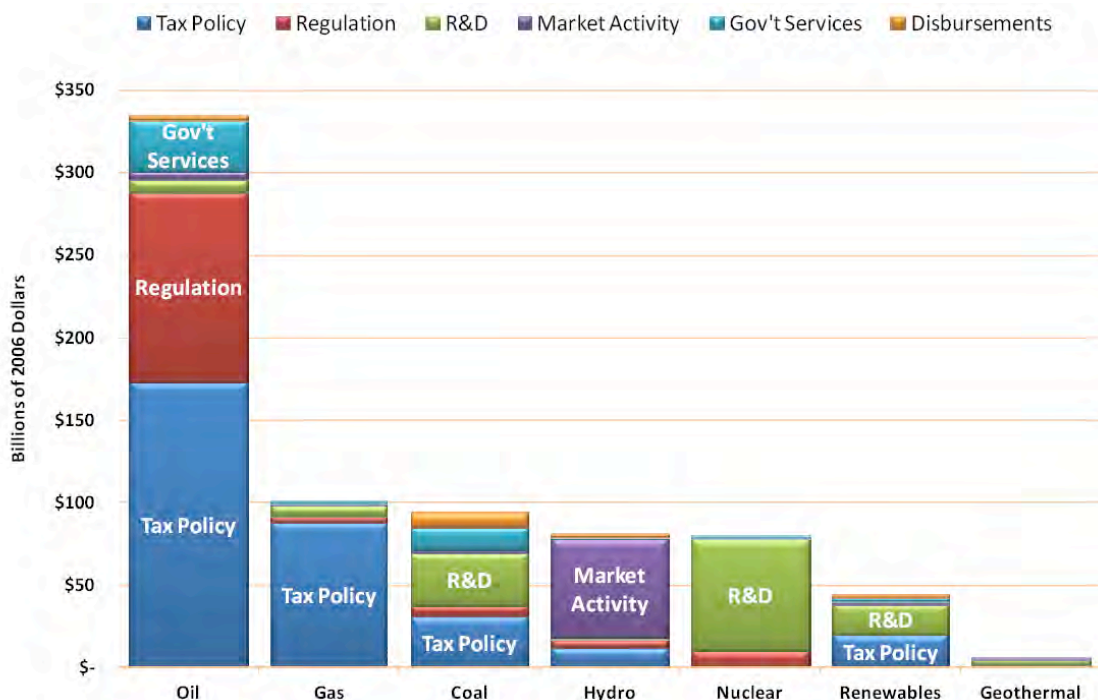
**Subsidies, taxation, and other policies favouring conventional energy are a worldwide problem and allow fossil and nuclear energy to be sold at artificially low prices. This is the most serious barrier inhibiting the rapid growth of green energy.**

A government's energy policies have a critical impact on clean energy development, and legacy energy policy, regulations, and subsidies are one of the key determinants of the success of clean energy initiatives and achievement of desired green energy goals. Due to legacy subsidies for conventional energy sources, large subsidies for clean energy may be required for many years to offset the embedded subsidies enjoyed by competing energy sources. Further, these clean energy subsidies may have to be larger and remain in place longer than most analysts and policy-makers realize.

**CONVENTIONAL ENERGY SUBSIDIES ARE  
THE MOST SERIOUS BARRIER TO THE  
GROWTH OF GREEN ENERGY**

For example, as summarized in Figure EX-5, in the USA the largest beneficiaries of federal government energy incentives have been oil, gas, coal, and nuclear energy, receiving nearly all incentives and subsidies provided. Of the \$725 billion (2006 dollars) in government subsidies, renewables received only six percent (\$44 billion). This situation is true in many other nations, and the historical legacy – and the pattern that continues – place clean energy at a serious economic disadvantage in the marketplace. Further, it will take decades of revised energy incentives policies to remedy these market distortions.

**Figure 5: Comparison of USA Government Incentives for Energy Development, 1950-2006**



Source: Management Information Services, Inc., 2009.

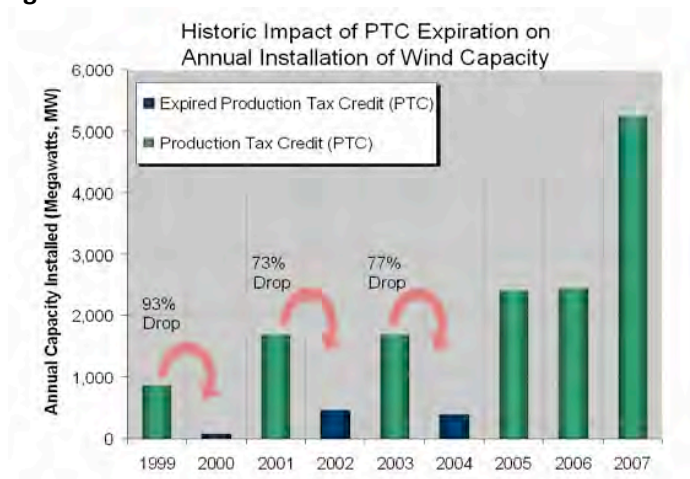
**Issue 5: What are the Most Effective Incentives for Renewable Energy and Energy Efficiency Programs?**

**Clean energy incentives must be coordinated, complementary, and consistent, and it is the entire portfolio of incentives that is critical.** Clean energy incentives must be complementary and reinforcing, and must be coordinated among federal, regional, and local governments, and even the largest financial incentives will not be effective unless appropriate, complementary regulatory and institutional incentives policies are also in place. Thus, to be effective, financial incentives for clean energy must be accompanied by complementary institutional and regulatory policies.

It is also important that clean energy incentives be consistent and predictable, and lack of these attributes will negate the incentives' effects. The importance of consistency is illustrated in Figure EX-6, which illustrates the inconsistent impact of the USA federal renewable energy production tax credit (REPTC) -- which provides a 2.1 ¢/kWh incentive (indexed to inflation) for the production of electricity from utility-scale wind turbines.<sup>1</sup> This figure shows that, not only has REPTC been critical in incentivizing the U.S. wind industry, but – even more important -- inconsistency and unpredictability in clean energy incentives

<sup>1</sup>Since the average U.S. electricity price is about 10.3 ¢/kWh (all sectors), REPTC represents an (indexed) electricity production subsidy of more than 20 percent. It is the most important U.S. federal renewable electricity incentive and has been critical in promoting wind generation in the U.S.

Figure EX-6:



Source: American Wind Energy Association, 2008.

policies can be devastating to the development of clean energy technologies. Thus, to be most effective, clean energy financial incentives must be consistent, predictable, and reliable.

Financial incentives must be carefully designed and implemented. The appropriate incentive size will depend on the context of the respective market, which will make it unique to each nation and jurisdiction, and well-designed fiscal incentives programs can play an important

role in increasing market penetration of clean energy if implemented as part of an incentive portfolio. Historically, tax incentives have been awarded based on capacity; however, the literature suggests that they may be more effective if they are production-based, and clean energy financial incentives based on production are more effective than those based on capacity.

It is important to note that strong financial incentives policies and barrier reduction policies are both required, in tandem, to significantly increase clean energy development and, to be effective, financial incentives must be accompanied by barrier reduction policies. It is the portfolio of incentives that is critical and there is a quantifiable connection between the incentives portfolio and clean energy development, but optimizing the portfolio is essential. Further, successful combinations of financial and regulatory policies can be serendipitous as well as planned, and monitoring of incentive effects, interactions, and feedbacks is required.

**THE PORTFOLIO OF CLEAN ENERGY INCENTIVES MUST BE COORDINATED, COMPLEMENTARY, CONSISTENT, AND PREDICTABLE**

## Issue 6: What Information is Required to Inform Policy-Makers and Elected Officials as to the Benefits of Green Stimulus Programs?

We found that clean energy programs have many advantages in terms of economic stimulus and net job creation. This is an important finding, since:

- Many governments around the world have embarked on large green stimulus programs to stimulate economic recovery and job growth, and it is essential to assess the relative effectiveness of such programs.
- Resources are limited, and governments need to know the “bang for the buck” of various stimulus program alternatives.
- The issue of green stimulus spending and its net job impact have long been controversial.

**POLICY-MAKERS MUST REALIZE THAT THE FUTURE IS NOW: BUSINESS AS USUAL IS NOT A VIABLE OPTION, AND TIME IS RUNNING OUT**

The following questions thus arise:

- Given the economic and job advantages of green energy programs, why are not they being given more emphasis in the current economic stimulus programs in different nations?
- What information is required to inform policy-makers and elected officials as to the benefits of green stimulus programs?

Here we summarized the major benefits of green stimulus programs. However, **many decision-makers are unaware of these benefits**, and the following information needs to be communicated to policy-makers and legislators worldwide:

1. Green spending programs are generally more effective in creating jobs and facilitating economic growth than most other types of spending. Thus, clean energy programs provide more economic “bang for the buck” and represent ideal economic stimulus programs.
2. Clean energy programs are *net* job creators: Even recognizing the inevitable job losses in the fossil fuel and carbon-intensive sectors, the net job creation of clean energy programs is strongly positive.

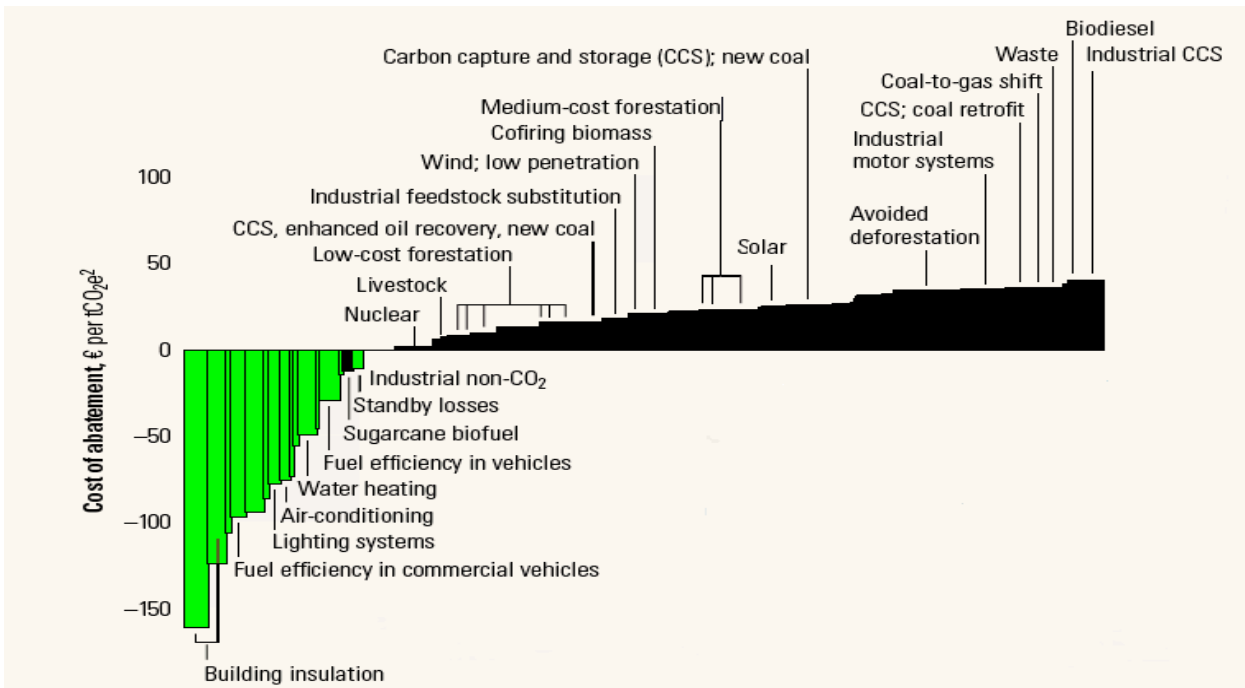
3. Tax cuts can be a useful and politically attractive policy instrument; however, green stimulus programs create three or four times as many jobs, per dollar, as do tax cuts. Thus, in the current depressed economic environment, green stimulus spending constitutes the preferred policy alternative.
4. Long term, holistic fiscal and institutional government policies are required to develop clean energy, and these incentives must be decades-long in scale due to imbedded subsidies for conventional energy.
5. The future is now: Business as usual is not a viable option. Even with large incentives and aggressive initiatives, it will take many years for clean energy to make significant inroads in the marketplace and to begin to displace conventional energy sources. Time is running out, and it is thus imperative that an accelerated policy shift to green energy be initiated immediately.

**EVEN WITH LARGE INCENTIVES, IT WILL TAKE MANY YEARS FOR CLEAN ENERGY TO MAKE SIGNIFICANT INROADS, AND AN ACCELERATED POLICY SHIFT TO GREEN ENERGY MUST BE INITIATED IMMEDIATELY**

Finally, decision-makers in all nations must recognize that green programs have complementary, mutually reinforcing effects on various policy objectives: They are cost effective, they increase energy efficiency and reduce fuel consumption, and they reduce environmental pollutants and GHG emissions. For example, Figure EX-7 illustrates that there are numerous inexpensive, reliable, and efficient green energy options, many of which are self-financing, and that clean energy contributes to the goal of sustainable development and also has significant economic benefits.

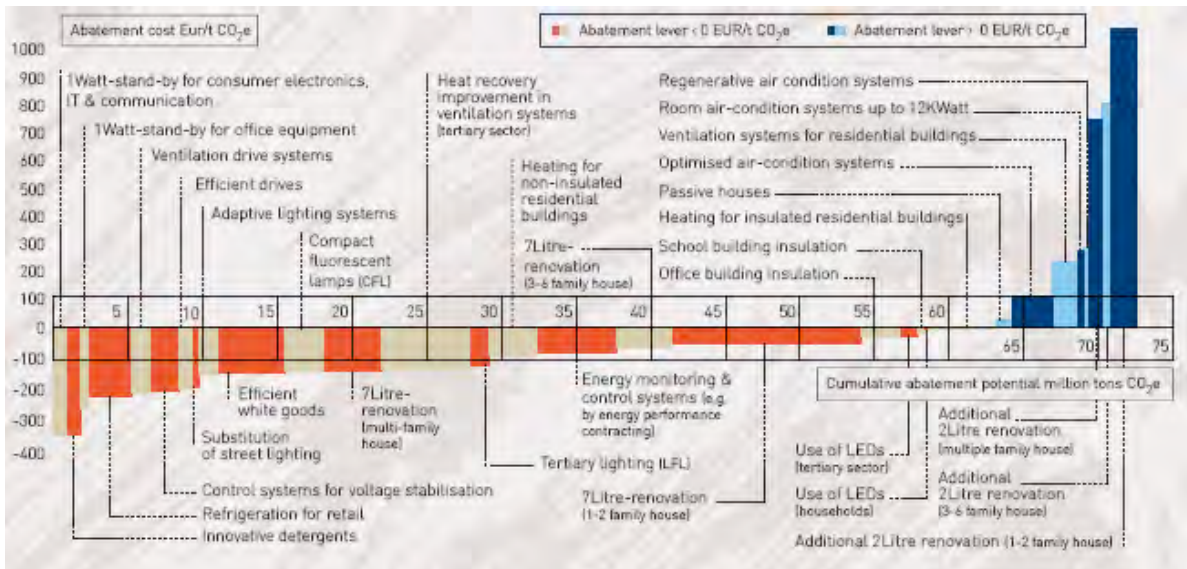
Green energy programs reduce GHG emissions and save costs, and of all possible measures to abate GHG emissions, those that use energy more efficiently have the lowest cost. For example, in the German economy, there is considerable untapped potential in cost-effective energy efficiency measures, especially for the residential sector -- almost 60 million tons of CO<sub>2</sub> by 2020. Figure EX-8 compares a number of CO<sub>2</sub> reduction measures for the residential sector in terms of cost and reduction potential -- the measures indicated in red are cost-effective.

**Figure 7: Cost Effectiveness of Clean Energy Technologies**



Source: Economic Commission for Europe

**Figure 8: Abatement Costs and Potential for the German Residential Sector by 2020**



Source: Business Europe, 2007



### **About the SEF Alliance**

The UNEP SEFI Public Finance Alliance, or “SEF Alliance”, is an international coalition of public and publicly-backed sustainable energy financing organisations. Its aim is to improve the effectiveness of member organisations to finance and transform clean energy markets within their own countries, and to assist other governments in establishing similar programmes.

The 2009 member funds are the U.K. Carbon Trust, Sustainable Development Technology Canada, SITRA, the Finnish Innovation Fund, and Sustainable Energy Ireland. Each member finances the development of sustainable energy markets in its respective region, and fund managers use this platform to exchange best practices, pool resources, and launch joint projects. The SEF Alliance is under the remit of the Sustainable Energy Finance Initiative (SEFI) of the United Nations Environment Programme (UNEP) but is governed directly by its members. For more information, see [www.sefalliance.org](http://www.sefalliance.org).

## **MANAGEMENT INFORMATION SERVICES, INC.**

### **About MISI**

Management Information Services, Inc. (MISI) is an economic research firm with expertise on a wide range of complex issues, including renewable energy, energy efficiency, the environment, labour markets, and education and training requirements. The MISI staff offers expertise in economics, information technology, engineering, and finance, and includes former senior officials from private industry, federal and state government, and academia. Over the past three decades MISI has conducted extensive proprietary research, and since 1985 has assisted hundreds of clients, including Fortune 500 companies, nonprofit organisations and foundations, trade associations, academic and research institutions, and state and federal government agencies including the White House, the National Academies of Science, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Department of Defense, NASA, the U.S. General Services Administration, the U.S. Energy Information Administration, the American Solar Energy Society, the Energy Foundation, the Rockefeller Foundation, the John Merck Foundation, the Joyce Foundation, and the Office of Al Gore.

For more information, please visit the MISI web site at [www.misi-net.com](http://www.misi-net.com).



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