



# Green Recovery

*A Program to Create Good Jobs and  
Start Building a Low-Carbon Economy*

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September 2008



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Start Building a Low-Carbon Economy**

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## Introduction and summary

For the past year, the U.S. economy has suffered through a serious economic slowdown caused by the collapse of the housing market bubble, the destabilizing effects of the housing implosion on financial markets, and the sharp rise in oil prices. The resulting increase in unemployment—reaching 5.7 percent in July 2008—is in fact even worse when taking into account a labor market where people are working fewer hours than they wish, taking pay cuts, or becoming discouraged from looking for work. What’s more, most evidence suggests the slowdown will continue for at least another year, extending in exaggerated form an eight-year pattern of economic performance that has done little for most Americans.

This report outlines a green economic recovery program to strengthen the U.S. economy over the next two years and leave it in a better position for sustainable prosperity. In the pages that follow, we detail how to expand job opportunities by stimulating economic growth, stabilizing the price of oil, and making significant strides toward fighting global warming and building a green, low-carbon economy. This green economic recovery program would be a down payment on a 10-year policy program recommended by the Center for American Progress in its 2007 “Progressive Growth” series, which lays out an economic strategy for the next administration and includes the report, “Capturing the Energy Opportunity: Creating a Low-Carbon Economy,” by John D. Podesta, Todd Stern, and Kit Batten. That report details how the transformation to a low-carbon economy would result in sustainable economic growth. (See Appendix 4 on page 28 for details of this plan).

By accelerating the implementation of these policies, we address our immediate need to boost a struggling economy and jumpstart our long-term transformation to a low-carbon economy. This green economic recovery program would spend \$100 billion dollars over two years in six green infrastructure investment areas. These are all areas that the CAP report outlined as key to transitioning to a low-carbon economy to create new green jobs—particularly in the struggling construction and manufacturing sectors. They are also all central to securing America’s energy security and combat global warming. This \$100 billion initiative is part of a comprehensive low-carbon energy strategy and could be paid for with proceeds from auctions of carbon permits under a greenhouse gas cap-and-trade program. This fiscal expansion would create 2 million jobs by investing in six energy efficiency and renewable energy strategies:

- Retrofitting buildings to improve energy efficiency
- Expanding mass transit and freight rail
- Constructing “smart” electrical grid transmission systems<sup>1</sup>
- Wind power
- Solar power
- Next-generation biofuels

This economic recovery program combines the \$100 billion fiscal stimulus with an additional credit stimulus—through a federal loan guarantee program to boost private-sector investment in energy efficiency and renewable energy. Most of the federal spending would be in the form of public infrastructure investments in public building retrofits, public transportation, and building smart grid systems because the money to support these activities can be delivered relatively quickly by the federal government, and through the federal government to state and local governments. Investments in renewable energy and energy efficiency are also central to this proposal, and would be funded through a combination of public funds, tax credits, and loan guarantees to spur private-sector investment. Together, this \$100 billion green energy stimulus package would result in:

- **Widespread employment gains.** Investments in these areas will produce employment opportunities across a broad range of familiar occupations—roofers, welders, electricians, truck drivers, accountants, and research scientists. It will also strengthen career ladders by providing pathways for workers to move up from lower-paying to higher-paying green jobs that can be created on a geographically equitable basis throughout all regions of the country.

- **Lower unemployment.** If this green economic recovery program were fully implemented in early 2009 and unemployment still stood at July 2008 levels, it would reduce the number of unemployed people to 6.8 million, down from 8.8 million, with the unemployment rate falling to 4.4 percent from 5.7 percent.

- **Renewed construction and manufacturing work.** Employment in construction fell to 7.2 million in July 2008, down from 8 million in July 2006. A green economic recovery program would replace, at least, those 800,000 lost construction jobs over the next two years, and could result in renewed investment in the housing sector that is at the root of the current economic slump. This green recovery provides a needed transfusion of new credit and investment into the construction industry, which could rapidly provide job opportunities that are badly needed. Our program would have similar, if somewhat smaller, effects in supporting U.S. manufacturing.

- **More stable oil prices.** Expanding investments in energy efficiency and renewable energy sources would help stabilize demand for oil, which in turn could slow the long-term rise in oil prices. No one can accurately predict the price of oil over the next two years, but if U.S. demand for oil were less than it would be otherwise because of increased U.S. investment in renewable energy and energy efficiency, then the price of oil would also fall. Reducing demand by providing real energy alternatives and transportation choices is one of the only effective long-term options for offering consumers sustained relief from rising gas prices.

▪ **Self-financing energy efficiency.**

Public and private investment in energy efficiency reduces energy demand and lowers energy costs, which in turn means that money spent now on energy efficiency will pay for itself through lower energy bills over the long term. Lowering energy costs for educational buildings eventually means more funds for teachers, books, and scholarships. Retrofitting hospitals over time releases money for better patient care. And providing incentives for investment in more private-sector energy savings at commercial buildings, factories, and residential homes helps American businesses and consumers save and invest money over the long term and improve our quality of life.

This \$100 billion green recovery program is roughly the same level of investment as the portion of the April 2008 federal government-directed economic stimulus package used for sending rebate checks back to taxpayers to boost household consumer spending. In the analysis that follows, we demonstrate that spending \$100 billion on green infrastructure investment would be an effective engine for job creation—and thus stronger economic growth—and would have the added benefit of preparing the way for the urgently needed long-term U.S. transition to a low-carbon economy.

This \$100 billion fiscal expansion, responsibly deployed, would frontload federal spending to launch a green energy economic development program based on all of the renewable energy and energy efficiency proposals contained in CAP's "Energy Opportunity" report. This initial boost in direct government spending would be financed as part of the 10-year low-carbon transition outlined in the

report, which calls for a balanced mix of private and public funding, the latter financed with revenue from a carbon cap-and-trade program. Under a cap-and-trade system, there will be a revenue stream dedicated to paying back the \$100 billion to be spent on the green recovery program. An economic analysis of CAP's comprehensive energy strategy will be released later this year.

All states and regions of the country can gain significantly from this green economic recovery program. Of course, due to climate and geography, not all areas of the country are equally capable of capturing the benefits of specific technologies—for example, solar or wind power. But they are all equally capable of making investments to dramatically improve energy efficiency through retrofitting buildings, expanding public transportation systems, and increasing the efficiency and stability of the electric grid.

Similarly, all areas of the country have significant renewable energy resources or the ability to participate in the work of producing the goods and services that will be demanded by a transition to clean energy. Thus in Appendix 3 we show how many jobs would be created on a state-by-state basis by examining 34 representative states to see how the full \$100 billion budgeted would be equitably distributed among all states.<sup>2</sup>

It is important to note that this recovery program does not replace the possible need for more immediate action to boost the economy. The nature of the investments described in this paper precludes their full implementation in the three to four months that are usually expected of short-term economic stimulus programs. Depending on conditions, such a stimulus

may be needed in addition to this program. Conversely, even if the economy is in recovery in 2009 it is highly unlikely that economic growth will be robust, the housing and financial markets restored, or the labor market creating jobs at levels sufficient to return employment to normal recovery levels. A green economic recovery program is needed to bring our nation's economy back to its full capacity.

In the pages that follow, our analysis shows that a targeted \$100 billion down payment on a better energy future implemented at a time when many sec-

tors of the U.S. economy need a boost will provide significant returns now and for years to come. This responsible federal investment amid weak economic conditions and volatile energy and financial markets will lead to reduced oil consumption and spur our transition to a low-carbon economy, providing us with energy and environmental security. By frontloading much of the cost of this energy transformation we will realize these returns sooner, boost our economy at a critical time, and help spark other nations to follow our lead.



## Green recovery

### The short-term economic perspective

In this study, we focus on six key infrastructure investment strategies for our short-term green economic recovery program—retrofitting buildings, expanding mass transit and freight rail, constructing smart energy grids, and expanding production of wind power, solar power, and next-generation biofuels. In the table below, we list some representative occupations that will be needed to advance investments in each of these areas.

As Table 1 below shows, new job activities would certainly be created by building a green economy. Some of these jobs will be in specialized areas, such as installing solar panels and researching new building material technologies. But the vast majority of jobs are in the same areas of employment that people already work in today, in every region and state of the country.

Constructing wind farms, for example, creates jobs for sheet metal workers, machinists, and truck drivers, among many others. Increasing the energy efficiency of buildings through retrofitting requires roofers, insulators, and building inspectors. Expanding mass transit systems employs civil engineers, electricians, and dispatchers. More generally, this green economic recovery program will provide a major boost to the construction and manufacturing sectors throughout the United States through much-needed spending on green infrastructure.

In addition, all of these green energy investment strategies engage a normal range of service and support activities—including accountants, lawyers, office clerks, human resource managers, cashiers, and retail sales people. We have not listed these and other related occupations in Table 1 below because these jobs are not directly linked to any of our six green investment strategies. But new employment opportunities will certainly also open up in these areas as a result of the green recovery program. (See Appendix 1 for details.)

While all six of our investment areas are crucial to accomplishing the long-term goal of rebuilding the U.S. economy on a low-carbon foundation, it doesn't follow that they all can contribute equally to a short-term green economic recovery program. Some of our investment strategies are clearly capable of delivering within a year, while others will require as long as two years to be implemented.

| GREEN INVESTMENTS AND JOBS               |  |
|--|--|
| STRATEGIES FOR GREEN ECONOMIC INVESTMENT | REPRESENTATIVE JOBS  |
| Building Retrofitting                    | Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers, Building Inspectors  |
| Mass Transit/Freight Rail                | Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Bus Drivers, Dispatchers, Locomotive Engineers, Railroad Conductors   |
| Smart Grid                               | Computer Software Engineers, Electrical Engineers, Electrical Equipment Assemblers, Electrical Equipment Technicians, Machinists, Team Assemblers, Construction Laborers, Operating Engineers, Electrical Power Line Installers and Repairers                    |
| Wind Power                               | Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors    |
| Solar Power                              | Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers   |
| Advanced Biofuels                        | Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agricultural Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors |

### ***Retrofitting buildings***

The most obvious option for rapid green investment in communities is a large-scale building retrofit program, which would rely entirely on known technologies such as high-performance windows, efficient heating, ventilation and air conditioning systems, geothermal heating and cooling systems, efficient lighting and day-lighting, building-integrated photovoltaic-powered energy, and the installation of efficient appliances. Retrofitting can begin almost immediately on buildings of all sizes, in all regions of the country, and can provide short-term returns on the money being invested. Existing federal programs that could serve as vehicles for this swift investment include but are not limited to:

- Fully funding weatherization assistance to the level authorized by the Energy Independence and Security Act
- Expanding the energy-efficiency retrofit program in the Low Income Home Energy Assistance Program

- Matching state public benefit funds and other locally based programs supporting energy efficiency and green building retrofits to both public and private buildings.

To achieve the most rapid and effective short-term economic recovery program through a program of building retrofits, the U.S. government should require the retrofitting of all public buildings, which could commence as soon as Congress appropriated the funds, and should include measures to ensure state and local government participation as well. Indeed, state and local programs to retrofit public buildings are already operating throughout the country, among them Minnesota's Guaranteed Energy Savings Program, Utah's State Building Energy Efficiency Program, California's Green Building Action Plan for State Facilities, and the Energy Efficiency Partnership of Greater Washington.<sup>3</sup>

These programs are creating new markets for energy-saving technology, and

could serve as a foundation for administering rapid federal investment. They could become the active starting point for constructing a more ambitious national program of public building retrofits that moved money through existing federal grant programs such as Community Development Block Grants and the recently authorized (but as yet to be funded) Energy Efficiency and Conservation Block Grants. Both of these grant programs would provide needed funds directly to cities and rural communities to invest in greater energy efficiency and reduced global warming pollution.

Of course, it is equally important to retrofit the country's stock of privately owned buildings, including residences and commercial structures. We propose a program of strong financial incentives—including both loan guarantees and tax credits—to advance such an initiative. Existing programs through which these tax credits and loan guarantees could be channeled include (but are not limited to) extending and increasing the:

- Residential Energy Efficiency Tax Credit
- Residential Solar and Fuel Cell Tax Credit
- Business Energy Tax Credit
- Energy Efficient Commercial Buildings Tax Deduction
- Energy-Efficient New Homes Tax Credit for Home Builders
- Energy Efficient Mortgage federal loan program

Our green economic recovery program also proposes loan guarantees and tax credits targeted for the private sector that provide especially generous incentives to stimulate rapid investment over the first two years, alongside longer-term green investment incentives to

give businesses and consumers alike the confidence that the greening of the U.S. economy is a long-term priority of the U.S. government. Over the longer term, policies that move private-sector investment into green economic development strategies will be increasingly important for a sustained clean energy transition, but the focus of this package is on near-term green investment to spur a sustainable economic recovery.

### ***Mass transit and freight rail***

Public investment in expanding mass transit systems and freight rail networks in the United States could begin immediately in some areas but would take longer in others. In the mass transit arena, investments that could be pursued in very short order include, but are not limited to:

- Expanded bus and subway services
- Lower public transportation fares
- Expanded federal support for state and municipal transit operation and maintenance budgets to deal with increased ridership
- Increased federal subsidies for employer-based mass transit incentives
- Higher funding for critical mass transit programs currently bottlenecked for lack of federal dollars to encourage new ridership and more transportation choices.

Other areas, such as building light-rail or subway systems, will entail long lead times before a large amount of new hiring and spending occurs, but higher funding for existing mass transit and light rail projects would result in job growth in engineering, electrical work, welding, metal fabrication, and engine assembly sectors. Investing in diverse transportation options is important in both urban

and rural communities, and can be an engine for far broader economic activity.

Upgrades to our freight rail through public investment would also yield some immediate job gains in similar professions, creating substantial employment through both construction and operations, alongside a down payment on more job creation over two years through improved maintenance and expansion of services. Existing federal programs through which these investments could be made quickly include expanding federal support and underwriting for freight rail infrastructure and rural economic development programs

### ***Smart grids***

Some smart grid investment projects are already in planning stages around the country. The projects entail combining advances in information technology with innovations in power system management to create a significantly more efficient distribution system for electrical energy. Through a green economic recovery program the U.S. government could deploy swift federal government support for these pilot projects.

Most smart grid investment initiatives, however, would require at least one year before significant levels of new spending and hiring could occur. Still, over the course of two years, new job opportunities with significant income growth potential could flourish, especially in locations where state utility policy is also designed to promote the efficiency of generation and distribution of electricity, through policies such as decoupling electricity sales from profits. Possible spending vehicles for these kinds of invest-

ments by the federal government include expanding the Smart Grid Investment Matching Grant Program established in the 2007 Energy Independence and Security Act.<sup>4</sup>

### ***Renewable energy***

In our three renewable energy areas—wind, solar, and next-generation biofuels—public- and private-sector investment growth is already picking up pace, with renewable energy technology supporting sustained double-digit rates of growth nationwide. Yet an unstable policy environment and the lack of long-term incentives have hurt the investment climate for these technologies, preventing them from realizing even greater growth. With sufficiently generous and stable federal tax incentives and credit subsidies, significant new private-sector investment would flow naturally and quickly into these three renewable energy arenas.

Existing federal programs through which these new green economic recovery funds could flow include renewing and expanding the investment tax credit and production tax credit for solar and wind energy. In addition, federal policy can be instrumental in building the infrastructure for next-generation biofuels, and federal loan guarantees are critical for moving rapidly to the next generation of advanced biofuels, where new companies face significant financing hurdles to break ground on next-generation manufacturing facilities that operate at a commercial scale.

Immediate vehicles for federal spending on biofuel infrastructure include (but are not limited to) funding and expanding the following programs established in the 2007 Energy Independence and Security Act:

- Renewable fuel infrastructure grants for retail and wholesale dealers
- Pilot grant programs to invest in renewable fuel distribution corridors

Public investment in renewable energy sectors will help to create the early infrastructure that will generate higher levels of private sector confidence in further investment. Federal programs currently in place through which these government investments could flow include increasing funding for Clean Renewable Energy Bonds that help Native American tribes, states, co-ops, and municipal utilities invest in public-sector renewable energy projects. Other important funding mechanisms include matching state public benefit funds, or tax incentives that support the generation and consumption of renewable electricity and advanced biofuels, as well as expanding funding for installation of renewable energy or alternative low-carbon fuels infrastructure at federal facilities.

### How a green recovery program creates jobs

There are many ways government spending as a part of an economic recovery program can create jobs. Public spending directed toward a green recovery program, however, would result in more jobs than spending in many other areas, including, for example, within the oil industry or on increasing household consumption, which was the primary aim of the April 2008 stimulus program.

There are three sources of job creation associated with any expansion of spending—direct, indirect, and induced effects. For purposes of illustration, consider these categories in terms of investments in home retrofitting or building wind turbines:

- **Direct effects.** Construction jobs created by retrofitting buildings to make them more energy efficient, or manufacturing jobs created to build wind turbines;
- **Indirect effects.** Manufacturing and service jobs created in associated industries that supply intermediate goods for building retrofits or wind turbine manufacturing, such as lumber, steel, and transportation;
- **Induced effects.** Retail and wholesale jobs created by workers in these construction, manufacturing, and service industries when they spend the money they earn on other products in the economy.

The table below shows the total number of jobs—direct, indirect, and induced—that we estimate would be created from spending \$100 billion in public funds in a combination of our six green investment areas.<sup>5</sup> We estimate the number at about 935,000 million direct jobs, 586,000 indirect jobs, and 496,000 induced jobs, for a total of about 2 million total jobs created.

We can use this same model to generate figures for the total job creation through

| TOTAL JOB CREATION THROUGH \$100 BILLION GREEN STIMULUS PROGRAM |           |
|---|-----------|
| Direct jobs   | 935,200   |
| Indirect jobs   | 586,000   |
| Induced job   | 496,000   |
| Total job creation  | 1,999,200 |

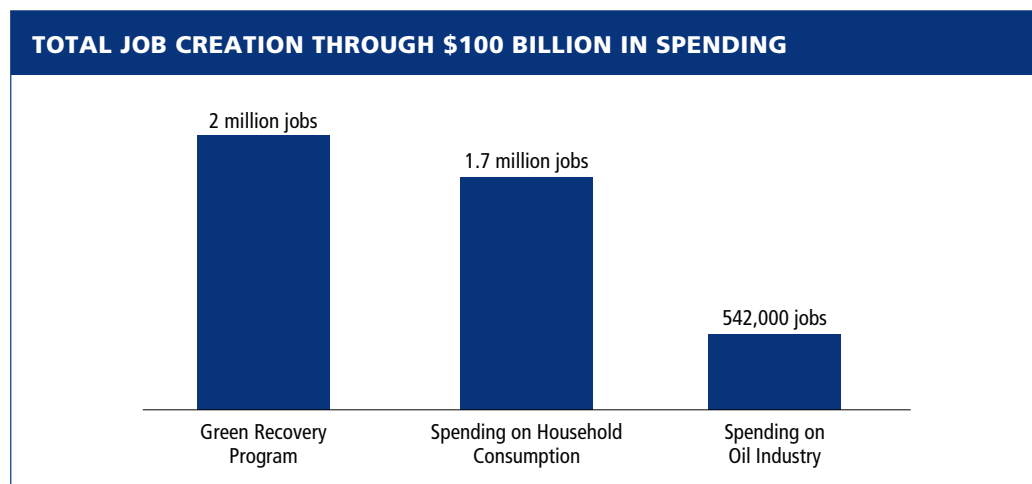
Source: U.S. Bureau of Economic Analysis and authors' calculations.

alternative areas of spending, such as spending the same \$100 billion either within the oil industry or on household consumption. The focus of the April 2008 economic stimulus program was to generate more jobs by expanding household consumption. It sent tax rebates back to U.S. taxpayers, averaging around \$600 per household. An equivalent proposal to spend \$100 billion on new investments within the oil industry does not exist; however, current federal subsidies and incentives offered to the oil industry amount to an average of nearly \$9 billion annually (an average of \$6.6 billion in domestic incentives and \$2.2 billion in international subsidies).<sup>6</sup> Additionally, some of the current legislative proposals in the U.S. Congress argue for increased domestic exploration and drilling as a solution to high gas prices.

There are many arguments against such a ramp up in oil and gas investment. The Center for American Progress argues that expanding new exploration and drilling is not an effective way to lower gas prices (it will not decrease oil prices for many years and will not decrease prices by much in a global market) and will result in greater greenhouse gas emissions and environ-

mental degradation than investing in clean energy solutions.<sup>7</sup> However, an additional reason not to support such an investment is jobs: If Congress were to decide as part of a domestic oil production and gas price reduction effort to spend \$100 billion on new oil and gas subsidies and subsidizing gasoline and oil prices, fewer jobs would be created than investing in a green economic recovery program.

As the graph below shows, our green recovery program is an effective engine of job creation compared to spending the same amount of money within the oil industry or on household consumption. Increasing spending by \$100 billion on household consumption along the lines of the April 2008 stimulus program would create about 1.7 million total jobs, or about 16 percent fewer jobs than the green recovery program.<sup>8</sup> In addition to creating more jobs with a green investment program rather than increasing household consumption, targeting an economic stimulus program at increasing green investments also offers longer-term benefits: consumer savings by reducing home energy bills; stabilizing the price of oil, natural gas, and other non-renewable energy sources through reduced



Source: U.S. Bureau of Economic Analysis and authors' calculations. See Appendix 1 for details.

demand and increased energy diversity; and, of course, building over time a low-carbon economy.

Spending \$100 billion within the domestic oil industry would create only about 542,000 jobs in the United States. A green infrastructure investment program would create nearly four times more jobs than spending the same amount of money on oil energy resources. And again, spending on oil offers no benefits in transitioning the U.S. economy toward a low-carbon future, while perpetuating the economic and national security vulnerabilities by continuing to rely on oil for the lifeblood of our economy.

Why does the green investment program create more jobs than spending within the oil industry or on household consumption? Three factors are at work.

### ***Relative labor intensity***

Relative to spending within the oil industry, the green investment program utilizes far more of its overall \$100 billion in spending on hiring people, and less on purchasing machines and supplies. These direct and indirect effects on job creation are the primary explanation why the green investment program creates nearly four times more jobs than spending on oil.

The relative labor intensity of spending on household consumption is roughly equivalent to that of green investments due to the direct and indirect effects of job creation. This means relative labor intensity is not a factor in explaining the differential job-creating effects of a green stimulus program versus increasing household consumption spending.

### ***Domestic content***

The green investment program relies much more on products and services made within the U.S. economy and less on imports compared to spending either within the oil industry or on household consumption. These direct and indirect effects on job creation are the most significant reason why the green investment stimulus program creates more jobs than a household -consumption stimulus.

In general, about 22 percent of total household expenditures will go to imports. With the green infrastructure investment program, only about 9 percent purchases imports. This is a critical benefit of a green economic recovery program: Investments are focused primarily on improving domestic infrastructure and making both local markets and the national economy more efficient over the long term.

### ***Pay levels***

Green investments generate not only significant numbers of well-paying jobs with benefits but also a relatively high proportion of lower, entry-level jobs that offer career ladders that can move low-paid workers into better employment positions over time.<sup>9</sup>

The average pay for employees associated with green investment areas is about 20 percent less than the average for those connected to the oil industry. But this number is deceptive because a green investment program will create roughly triple the number of good jobs—paying at least \$16 dollars an hour—as the same level of spending within the oil industry.



A green infrastructure investment program creates more jobs at all wage levels than spending within the oil industry because of both higher labor intensity and greater domestic content—resulting in average wages that are lower than the oil industry but spread across a greater number of jobs created. This attribute is significant.

The average pay of the green investment program is about 14 percent higher than that for the industries associated with household consumption. So in comparison with an economic stimulus centered on expanding household consumption, the green recovery program creates more jobs total, more spending within the U.S. economy, and better paying jobs on average over time. This is in addition to the longer-term benefits in terms of building a clean energy economy and creating downward pressure on the price of oil.

### Overall labor market effects

As of July 2008, there were 8.8 million people officially unemployed within the U.S. labor force of 154.6 million, producing an official unemployment rate of 5.7 percent, according to the most recent data from the U.S. Bureau of Labor Statistics. For purposes of illustration, let's assume that the \$100 billion green economic recovery program is enacted amid roughly July 2008 labor market conditions. As we have seen, this program could produce a net increase of about 2 million jobs, which would reduce the July 2008 number of unemployed to 6.8 million people, a decline of 23 percent. This would cut the unemployment rate to 4.4 percent, moving the job market forcefully away from its current slump.

In reality, we cannot assume that everything about the U.S. labor market would

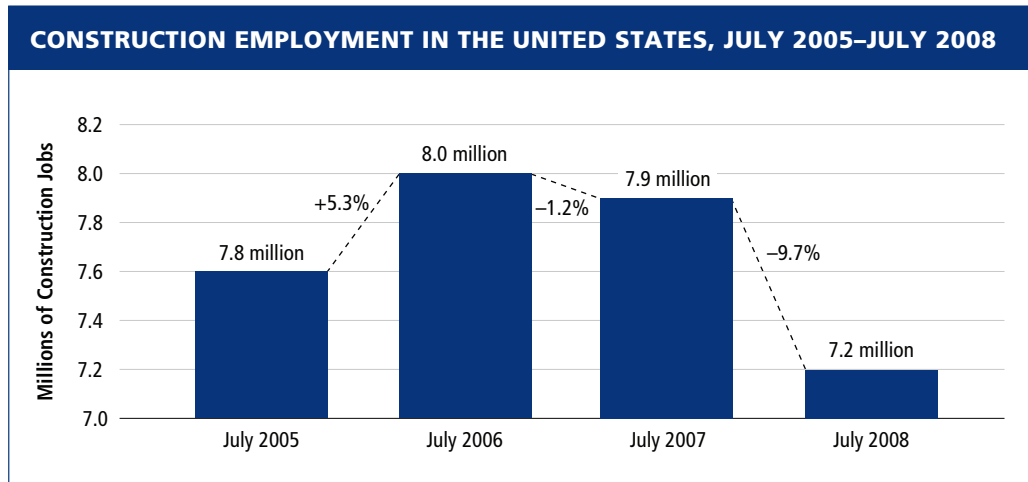
stay unchanged relative to July 2008.

First of all, we cannot know how the current economic slump will proceed over the next two years absent any additional stimulus measure. We also cannot know how the \$100 billion in government spending would affect other forces in the economy. The fall in unemployment, for example, could produce some shortages of labor and materials in a few sectors, particularly construction. But evidence suggests the risks of inflationary labor shortages from job creation are minimal.

The primary challenge today is to create more good jobs, not deal with inflationary pressures from an overheated economy. We can see this clearly by considering the job picture in the construction industry over the past four years. The graph on page 13 shows total construction employment in the United States between July 2005 and July 2008. As we see, between 2005 and 2006, construction employment rose to 8.0 million from 7.6 million, a healthy 5.3 percent increase. Then job creation stagnated between 2006 and 2007 as the housing market bubble started deflating. By July 2008, job losses were mounting, with employment falling to 7.2 million, a nearly 10 percent decline from the previous year.

Based on these figures, we estimate that there are roughly 800,000 construction workers ready to accept new job opportunities. This job slack in the construction industry alone amounts to roughly 40 percent of the total 2 million jobs that could be generated by the overall green infrastructure investment program. Of course, beyond construction, we are still left, as of July 2008, with 8 million additional unemployed workers in other sectors of the economy. There is thus little chance that we will face serious labor shortages through creating 2 million more jobs overall.





Source: U.S. Bureau of Labor Statistics.

Note: July 2008 figure is preliminary.

## Impact on U.S. oil prices

The price of crude oil rose significantly over the past few years. After accounting for inflation, the price of oil earlier this summer was comparable to its peak during the 1979 oil price shock. Prices have fallen back since then as rising prices prompted lower demand around the world, and especially in the United States. But expectations are that over the long term oil prices will continue to rise.

The long-term aim of a green economic recovery program is to provide some initial forward motion toward creating a low-carbon economy in the United States. But in the short-term, how much impact could a green infrastructure investment program have on oil prices?

To begin with, we can state with certainty that U.S. policy intervention cannot set the price of oil, and that no economic forecaster can consistently predict the price of oil.<sup>10</sup> The price of oil is set on the global market, not just within the United States, so any forecasts must take into account highly uncertain factors such as the total amount of crude oil reserves and the future extraction costs of

reserves. The Organization of Petroleum Exporting Countries also exerts a strong influence on global oil prices, as do broader geopolitical factors, such as the Iraq war and negotiations with Iran.

Rapid increases in demand by China and elsewhere in the developing world are also capable of pushing prices up rapidly. In addition, oil futures and options markets move in response to this whole range of influences as industry and institutional investors calculate the effects of shifting oil prices on inflation and the value of the U.S. dollar. Because much of the oil consumed in the United States is imported, any fluctuation in the value of the greenback will generate corresponding movements in oil prices, which further complicates price forecasting.

But even though U.S. energy policy cannot set the price of oil, a green energy policy could exert downward pressure on the global oil price by lowering U.S. demand. The United States accounts for nearly one quarter of total global oil consumption. A comprehensive strategy to fundamentally transform the way we produce and consume energy—such as that outlined in CAP’s “Capturing the Energy

Opportunity” report (see Appendix 4 on page 28 for details), and jumpstarted by the short-term green economic recovery program we have proposed—could eventually reduce demand for petroleum in the United States by about 5 percent per year. This would produce an annual reduction in global oil demand of 1.2 percent.<sup>11</sup>

We developed a model to estimate the effect of a 1.2 percent annual decline in global oil demand, but we emphasize that the model does not predict the price of oil. It assesses the effect of a drop-off in global oil demand on prices—assuming everything else about the global oil market stayed constant. According to our model, we estimate that a 1.2 percent reduction in oil demand would have the power to push oil prices down by 7 percent to 8 percent if everything else about the global oil market otherwise stayed the same.<sup>12</sup>

Put another way, a 5 percent reduction per year in U.S. demand for oil would mean that the annual rate at which oil prices increased in the future would be lower by about 7 percent to 8 percent compared to what those price increases would be had U.S. demand not been cut. How would this effect operate in a real-world setting? As a hypothetical example, assume that the price of crude oil were to rise to \$140 a barrel from \$120, a 17 percent increase. But if, due to a comprehensive low-carbon energy strategy jumpstarted by a green infrastructure investment program, U.S. oil demand were to fall by 5 percent, then this would mean that the global crude oil price would instead rise only to \$132 as opposed to \$140 from the base price of \$120 a barrel.

If we also assume this effect were fully reflected at the gas pump to consumers, then it would mean that instead of the

price of a gallon of gas rising from \$4.00 to \$4.70 in these circumstances, it would instead rise to \$4.40. Clearly, a two-year green recovery program will not create sufficient leverage to counteract the full range of forces that combine to push up the price of crude oil in current global conditions. But it will make a difference. And the degree of leverage will only increase with time, to the extent that the short-term green economic recovery initiative folds into a longer-term comprehensive strategy for supplanting carbon-burning fuels with clean energy sources.

## Our green recovery program in practice

We propose that the green recovery program be financed through a \$100 billion fiscal expansion, temporarily increasing the level of federal deficit spending targeted specifically to underwrite a green investment program. We propose that the increase in government spending include three sources of new investment funds:

- **\$50 billion for tax credits.** This would assist private businesses and homeowners to finance both commercial and residential building retrofits, as well as investments in renewable energy systems
- **\$46 billion in direct government spending.** This would support public building retrofits, the expansion of mass transit, freight rail, and smart electrical grid systems, and new investments in renewable energy
- **\$4 billion for federal loan guarantees.** This would underwrite private credit that is extended to finance building retrofits and investments in renewable energy

The funds for the green recovery program would come directly from the U.S. Treasury, but a high proportion of the \$100 billion would be channeled down to state and local governments, which administer many of the programs we described earlier in this study, and to the private sector through tax credits and loan guarantees.

This green economic recovery program would pay for itself relatively rapidly at the macroeconomic level through returns on energy efficiency in both the public and private sectors. Better insulated schools could spend more over time on teachers, books, and other learning materials. Hospitals in time could spend more on direct patient care. And companies could invest more over the long term in new production and services facilities, raising productivity.

Homeowners, too, would benefit over time from investing in green retrofits and other green investments. For the average U.S. homeowner, the Department of Energy has found that a \$2,500 investment in home retrofitting can reduce average annual energy consumption by 30 percent. As of 2006, the average household income was around \$60,000, and the average household spent about 5 percent of its income on household energy consumption. The 5 percent of total income going to energy amounts to \$3,000 per year. A 30 percent saving of that \$3,000 total household energy bill would therefore amount to \$900 per year (See table below).

All of these benefits from a green infrastructure investment program would of course be in addition to the benefits, still within a two-year period, of 2 million more people working at jobs and the economy enjoying more rapid growth through this green economic recovery program. That's why a short-term increase in the fiscal deficit to finance this program is an appropriate and affordable policy choice while policymakers implement major new revenue sources to finance the U.S. transition to a low-carbon economy and restore fiscal balance.<sup>13</sup>

This future revenue is not speculative. The primary long-term source of funds should be revenues generated through a carbon cap-and-trade program such as those sponsored last year in the U.S. Senate and House of Representatives. A cap-and-trade program would set limits on greenhouse gas emissions and require companies to obtain permits to release global warming pollution into the air. The government would generate revenues by charging businesses to obtain the emissions permits. Credible estimates as to how much the government could raise through such a program range widely, between \$75 billion and \$200 billion per year.

The Center for American Progress, in its "Capturing the Energy Opportunity" report, estimates revenues of \$750 billion over 10 years and details the types of transformative clean energy policy initiatives that could be financed using a

#### ANNUAL SAVINGS FROM INVESTMENT IN HOME RETROFIT

*Example is for average household, \$2,500 retrofit*

|  |          |
|--|----------|
| Annual household income  | \$60,000 |
| Annual household energy expenditures (5 percent of total income)                         | \$3,000  |
| Potential annual savings from \$2,500 retrofit (30 percent of current expenditure level) | \$900    |

Sources: U.S. Household Expenditure Survey; U.S. Energy Information Agency.

dedicated portion of this auction revenue. In addition, over the longer term, the government could generate in the range of another \$6.6 billion annually by eliminating domestic subsidies that are now funneled to the oil and gas industries.<sup>14</sup>

### ***Expanding tax credits***

Tax credits already play a significant role in promoting investments in renewable energy. This is despite the fact that the federal government has provided these credits only on a sporadic basis and with minimal levels of support when they are available at all. Case in point: “Lapses in federal production tax credits, occasional one- to two-year extensions, and uncertainty about the future of these credits have led to a ‘boom and bust’ cycle in the development of wind power,” according to CAP’s Energy Opportunity report. Additions to wind power capacity fell between 2003 and 2004, to 389 megawatts from 1,687 megawatts due to a lapse in tax credits. But when the tax credits were renewed in 2005, wind capacity rose sharply, by 2,431 megawatts.

The Center for American Progress therefore proposes that “production tax credits for all types of renewable energy should last long enough so that businesses can make sound investment decisions.” And given the evidence that private green investors do respond strongly to tax credits, it is also important that they be made much more widely available. The Office of Management and Budget estimated in May 2007 that total tax credits for all federal measures that “may reduce greenhouse gases” would be only \$1.2 billion in 2009. We are proposing an overall fiscal expansion on the order of \$50 billion.<sup>15</sup>

### ***Expanding direct spending***

The direct spending component of the overall green recovery package would cover public investments for public building retrofits, along with expansion of mass transit, freight rail, and smart electrical grid systems. These green infrastructure investments could move forward as soon as funds are appropriated by Congress for many existing programs, in turn sparking quick job-creation opportunities, particularly in the construction sector.

Public building retrofits have the most potential for operating at a large scale within a short time period. According to the most recent Commercial Buildings Energy Consumption Survey, there was about 20 billion square feet of building stock in the United States devoted primarily to education, government offices, and hospitals at the end of 2003. Working from these figures, the U.S. Green Building Council estimates that, on average, these buildings could be effectively retrofitted for about \$1.30 per square foot. Retrofitting all of these buildings would therefore cost about \$26 billion.

Moreover, the average payback period for these investments would be about five years. Spending \$26 billion would generate cost savings on energy of about \$5 billion per year, which means that total savings would exceed \$26 billion roughly five years after the retrofits were conducted.<sup>16</sup> The remaining \$20 billion in direct government green infrastructure spending—on mass transit and light rail and smart grid electric transmission systems—would reap similar macroeconomic returns over time as these investments stabilized oil prices through transportation diversification and energy efficiency gains.

## **Expanding loan guarantees**

In addition to \$96 billion in direct federal spending and tax credits, there is also good reason to begin laying the foundation for more private-sector involvement in the low-carbon economic transition through targeted federal loan guarantees. As of April 2008, the U.S. government is already committed to offering \$10 billion in loan guarantees for energy efficiency and renewable energy.<sup>17</sup> We propose that the federal government budget \$4 billion to expand the loan guarantee program. We estimate this money would net \$20 billion in new private-sector green infrastructure investments, but would cost the U.S. Treasury only \$4 billion since the government directly spends money on its loan guarantees only when borrowers default on their loans.<sup>18</sup> As long as investors in green investment projects are making payments on their loans, U.S. taxpayers face no direct costs from the loan guarantee program.

We arrived at the \$4 billion cost to the federal government of these loan guarantees by considering several factors. The first is the percentage of a loan that would be guaranteed. For purposes of estimating, we assume that the federal guarantee cover 75 percent of the total value of a loan. The second factor is the default rate on these loans. We assume a default rate of 2 percent on loans that the government would have to pay out to make lenders whole. This is a high figure, even within the current unstable market conditions. And a third factor is what percentage of these guaranteed loans might have occurred anyway without the benefit of the guarantee. We estimate that the net increase in green investments generated by the loan guarantee program would be less than the total amount of loans that would be guaranteed.

Taking account of these and other, related factors we believe a cautious budget estimate of \$4 billion for loan guarantees is capable of generating at least \$20 billion in new green investment lending, significantly increasing the amount of guaranteed loans for green investments over the amount currently budgeted by the federal government. In Appendix 2 we explain in detail how we arrive at this figure, and also describe how, using less cautious but still reasonable assumptions, the total amount of new green lending generated by a loan guarantee program could be much larger.

Over the longer term, these loan guarantees alongside tax credits for private companies would increasingly become a major impetus for private-sector financing of a green infrastructure investment program. But over the next two years these loan guarantees will not deliver as large a boost to spending and jobs as the direct public investments.

## **The fiscal deficit**

To serve effectively as an economic recovery program, government spending and tax incentives to boost green infrastructure investments would have to be financed by increasing the fiscal deficit. These expenditures would be covered by a carbon cap-and-trade program, which would provide the revenues needed to pay for the U.S. transition to a low-carbon economy. But in the short term, we have demonstrated that frontloading these green investments makes sound economic and environmental sense.

At the end of fiscal year 2007, on September 30, 2006, the federal government's annual fiscal deficit stood at \$162

billion, but with the economy slowing in 2008, this figure inevitably rose sharply, to \$389 billion in fiscal 2008, according to the Office of Management and Budget's *Mid-Session Review*. The OMB estimated in July 2008 that the 2009 fiscal deficit would rise further, to \$482 billion.

The United States cannot run a reckless fiscal policy no matter how pressing the country's social and environmental needs. But it is important to keep these deficit figures in perspective. The current deficit figure is certainly a matter of concern, but measured as a percentage of GDP the federal deficit today is manageable as part of a responsible long-term plan. And as long

as the economy remains in a slump, the primary problem is not the size of the federal deficit but how money is being spent.

Investing funds in a green economic recovery program that is capable in the short run of creating jobs, dampening upward pressure on oil prices, and moving our economy significantly toward a clean energy economy is a responsible investment of taxpayer money in our present circumstances. Our proposals for financing this short-term green recovery program through future cap-and-trade revenues are both realistic about current conditions and responsible about facing longer-term fiscal challenges.

## Conclusion

**T**his report outlines a green economic recovery program that could create about 2 million new jobs within the U.S. economy over two years. This program can also help to stabilize the price of oil, and would help jumpstart a wide range of new investment initiatives that can effectively fight global warming and build a clean energy economy in the United States.

To create 2 million new jobs within two years, the overall level of fiscal expansion will need to be around \$100 billion, or roughly the same as the portion of the April 2008 stimulus program that was targeted at expanding household consumption. This green economic recovery program will create more jobs and better paying jobs. If fully implemented, it would push the unemployment rate down to 4.4 percent from 5.7 percent if July 2008 labor market conditions persist.

Of course, labor market conditions will change in the coming months, no doubt in some unexpected ways. Nevertheless, whatever else may change about the U.S. economy over the near term, we can be certain that the green economic recovery program will serve as a strong counterforce against pressures that currently are pushing unemployment up as well as more broadly increasing economic disparities. Our green infrastructure investment proposal also makes significant long-term advances toward creating the green, low-carbon economy that we need.



# Appendix 1

## Techniques for Generating Job Estimates

How do we come up with our jobs estimates from our \$100 billion program (comprised of \$50 billion in tax credits, \$46 billion in direct spending, and \$4 billion to cover the cost of loan guarantees to generate \$20 billion in net new lending)? Our primary tools for generating estimates of the direct and indirect employment impacts of spending on alternative energy sources are national and state-specific input-output models. In our forthcoming full study for the Center for American Progress, we present an extended discussion of our methodology in building these input-output models. Here we present a brief non-technical summary of the fuller discussion.

The input-output model allows us to observe relationships between different industries in the production of goods and services. We can also observe relationships between consumers of goods and services, including households and governments, and the various producing industries. For our purposes specifically, the input-output modeling approach enables us to estimate the effects on employment resulting from an increase in final demand for the products of a given industry. For example, we can estimate the number of jobs directly created in the construction industry for each \$1 million of spending on construction. We can also estimate the jobs that are indirectly created in other industries through the \$1 million in spending on construction—industries such as lumber and hardware. Overall, the input-output model allows us to estimate the economy-wide employment results from a given level of spending.

As yet, the U.S. government surveys and accounts that are used to construct the input-output tables do not specifically recognize wind, solar, biomass, building retrofitting, or new mass transit as industries in their own right. In order to estimate employment results in these industries, we therefore had to construct synthetic “industries” by combining components of industries that are now included in the government accounts.<sup>19</sup> For example, we have created within the model a synthetic representation of the biomass industry, which consists of a combination of farming, forestry, wood products, and refining. We have assigned relative weights to each of these industries in terms of their contributions to producing biomass products. Once we constructed this synthetic biomass industry within our input-output model, we were able to estimate the employment effects that would result from increased spending on biomass products, just as we estimate employment effects in the oil and coal industries.

There are two main approaches we could pursue for comparing the number of jobs generated through spending on, say, solar power versus the oil industry. One approach is to estimate job creation based on a given level of spending—\$1 million spent on solar power versus that same \$1 million spent within the oil industry. The other approach is to generate estimates based on a given level of power production—the number of jobs created through producing 1 million BTUs of power through solar energy or through burning petroleum.



In principle, there is some advantage to comparing effects based on a given level of power production. This approach is most consistent with the idea that we are attempting to proceed to a low-carbon economy without having to make significant sacrifices in the total amount of energy we consume, regardless of whether our energy source is solar power or oil. Yet under this approach our employment estimates become highly sensitive to the current state of technology and energy costs in each energy industry. This would produce highly inflated employment figures for solar power and other forms of renewable energy, where, at present, the costs of generating a given supply of BTUs is much more expensive than traditional energy sources. As such, the approach we have taken is to estimate employment effects in terms of a given amount of money spent within each industry—\$1 million in solar power versus \$1 million on oil.

## Estimating induced job creation

It is much more difficult to estimate the size of the induced employment effects—or what is also commonly termed “multiplier effects”—than to estimate direct and indirect employment effects of a program such as the \$100 billion program we propose. Of course, we know that when 2 million more people become employed directly and indirectly through the green economic recovery program, those people will spend most of the money they have newly earned on other products in the economy. Moreover, we have a good sense of what percentage of the additional income people receive will be spent by them—between about 95 percent and 97 percent.<sup>20</sup>

But how much this extra spending will mean in terms of overall job creation depends on the existing conditions in the economy, including how many people are unemployed, what the inflation rate is, what is happening with oil prices, the size of the government’s fiscal deficit, the size of the economy’s trade deficit, and whether the increase in government spending is targeted to either encourage or discourage private-sector investment. A 2002 article by economists at the International Monetary Fund surveyed the professional literature estimating the size of the induced effects in the United States, among other economies, in a range of circumstances and time periods (Hemming et al. 2002).<sup>21</sup> They report wide variations in these estimates. This includes some estimates of a negative induced effect—an overall expansion of less than \$100 billion resulting from an initial \$100 billion program—to a doubling of the initial expansion—\$200 billion in overall expansion emerging out of an initial \$100 billion stimulus.

The green economic recovery program we propose is designed specifically to generate a large induced expansion of jobs. This is because the economy at present is operating with high unemployment, with plenty of slack resources to be utilized; spending will be focused on domestic industries rather than imports; it aims specifically to encourage private-sector investment rather than relying on government spending; and it will help control the upward movement in the price of oil. Given these factors, one might expect that the induced effect would be closer to the higher end estimates of the IMF study—that another 1.5 million induced jobs could be created through

the initial \$100 billion green stimulus program, on top of the 1.5 million jobs that will be generated directly and indirectly. Nevertheless, to be cautious, it is appropriate to underestimate rather than overestimate the induced employment effect, even if the program is designed, and conditions are favorable, for a relatively large induced effect. We therefore assume that the induced employment effects of the green economic recovery program will add one-third to the overall level of job creation generated by the direct and indirect effects. This is in line with the lower-end estimate of such effects for the U.S. economy reported in the IMF survey study.

## Appendix 2

### Estimating the Level of New Green Investments from Loan Guarantees

We have budgeted \$4 billion in government funding to underwrite a loan guarantee program supporting green infrastructure investments. How would this program operate? Let's assume that the level of guarantee is 75 percent of the principal on these loans. Note, crucially, that under such an arrangement, private lenders would still face significant risk on 25 percent of the credit they had extended, and would therefore have to evaluate these loans based on their potential for profitability. The loan guarantee program would necessarily operate on the basis of market controls and discipline.

What would be the government's financial obligation in such an arrangement? Any loan guarantee program creates contingent liabilities for the government—that is, the government's funding liability is contingent on when borrowers default on the guaranteed loans. Thus, to know the level of government's financial costs we would need to first know the level of accruals on the contingent liabilities.<sup>22</sup> For the purposes of the discussion, we therefore need to make an assumption about the default rate on these guaranteed loans. As a reference point, we assume a default rate of 2 percent on the subsidized loans.<sup>23</sup>

We therefore consider the loan guarantee program on the basis of three key assumptions:

- The government pays \$4 billion in accruals on the contingent liabilities from the loan guarantee program
- The default rate on these loans is 2 percent
- The guarantee on these loans covers 75 percent of principal.

Under these three assumptions, it follows that the maximum level of lending from this program would be \$267 billion, ( $\$4 \text{ billion} / [(0.75) \times (0.02)]$ ). This maximum figure for loan guarantees based on our three assumptions is 13 times greater than the assumption we are making in this study—that \$4 billion set aside for government accruals will generate a net increase in green investments of \$20 billion.

Why are we assuming that the total level of green investments resulting from a \$4 billion government fund for accruals would yield only about \$20 billion in new lending rather than a figure more in the range of \$200 billion or higher? We are taking into account three factors.

First, financial markets are exceedingly risk-averse today, which is why we do not assume in the short run that lenders are likely to respond fully to the large-scale opportunities offered by this green investment loan guarantee program. As such, it is also likely that even though we have budgeted for \$4 billion to cover accruals on the defaulted loans, the actual figure that the government would have to pay is likely to be much lower.

Second, some of the loans that would be underwritten by the guarantee program would have occurred even without the opportunity to receive the guarantees. The net increase in green investments generated by the loan guarantee program for the purposes of the input-output model is therefore less than the total amount of loans that would be guaranteed.

Third, some green investments underwritten by the guarantee program would also likely receive support through the tax credits we have proposed. We therefore could not count any given green investment project receiving both tax credits and loan guarantees as two distinct green investment projects. To do so would amount to double counting this single investment simply because it had received two separate government subsidies. We note that it would be perfectly legal for a single green investment project to receive both tax credit and loan guarantee subsidies—indeed, such dual incentives will constitute a strong positive force enhancing the overall level of green investments in the U.S. economy.

The upshot: Our highly conservative assumptions allow for only \$20 billion in net new green investments through a \$4 billion government commitment to cover accruals on defaulted guarantee loans. Over time, however, this loan guarantee program could grow considerably after financial markets settle down as financial institutions and investors work their way through the U.S. housing and global credit crises. Indeed, in time a green infrastructure loan guarantee program could help counteract the current slump in credit markets resulting from the collapse of the housing bubble and the subsequent tightening of available credit.

Consider that overall lending in the U.S. credit markets fell in the first quarter of 2008 by \$271 billion dollars relative to the same period in 2007—to \$2.04 trillion from \$2.31 trillion—a decline of 11.8 percent in overall lending. Home mortgage lending over this same period fell by an extraordinary 59 percent. At the same time, financial institutions have increased their holdings of cash reserves. Commercial banks in the first quarter of 2008 were holding 22 percent more cash reserves than the same time in 2007, and similar patterns hold for other financial institutions.

Financial institutions are clearly wary about making loans in the current environment and are choosing to hold more cash in reserve, even though they don't earn income from their cash holdings.<sup>24</sup> Our proposal to expand subsidized credit by \$20 billion would in itself only go about 7.5 percent of the way to raising total lending in the U.S. economy to its 2007 level. In these circumstances, there is clearly available space for a large-scale expansion of credit.

## Appendix 3

### Allocating Green Investment Funds Across Individual States

Our green investment program is designed to benefit all communities throughout the country—to create good jobs and help businesses grow. To get a sense of how these national numbers translate into the lived experience of Americans, and how they offer concrete opportunities for economic development, it is important to examine the effects of our program at the state level as well as the national level.

For this reason, we have estimated how the benefits of our program could be distributed across the states, not just at a national economy-wide level. We present here our calculations for a representative sample of 34 of those states.

Calculating the consequences of our green infrastructure investment program on a state-by-state basis requires us to make some assumptions as to what share of the \$100 billion in federal support should be allocated to each state. There is no obvious formula as to how this should best be modeled, but to approximate the distribution of jobs and investment we have made some simplifying assumptions here, and present the results in the table below.

One way to allocate the flow of investment funds would be to make a determination as to which states have advantages in various investment areas, such as solar or wind power, urban density for mass transit investments, or with agriculture to produce targeted advances in next-generation biofuels. But whatever funding allocations we establish on that basis would inevitably be highly sensitive to our assumptions. More to the point, we don't have an empirically rigorous way to balance the importance of these geographic or climate advantages for any given state or region relative to the needs of the different states for the spending from the \$100 billion green economic recovery program.

With this in mind, we considered two approaches to assigning investment levels for each state based on easily observable and measurable traits for each state to distribute the overall investment budget of \$100 billion. We then settle on a solution that combines the two approaches to estimate an allocation for each of the states we looked at.

First, we examine the effects of distributing green investments on the basis of each state's share of national gross domestic product. This allows us to model the distribution of the green energy investments based on existing patterns of financial investments and current economic development trends. This provides an accurate measure of how our green infrastructure investment would flow if it followed current patterns of state-level economic development.

Then we examine an allocation based solely on each state's population, to achieve a highly equitable per capita distribution of resources. Calculating the distribution of \$100 billion in new green recovery funds on the basis of population is, of course, the most egalitarian approach, with each person in the country having an equal dollar claim on the overall pool of investment funds. We then try to balance these two approaches, recognizing that retrofits, for example, will in part follow a pattern based on population density, but that capital investment will also naturally flow toward areas of pre-existing capital investment in industry, infrastructure, and building stock.

We recognize that each approach, both a GDP-share and a population-based allocation of funds, represents a reasonable argument for determining state investment allocations and hence job creation numbers. Accordingly, we calculate what the allocation of investment should be under both the GDP- and population-based approaches, and use the midpoint of these two calculations as our figure for each state's allocation of the \$100 billion for the overall green stimulus program. In this way we offer an estimate of how job growth and investment levels would be experienced on the ground in the states as a result of a green investment package.

In addition to calculating the levels of investment and job creation by state, we also looked at the broader impact of job growth on the state economies through the reduction in the rate of unemployment that these job gains would provide. State unemployment levels are presented in the table below, alongside the potential unemployment level if job gains from a green investment package were realized.

Every state in the country is facing deteriorating economic conditions, even though some states, such as Michigan and Ohio, are worse off than, say, Virginia or Iowa. At the same time, we have shown how each state is now poised to gain substantial benefits through our economic recovery program to promote green investments in both the private and public sectors. Regardless of a state's topography or climate, major opportunities for green investments exist now and will grow with time. These investments, in turn, will become a powerful engine of job creation as the United States advances toward building a low-carbon economy.

**STATE-BY-STATE JOB CREATION FROM \$100 BILLION**  
***U.S. Green Recovery Program (figures are for 34 states)***

|                | State Share of<br>\$100 billion Green<br>Recovery program | Total Job Creation<br>for State from<br>Program | Actual<br>Unemployment Rate<br>as of June 2008 | Unemployment Rate Under<br>June 2008 Conditions after<br>Green Recovery Program |
|----------------|---|---|--|---|
| Alaska         | \$275.3 million   | 4,959   | 6.9%   | 5.6%  |
| Arizona        | \$1.93 billion  | 37,234  | 5.0%   | 3.8%  |
| Arkansas       | \$813.7 million   | 19,534  | 5.3%   | 3.9%  |
| California     | \$12.70 billion   | 235,198   | 7.0%   | 5.7%  |
| Colorado       | \$1.67 billion  | 32,849  | 5.3%   | 4.1%  |
| Florida        | \$5.72 billion  | 123,756   | 5.7%   | 4.4%  |
| Illinois       | \$4.36 billion  | 83,710  | 7.1%   | 5.9%  |
| Indiana        | \$1.96 billion  | 43,353  | 5.8%   | 4.5%  |
| Iowa           | \$967.8 million   | 21,057  | 3.9%   | 2.7%  |
| Kansas         | \$880.9 million   | 19,142  | 4.4%   | 3.2%  |
| Maine          | \$396.3 million   | 9,132   | 5.0%   | 3.8%  |
| Maryland       | \$1.91 billion  | 36,739  | 4.3%   | 3.1%  |
| Massachusetts  | \$2.35 billion  | 42,530  | 5.3%   | 4.1%  |
| Michigan       | \$3.13 billion  | 61,394  | 8.7%   | 7.5%  |
| Minnesota      | \$1.78 billion  | 37,429  | 5.3%   | 4.0%  |
| Missouri       | \$1.81 billion  | 43,047  | 6.0%   | 4.6%  |
| Montana        | \$279.0 million   | 6,335   | 4.1%   | 2.9%  |
| Nebraska       | \$580.6 million   | 12,766  | 3.4%   | 2.2%  |
| Nevada         | \$865.4 million   | 15,021  | 6.5%   | 5.4%  |
| New Hampshire  | \$432.1 million   | 9,245   | 4.0%   | 2.7%  |
| New Jersey     | \$3.16 billion  | 57,228  | 5.3%   | 4.0%  |
| New Mexico     | \$599.9 million   | 13,717  | 4.5%   | 3.1%  |
| New York       | \$7.12 billion  | 131,991   | 5.2%   | 3.9%  |
| North Carolina | \$2.92 billion  | 62,015  | 6.2%   | 4.8%  |
| North Dakota   | \$204.2 million   | 4,380   | 3.6%   | 2.5%  |
| Ohio           | \$3.66 billion  | 80,360  | 6.7%   | 5.4%  |
| Oregon         | \$1.19 billion  | 27,307  | 5.5%   | 4.1%  |
| Pennsylvania   | \$4.01 billion  | 86,385  | 5.3%   | 4.0%  |
| South Carolina | \$1.28 billion  | 28,064  | 6.5%   | 5.2%  |
| Tennessee      | \$1.90 billion  | 44,942  | 6.8%   | 5.3%  |
| Virginia       | \$2.67 billion  | 56,459  | 4.2%   | 2.8%  |
| Washington     | \$2.17 billion  | 42,690  | 5.4%   | 4.2%  |
| West Virginia  | \$516.0 million   | 12,149  | 5.5%   | 4.0%  |
| Wisconsin      | \$1.77 billion  | 37,165  | 4.9%   | 3.7%  |
| <b>TOTALS</b>  | <b>\$77.98 billion</b>                                    | <b>1,578,282</b>                                |  |   |

Source: Data for the first two columns derived from authors' calculations. See Appendix 1 and text of Appendix 3. Labor market figures are from Bureau of Labor Statistics.

## Appendix 4

### 10 Steps to a Low-Carbon Economy from “Capturing the Energy Opportunity,” by John Podesta, Todd Stern, and Kit Batten

The Center for American Progress presents ten broad policy steps to limit temperatures to 3.6°F (2°C) above pre-industrial levels—the threshold at which scientists agree humanity can weather the affects of global warming. By pursuing these steps we will create new jobs and new technologies that will boost job growth, productivity, and innovation, restoring our global leadership in key 21st century industries.

#### Create an economy-wide, greenhouse-gas-emissions cap-and-trade program

Market-based trading of properly priced carbon emission permits will lead businesses, consumers, and governments alike to price the cost of greenhouse gases into their work-a-day world and link the United States to an already emerging global marketplace in carbon credits. We propose to auction 100 percent of these credits, allocating 10 percent of the revenue to businesses operating in energy-intensive sectors. Half of the remaining 90 percent of the revenue will be allocated to low- and moderate-income Americans to help offset energy-related price increases. The remaining half would go to spur science and technology innovation across the board and to drive our transition to a low-carbon economy by funding RD&D projects, tax incentives, and other initiatives described here.

#### Eliminate Federal tax breaks and subsidies for oil and gas

The federal government currently invests billions of dollars annually in tax breaks and other subsidies to the oil and gas industry. Given the high price of oil, oil companies are making record profits and do not need this government assistance. It is time to shift this investment away from high-carbon dirty sources of energy to the clean energy necessary to power a low-carbon economy. Redirecting this investment to help fund the low-carbon energy policies outlined here will help transform our economy and capture the energy opportunity this transformation provides.

#### Increase vehicle fuel economy

To create low-carbon transportation across our country we propose a rapid increase in the fuel economy of our vehicle fleet to 40 mpg by 2020 and at least 55 mpg by 2030. This goal is readily achievable through the swift development of existing fuel-efficient technologies, including hybrid and electric technologies as well as more efficient engines



that can run on low-carbon biofuels, and through the dedicated research and development to deploy new technologies. Providing incentives to U.S. auto manufacturers to retool their automotive fleets and consumer tax credits for the purchase of more fuel efficient vehicles will also help pave the way for clean transportation in this country.

## **Increase production and availability of alternative low-carbon fuels**

Reducing our nation's dependence on carbon-based fossil fuels requires a dramatic increase in the production and use of bio-based fuels including E85 (85 percent ethanol/15 percent gasoline) and a swift shift to even cleaner cellulosic biofuels and electricity. To achieve these goals, we propose that low-carbon alternative fuels, including electricity, supply 25 percent of our nation's transportation fuels by 2025. We propose two measures to ensure these alternative fuels, over their lifecycle of production to consumption, generate fewer greenhouse gas emissions and are sustainably produced: a low-carbon fuel standard to reduce lifecycle emissions from transportation fuels by 10 percent by 2020; and a renewable fuels certification program with transparent sustainability labeling. To ensure the fueling infrastructure is in place to accommodate this change, we propose a pump-or-plug mandate that requires 15 percent of fuel "pumps" (including dedicated electricity charging stations for plug-in hybrid vehicles) provide low-carbon alternative fuels in any county in the U.S. where 15 percent of vehicles can run on these alternative fuels.

## **Invest in low-carbon transportation infrastructure**

Less fuel-intensive transportation options means less greenhouse gases. To boost greater use of alternative low-carbon transportation we propose new investment in more diverse and inter-modal transportation networks such as local mass-transit networks, regional and interstate long-distance high-speed rail systems, and green city programs to encourage the redevelopment of urban areas and reduce long commutes and suburban sprawl.

## **Improve efficiency in energy generation, transmission and consumption**

Energy efficiency is the cheapest, fastest way to reduce the carbon intensity of our economy. The United States currently uses nearly twice as much energy per dollar of GNP than other industrialized countries, so there is much we can do to reduce the inefficiencies of our energy generation, transmission, and consumption. To this end, we propose a National Energy Efficient Resource Standard to require electricity and natural gas distributors to meet a 10 percent energy savings threshold through efficiency upgrades by 2020, and a major upgrade of the U.S. electricity grid to increase energy and national security, encourage distributed generation, and increase the efficiency of transmission. Additional significant gains in efficiency can be made by requiring efficiency upgrades for our appliances and private, commercial, and federal buildings.

## **Increase the production of renewable electricity**

We can lower the amount of greenhouse gases produced by electric power, which now generates 36 percent of our carbon emissions and will grow dramatically as the demand for electricity increases unless we significantly change the way we produce power through new investments in renewable energy sources and advanced-coal energy production. Specifically, we propose a new national renewable electricity standard to require 25 percent of energy produced in the United States to come from renewable sources by 2025, increasing distributed renewable electricity generation and facilitating investment in renewable energy by improving the structure of production tax credits and low interest loans.

## **Use carbon capture-and-storage systems to capture and bury the carbon emissions from burning coal**

The United States boasts 27 percent of the world's coal reserves, enough to last over 200 years, but coal-fired power plants today account for 80 percent of all carbon emissions from power plants. Our answer is the deployment of new carbon capture-and-storage technologies that allow power plants to burn coal for energy while sequestering carbon emissions in underground geologic reserves across the country. We recommend the establishment of an emission performance standard for all new coal-fired facilities equivalent to the best available capture-and-store technology, and the provision of federal funds to help offset additional costs of implementing carbon capture-and-storage technology.

## **Create a White House National Energy Council and make the Federal government a low-carbon leader**

The federal government must first create a White House National Energy Council to lead all other agencies in making energy and global warming top administration priorities. The new Council will ensure that the U.S. government leads the way on all of these fronts, not just by enacting these proposals but also by wielding the purchasing power of the federal government to promote low-carbon technologies, implementing new tax policies, and creating dedicated federal agencies to address global warming. The federal government must ensure that taxpayer investments reduce and withstand the effects of global warming. It must also create an Energy Innovation Council to spur interagency alternative energy-related research and development, an Energy Technology Corporation to demonstrate the efficacy of these new clean technologies, a Clean Energy Investment Administration to ensure these technologies make it to the marketplace, and a Clean Energy Jobs Corp to promote new “green collar” jobs in a new clean economy. We must also more than double currently existing federal investment in low-carbon energy RD&D.

## Lead efforts to advance international global warming policies

Global warming is obviously an international problem that requires concerted action by all countries. The United States needs to reclaim the lead in global efforts to combat climate change by getting our own house in order while simultaneously joining current international efforts to reduce greenhouse gas emissions. This means creating an E-8 of nations comprised of leading developed and developing countries devoted to addressing global ecological and resource issues. And it means taking the lead once again in the U.N. Framework Convention for Climate Change, where the Kyoto Protocol of 1997 on reducing greenhouse gas emissions was first enacted—without U.S. support. As a component of these efforts, the United States must also invest in the energy, environment, and infrastructure sectors in developing nations to alleviate energy poverty with low-carbon energy systems and to help these nations adapt to the effects of climate change.

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## Endnotes

- 1 A “smart grid” combines advances in information technology with innovations in power-systems management to create a significantly more efficient distribution system for electrical energy. A smart grid would accommodate decentralized power production from renewable sources; directly interface with equipment, appliances, and electrical vehicles to improve energy efficiency; and redistribute energy supply to accommodate unexpected surges in use and avoid mass outages.
- 2 Employment in these 34 states amounts to about 78 percent of the U.S. labor market. Our approach to distributing the total \$100 billion program equitably among all states is based on a formula that considers equally the population and GDP levels in each state.
- 3 These programs are described at the following sites: [http://www.admin.state.mn.us/pmd/energy/2-0\\_services.htm#energy\\_savings\\_programs](http://www.admin.state.mn.us/pmd/energy/2-0_services.htm#energy_savings_programs); [http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=UT09R&state=UT&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=UT09R&state=UT&CurrentPageID=1&RE=1&EE=1); <http://www.energy.ca.gov/greenbuilding/index.html>; <http://washington.bizjournals.com/washington/stories/2008/04/21/tidbits4.html>.
- 4 Austin Energy has established itself as an innovative leader in smart grid investments. See Burkhalter, “Austin Energy Delivers Opportunity,” [http://www.smartgridnews.com/artman/publish/industry/Austin\\_Energy\\_Delivers\\_Opportunity.html](http://www.smartgridnews.com/artman/publish/industry/Austin_Energy_Delivers_Opportunity.html)
- 5 The allocation of total investment funds that we are working with is: 40 percent retrofits; 20 percent mass transit/freight rail; and 10 percent each for smart grid, wind power, solar power, and biomass fuels. Adjusting the budgetary allocations would affect the job total estimates, but not by a dramatic extent. Appendix 1 discusses briefly how we derived the job figures. In sum, we worked with the U.S. input-output model to generate direct and indirect employment effects. We then assumed an induced effect as a 33 percent increment above the direct and indirect effects, working from the existing literature to assign that 33 percent figure.
- 6 Friends of the Earth, “Big Oil, Bigger Giveaways” (July 2008). Available at [http://www.foe.org/pdf/FoE\\_Oil\\_Giveaway\\_Analysis\\_2008.pdf](http://www.foe.org/pdf/FoE_Oil_Giveaway_Analysis_2008.pdf).
- 7 Center for American Progress, “Ten Reasons Not to Lift the Offshore Drilling Moratorium,” June 2008. Available at [http://www.americanprogress.org/issues/2008/06/offshore\\_drilling.html](http://www.americanprogress.org/issues/2008/06/offshore_drilling.html).
- 8 The April 2008 stimulus included about \$100 billion of a total \$150 billion targeted to provide tax rebates for households. The rest provided for business tax credits and an increase in the value of mortgages eligible for purchase by government-sponsored agencies. Because fully \$50 billion of the total stimulus package was aimed at business incentives, it will take longer to determine how high was the business take-up rate on these incentives. Nevertheless, the stimulus program should have yielded a significant increase in employment since last April. Why then has unemployment been rising since the program was implemented? This stimulus measure almost certainly had a positive effect on jobs, but those effects are being swamped by the negative counteracting forces deriving from the housing bubble collapse, financial market crisis, and high oil prices. Indeed, it is precisely these strong economic headwinds that have created the need for a second stimulus injection. Broda and Parker (2008) estimate that the typical U.S. family did in fact increase spending by 3.5 percent when the rebate arrived, boosting overall nondurable consumption in the United States by 2.4 percent in the second quarter of 2008. They further estimate that spending should rise by 4.1 percent in the third quarter of 2008.
- 9 In fact, a high proportion of the low-paying jobs created by green investments will be in construction and manufacturing, where career ladders are substantially more effective than in service-sector areas—such as hotel and restaurant workers—associated with household consumption.
- 10 Thus, three prominent forecasts published in 2007 of where crude oil prices would be in 2008 include JP Morgan Chase & Co., in August 2007, estimating \$59.75 a barrel (Harvey 2007); Goldman, Sachs & Co., in September 2007, estimating \$85 a barrel (Safdar 2007); and the U.S. Energy Information Agency, also in September 2007, estimating \$71.17 a barrel (U.S. EIA 2008).
- 11 We do not attempt in this report to establish how much oil demand can be reduced through a combination of green investment strategies standing alone, or in combination with a cap-and-trade program. Here we are focused on the more narrow question of how much such a 5 percent fall in U.S. demand could reduce the global oil price, assuming all else about the global market remained equal. In addition to these measures to reduce oil demand, the United States does have the ability even in the short run to dampen oil price run-ups through expanding supply, via its Strategic Petroleum Reserves. Davidson (2008) estimates that releasing about 70 million to 100 million barrels of oil from the reserve, or about 10 percent to 15 percent of the total stockpile, could effectively counteract at least the speculative forces pushing up prices.
- 12 A major reason we estimate that the price of oil would fall by this much is that we expect that the supply of oil would remain fairly stable even though the price has fallen (in technical terms, the oil supply curve is relatively steep). Our expectation of relatively weak oil supply reductions in the face of declining prices is consistent with the general behavior of the market in the short term.

- 13 We also assume that the Federal Reserve would maintain at least a neutral monetary policy stance while the green recovery program is being implemented. An accommodative stance by the Fed would, of course, support the expansionary aims of the program, while a restrictive stance would constrain its effectiveness. In general, we would not expect that the Fed would attempt to counteract the intentions of this program by assuming a restrictive monetary stance.
- 14 Concerning carbon cap-and-trade revenue figures, the \$75 billion estimate is from Podesta et al. 2007; the \$200 billion estimate is from Boyce and Riddle (2007). Both of these studies also report on other estimates, some of which are even higher than \$200 billion. The estimate for oil and gas subsidies is from Friends of the Earth (2008).
- 15 At the same time, it is important to recognize that not all the support businesses receive via tax credits promotes new investments. Some proportion of government funds (tax expenditures) that businesses receive in tax credits goes to support investments that businesses were planning to make anyway. The proportion of such unnecessary tax credit subsidies is likely to be relatively low in the green investment area, since the level of investment at present is still small. But the concern remains real, as Michael Ettlinger will discuss in a forthcoming CAP study.
- 16 A good overview of the benefits of green retrofits for private commercial buildings—including benefits in terms of productivity, healthcare costs, employee attraction and retention, as well as energy savings itself—is presented in “The Dollars and Sense of Green Retrofits,” by Deloitte and Touche Consulting and Charles Lockwood, available at <http://www.deloitte.com/dtt/article/0%2C1002%2Csid%25253d2232%252526cid%25253d213564%2C00.html>.
- 17 This is in addition to \$20.5 billion for nuclear power investments and \$8 billion in advanced fossil fuel technologies. The Department of Energy document announcing these guarantee programs provides no discussion on the extent of the guarantees, or a broader assessment of their financial implications. See [http://www.doe.gov/media/Loan\\_Guarantee\\_Program-Implementation\\_Plan\\_April\\_2008.pdf](http://www.doe.gov/media/Loan_Guarantee_Program-Implementation_Plan_April_2008.pdf).
- 18 The \$4 billion subsidizes more than \$20 billion in loans, but as explained in Appendix 2 not all of the loans create net new investment in the economy.
- 19 We are in the process of conducting our own survey of the renewable energy and energy efficiency industries. The questions in the survey are drawn from those used for the Department of Commerce input-output tables. Once the survey is completed, we will be able to incorporate our results into the standard input-output model and generate calculations for the renewable energy and energy efficiency sector—as well as its subsectors, such as building weatherization, mass transit, wind power, solar power, and biomass fuels—just as we now do with traditional energy sectors, such as oil.
- 20 The Bureau of Economic Analysis of the U.S. Commerce Department reports that personal consumption as a percentage of disposable personal income was 97.5 percent in June 2008, compared with 95.1 percent in May. The jump in the consumption rate could be due, at least in part, to the rise in income associated with the April economic stimulus program. At the same time, as we have mentioned before, the consumption rate could also be constrained by the needs of households to pay off debts rather than increase spending. However, with households carrying high levels of debt, the chances rise that upon receiving a government rebate check households will use the money to repay debts rather than increase their consumption.
- 21 The fact that the Hemming et al. IMF study is focused on induced effects in terms of *output and income* and we are concerned with induced effects on *employment* does not affect the overall approach or implications of the findings significantly. This is because employment growth generally varies closely with income and output growth. There will be differences between the two based, for example, on different consumption functions for households at different income levels—with poorer households spending a higher fraction of an overall income increase than richer households. But relative to the wide range of the output multipliers themselves reported in the IMF survey, this factor will play only a small role in generating divergences between the induced effects as related to employment on the one hand, and income and output on the other.
- 22 Many government guarantee and insurance programs charge a guarantee or insurance fee that is calculated so that it will pay for anticipated losses, leaving the government in the position of paying for only the unanticipated risk and thus avoiding high private-sector risk premiums that may preclude credit availability. We do not include any guarantee fee for the purposes of this example.
- 23 We note that well into the depths of the subprime mortgage loan crisis at the end of 2007, the default rate on mortgage loans in the United States was 0.83 percent. Our assumption of a 2 percent default rate for the purposes of this exercise is a figure more than double the size of this crisis-level rate in the mortgage market.
- 24 In addition, institutional investors who would normally purchase many of these loans after they were securitized by Wall Street are holding back. This leaves lenders no choice but to hold loans on their own books, which in turn crimps lending further.





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