Electricity Market

- Electricity Market doesn't meet Long-term Customer and Stakeholder Needs
- Key change – transition to Green Power
- Current transition too slow to best serve customers
- Change resisted and sabotaged by industry corporate executives

The current mix of free markets and regulated markets used in the electricity market doesn't address a full suite of customer needs, and doesn't serve the long-term interests of customers and other stakeholders. The predominant sources of energy used to generate electricity: coal, nuclear, and natural gas; have significant external costs not included in pricing. The marketplace shifts the cost burden to our children and grandchildren, and rewards industry corporate executives for short-term strategies that essentially try to grab money from current operations, leaving stakeholders stuck with high loaded cost long-term power sources. Many industry leaders avoid or deny the need to transition to green power sources. These companies' apparent strategy involves maximizing cash flow from current facilities before moving on; leaving ratepayers, taxpayers, and the general population to pay the eventual cost of environmental destruction and climate change; and the eventual long term costs of an electricity system ill-suited to provide low long-term total loaded cost electricity to future customers.

The key change required to improve the electricity market involves a rapid transition to over 80% green power sources within 25 years. Green power supply in the last ten years has increased at a rate too slow to best serve customers and stakeholders. Many corporate executives in the industry have opposed and stymied change by attempting to block actions intended to increase green power market share rapidly. Some of their sabotaging actions include funding political disinformation campaigns to mislead customers and the American public. These corporate managers have failed to develop a comprehensive plan to transition to green power, and failed to provide the leadership needed to drive the transition.

Current Electricity Market Long-term Problems – Major Changes Required

- Lowest cost electric power generated from publicly owned renewable energy sources
- Short term prices exhibit extreme volatility due to limited surplus capacity during peak demand periods (similar to oil market price volatility due to lack of curtailed production capacity
- Deregulating electricity markets has caused unusual customer price increases, sometimes caused by supplier collusion
- Private sector power suppliers have repeatedly attempted to sabotage and block public power projects
- Lack of electric power storage options and capacity
- Electric power has regional problems due to lack of transmission interconnection and lack of diverse power generation sources
- Difficult to add infrastructure such as power transmission and storage in a timely manner without a source of cash flow to make projects profitable and a national plan in place
- Coal-fired power, and supporting coal mining activities, have caused some of the worst environmental degradation and loss of resources in American history

The current electricity market doesn't serve customers well either. Electric power from fossil fuels has total loaded real costs much higher than realized. Nuclear power also has hidden costs and future liabilities not priced into purchase price.

The key change required in the electricity market transitions from fossil fuel power generation to green power supplies, and this transition should occur sooner rather than later. The longer America delays the green power ramp, the more difficult the transition, and stakeholders get hit with higher costs and risks associated with climate change and weather disruptions. The transition to green power requires a complex and multifaceted plan to effectively replace existing power sources.

The lowest priced power in America comes from publicly owned hydro. Geothermal power generated from high value geothermal resources, in projects with fully recovered capital investment also has low costs; but generally these privately owned projects sell power at market prices. The lower generation costs benefited the geothermal project owners, without passing most of the cost savings down to customers.

This geothermal example demonstrates two key factors important to developing green power sources; capital recovery comprises most of the cost, and green power projects have long operating lifetimes. Investment recovery comprises the biggest portion of the cost, with operating cost generally less than 20%. The electricity costs depend strongly on debt financing, and public debt has the lowest interest cost available. This means publicly owned green power projects have the lowest green power costs long term, all other subsidies, tax breaks, and loan guarantees being equal. And after recovering the investment cost, publicly owned green power projects would generate low cost electricity for customers, unmatched by private projects.

In spite of the natural cost superiority of publicly owned green power projects, particularly green power technologies such as hydro, solar thermal, central station PV and CPV, and distributed PV (rooftop) on government land or buildings; most government green power subsidies goes to private sector projects. And the biggest sources of government subsidies: the investment tax credit, accelerated depreciation, and domestic manufacturing deduction, also apply to fossil fuel power sources that shouldn't get any tax subsidies at all. Existing fossil fuel facilities should have these subsidies phased out. Current energy policies subsidize activities scheduled for phase out in the transition to green power; continuing these policies makes no sense.

Throughout American history, private sector power suppliers have repeatedly attempted to sabotage and block public power projects. The most famous of these attempts were private sector attempts to block large-scale hydroelectric projects in the western US during the Depression. Wild claims that there wouldn't be any customers except jackrabbits, power costs would be too high, and the cities on the West Coast wouldn't keep growing to consume the power generated, filled the media. Of course, it didn't work out that way. The access to plentiful cheap hydroelectric power made it possible for the War Department planners to build the aluminum, steel, aerospace, and shipbuilding industries on the West Coast in time to play a key role in winning WWII.

The current subsidy programs demonstrate that the government continues to subsidize private power options more than publicly owned power. The vast majority of subsidies go to privately owned power projects.

Short-term electricity prices exhibit extreme volatility due to limited surplus capacity during peak demand periods (somewhat similar to oil market price volatility due to lack of curtailed production capacity). Electric power markets that use substantial green power, needs a large amount of standby and spinning reserve power generation capacity. Paying for this standby and reserve power capacity likely requires a better funding and reimbursement plan than currently used.

Deregulating electricity markets has caused huge customer price increases, sometimes caused by supplier collusion and market manipulation. Deregulation used simple free market economic models that ignored the physical reality of tight power generating capacity in certain seasons or regions. The electricity market has regional problems due to lack of transmission interconnection and lack of diverse power generation sources.

In many cases, deregulation created incentives for suppliers to withhold or reduce supply in order to create shortages and price spikes. In order to prevent price spikes, properly regulated markets would have rules and enforcement mechanisms to prevent withholding power supply, as well as reserve capacity, particularly spinning reserve capacity. If public or coop power projects comprise a significant portion of capacity, especially reserve capacity, then customer-driven organizations have more direct control of incremental supply and electricity market pricing. Significant public ownership makes it more difficult for private sector companies to overcharge customers.

A lack of electricity storage options and capacity limits the deployment of key green power sources, and eventual market share. As green power comprises more than half, then more than 80% of electricity generated, the system requires increasing storage capability, more reserve capacity, and significantly more interconnect capacity. Someone has to pay for storage and standby reserve capacity. The current systems don't have the necessary revenue raising capability to pay for the additional storage capacity, and don't have the incentives to develop these projects rapidly.

America must develop and deploy large-scale electric power storage capability, and needs a comprehensive development plan in place as soon. A development plan should schedule construction of storage projects, coordinated with a deployment plan for green power projects. The management of these plans requires a national project manager and coordinator for green power development, storage, and transmission and interconnect capacity development. Without a source of cash flow to fund these projects and a national plan, makes it difficult to add infrastructure in a timely manner.

Contrast the long-term benefits of green power deployment that addresses climate impacts and lowers long term customer costs, with the high long-term cost and the huge environmental cost of existing fossil fuel sources. Coal-fired power plants, and supporting coal-mining activities, have caused some of the worst environmental degradation and loss of resources in American history. America can avoid the difficult task of administering the complex regulations needed to control environmental impacts and mitigate GHG emissions from coal plants and mining activities by replacing existing coal-fired plants with clean coal plants using carbon capture and sequestration, or pricing coal-fired power out of the market. This requires planning and coordination, and an organization capable of negotiating closure and transition away from coal-fired power. This review discusses a proposal to set up an organization to do this, after discussing the recommendations to repair problems in each energy market.

Electricity Market: "Customers First" Approach

- Electricity market – Needs transition to Reduce Carbon Sources
- Possible Total Power Source Mix (2040) based on 1% Annual Growth
- Comparison of Source Mix in different Forecasts (1% Annual Growth)
- Possible Total Power Source Mix (2040) based on 2.5% Annual Growth
- Comparison of Source Mix in different Forecast (extrapolated to 2.5% Annual Growth)
- Comparison of Electricity Cost over Ramp for Different Ownership/Subsidy Options
- Possible Cost Forecast for a Ramp of CSP Projects
- Accumulative Average Cost of Electricity from a Pipeline of Green Power Projects
- Forming a Green Power Coalition
- Alternative Financial Structures: Green Power Coalition Projects
- Green Power Coalition Project Investments
    - Ramps to $80B-100B in ten years, and could peak at $200B in thirty years
    - Availability of debt financing (especially public financing and ownership)
    - Invest in energy efficiency and load shifts
    - National transmission grid projects included in project pipeline
- Results of Green Power Ramp
    - Green power seizes 80% of electricity market within 30 years
    - Electricity costs fall to 1.5% of household expenses
    - Electricity costs decline to 2% of GDP (versus 2.8% currently)
- Energy storage key part of Green Power ramp
- Green power transmission across America required – need means to fund projects profitably
- Requires a national electric power system owner – nongovernmental body not subject to political whims
- Caution: conditions exist for companies to use TTMAR business strategies, to the detriment of stakeholders

This review evaluates the electricity market performance by considering the needs of customers first, then analyzing various alternatives in terms of improving the market to better serve customers. Slide 18 from the 'Customers First' presentation summarizes some of the key findings.

The most important conclusion: the electricity market must transition to green power rapidly to reduce carbon emission sources. The key change required in the electricity market transitions from fossil fuel power to green power, and the critical task involves managing this transition. The longer America delays the green power ramp, the more difficult the transition, and costs of climate change and NH weather disruptions cause customers pain. The costs of green power decline dramatically within the first 15-20 years after starting a rapid ramp, so building more projects and installing green power capacity more quickly, eventually reduces the cost to customers faster. The transition requires an aggressive investment schedule, which in turn requires a complex and multifaceted plan to effectively replace existing power sources.

An alternative often suggested and considered, uses natural gas as a 'bridge fuel' for electric power generation, exploiting America's abundant shale gas resources. But natural gas and shale gas supply critical stopgap electric power, and an important backup heat source. We don't want to blow through our gas reserves quickly.

Electricity Market

Electricity Market – Needs Transition to Reduced Carbon Sources

- Conventional coal-fired power plants need to be shut down to reduce GHG emissions
- Power Market in 2040 will have 80% Green Power
  - solar, wind, geothermal, biomass, and wave
  - natural gas will be important stopgap generator source of energy
- Shale gas = opportunity to transition to Green Power sources => Don't blow through reserves, quickly.
- Government tax breaks and subsidies are not working well to ramp Green Power.
- Best customer costs result from Public Green Power projects
- Need a Green Power Coalition to build Public Green Power projects and close down coal PPs
- Government should give Public Green Power projects subsidies similar to private sector.

16 August 2012 Skibo Systems LLC - Confidential 18

Existing government tax breaks and subsidies, even though very generous for private green power projects, have not resulted in the rapid ramp of green power supply needed. Instead the predominant transition so far, has substituted coal-fired power generation with natural gas fired power generation. In some cases, government subsidies exceed half of the investment cost of private green power projects, but with the long term upside potential value of the project belonging entirely to the private owners.

Our analysis finds that the best alternative for reducing green power costs for customers, results from an expanded build-out of publicly or cooperatively owned green power projects. Low cost debt financing represents the best means of reducing cost, and public debt financing costs less. Although debt guarantees for private projects work, much of the value passes to the owners, not to customers. If the public makes the investment using or guaranteeing debt financing, then most the value delivered should belong primarily to the public taxpayers and customer ratepayers.

Clearly publicly owned green power projects should receive subsidies similar to private projects, particularly investment subsidies. Most private sector capital investment projects in the US receive tax breaks and subsidies worth approximately 30% of the investment. Private green power projects receive even more subsidies, often totaling over half the investment. If public green power projects received a 30% subsidy, coupled with low cost public financing, no other readily available alternative provides lower green power costs for customers over the long term.

One key problem with the current attempts to ramp green power involves advocates overreliance on free market incentives, driven by the mistaken idea that electricity costs should rise to reduce electric power demand. This mistaken idea leads to advocacy for carbon taxes. Since a carbon taxes doesn't have political support, advocates turn to government rules and regulations. The attached report "Options to Address Climate Change" that reviews options currently considered. The report also discusses and recommends an option not currently considered, using a regulated private sector coalition (Green Energy Coalition) to monitor energy markets and invest in incentives to deploy green energy sources. In the electricity market, a subsidiary group, a Green Power Coalition would make the needed investments, such as public green power project investment subsidies, and receive compensation from some sort of tax proceeds. Later in this review expands on the idea of a Green Power Coalition, and ties this group into a large Green Energy Coalition.

Building a large green power supply base with an aggressive installation program helps customers and other stakeholders. Stakeholders really need an abundant supply of inexpensive green power to help:

- Provide the transportation sector with electric vehicles.
- Supply water to the water resource sector, agriculture, forestry, cities and residential areas, and replenish groundwater.
- Transition from using natural gas as the primary space and water heating source; instead use heat pumps and electric instantaneous water heaters for residential/commercial use, relegating natural gas-fired heaters to backup heat.
- Replace coal-fired power plants, while minimizing the switch to natural gas as a transition fuel.

Inexpensive green power is critical to address environmental and quality of life issues, and to reverse adverse climate change impacts.

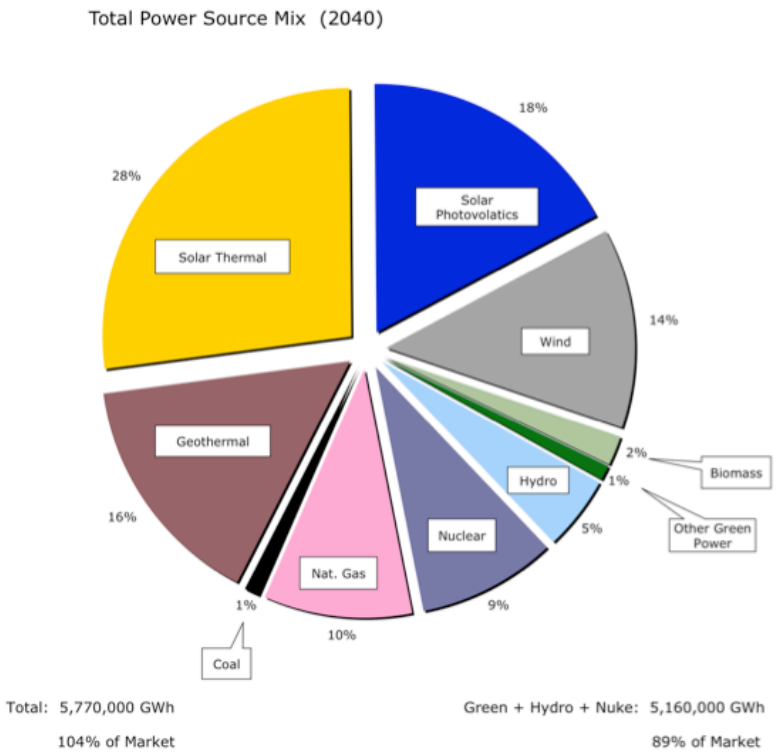
Government departments and agencies also make a key mistake when trying to assist green power and electricity efficiency technology developers. The government entities attempt to avoid a "pick and choose" process, when success critically depends on knowledge and skill based selection of alternative sources and infrastructure development. This mistaken strategy leaves the electricity market transformation unplanned and uncoordinated. Using a Green Power Coalition to invest in alternatives, evaluate performance, and plan/coordinate increased green power installations accordingly, would rectify this mistake.

Power Source Mix Following a Rapid Green Power Ramp

This section of the review discusses possible scenarios resulting from a rapid ramp of green power sources under a low-growth demand scenario, and under a high-growth scenario.

Slide 19 shows a possible Total Power Source Mix (2040) based on 1% Annual Growth from 2012 power use, where non-fossil fuels comprise only 11% of the electricity generated, and with green power sources contributing 80%. Forecasting a mix of green

power this far into the future seems impossible, but actually green power has some key limitations that make forecasting the mix possible.



The most important limitation involves storage. Storing electricity is expensive; battery storage costs 15-25 cents per kilowatt-hour, and the lower range requires low financing costs plus 200+ storage cycles annually. Pumped hydro has the lowest storage cost for electricity, but even with low cost financing and frequent cycling, still can only reach 6-8 cents per kw-hr. Plugged in off-duty EV batteries offer one means of electricity storage with the primary cost charged elsewhere, but the capacity of this storage will take a long time to build.

Thermal energy storage (TES), used to heat working fluids in a thermal power plant, has a significantly lower cost. Currently, molten salt TES can store energy at a cost of 5-6 cents per kwh, beating pumped hydro costs. But TES works only with thermal green power sources such as solar thermal (aka concentrated solar power, CSP), geothermal, and biomass generators. TES systems under development for use with green thermal energy sources should lower storage costs into the range of only 2-5 cents per kwh.

(Our company, Skibo Systems LLC has been working on early stage development of TES process designs that lower storage costs for use in combined solar thermal – geothermal projects. Skibo Systems has named this process geosolar power, and expects that this storage would cost less than 3 cents per kwh. The process would provide large-scale seasonal storage capability.)

Even with some electricity storage systems, it will be difficult for solar PV to penetrate over 20% of the annual usage. The annual capacity factor for solar PV generally falls into the range of 20-25%, so at peak summer generation, the power generated from solar PV penetrating 20% of the market would exceed 80-100% of average annual electric power demand. Although demand in the summer increases, this doesn't leave a lot of room for other power sources, with the probable result of "dumped power".

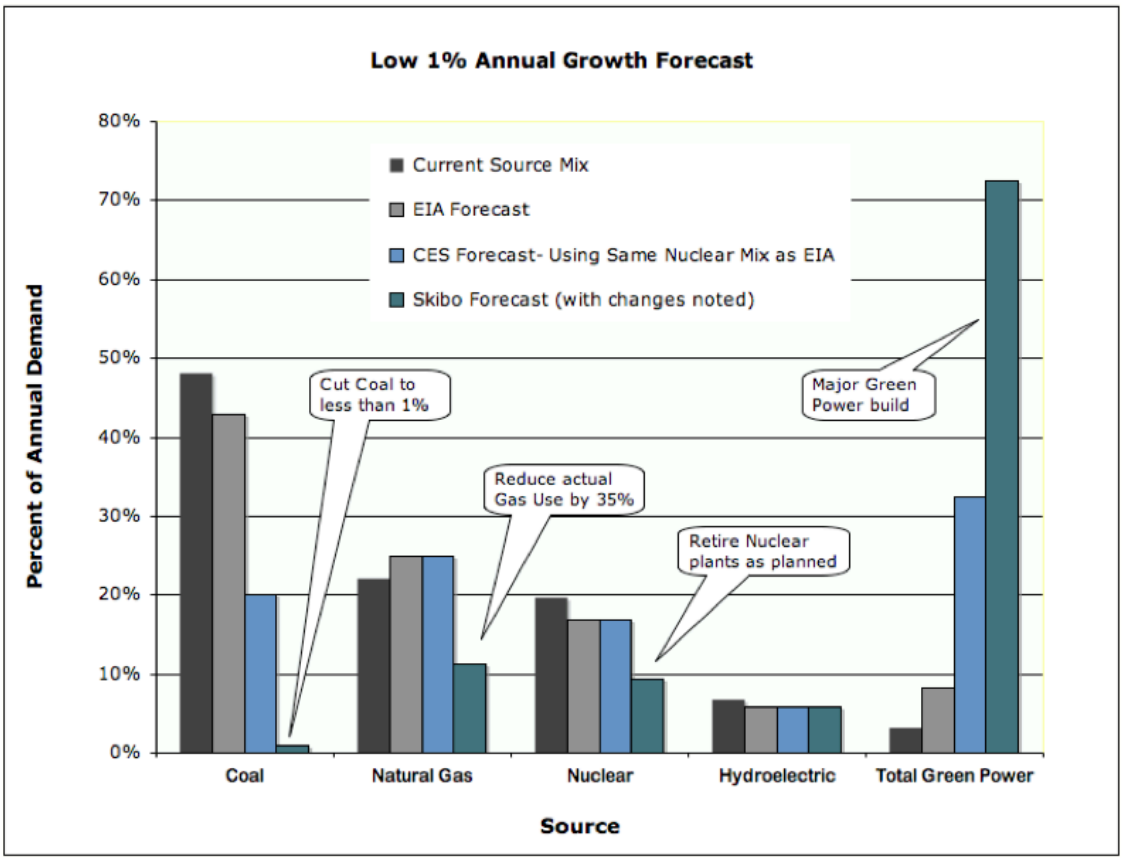
Wind power has a similar issue, which should limit wind to about 15% of the total electricity generated annually. Wind has somewhat higher capacity factors, but reaches maximum output in the winter and spring when demand is lower. Already the Pacific Northwest dumps green power in the spring, a season when both wind and hydro peak.

The large wedges contributed by solar thermal and geothermal depends on advanced TES, and in the case of geothermal, new methods of recovering geothermal energy from hot rock. Nevertheless, these sources could contribute a large portion of the green power needed to hit 80% of annual electricity needed, if managed and planned to hit these targets.

Solar thermal and advanced geothermal are currently lagging the deployment of solar PV and wind power, but over the long haul these are critical green power sources. In a rational planned transition to green power, these sources would clearly be scheduled for consistent and growing development and deployment.

The contribution from natural gas (10% of annual electricity supplied), and lack of contribution from coal, shows the other key strategy resulting in the forecasted source mix for 2040. Solar thermal power plants can use backup gas-fired units to generate power on a stopgap basis. Natural gas shouldn't be used for peak power supply, but rather as reserve power source, particularly spinning reserve power. Coal can't really be used as a stopgap fuel source. Natural gas will be needed for a long time in America, for use as a stopgap fuel for power generation. Natural gas also has some other critical end uses discussed in the section of these comments covering the natural gas markets.

Slide 20 shows a comparison of source mixes in different electricity market forecasts (using approximately 1% annual growth, that was done in late 2012. The Skibo forecast has coal dropping to less than one percent of the American market, much lower than the EIA and CES forecasts. Natural gas also falls by 35% from the current market share, representing the Skibo forecast that uses natural gas as a stopgap fuel, and not as a "bridge" energy source. The EIA and CES forecasts increase natural gas use in terms of market share, with larger increases in actual natural gas energy used to generate power.



Nuclear energy falls as nuclear power plants retire as planned, leaving nuclear less than 10% of the source mix. Nuclear doesn't fit very well with green power sources. Nuclear power costs soar if nuclear plant capacity factors fall below 50%, and with rapid ramps in wind and solar PV there isn't room in the market to take enough nuclear power to reach 80-90% annual capacity factors.

Green power mix was already addressed, but the Skibo forecast shows rapid and deep penetration in the market for green power sources such as solar PV, wind, solar thermal, and geothermal, with minor contribution from biomass and other green power sources (tides, low temperature and waste heat, etc.).

Long-term costs of solar thermal and geothermal should begin declining fast toward the end of the planning period. Skibo expects that CSP plants will remain operational for a very long term; at least 50 years, and more likely 100+ years. The portions of the CSP project that eventually require replacements are most likely the reflectors (about 8% of total investment) and the collectors/receivers (less than 5%) can easily be replaced and upgraded in staged increments. Much of the CSP project cost (35-40%) is upfront engineering design and construction management, and offsite and off plot costs, and these costs won't be repeated. After twenty years or so of operation, the remaining debt can be refinanced and extended, reducing the debt service level, and decreasing the

effective cost of the power. In publicly owned projects, this cost savings due to lower debt service costs will pass through to customers. The price of electricity from these CSP projects will fall into the range of 3-5 cents (in current dollars).

Similarly, the cost of electricity from enhanced geothermal projects should drop significantly after the cost of the capital has been recovered. In general, many green power projects that have long operating lifetimes will be contributing low cost power in this timeframe. Even wind and solar PV, with systems that have shorter lifetimes, the cost of the power could decline by extending the debt amortization period by refinancing 10-20 years into the project.

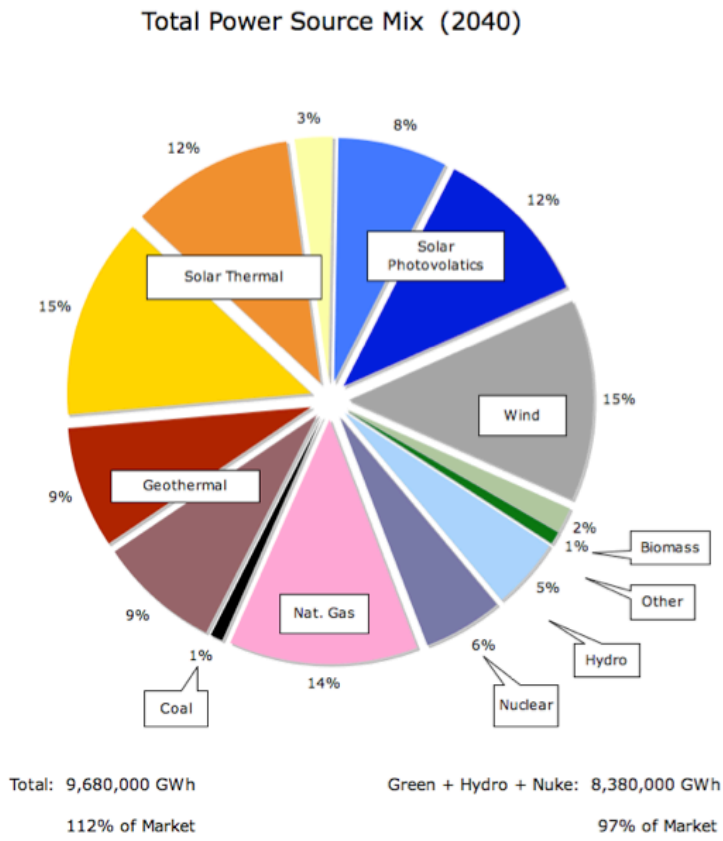
Since green power would generate very low cost power over the long haul, a sensible strategy would subsidize investment in green power projects using customer cost savings from other energy markets. As subsidized green power substitutes for other energy sources, the customer pays less for a mix of much higher quality of products and services. Eventually measures of customer costs decline (including the inflation adjusted household energy expense, or energy percentage of GDP). We can build a very powerful and effective Green Energy Coalition around this strategy.

Some customer needs, particularly environmental and resource scarcity issues, benefit from plentiful low cost power. America could enter an era of increased electricity demand to address issues like water scarcity and storage, drought mitigation, river and fishery improvements, increased irrigation water availability, better urban and suburban QOL, and meet increased AC demand due to hotter climate. With this in mind, the next few slides cover higher electricity growth scenarios.

High Growth Power Source Mix

Slide 21 shows a possible total power source mix for 2040 based on 2.5% annual growth from 2012. The electricity used annually rises to about 8.7 million GWh compared to 5.8 million in the 1% annual growth case, and up substantially from the 2012 demand of approximately 4 million GWh. The power source mix actually plans to overshoot actual demand by 12% to provide a reasonable capacity cushion, given the higher annual demand. This cushion also may be necessary to provide storage capability and ensure adequate curtailed capacity even with significant year-to-year variation of both supply and demand.

Several important concerns dictate that a reasonable plan to ramp green power uses a high demand scenario at the start. Even if eventual growth in demand falls below the high demand case projection, prudent planning should require that initial development over the next five years match the high demand growth case. Optimal development requires long lead-time projects that must be engineered and designed; with initial construction activity started five years prior to full capacity production. Transmission and interconnect capability requires even longer lead times. Projects aimed at shifting demand to peak supply periods need long lead times to test, evaluate, and ramp. In northern Europe, demand shifting has made more effective use of wind power. Interconnect capacity and coordination has permitted supply to shift from wind in Denmark to hydro in Norway. In North America, similar projects and coordination between the East and Southwest, Northern Plains and East/Southeast, Southwest and Northwest, and coordination with Canadian hydro and eventually Mexico solar/geothermal, would improve the efficient operation of the American electrical grid.

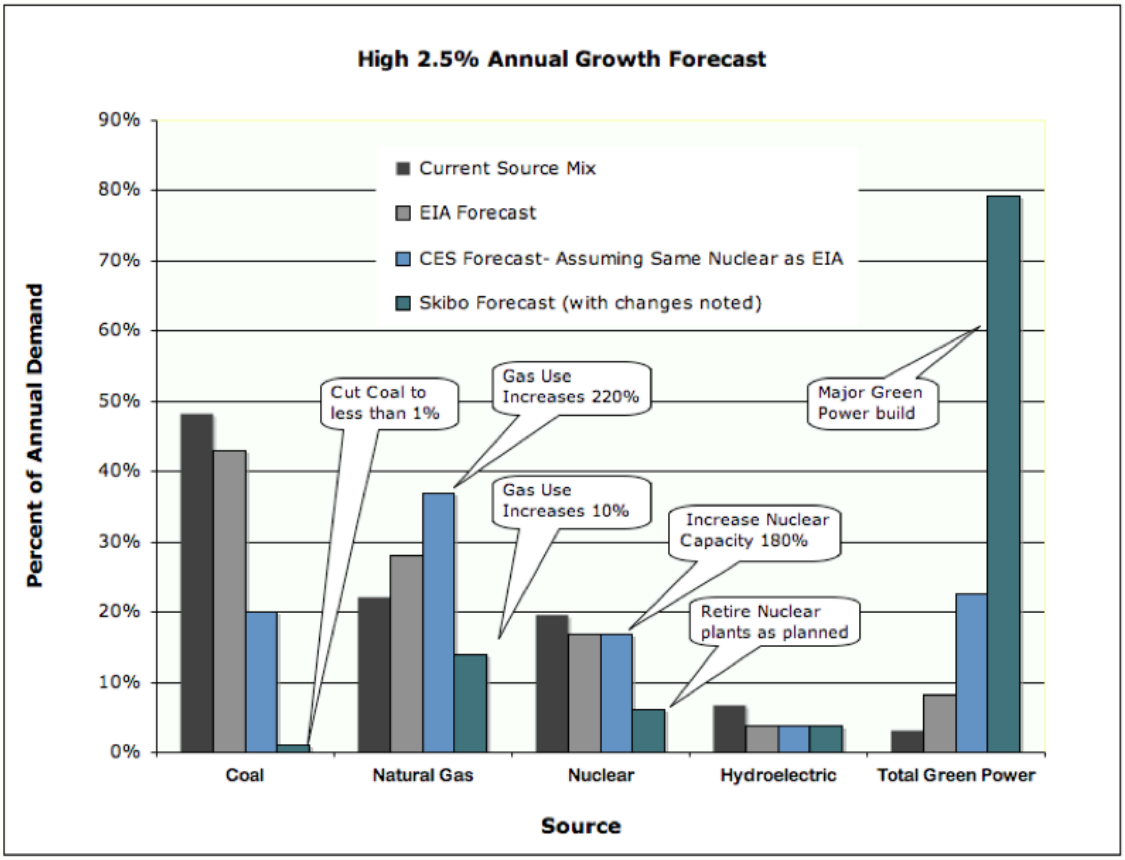


The Skibo forecast has natural gas providing a 14% of the source mix, higher than the low growth case, with existing nuclear and hydro contributing smaller slices of the market mix. Given the higher demand level, natural gas has increased importance as a stopgap energy source to fill in for cyclical green power sources. If extensive storage capacity and load shifting builds out in time, then natural gas would have a smaller market share, to conserve gas for long term use and further reduce carbon emissions.

Our forecast source mix has several unusual projections. Because of the attractive cost of thermal energy storage versus electricity storage, the renewable thermal sources (solar thermal/CSP and geothermal) provide a much larger share of the total source mix.

Not ramping CSP projects incorporating TES faster in recent years was a major mistake. Optimizing the supply chain for CSP will take a decade, and the deployment delay means that CSP+TES costs 30% more today. A second major error was not moving forward more quickly with commercial engineered geothermal systems (EGS) projects to develop hot dry rock resources. EGS optimization will take a decade, but geothermal offers a very good continuous green power source, with turndown capability. Not funding larger incentives for EVs is a third error; besides the huge economic incentive to substitute for oil, EVs plugged into a smart grid shifts load and supplies storage capacity.

Slide 22 shows a comparison of source mix in different forecasts (extrapolated higher to meet the 2.5% annual growth demand).The EIA and CES forecasts would need much higher natural gas contribution (up as much as 220% from 2012), whereas the much higher green power built in the Skibo forecast keeps natural gas demand for power generation only 10% higher.



16 August 2012 Skibo Systems LLC - Confidential 22

The biggest change from other forecasts, coal fired power declines to less than one percent of the market versus 20% in the gas-as-transition fuel forecast and over 40% in the EIA forecast. Meanwhile, natural gas fueled power generation increases ten percent versus 100% in the EIA forecast, and over 200% in the gas-as-transition fuel forecast.

The Skibo forecast also limits new nuclear power plant buildup. In a market that doesn't really need continuous baseload supply, but rather on-demand supply, nuclear power doesn't fit. Nuclear+TES could make sense, but why use nuclear when publicly owned CSP+TES projects with backup natural gas firing capability has better turndown, and has lower long term costs without the risks associated with nuclear power?

The green power ramp required to reach this high growth forecast requires larger investment flows into green power projects than any other forecast scenario currently proposed. Sourcing and managing this large investment flow requires management and coordination beyond the capability of government departments and agencies. The DOE cannot handle this mission and the associated tasks involved. This fast transformation of the electricity market requires another type of management system. A regulated private

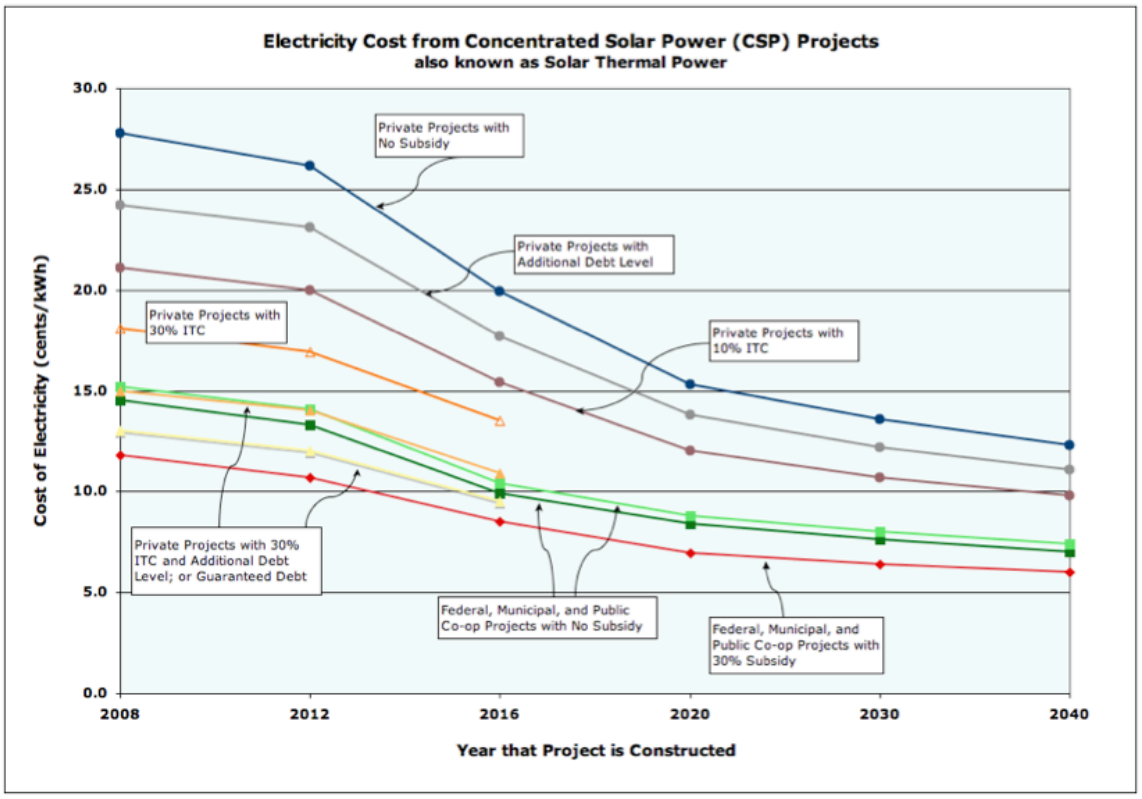
sector group could execute this task better than other alternatives, and much better than either a government organization, a regulated market system, and definitely better than the mostly unregulated and unplanned efforts in the current market.

Electricity Cost and Pricing After a Rapid Green Power Ramp

- Comparison of Electricity Cost over Ramp for Different Ownership/Subsidy Options
- Possible Cost Forecast for a Ramp of CSP Projects
- Accumulative Average Cost of Electricity from a Pipeline of Green Power Projects

Because the cost of debt strongly determines the cost of green power, the project ownership and access to low cost public debt has a major impact on green power costs. Publicly owned green power projects, financed primarily by public debt, have a huge cost advantage over private projects, after removing the impact of all government subsidies.

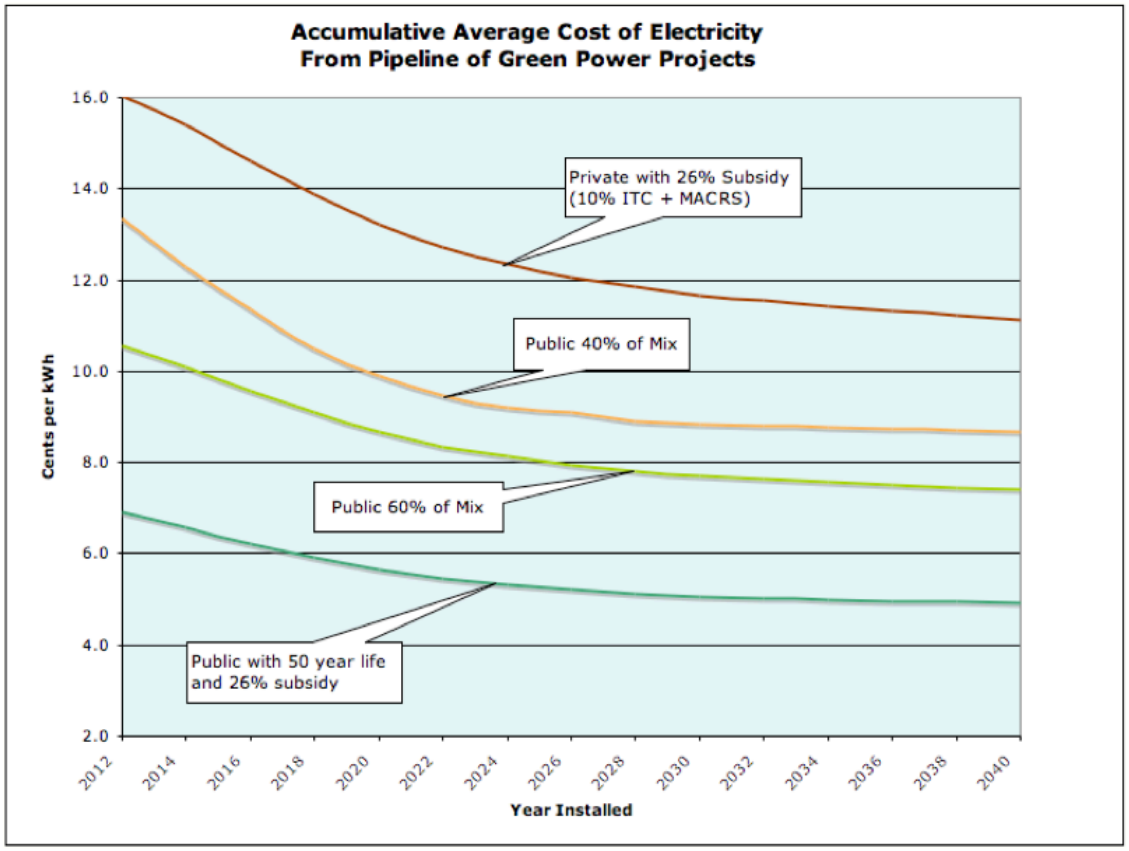
Slide 23 shows an example demonstrating the superiority of publicly owned green power projects, when applied to CSP projects. The analysis was done in early 2012, and assumed a rapid build of solar thermal projects, which didn't happen at that time. But the example illustrates several key factors and benefits associated with developing green power.



16 August 2012 Skibo Systems LLC - Confidential 23

As shown in the graph, project costs decline if an accelerated ramp of CSP projects helps suppliers and builders optimize the supply chain. Any of the green power technologies would follow similar cost trajectories as deployment unfolds and increases. The cost projection shown in the curves conservatively uses a slower cost decline than projected in DOE studies done for the cost of deploying CSP.

The top curve shows the estimated cost of electricity using privately funded projects with corporate bond financing, and no subsidies. This curve compares with the green curves for non-subsidized publicly owned projects using federal or municipal bond financing. The brown curve shows private projects getting standard tax subsidies (10% ITC, MACRS depreciation, and the domestic manufacturing allowance), which brings the tax subsidy to about 30% of the project capital cost. The red curve shows the cost of CSP from public projects, when given the same 30% subsidy (a subsidy similar to most capital projects in US).



We prepared a spreadsheet with a ramp in green power deployment to reach the 2040 source mixes shown in our forecast. Publicly owned projects were used primarily for solar thermal, geothermal, and large central station solar PV/CPV, with lower public project ownership for wind and distributed solar PV. Slide 24 shows the Accumulative Average Cost of Electricity from this pipeline of green power projects. All the projects received a 26% investment subsidy, regardless of ownership. The top curve shows the cost with only private projects, with the middle curves showing the 40% and 60% public

project mix. The lowest curve shows the cost of a 60% public mix, with a more realistic extended 50-year life amortization of the debt on the public projects (similar to refinancing with 30-year bonds, twenty years into the project lifespan).

Using a healthy mix of publicly owned green power can bring accumulative green power costs down into the range of 6-8 cents over the ramp to 80% green power, if:

1. Public debt financing has interest rates similar to recent interest rates.
2. Publicly or cooperative projects receive subsidies similar to the blanket subsidies provided to most private investment projects in America.

Managing a green power ramp of this magnitude in the required timeframe involves juggling complicated issues and customer needs, in a complex process requiring speed and agility. Governments and government agencies cannot handle this mission effectively. A better process would form a regulated business coalition, a Green Power Coalition to invest in development activities, subsidies, and incentives to manage the ramp of the Green Power sector.

Forming a Green Power Coalition

The Green Power Coalition would have the mission to evaluate and support green power technologies and projects, and invest in subsidies to help fund green power projects. The participants could include private sector companies, governments or government agencies, or cooperatives that provide power. The Coalition should aim to support publicly or cooperatively owned power providers. The next slide discusses some of the concepts behind using the Coalition to manage the green power ramp.

Forming a Green Power Coalition

- Green Power Coalition
  - Group of primarily publicly or cooperatively owned power providers that uses public financing to build a pipeline of green power projects.
  - Receives 25-30% capital cost subsidies (similar to private power project subsidies).
  - Private sector companies build and operate many of the green power projects.
  - Private companies could be minority owners.
- Provides incentives for state and local governments and existing publicly owned electric power providers to build green power projects.
  - Many states and local governments want to increase green power supply to reduce fossil fuel use.
  - Doesn't require that all states or local governments participate.
- Spreads the costs and benefits of developing of green power projects.
  - Costs of green power should drop by 40-60% (or more) over a 20-30 year ramp.
  - Continuous deployment is key to reducing costs and optimizing benefit to customers.
- Coalition members control investment allocation and project selection
  - Local control of project builds ensures projects address local/regional issues
  - Creates a huge market for green power project/technology developers

Even though the public ownership of the majority of the green power projects allows the use of public financing, there could be private sector minority owners. And private sector companies could build and operate most of the green power projects. Since the GPC provides incentives for state and local governments to build green power, even in regions outside their jurisdiction. This meets the needs of many state and local governments that want to increase green power supply to reduce fossil fuel use. At the same time, it doesn't require that all states or local governments participate. Some states may not want to build publicly owned green power projects.

The Green Power Coalition would have a major impact on transitioning to green power. The Coalition can effectively spread the costs and benefits of developing green power, with continuous deployment the key factor to reducing costs and optimizing benefits to customers. Coalition members will have control over investment allocation and project selection, so in most cases, members can provide local control of project builds to ensure projects address local/regional issues.

The next slide discusses alternative financial structures for Green Power Coalition projects using public debt as the primary financing.

Alternative Financial Structures: Green Power Coalition Projects

- Public Entity Ownership Using 100% Financing
  - Option 1: Government Owned Operating Company
  - Option 2: Government Owned – Company Operated (GOCO) Organization structure
  - Receives 25-30% capital cost subsidies (similar to private power project subsidies).
- Joint Public / Private Ownership
  - Use primarily public financing, plus some private investment.
  - Use 100% public financing, with private company covering a portion of the annual debt payments in return for an ownership share
- Alternate Ownership/ Financing Option: Green Power Coalition owns projects and uses Federal government loans to fund project
  - Green power coalition receives pass-through government financing
  - Coalition agrees to build a pipeline build of green power projects
  - Government agencies provide regulatory oversight of the Green Power Coalition
  - Mix of public, cooperative, and private investors comprise the Green Power Coalition

The best way to support green power deployment, seems a mixture of government pass-through debt financing, plus a 30% investment subsidy primarily from the GPC, with some types of green power receiving a portion of the subsidy in the form of government tax credits. But the optimal solution seems a mix of projects using all three ownership/financing options; this preliminary finding needs review and analysis. Financing experts can likely recommend improvements to each of these options.

The last alternative, GPC ownership of green power projects isn't what we originally envisioned. The role of the GPC should involve planning, market monitoring and analysis, deployment scheduling, and coordinating infrastructure development; with most projects receiving partial subsidy funding supplied by the GPC without an ownership in any specific green power project. The GPC should get funding through government taxes or industry or customer fees. The best solution seems to tie GPC funding to declining energy costs, particularly a tax tied to declining crude oil prices. This funding method is discussed later in this review.

Green Power Coalition Project Investments

- Ramps to $80B-100B in ten years, and could peak at $200B in thirty years
- Ramp depends on availability of debt financing (especially public financing and ownership)
- Invest in energy efficiency and load shifts
- National transmission grid projects included in project pipeline would increase the investments

Green Power Coalition Project Investments

- Green Power Coalition Capital Investments
  - Ramps to $80-100B annually within ten years (approximately 40-60% of all green power investments).
  - Hits $120-160B annually in 20 years, and could peak at at $200B in 30 years
  - Receives 25-30% capital cost subsidies (similar to private power project subsidies).
- Investment ramp depends on availability of debt financing and "need for speed"
  - If AGW impacts worsen, then accelerate ramp
  - Green Power Coalition assesses and promotes green power technology development
  - Continuous deployment is key to reducing costs and optimizing benefit to customers.
- Energy efficiency and load shift projects can be part of GPC pipeline of projects
  - Investing in negawatts should generate high returns and reduce costs to customers
  - Green Power Coalition would be looking for best projects to reduce carbon emissions, so energy efficiency/conservation projects would easily compete for funding
- National transmission (grid) projects can be part of GPC pipeline
  - Used to reduce dumped power from green power sources
  - Supply peak green power across the country

Skibo has developed a preliminary spreadsheet analysis of green power projects, with about half involving GPC subsidies or investments. The green projects built annually with GPC assistance ramps to $80B-$100B within ten years, then to $120B-$160B in twenty years, and could peak at $200B in thirty years, in a high-growth scenario. The GPC subsides would exceed $25B annually within ten years, and could eventually exceed $40B annually. The cost of the subsidies could be higher or lower to achieve the

required green power ramp, depending on the availability of public debt financing and the improvement in the supply chain.

In this analysis, privately owned green power projects would constitute about 50% of green projects in the first ten years, then grow to eventually reach more than 70% of green power deployment in the last ten years of the thirty-year planning period. By that time period, lowered costs of green power due to supply chain improvements, should allow private projects to supply low cost electricity.

Results of Green Power Ramp

The next slide covers the expected result of a green power ramp using the methods discussed in this review.

Results of Green Power Ramp

- Green Power seizes over 80% of electricity market within thirty years
  - Coal fired power plants can be priced out of the market, or shut down due to regulatory issues
  - Natural gas plays key role as stopgap electric generation energy source, but doesn't simply replace coal
  - Green power ramp covers retirement of nuclear plants
- Electricity costs to customers fall to about 1.5% of household expenses (versus 2.6% currently), with lower consumption per unit of customer quality of life (QoL)
  - Costs would fall more, but forecast uses high growth to increase customer QoL
  - Significant build-out of the national grid occurs, but costs decline anyway
- Electricity costs as fraction of GDP falls to about 2% (versus 2.8% currently)
  - GDP grows faster than electricity expenditures
  - Electricity costs fall to about 1% of GDP by 2060

With the forecast schedule, green power seizes 80% of the electricity market within thirty years, even with substantial market growth leading to a doubling of electric power demand in this timeframe. Almost all coal fired power plants will be priced out of the market, or shut down due to regulatory issues. With a Green Power Coalition, incentives can be offered to coal plant owners to abandon their plants, coupled with the Coalition offering opportunities to transition investment into green power projects.

At the completion of this green power ramp, electricity costs would decline to 2% of GDP from 2.8% currently. Household energy costs fall even faster, and decline to 1.5% of household expenses from 2.6% currently. This relative cost reduction occurs, even with an overall doubling of the nation's electricity demand. Green Power Coalition actions cause more effective electricity use and should increase customers' quality of life,

delivering better transportations options and more comfortable housing and workplace conditions, even as the relative cost declines.

This combination of improved outcomes shows that a rapid, subsidized, green power ramp benefits customers by providing a far superior product at a lower cost than the BAU scenario.

- Energy storage key part of Green Power ramp
- Green power transmission across America required – need means to fund projects profitably
- Requires a national electric power system owner – nongovernmental body not subject to political whims

One of the key improvements that a Green Power Coalition can bring in the effort to ramping green power in America is a means of financing transmission grid development and energy storage systems. Putting a GPC in a position to drive the green power ramp, would result in a substantial engineering and planning effort to analyze and improve transmission and storage as well as a source of funding. Green power cannot reach 80% of America's annual electricity supply without substantial investment in transmission and storage. The GPC would need to address deficiencies in these systems to achieve green power goals and objectives. If the Coalition has access to sufficient cash flow and receives government support, then the GPC can fund transmission and storage projects to ensure that lack of connectivity and storage doesn't limit the transition to green power sources.

Essentially, the transition requires green power transmission across America and massive energy storage, and requires a means to fund these projects profitably. This in turn requires a responsible organization "own" the continent's electric power system, and coordinate with the regional grid operators. Establishing a Green Power Coalition would move substantially toward this goal; the Coalition could help fund improvements in the grid beyond the capability of the regional operators. Especially if coordinated and coupled to efforts in Canada and Mexico, getting a large umbrella coalition in place could help accomplish the needed objectives of long distance interconnection and substantial storage.

<u>Caution: conditions exist for companies to use TTMAR business strategies, to the detriment of stakeholders.</u>

As the transition to green power (and green vehicles and biofuels) happens, many owners of fossil fuel businesses might decide to follow a TTMAR business strategy ("Take the money and run…"), leaving behind financial liabilities and environmental degraded sites requiring remediation. The responsibility to police the abandonment of fossil fuel mining and power generation sites falls to the state and federal governments. Many of the companies operating these sites have profited greatly over the previous decades, and clearly these companies should be held responsible for cleaning up and shutting down these business sites as the market shifts. The government agencies involved in monitoring these sites should examine the owner's plans and finances to ensure that customers and taxpayers don't end up picking up the tab for abandoned operations, as has happened too often in the past.

Electricity Market – Summary and Conclusions

This review of the electricity market, plus a preliminary analysis and projection of market improvements resulting from a rapid green power build out, leads to these important conclusions:

1. The existing electricity market, including transmission and storage, doesn't serve customers, future customers, and other stakeholders well; the current market and BAU forecast doesn't provide customers with electricity at the lowest optimal fully loaded cost.

2. Rapidly ramping a mixed portfolio of green power sources, including subsidized publicly owned green power projects, along with needed transmission and storage capacity, results in significantly lower long-term costs for customers. A rapid green power ramp meets critical environmental objectives, improves the economy, and assists deployment of green energy substitutes for crude oil.

3. Over the long-term, green power projects built using public debt financing and receiving investment subsidies similar to private sector capital projects, would supply the lowest fully loaded cost electricity for customers.

4. Building a larger electricity system comprised primarily of green power, provides an important long-term low cost energy source needed to address environmental and resource scarcity issues. These include water scarcity, agricultural and forestry problems, natural resource and habitat restoration, and customer QOL.

5. Reaching the desired green power market penetration into the market requires a coordinated build out of infrastructure, with improved transmission and interconnect capability, larger storage capability, and use of smart grid methods.

6. Existing industry management teams haven't adequately evaluated and planned the transition to green power; partly due to lack of knowledge about the oil and natural gas markets, and partly because many management teams appear to use business plans designed to maintain fossil fueled power generation.

7. Some industry management teams have engaged in efforts to restrict and stop green power build out, and use TTMAR business models to avoid responsibility for external costs from coal and natural gas power generation; instead dumping these costs on future customers, taxpayers, and the general population.

8. A rapid ramp of green power with associated infrastructure requires a source of investment subsidies and low cost debt financing; and should be coordinated by an organization responsible for effectively managing the transition.

9. Government actions, including regulations and subsidies, won't result in an effective transition to green power and provide the best outcome for customers. A better approach uses a regulated private sector group to fund green power subsidies and manage the transition.