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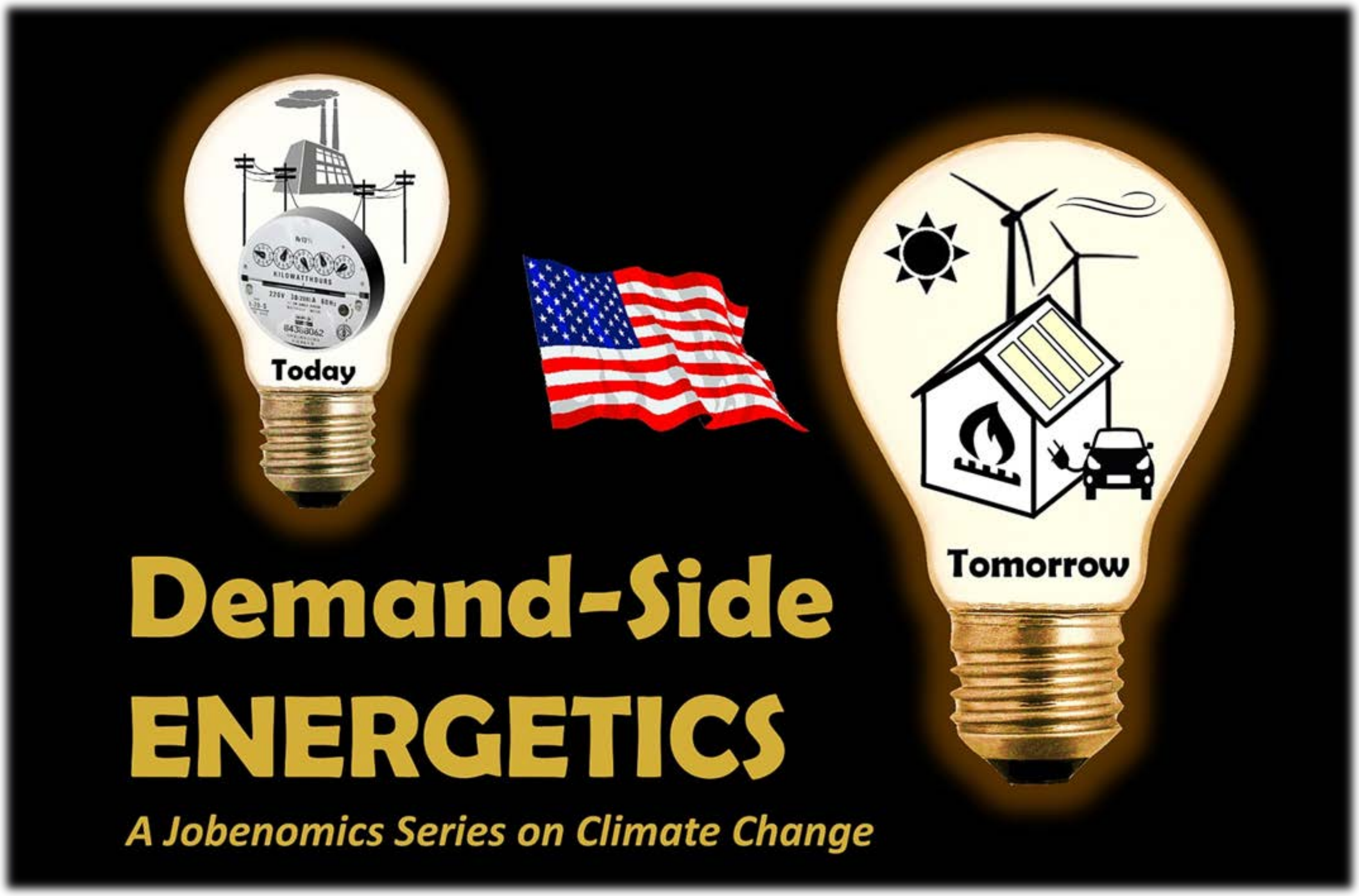

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Paris Climate Accord?

Jobenomics Series on Climate Change: Part 1

Keywords: *Demand-Side Energetics, Energy Economics, Climate Change, Paris Climate Agreement, United Nations Framework Convention on Climate Change, UNFCCC, COP 21, President Obama, EIA, Energy Information Agency, Annual Energy Outlook 2017, President Trump, Trump Administration, Grid Level Power Generation, Point-of-Use Power Generation, Point-of-Consumption, Disbursed Generation, Distributed Generation, Renewable Energy, Elon Musk, Sun City, Tesla, Employment, Workforce Development, Economic Development, Business Development.* ***Caption:*** *If the U.S. were to resume Paris Climate Accord participation, focus should be on reducing greenhouse gases as opposed to achieving 100% renewable energy.*

In December 2015, the Obama Administration committed to the Paris Climate Accord to reduce toxic greenhouse gases and reduce "economy-wide" emissions by as much as 28% by 2025 via the implementation of ultra-clean renewable energy sources.[1] Unfortunately, this ambitious goal was "a bridge too far" given America's inability to implement new renewable energy sources and willingness to retire traditional "dirty" sources of fuel. In June 2017, the Trump Administration announced that the United States planned to withdraw from the Paris Climate Agreement since it was a "bad" deal for the American people and the environment. However, on 17 September 2017, several Trump Administration officials (Secretary of State Tillerson and Press Secretary Sanders) signaled that there might be some wiggle-room "under the right conditions" to rejoin the international community to combat the ravages of climate change. If the U.S. were to resume participation with the international climate change community, the primary focus should be on reducing greenhouse gases as opposed to achieving 100% renewable energy.

In June 2015, Jobenomics published a 160-page book on the emerging Energy Technology Revolution (ETR), which can be downloaded for free at Jobenomics.com.[2] The objective of the ETR book is to help decision-makers and opinion-leaders focus on the strategic value of the ETR with emphasis on the economics of business and job creation—the mission of Jobenomics. Properly managed, ETR technologies, processes, systems and markets can: (1) provide affordable clean energy solutions, (2) achieve the climate change goal of limiting greenhouse emissions to a global temperature increase of 2°C over 2005 levels, and (3) improve national economies via implementing highly-scalable business initiatives that will create millions of new middle-class jobs.

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[1] United Nations Framework Convention on Climate Change (UNFCCC), United States NDC Registry, retrieved 5 June 2017, http://www4.unfccc.int/ndcregistry/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf

[2] Jobenomics, Energy Technology Revolution, http://jobenomicsblog.com/wp-content/uploads/2015/06/Energy-Technology-Revolution-18-June-2015-Reduced-File-Size.pdf

In order to achieve these three synergist goals, America (as well as the rest of world) can no longer afford a business-as-usual approach to maintaining an energy ecosystem that is dependent on aging, vulnerable and inefficient centralized energy infrastructures. The primary thrust of the ETR is that America must implement a **modern energetics architecture** that emphasizes new decentralized point-of-use systems over traditional centralized grid-based power generation systems and petroleum-based transportation. Fossil fuels are projected to be the principle from of energy production for the remainder of this century even with rapid advances in renewables and electric vehicles. The dream of 100% renewable energy, an important and worthy goal, will likely take a century to accomplish without significant disruption to national economies (Trump's major concern). Energy efficiency will move from the "hidden fuel" to a "first fuel" exceeding output from any other supply-side fuel sources as well as being the major mitigator of toxic greenhouse gases—the primary objective of the Paris Accord. Gains in energy efficiency between 2015 and 2040 will restrict the U.S. Energy Information Administration (EIA)'s projected U.S. energy consumption growth to only 5% compared to worldwide growth of 28%. China, India, and the other non-OECD Asia nations account for more than 60% of the projected increase in world energy demand. U.S. technology and expertise should be available worldwide to help make energy consumption growth as clean and emissions-free as possible.[3]

Today, "dirty" fossil fuels (petroleum, natural gas and coal) constitute 83% of U.S. energy consumption. By 2050, 79% of all U.S. energy consumption will be fossil fuels, according to the EIA's 2017 Outlook Report (the leading U.S. authority on energy analytics).[4] By 2050, renewable energy (hydro, wind, solar, geothermal) will increase by only 7% (up from 7% in 2017 to 14% in 2050), largely replacing retiring coal-fired and nuclear-power electrical generation plants.

U.S. Total Energy Consumption: 2017, 2025 and 2050

Source: EIA AEO 2017 Table 1	2017	2025		2050	
Total Consumption (Quadrillion Btu)	**97.3**	**100.2**		**106.7**	
Petroleum and Other Liquids	38.2%	36.9%		36.1%	
Natural Gas	29.6%	29.1%	*% Change*	33.4%	*% Change*
Coal	14.5%	13.4%	*2017 - 2025*	9.2%	*2017 - 2050*
Nuclear	8.5%	8.1%		6.0%	
Traditional Sources	**90.8%**	**87.5%**	**-3.3%**	**84.7%**	**-6.1%**
Renewable Energy	**9.2%**	**12.5%**	**3.3%**	**15.3%**	**6.1%**
Conventional Hydroelectric Power	2.6%	2.9%		2.8%	
Renewables (Wind, Solar, MSW, etc.)	3.4%	6.2%		9.1%	
Biomass	2.8%	2.9%		2.9%	
Other (e.g. hydrogen, imports)	0.3%	0.4%		0.4%	

[3] U.S. Energy Information Administration, Today In Energy, 14 September 2017, EIA projects 28% increase in world energy use by 2040, https://www.eia.gov/todayinenergy/detail.php?id=32912&src=email

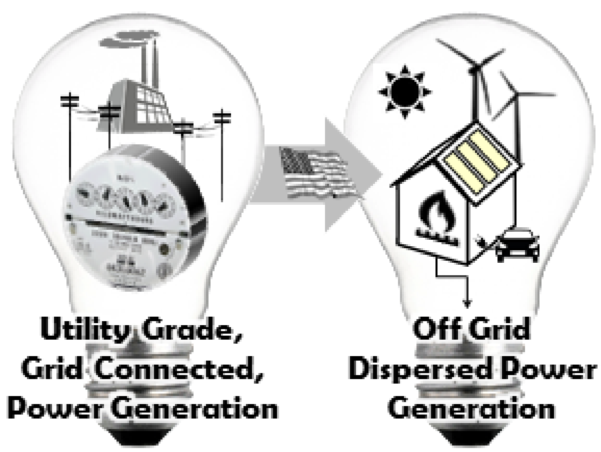
[4] U.S. Energy Information Administration, Annual Energy Outlook 2017, Table 2 - Energy Consumption by Sector and Source, 5 January 2017, https://www.eia.gov/outlooks/aeo/

According to the U.S. Energy Information Agency's Annual Energy Outlook 2017 data, by the 2025 Paris Agreement deadline, the United States is forecast to transition **only 3.3%** of its energy consumption from traditional to renewable fuels. Even more surprisingly, by mid-century (2050), Americans are projected to transition from traditional sources by only 6.1% from fossil to renewable fuels.[5] According to this official U.S. government data, it is obvious that the United States was never really capable of implementing its "nationally determined contributions" (NDC) as proclaimed on the United Nations Framework Convention on Climate Change (UNFCCC) NDC website.[6] A 3.3% reduction in fossil fuel consumption and burning will not generate a 28% decline in greenhouse emissions by 2025.

Consequently, it should not be too surprising that the Trump Administration, which inherited an unrealistic NDC commitment, would act in the manner that it did by pulling out of the Paris Agreement. Contrary to popular opinion, President Trump's walking away from the Paris Accord could be a positive action from a climate change perspective. President Obama's evangelical and activist approach to the renewable energy promise brought the world to the climate change table in Paris. President Trump's hardnosed approach has now renewed the climate change debate with a new sense of urgency and energy. Perhaps, now Americans can get down to a realistic **energetics** strategy with measurable and achievable milestones to combat the ravaging effects of manmade climate change while simultaneously promoting economic development.

Energetics (also called energy economics) is the study of energy conversion or energy transformation. Examples of energy conversion include transformation of electricity-to-light, fuel-to-kinetic energy, water power-to-mechanical power, and biomass-to-heat. For millennia, the focus of energy conversion has been on the supply-side of the energy ledger—the side closest to the producer or supplier. The future is on the demand-side—the side closest to the consumer or point-of-consumption.

There are essentially three energetics architectures: (1) large-scale, centralized, **utility generation** designs engaged in selling electric energy to the public, (2) grid-connected **distributed generation** designs intended to directly offset retail sales, and (3) small-scale, off-grid **dispersed generation** designs.



Utility-scale and distributed generation designs are supply-side oriented, whereas dispersed generation focuses on demand-side energetics at the point-of-consumption. Today, dispersed off-grid generation

[5] U.S. Energy Information Agency's Annual Energy Outlook 2017, Table 1, Total Energy Supply, Disposition, and Price Summary, https://www.eia.gov/outlooks/aeo/

[6] United Nations Framework Convention on Climate Change (UNFCCC), United States NDC Registry, retrieved 5 June 2017, http://www4.unfccc.int/ndcregistry/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf

is usually considered an anomaly best used for remote applications where grid-connected electricity is cost-prohibitive. Jobenomics disagrees and asserts that off-grid, net-zero dispersed energy systems are ready and should be viewed as a viable alternative to centralized grid-based systems. Net-zero energy buildings/ communities are entities that create enough on-site energy to satisfy their internal energy needs without having to rely on external sources.

Furthermore, Jobenomics believes that America should strive to be demand-driven where every building and every community is energy sufficient—able to produce and store the energy it needs—at the point-of-consumption. Integration of dispersed generation with existing grid-centric electric power system will not be easy mainly due to the massive political, regulatory and legal power of the major utility companies—as evidenced by *Energiewende*.

Germany's *Energiewende* (German for energy transition) is a national initiative to transition Germany from fossil and nuclear fuels to a renewable energy target of 60% by 2050. To achieve this goal, the German government is restructuring their largest German utilities, into essentially good and bad technology companies. The "bad utilities" are focused on shuttering fossil fuel and nuclear businesses, while the "good utilities" are focused on growing renewable suppliers and developing new service businesses, such as smart metering, distributed generation management, consumption analytics and energy management. It will be fascinating to watch *Energiewende* transform the German energy sector from a centralized model to a more decentralized, distributed model. Lessons learned will be especially valuable for policy-makers in democratically-elected Western economies.

California has its own version of *Energiewende*. According to California's governor, "California has the most far-reaching environmental laws of any state and the most integrated policy to deal with climate change of any political jurisdiction in the Western Hemisphere."[7] In his 2015 Inaugural Address, Governor Brown announced three ambitious new 2030 goals: increase from 33% to 50% electricity derived from renewable sources; reduce automotive petroleum by up to 50%, and increase building efficiency and clean heating fuels by 100%. In 2017, the California Senate has proposed increasing the renewable target to 60% by 2030. To achieve these goals, California's energetics architecture is replete with more distributed power, expanded rooftop solar, micro-grids, an energy imbalance market, battery storage, integrated information technology and electrical distribution, and millions of electric and low-carbon vehicles. These mandates were implemented by executive order by the Governor and enforced by the California Public Utilities Commission.

Today's supply-side energetics architectures are inefficient, given existing and emerging ETR technologies, processes and systems. America produces and distributes electricity, heat and transportation fuels primarily by a centralized supply-side approach. America's supply-side energetics model was originally created to deliver energy from principal sources of energy, such as coal mines, oil refineries, rivers, dams and ports. This energy was then delivered over long distances to population and industrial centers. Substantial losses occur across the entire energy value chain, whether it is in production or generation, during distribution over 5 million miles of pipelines and electrical grids, or in inefficient burning or waste heat loss at the point-of-consumption. A 2012 EIA

[7] Office of Governor Brown, Inaugural Address, 5 January 2015, http://gov.ca.gov/news.php?id=18828

report states that “roughly two-thirds of the fuels used for generation are lost in the generation and distribution of electricity.” [8]

The bulk of the losses occur at the generation facility. The most efficient electrical power generation plants are hydro and tidal power plants with 90% power efficiencies (i.e., the amount of potential or kinetic power turned into electricity). Natural gas plants are roughly 60% efficient. Nuclear, coal and oil-fired plants are 40% efficient. The most inefficient are today’s solar and geothermal plants with 15% to 20% efficiencies. However, new technology and cogeneration systems are rapidly enhancing energy efficiencies of these plants.[9] Cogeneration technologies have double the energy efficiencies of combined heat and power plants.[10] Cogeneration involves the recovery of otherwise-wasted thermal energy to produce electricity or heat. Despite a number of recent success stories, supply-side energetics are reaching the point of diminishing returns compared to demand-side energetics.

The second greatest amount of supply-chain electrical losses occurs during transmission and distribution. The U.S. electrical grid is the world’s largest commercial monolith, annually distributing $366 billion worth of electricity over 3 million miles of power lines from 7,000 power plants that are owned by 3,300 utility companies who employ 500,000 people who service 159,000,000 American customers[11,12]. Unfortunately, this 50-year old monolith is aging, requiring tens of billions of dollars to maintain annually and investments of up to $2.0 trillion[13] by 2030 to modernize and protect. According to a recent analysis[14] of federal energy records, about once every four days, part of the nation's power grid is struck by a cyber or physical attack. A 2014 testimony[15] by Admiral Rogers (NSA Director) to Congress revealed the possibility of a major Chinese or Russian cyberattack against the U.S. power grid, which could cause cascading regional blackouts lasting days to months—with major economic damage and loss of life.

Electricity Related Losses during Transmission & Distribution

Source: EIA Annual Energy Outlook 2017, Table 2, Year 2017

Quadrillion Btu	Commercial	Residential	Industrial	Transportation	Grand Total
Delivered Energy	8.82	10.90	24.95	28.40	**73.08**
Electricity Related Losses	**9.01**	**9.37**	**6.41**	**0.08**	**24.87**
Total	17.83	20.27	31.37	28.48	**97.96**
Losses % of Total	**51%**	**46%**	**20%**	**0.3%**	**25%**

[8] EIA, Today In Energy, Energy Perspectives, 18 December 2012, http://www.eia.gov/todayinenergy/detail.cfm?id=9250
[9] EIA, What is the efficiency of different types of power plants?, https://www.eia.gov/tools/faqs/faq.php?id=107&t=3
[10] EPA, Combined Heat and Power Partnership Efficiency Benefits, http://www.epa.gov/chp/basic/efficiency.html
[11] American Public Power Association, 2014-2015 Annual Directory & Statistical Report, U.S. Electric Utility Industry Statistics, http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf
[12] Edison Electric Institute, Electricity 101, http://www.eei.org/electricity101/pages/value.aspx
[13] U.S. Quadrennial Energy Review, Summary For Policymakers, Aging Infrastructure and Changing Requirements, Page S-4, http://energy.gov/sites/prod/files/2015/04/f22/QER%20Summary%20final_1.pdf
[14] USA Today, 27 March 2015, http://www.usatoday.com/story/news/2015/03/24/power-grid-physical-and-cyber-attacks-concern-security-experts/24892471/
[15] C-Span, 20 November 2014, Cyber Threats, http://www.c-span.org/video/?322853-1/hearing-cybersecurity-threats

The U.S. energy consumption in 2017 is projected to be 97.96 quadrillion Btu across all sectors from all sources.[16] Of the 97.96 quads, 25% will be electricity related losses in electricity transmission and distribution. However, energy losses vary significantly by sector. About half of the energy that commercial and residential consumers purchase is lost (51% and 46% respectively), whereas industrial plants operate more efficiently with electricity related losses of only 20%. Since the transportation is largely petroleum-based, its electricity related losses are minimal. The widespread adoption of electrical vehicles is likely to change the transportation equation.

From an energetics architecture perspective, wouldn't it be much wiser to generate electricity as close to the light bulb as technically possible as opposed to generating it miles away? Disbursed demand-side energetics architectures offer much higher potential for energy efficiency by producing energy on-site. If residences and businesses could produce and store energy on-site, there would be little need for outside electrical supply and expensive utility-grade electrical grids. The problem with on-site power generation has been the high cost of dispersed generation equipment. However, this is changing. Dispersed generation is becoming increasingly affordable to individual homeowners and small businesses due to lower installation costs, lower operational costs, smarter information and network technologies, and innovative leasing, subscription and net-metering services.

An analysis by the Energy Department's National Renewable Energy Laboratory (NREL) estimates that U.S. building rooftops could generate close to 40% of national electricity sales using rooftop photovoltaic (PV) systems.[17] Jobenomics thinks that NREL's 40% rooftop estimate is likely to be a conservative estimate considering the advent 3rd generation PV systems that could be used throughout the exterior of the building as opposed to only rooftops. 1st generation silicon solar panels and 2nd generation solar thin-film photovoltaic technologies are restrained by the Shockley-Queisser limit of 34% power efficiency (the amount of sunlight power turned into electricity), whereas 3rd generation multi-layer solar cells may be able to approach efficiencies near 86%. Consequently, next-generation solar systems are likely to be much more efficient and significantly cheaper than current 1st generation solar panels. In addition to efficiency, multi-layer solar cells are likely to have vastly greater applications, such being embedded in roofing shingles (already happening) as well as window glass and vinyl siding appliques.

Dispersed electrical generation is not a new concept. In fact, it is often the dominant way of doing business in many parts of world that are dependent on diesel-powered generators as opposed to 24/7 electrical power supplied by utilities. In the United States, there are approximately 12 million residential electrical generators: 9 million used for emergency or backup power and 3 million for primary power. From an environmental perspective, most of the 9 million emergency generators are noisy and dirty and limited to 200 hours per year. The 3 million primary power generators are generally more expensive due to cleaner burning fuels (propane), better fuel efficiencies and more interconnectivity to household systems. As renewable energy costs decrease, the likelihood of mass deployment of residential dispersed electric and heat generation will increase.

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[16] EIA, Annual Energy Outlook 2017, Table 2, Energy Consumption by Sector and Source http://www.eia.gov/forecasts/aeo/

[17] National Renewable Energy Laboratory, NREL Raises Rooftop Photovoltaic Technical Potential Estimate, 24 March 2016, http://www.nrel.gov/news/press/2016/24662

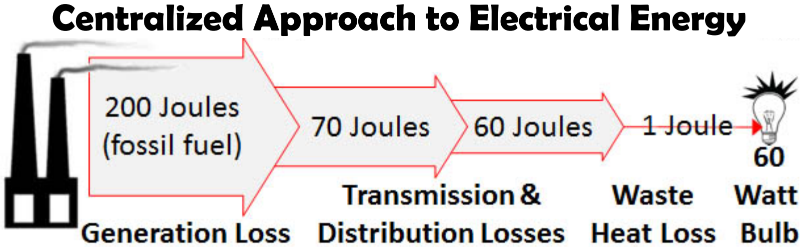
Few American policy-makers realize that gains in demand-side energy efficiency has produced far greater gains in energy conservation and greenhouse gas mitigation than all renewable energy advances combined. The IEA's inaugural 2013 Energy Efficiency Report[18] states that energy efficiency savings from 11 developed economies[19] are equivalent to one-quarter of all petroleum products consumed annually by the U.S. transportation sector.

Energy efficiency has moved from the "hidden fuel" to the "first fuel," exceeding output from any other supply-side fuel sources. In 2010, this new first fuel reduced total fuel consumption in the 11 IEA member countries by an estimated 65%. By reducing demand at the point-of-consumption, energy efficiency enables energy conservation, reduces the pressure on the energy infrastructure, augments energy assurance and security, and improves health and wellness via mitigation of toxic emissions.

For a modern energetics architecture to be truly transformative, policy-makers must focus on the demand-side of the equation. A majority of 150 million U.S. homes and small businesses could be energy efficient or energy independent within a few decades. In addition, a distributed/dispersed, point-of-consumption, intelligent architecture that integrates multi-sources of indigenously-produced energy (wind, solar, biomass, geothermal, hydro and/or natural gas) could produce many millions of net new jobs nationally and tens of millions internationally. If underwritten by government loans and guarantees, like the government does for mortgages, demand-side energetics is likely to attract significant private sector investor interest.

Fortunately, the Trump Administration does not have to start from scratch on a modern Demand-Side Energetics Architecture. As mentioned earlier, California has its own version of *Energiewende* which was largely implemented by executive order by the Governor and enforced by the California Public Utilities Commission. Along with other states, the Administration could use California as model and work with Congress to implement an aggressive Energetics/Climate Change architecture that could create tens of millions of jobs, millions of startup businesses, boost GDP, protect the environment and significantly reduce consumption by generating power at the point of consumption. The Trump Administration could also attract Demand-Side Energetics visionaries like Elon Musk who just resigned his position on President Trump's economic advisory board in the wake of the President decision to leave the Paris Climate Accord.

Centralized Approach to Electrical Energy



[18] IEA, Energy Efficiency Unit (EEU), Energy Efficiency Market Report 2013, http://www.iea.org/publications/freepublications/publication/EEMR2013_free.pdf

[19] United States, United Kingdom, Germany, France, Italy, Denmark, Finland, Netherlands, Sweden, Japan and Australia.

Using today's centralized supply-side energetics approach to electrical power generation, less than 1% of the total energy consumed is ultimately converted into light energy. The other 99% is wasted across the supply chain. On average, 200 joules of energy are needed to deliver 1 joule of power (1 joule = 1 watt second), the amount needed to illuminate a 60 watt incandescent light bulb. By replacing the 60 watt incandescent light bulb with a 15 watt fluorescent lamp, energy efficiency increases by 75%. Replacing fluorescent lamps with light emitting diodes (LEDs) increase energy efficiency by additional 30%. Moreover, LEDs last five times longer than fluorescent lamps, which last eight times longer than incandescent bulbs.

Using demand-side energetics approach to electrical power generation and renewable energy transportation fuels, the vast amount of energy produced at the point of consumption would ultimately be converted into kinetic energy or stored as potential energy. From a Jobenomics perspective, Elon Musk's Demand-Side Energetics Architecture is not only state-of-the-art, but available now, highly-scalable and dual-use inasmuch as it can be used for both electrical power generation and transportation. Musk essentially has unified multiple Tesla/SolarCity companies (electric powertrain systems, lithium Gigafactory, home Powerwall battery storage systems, solar roofs, solar installation and maintenance services, and renewable energy financing) that can collectively produce energy at the point of use at home, in a business or on the go.

It is not inconceivable that wireless electricity (also known as wireless power transmission or electromagnetic power transfer without the use of wires or cables) that could soon be as common in the near future in homes and businesses as Wi-Fi is today. Wireless energy coupled with stationary or transportable solar power could power wireless buildings or charge portable wireless devices without the need for chargers, charging stations or batteries. The net result of such a Demand-Side Energetics Architecture could reduce energy consumption in homes and businesses by an order of magnitude. It is not hard to imagine a day when every household light and small appliance is powered wirelessly via a miniature renewable energy receiver and managed by the internet-of-things to ensure maximum energy efficiency. That day is available today. All we need is a modern Demand-Side Energetics Architecture and will to make it happen sooner than later.

About Jobenomics: *Jobenomics deals with the process of creating and mass-producing small businesses and jobs. The Jobenomics National Grassroots Movement's goal is to help facilitate creation of 20 million net new U.S. jobs within over the next 10-years. Over 20 million people have been reached by Jobenomics via its media, website and lectures, and has garnished wide-spread support for it economic development, workforce development and business development efforts. Jobenomics website and blog receives tens of thousands of page views each month with over half the viewers regularly spending over an hour of online research on the Jobenomics website. Jobenomics regularly updates its nine books and e-books (shown below) to keep its members current on the latest national and international economic and labor force issues, trends and solutions. Jobenomics research is perhaps the most complete library of employment and unemployment challenges facing the nation and world. Jobenomics also provides special reports on national and international events that impact the economy that range from the U.S. workforce development challenge to international competition in the emerging digital economy to helping solve delicate labor force issues like discontent and extremism. For more information, see Jobenomics Overview and the Author's Biography.*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A PLAN FOR AMERICA
CHUCK VOLLMER
Comprehensive U.S. Labor Force & Employment Report: Q1 2017
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Energy Technology Revolution (ETR)
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Urban Mining
Urban Agriculture (Freedom Farms)
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