

## **The Unified Energy System**

In today's energy environment, there is a growing need and expectation that our energy systems must become more and more carbon free. And indeed, Renewables are gaining larger shares of the energy pie. Last year alone, over 70 GWs of wind and solar were installed globally. Where a goal of 35% renewable energy seemed aggressive just a few years ago, new goals of 55% to 60% are now becoming the new markers of progressive energy policy. Such is the case in Austin, Texas.

However, in order to reach these percentages and higher, we need to rethink the current system.

For in today's world, we have the stationary energy grid that is our electric system. And in this system, large utilities produce and sell energy to their customers in the form of Kwhs and they send them a bill for it.

And in the world of transportation, almost all energy comes from oil. Sure, there are electric subways and the like, but most of the energy comes from oil.

In the Unified Energy Grid, utilities still sell their product to their customers but the customers also sell product back to the utility. And instead of the transportation industry running exclusively on oil, it begins to slowly become transformed by electric drive cars and other transportation appliances that connect not only to the utility, but also to the dwellings that are also energy producers. And as the future arrives, those electric powered vehicles will be able to provide energy and voltage support to the utility on the occasional peak load demand day. Moreover, larger plug in vehicles with on board generators can provide critical support and community resilience in times of storm outages.

This triangle of generation, load, and transportation, each feeding to each other and each supporting each other, is then encompassed within a sphere of intelligence, The Smart Grid. The Unified Energy System is then made complete with smart roads, smart buildings with smart appliances, and networked smart transportation options.

This grid is further supported by smart policies at the community, regional, and global level that foster and implement what R Buckminster Fuller called a Dymaxion World, which is the use of technology and resources to maximum advantage with a minimum of energy and materials.

Energy needs to flow in this new unified system from the increasingly green utility to the house and to the car. And energy needs to flow from the house to the car and from the utility to the car. And the energy must flow in both directions, from the car to the house, (if the house is off the grid), from the car to the utility (V to G), as well as from the house to the utility.

With an integrated, unified energy system, we would no longer have the waste that exists at a typical football stadium parking lot where more generation capacity sits idle on the pavement outside the stadium than exists in the whole community's electrical generation portfolio.

With Plug-in Hybrids and other electric drive transportation appliances, that capacity would no longer be stranded.

Years ago, these ideas were considered to be outside of the bell curve of accepted public policy. That was before John Wellinghoff, former head of the Federal Energy Regulatory Commission. He never used the term Unified Energy System, but he preached it.

During his FERC tenure, and as the longest serving chair of the FERC, Wellinghoff worked to make the U.S. power grid cleaner and more efficient, integrating emerging resources such as renewable energy and demand response, including energy efficiency and local storage systems such as those in plug-in hybrid and all electric vehicles.

He championed the agency's landmark Order 1000, which required grid planners and public utilities to coordinate regional power line projects and encouraged the integration of solar and wind installations. That is exactly what Texas did in building the CREZ lines in the western part of the state.

And it was before Elon Musk of Tesla began to actualize his vision.

According to Lyndon Rive, Elon Musk's cousin and CEO of Solar City, "Thanks to the economies of scale that will come from Tesla's gigafactory, within 10 years every solar system that SolarCity sells will come with a battery-storage system, says Mr. Rive, and it will still produce energy cheaper than what is available from the local utility company."

The vision of a unified world of energy where renewables, electric cars, and energy storage work together to bring about an energy transformation where energy is swapped and sold and moved about through the energy economy primarily as electricity is revolutionary. In this near future, this "photonic energy web" will ultimately become an "energy internet".

And its embodiment will be the Unified Energy System.

In the same manner that hydropower in the northwest United States powers Southern California through DC intertie, Wind fields in the Texas Panhandle may soon help meet peak demand in Phoenix, even as Solar fields east of El Paso provide peak power to Dallas, Houston, and Austin. And as we sleep, the great nighttime winds of the Llano Estacado charge our urban cars for the next day's commute. And after we commute to work, these same cars will take on excess early morning solar power from local rooftops that will be repurchased in the afternoon at premium prices by the system operator.

And through this unification of effort and design, human kind will find that we will not only meet the great challenges that face us, we will create a better and more resilient world in doing it.